Wicked complexity in surgical services: analysing perioperative high-risk, work practice organisation and context for future policy implementation

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Wicked complexity in surgical services: analysing perioperative high-risk, work practice organisation and context for future policy implementation

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Thesis submission for the degree of Doctor of Philosophy

Thesis Title and Abstract | Declarations | Inclusion of Publications Statement | Corrected Thesis and Responses

Thesis Title

Wicked complexity in surgical services: analysing perioperative high-risk, work practice organisation and context for future policy implementation

Thesis Abstract

Title: **Wicked complexity in surgical services: analysing perioperative high-risk, work practice organisation and context for future policy implementation**

Background: Knowledge of perioperative risk and context are important as year-on-year the global volume of surgery is increasing. Despite decades of policy responses to surgical demand, national registries and local evidence report that a distinct cohort of surgical patients have a higher-than-average risk of complications with added costs to quality of life and service sustainability. The research aim was to examine the impact of context on how in practice the perioperative workforce (comprising clinicians and managers) understand risk, and how this knowledge influences their work practices and use of resources. Three questions were investigated: what has been the impact of health policy on the organisation and practice of perioperative care; how is perioperative work practice organised around low, intermediate and high-risk patients; and what do individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient?

Methods: Mixed methods study. The research setting was four university adult general hospitals (113, 360, 440, 547 bed capacity) in a health district in NSW, Australia. Institutional ethics approved a mixed methods study – site observation (187 hours), secondary documents (223 documents: paper and electronic), survey (113 completed) and interviews (143 conducted). Purposive sampling targeted 129 participants in 167 roles, including multidisciplinary clinicians (nurses, doctors and allied health) in senior and junior roles, and managers. Data collection (September 2017 – June 2019) and analysis was conducted using a parallel convergent design through triangulation with descriptive statistics and thematic analysis.

Results: National and state health policies that focused on access and efficiency successfully addressed high volume surgical demand for low and intermediate risk patients in predictable, reliable and linear perioperative business process models (BPMs). However, the policies are now three decades old, have resulted in unintended consequences and not addressed the clinical and organisational complexity evident in the three larger hospitals today. The high-risk complex care surgical patient traversed parallel BPMs that were not linear but rather, unpredictable complex adaptive systems. High-risk patients had more invasive surgery and the challenges of chronic multisystem disease and ageing. Complications were more common and cumulative with increased utilisation of hospital resources across multiple fragments of perioperative care; increasing specialty specific expertise were co-opted from multiple clinical disciplines, multiple 'one-off' teams were deployed for rescue, resuscitation, and critical care. Complications were associated with months-long hospital stays, discharge to a care level higher than home and readmissions.

For high-risk patients the impact of context on the perioperative workforce caring for them could be synthesised as a wicked complexity in perioperative context (WC_{PC}). Wicked complexity is a complexity that was unintended, unwarranted and promulgated by the behaviours of the practice environment. Three research arcs were identified. In the policy arc, at the intersections of the three themes of compression of time and space, fragmentation of care and clinical complexity, there was a wicked complexity in competing priorities and demands (WC_{CPD}) arising from the pressure on clinicians and managers to deal with the 'here and now' and not delay care processes downstream. In the risk and practice arc, at the intersections of the three themes of multiple incomplete understandings of high-risk, work practice organisation and an unclear patient outcome measure, there was a wicked complexity in gaps in fully comprehending high-risk (WC_{GFCHR}). In the interprofessional arc, at the intersections of the three themes of professional immersion, multiple formations of perioperative teams and using technology, there was a wicked complexity in gaps in perspective (WC_{GP}). Service sustainability in the perioperative system evolved to encompass WC_{PC}. WC_{PC} was the outcome and rendered solutions clinicians, managers and the organisation derived by continually adjusting elements of care to address current challenges. Wicked complexity in perioperative context is represented by the equation:

$WC_{PC} = WC_{CPD} + WC_{GFCHR} + WC_{GP}$

Discussion: Continually adjusting elements of perioperative care to address current challenges is supported by frontline clinicians and the initiatives of local and international medical colleges and societies However, the consequences of continuing this strategy alone without acknowledging and addressing WC_{PC} , include: the potential practical inability of the majority of clinicians and clinician managers to be involved with new initiatives as they continue to struggle with competing priorities and demands in day-to day practice, the organisational gaps in fully comprehending high-risk and the cultural gaps in perspective.

The research shows that what is critically needed is a commonly agreed and complete definition of perioperative high-risk that considers the impact of context and culture. The impact of context on the perioperative workforce and their patients can be clearly analysed and articulated. Addressing WC_{PC} systematically enables the charting of an evolving course to equip clinicians and managers to: deal with the impact of context, face economic challenges to service sustainability and address the needs of the high-risk complex care perioperative patient.

It is necessary and time to revisit a policy strategy that was successful short-term, a workforce generation ago when surgical services were first re-engineered. Namely, an investment in leadership for the future, capable of generating the solutions to optimising care for the high-risk surgical patient, both clinically and contextually. This may only be achieved through interprofessional education and collaboration at all levels of policy enactment, across all professions. The health services research perspective that enabled defining WC_{PC} could work to simultaneously address clinical complexity, context and culture.

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Mixed methods study. The research setting was four university adult general hospitals (113, 360, 440, 547 bed capacity) in a health district in NSW, Australia. Institutional ethics approved a mixed methods study – site observation (187 hours), secondary documents (223 documents: paper and electronic), survey (113 completed) and interviews (143 conducted). Purposive sampling targeted 129 participants in 167 roles, including multidisciplinary clinicians (nurses, doctors and allied health) in senior and junior roles, and managers. Data collection (September 2017 – June 2019) and analysis was conducted using a parallel convergent design through triangulation with descriptive statistics and thematic analysis.

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Glossary of terms

Term	Meaning
Allied Health	Allied health professionals include physiotherapists, occupational therapists, dieticians, speech therapists and pharmacists.
Clinical complexity	Clinical complexity is characterised by a complicated process with multiple interconnected steps, where the condition of the patient is unstable, rapidly changing or not easily understood by one medical specialty alone, and required multiple points of negotiated communication or discussion, between diverse members of the healthcare organisation, to arrive at the best next step.
Clinical reasoning	Clinical reasoning is a context dependent way of thinking and decision making in professional practice to guide practice actions.
Complex adaptive systems	Complex adaptive systems are non-linear models of care that are capable of reorganising and reacting to changes in patients' medical conditions for their resource deployment.
Complicated care	Complicated care is characterised as requiring multiple interconnected technical steps to be undertaken for the process to be completed.
Complication	A secondary pathological process or condition aggravating an already existing one.
Compression of time and space	The perception that time and space availability, to simultaneously care for patients across multiple discrete locations in day-to-day practice, is limited and reducing.
Construct	An idea or theory that is formed by or contains various conceptual elements.
Context	The circumstances or conditions that form the setting for perioperative policy enactment and, in terms of which policy enactment can be fully understood.
Episode of perioperative care	An episode of perioperative care is defined as the continuum from preoperative contemplation of surgery in primary care, to hospitalisation for intraoperative surgery-procedure-anaesthesia and postoperative acute care, then back to primary care for rehabilitation.

Term	Meaning
Evidence-based medicine	EBM is the practice of applying valid evidence and data to a specific clinical question engendered during patient care.
Evidence-based health policy	Evidence-based health policy is defined as the interaction between Evidence-Based Medicine (EBM) and Health Policy (HP). Evidence based health policy (EBHP) extends the construct of EBM to encompass governance for populations of patients and is defined broadly as encompassing courses of action or inaction, that government may initiate that affect the set of institutions, organisations, services, and funding relationships of the health system.
Failure in escalation of care	Failure to recognise and communicate patient deterioration to a senior colleague.
Failure to rescue	Death after a complication.
Fragmentation of care	Fragmentation of care is the separation of components of perioperative care into specialised but isolated, incomplete parts of the whole care process.
High perioperative risk	A greater likelihood that a patient will suffer a complication such as organ injury, disability, or death as the result of having surgery and anaesthesia.
Interprofessional collaboration	Interprofessional collaboration is the action of working with multiple professions, sharing professional and other expertise, to create a new work practice from existing components.
Knowledge broker	An individual clinician whose team role in perioperative teams is characterised as one that crossed professional and structural boundaries facilitating interprofessional collaboration.
Linear systems	Linear systems tend to have standard, fixed components, for example staffing, and are focused on specific pathways and outcomes.
Multidisciplinary cooperation	Multidisciplinary cooperation involves sharing professional expertise with mutual assistance in working towards a common goal.
Multidisciplinary team	A multidisciplinary team consists of two or more disciplines – branches of learning and instruction. Each of the professions within a multidisciplinary team made up a uni-disciplinary team.

Term	Meaning
Opportunity cost	An opportunity cost is the foregone benefits from other alternative actions, when one action is selected and resourced over the others.
Organisational culture	A set of shared values and norms that guide the actions of people in their day-to-day work. It is an ongoing interactive process operating between individuals and the systems in which they work.
Perioperative system	A perioperative system is characterised by an assemblage of components of healthcare delivery, that form a complex or unitary whole, across a perioperative continuum of pre-, intra-, and post-operative phases.
Perioperative teams	Perioperative teams comprise multiple team formations for a high-risk patient's episode of care. Perioperative team orientation for individual clinicians and managers - that is, their ability to locate themselves in time, space and people - is both uni-disciplinary and multidisciplinary, perioperative team roles are stationary or boundary crossing.
Perspective	The ability to regard all the relevant components of perioperative healthcare delivery in a meaningful relationship.
Professional immersion	Professional immersion is the process that individual clinicians and managers follow in order to develop their expertise in managing and understanding high-risk patients.
Rehabilitation	Rehabilitation is the process to restore to former capacity or to a good condition of health.
Separations	NSW Health Data Collection by source systems administrators - Patients are assigned separation codes as they undergo a clerical registration process, are provided assessment and/or treatment of their condition and leave or depart to a location outside of the hospital.
Shared decision making	Shared decision making is a process where the patient and clinician jointly come to an understanding of the patient's values, goals, preferences together with the best available evidence about the benefits, risks and uncertainties of proceeding to surgery and anaesthesia or alternate treatment and care, including ceilings of care. The purpose of shared decision making is to come to the most appropriate healthcare options for that person.

Term	Meaning
Specialisation	Specialisation is the process of concentrating on and becoming expert in detailed profession specific knowledge or a particular component of perioperative care.
Wicked complexity in perioperative context	Wicked complexity in perioperative context is a new form of complexity, a counterproductive situation that is unintended, difficult to overcome, embedded deep in context, dynamic and caused by the very people tasked with planning and delivering safe value-based surgical services.

List of Abbreviations

Term	Meaning
ACI	Agency for Clinical Innovation
BPM	Business process model
CAS	Complex adaptive system
CC	Clinical complexity
CNC	Clinical nurse consultant
CNE	Clinical nurse educator
CNS	Clinical nurse specialist
CTS	Compression of time and space
DA	Documents amalgamation
DOS	Day-only surgery
DCS	Director of Clinical Services
DON	Director of Nursing
DOS	Day-only surgery
DOSA	Day of surgery admission
EBHP	Evidence-based health policy
EBM	Evidence-based medicine
EDO	Extended day-only surgery
eMR	Electronic medical record
ESWT	Elective Surgery Waiting Times
FC	Fragmentation of care
FEOC	Failure in escalation of care
FTC	Failure to rescue
HVSSS	High volume short stay surgery
IDS	Interview data sheet
JRMO	Junior Resident Medical Officer, or junior doctor
LHD	Local Health District
MET	Medical Emergency Team
MOH	Ministry of Health
MDT	Multidisciplinary team
4HR/NEAT	National Emergency Access Target
NEST	National Elective Surgery Targets
NUM	Nurse Unit Manager
POT	Perioperative teams
PI	Professional immersion
PPPT	Pre-Procedure Preparation Toolkit
PT	Perioperative Toolkit
SDS	Survey data sheet
SDM	Shared decision making
STC	Systematic text condensation
TDEQ	Thematic display of exemplar quotes
UPOM	Unclear patient outcome measure
UHR	Understandings of high-risk
UT	Using technology
WC	Wicked complexity
WC_{PC}	Wicked complexity in perioperative context
WC_{CPD}	Wicked complexity in competing priorities and demands
WC_{GFCHR}	Wicked complexity in gaps in fully comprehending high-risk
WC_{GP}	Wicked complexity in gaps in perspective
WPO	Work practice organisation

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For my family, Andrew, Mei, Ren and Xavier, and my parents Koon Chan and Yit Kim – may we be so blessed as to remain in the Light of our Saviour, Jesus Christ.

I have loved you with an everlasting love, I have drawn you with loving kindness

Jeremiah 31:3

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Chapter 1 Introduction

1.1 Background

Life expectancy is increasing all over the world and, people are living longer with chronic diseases (AIHW AH 2018, AIHW ESWT 2017-2018, Weiser 2016). This is happening in parallel with major advances in medical technology (AMA 2019, SMH 2019, AIHW AH 2018, AIHW ESWT 2017-2018, PC 2017a, PC 2017b, PC 2005, SMH 2005a, SMH 2005b). Medical advances have generated the ability to offer more complex and/or new procedures, to high-risk patients (PC 2017a, PC 2017b, Weiser 2016, PC 2005). These advances can either result in better functional capability (that is, reduce mortality and improve health outcomes) or they also sometimes, may give rise to negative effects such as permanent physical harm to the individual and/or increasing high costs to the health system (Kahan 2017, ISOS 2016, Devereaux & Sessler 2015, Grocott & Mythen 2015, Johnston 2015, Story 2010, Hamel 2005, Khuri 2005, IOM 2001). Dying in the operating theatre is a rare event today but disability and dying after the operation is not, particularly in patients with multiple chronic diseases and including some elderly patients (Kahan 2017, ISOS 2016, Devereaux & Sessler 2015, Grocott & Mythen 2015, Johnston 2015, NCEPOD 2011, Story 2010, Hamel 2005, Khuri 2005, IOM 2001).

Providing access to surgical services is well established as a necessary and expensive, independent and constituent, part of any public health system (AIHW AH 2018, AIHW ESWT 2017-2018, Weiser 2016). Currently, the global volume of surgery is estimated at 312.9 million operations per single year and rising (Weiser 2016). The American College of Surgeons (2007) describe surgery as:

> *Surgery is performed for the purpose of structurally altering the human body by incision or destruction of tissues and is part of the practice of medicine. Surgery also is the diagnostic or therapeutic treatment of conditions or disease processes by any instruments causing localized alteration or transportation of live human tissue, which include lasers, ultrasound, ionizing radiation, scalpels, probes, and needles. The tissue can be cut, burned, vaporized, frozen, sutured, probed, or manipulated by closed reduction … or otherwise altered by any mechanical, thermal, light-based, electromagnetic, or chemical means. Injection of diagnostic*

or therapeutic substances into body cavities, internal organs, joints, sensory organs, and the central nervous system is also considered to be surgery … All of these surgical procedures are invasive… Patient safety and quality of care are paramount. [ACS 2007 p2]

Associated with surgery is anaesthesia. The Australian and New Zealand College of Anaesthetists describe general anaesthesia as:

General anaesthesia involves putting a patient into a medication-induced state of carefully controlled unconsciousness. When the anaesthetic is deep enough, the patient will not respond to pain. It also includes changes in breathing and circulation. During a general anaesthetic, the anaesthetist is constantly monitoring the patient to manage the airway, blood circulation and general responses…Core anaesthesia practice involves assessing patients thoroughly and applying both physiological and pharmacological knowledge to best care for them through surgery. [ANZCA webpage 2021]

For three decades, perioperative systems have been restructured through policy, in a hierarchical manner (MacLellan 2012, MacLellan 2008, NSW_ACI_PSP_2004). Leadership models for surgery reflect this format and have not evolved in parallel with the increasing number and complexity of both our medically high-risk patients, and the systems and processes they navigate (Peden 2019, Oliver 2018, Grocott & Mythen 2015, Freidrich 2009, Porter & Teisberg 2006, IOM 2001). This one-dimensional hierarchical type of leadership is not appropriate to address the current, and growing, complexity of our patients and hospitals (Peden 2019, Oliver 2018, Freidrich 2009, Porter & Teisberg 2006). Despite decades of experience and organisational change to sustain access and affordability, and improve safety, the challenges seem intractable and even more complex than before (AMA 2019, SMH 2019, AIHW AH 2018, AIHW ESWT 2017-2018, PC 2017a, PC 2017b, PC 2005, SMH 2005a, SMH 2005b).

The rate of perioperative innovation has been linear, achieving greater efficiency and enhancements in care quality for low and intermediate risk patients (MacLellan 2012, MacLellan 2008, NSW_ACI_PSP_2004). This has led to the situation today: complex high-risk patients in an increasingly complex hospital system where resources are used in an uncoordinated or inefficient manner (Grocott & Mythen 2015, IOM 2001). Medically complex patients require multidisciplinary team-based care to avoid and manage, anticipated and unanticipated, complications of care (Peden 2019, Pinto 2019, Oliver 2018, Ravikumar 2010, Freidrich 2009).

The focus of the thesis is how health care organisations and their workforce continue to respond to the threefold challenges of, meeting public demand for safe quality surgical care; managing resource constraints; and identifying and managing the high-risk high-cost patient cohort. Inattention to the high-risk patient cohort threatens the sustainability of surgical services, and health services more broadly (AIHW AH 2018, AIHW ESWT 2017-2018, PC 2017a).

Value-based health care is a strategy to address the sustainability of healthcare systems (Koff & Lyons 2020, PC 2017a, PC 2017b, Porter & Lee 2013, Blumenthal & Dixon 2012, Porter 2009). Value-based healthcare is understood as the impact of funding invested into the health system against outcomes achieved (Porter & Lee 2013, Porter 2009). There are six independent components of the value based health care model for change (Porter & Lee 2013 p 52): organising around a patient's medical condition rather than physicians' medical specialty; integrating care across facilities; expanding geographical reach of excellent services; building an enabling information technology platform; measuring costs (using economic evaluation modelling) and outcomes valued by patients; and developing bundled prices for full care cycles.

Sustainability is aligned with a transformation of health financing across the United States of America, United Kingdom, Europe and Australia. This transformation attempts to reduce the healthcare cost curve through governments moving away from being a passive funder to becoming an active purchaser of healthcare (Koff & Lyons 2020, PC 2015, Blumenthal & Dixon 2012). This is seen in a shift in the funding model from a volume based (fee-for-service) to a value based (pay-for-performance) payment system (PC 2015, Blumenthal & Dixon 2012). A value-based healthcare approach addresses the Institute of Medicine's 'triple aim' of better patient experience of care, better population health and improved efficiency (Porter & Lee 2013, Porter 2009). The Australian and NSW governments link the high-risk, high-cost surgical patient cohort with a value-based proposition for change (Koff & Lyons 2020 PC 2017a, PC 2017b). High-risk patients by definition are more likely to suffer an adverse event in the course of healthcare delivery and, when they do, their cost of care escalates (PC 2017a, PC 2017b). An adverse event related to surgery acts in opposition to the 'triple aim' - it is a negative experience of care for individual patients; it is inefficient requiring extra resources to address the complications; it competes for healthcare funding for hospital care, and away from community population health initiatives that promote health and disease prevention. Adverse outcomes in high-risk patients from surgery lead to an unsustainable health system (PC 2017a, PC 2017b, Porter & Lee 2013, Porter 2009).

1.2 The case for the research

Context was identified as an important constituent in the perioperative healthcare domain, frequently acting as a moderator of change, influencing what people think and do and how they interact and learn (Buse 2011). The impact of context gave rise to five significant reasons that impel this study.

1.2.1 Public demand for surgery

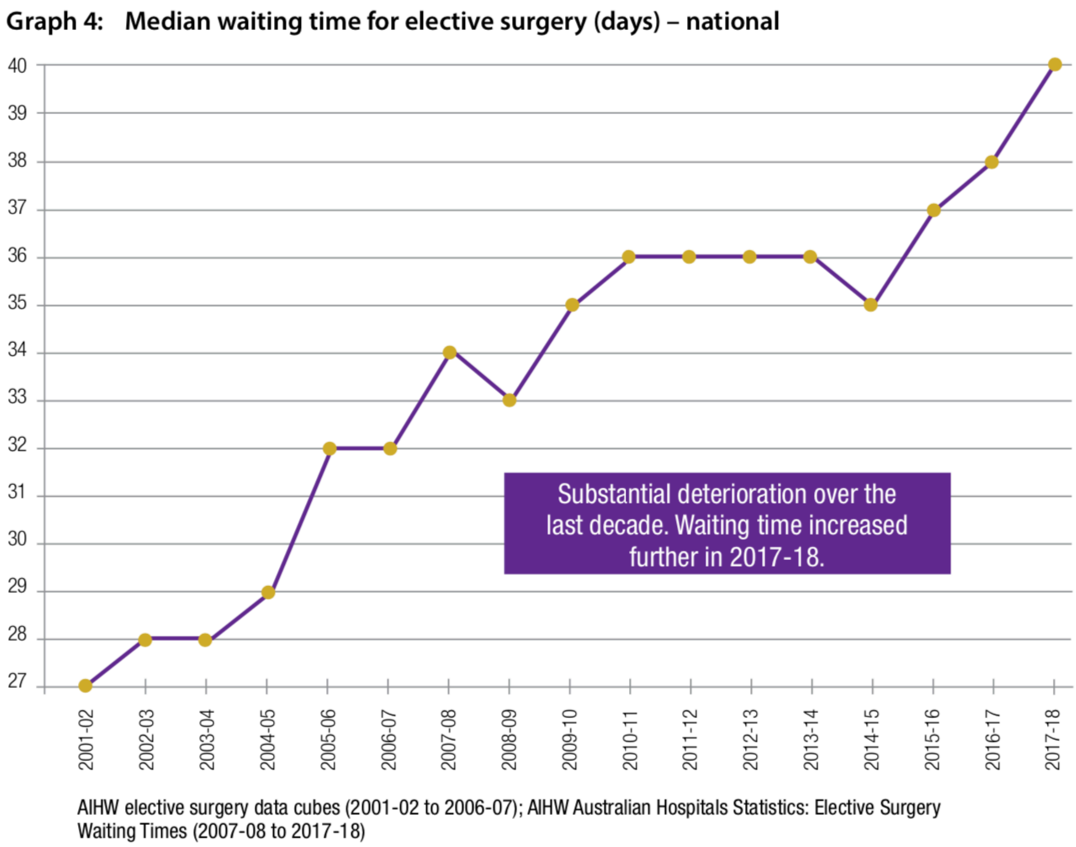
The first significant reason for the study is the need for public hospitals to meet the public demand for safe quality surgery in NSW, Australia (AIHW ESWT 2017-2018). Elective surgery waiting times have been growing longer over time:

> *"… the median waiting time for elective surgery has risen since 2013–14. It was 36 days in 2013–14, 37 days in 2015–16, and 40 days in 2017–18. In 2017–18, across the states and territories, the median waiting time for elective surgery ranged from 23 days in the Northern Territory to 55 days in New South Wales*"

(AIHW ESWT 2017-2018 p. iv)

The Australian Medical Association (AMA) in their Public Hospital Report Card 2019 concluded that this was the worst performance against this measure since 2001-2002 (AMA 2019 p8). The increase in waiting time, across the last two decades has increased, year on year (Figure 1.1).

Figure 1.1 Elective surgery waiting times (AMA 2019 p8)



1.2.2 Finite resources and value-based healthcare

The second significant reason is the need to manage resource constraints. Over decades, demand for surgery and resource constraints are the two interrelated drivers for change and innovation in surgical services provision. Australia's total health expenditure increased from $113 billion in 2006–07 to $170 billion in 2015–16, an annual average rate of 4.8% (AIHW AH 2018 p.54). Gross domestic product (GDP) had an average annual growth rate of 2.8% between 2006–07 and 2015–16 (AIHW AH 2018 p.55). This means the growth in health expenditure was greater than the growth in the economy as a whole and, was also greater than the growth in the population (AIHW AH 2018 p.55).

That is:

> *"the largest proportion of expenditure for 2015–16 was for public hospital services ($51 billion)"*

(AIHW AH 2018 p.58)

There is the day-to-day need to manage shared resources in public hospitals. In a media release on December 6, 2018, the Australian Institute of Health and Welfare (AIHW) introduced two related reports informing that waiting times for emergency department care and elective surgery, are steadily rising (AIHW 2018). Associated with the provision of surgical services, is the growing need for public hospitals to also provide beds and other resources, for patients subsequent to emergency department care. The situation is assessed as follows:

> *"In 2017–18, more than 8 million patients presented to Australian public hospital emergency departments—an average of about 22,000 patients per day. This was 3.4% higher than the previous year (compared with 2.7% growth per year between 2013–14 and 2017–18). Patients aged 65 and over (who make up about 15% of the population) accounted for 22% of presentations. Older patients were also more likely to be subsequently admitted to the hospital"*

(AIHW EDC 2017-2018 p. v)

Attention to the interplay between addressing growing public demand and finite resources is a fundamental aspiration of the value proposition (Koff & Lyons 2020, Porter & Lee 2013). Future expenditure in developing education, leadership and best practice models of care need to be transparent and coordinated on the clinical floor. The education must be accompanied with surveillance and closed-loop accountability for patient outcomes and return on investment (Koff & Lyons 2020, Peden 2019, Pinto 2019, PC 2017a, PC 2017b, Grocott & Mythen 2015, Porter & Lee 2013, Ravikumar 2010, Weiss 1997).

1.2.3 The challenge of the high-risk high-cost surgical patient cohort

Third, the next significant reason for the research, is the modern challenge of identifying and collectively managing the small, but growing cohort, of high-risk, high-cost complex care patients that threaten the sustainability of surgical services. High perioperative risk is defined as a greater likelihood that a patient will suffer a complication such as organ injury, disability, or death as the result of having surgery and anaesthesia. The challenge in focusing on the high-risk patient cohort is that multiple disciplines are using similar language and sharing different understandings, and assuming that they all mean the same thing, and that all key stakeholders are heard.

Statistical modelling of the Local Health District Directorate of Planning, Population Health and Equity - Technical papers for Hospital A Redevelopment identified that:

> *"A subset of predominantly surgical inpatients are those requiring high cost and complex care…identified as National Weighted Activity Unit (NWAU) of 3 or higher… Of these high cost and complex patients in 2013/14: more than 98% were surgical patients; more than 60% were planned admissions; people aged 70 years and older accounted for nearly 40% of separations and slightly more than 40% of bed days … By 2027, using base case scenario, high cost and complex separations are expected to remain constant, but with an increase to nearly 37,000 bed days, equating to an increase (from nearly 90 beds) to 117 beds (assuming 85% occupancy rate) … In comparison to other inpatient activity these high cost and complex patients are projected to have more than double the average length of stay (10.7 days for high cost and complex patients versus 3.9 for all other acute patients)*"
>
> (LHD 2015b p19)

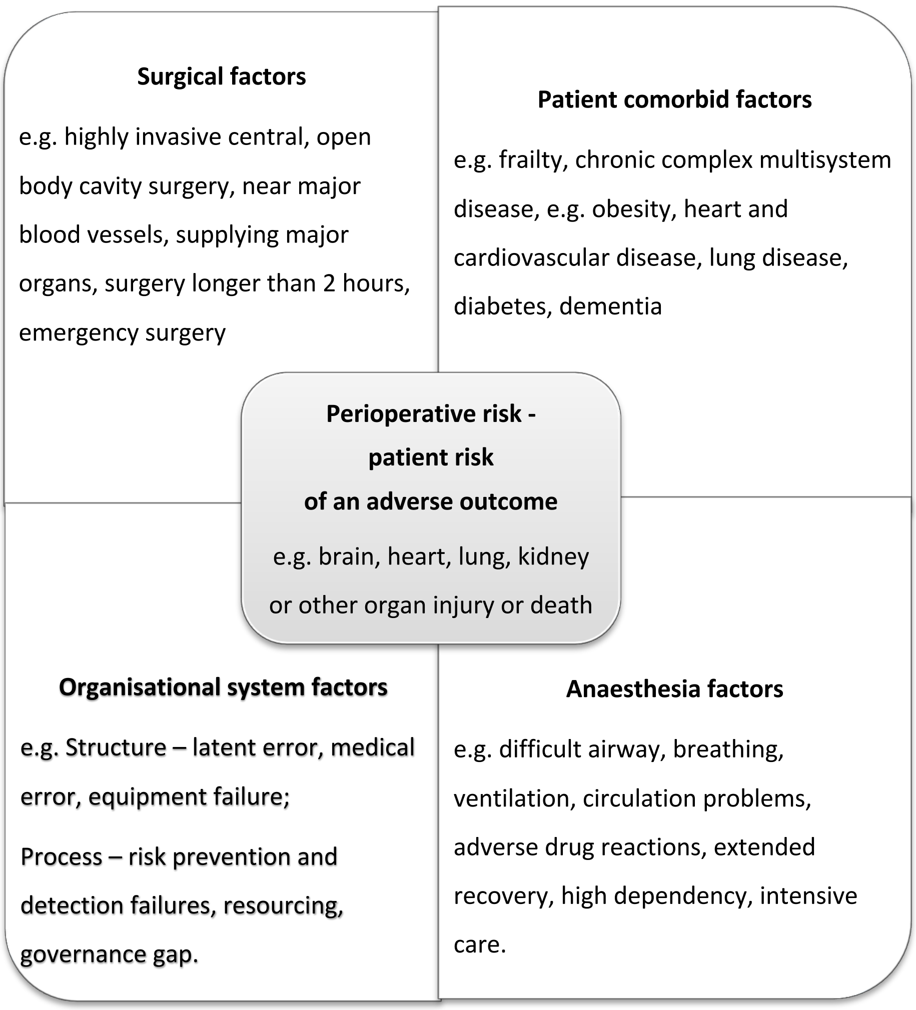
Local evidence from the research context (Lewin 2009), predicting an impending blowout in surgical costs for the high-risk complex care patient, is consistent with reports from independent organisations (AIHW AH 2018, AIHW ESWT 2017-2018, PC 2017a).

Gaba (2000), an anaesthetist and pioneer in patient safety astutely identified healthcare as a high hazard industry because patients do inadvertently come to harm during service delivery. Epidemiologists define risk as the chance or probability of a bad outcome if exposed to potential harm, in a defined population over a defined period (Badenoch & Heneghan 2002, Myles & Gin 2000). Epidemiologists and clinicians are interested in how much more likely an adverse outcome will be for a given treatment or when a risk-factor is present (Myles & Gin 2000). In appraising therapy articles, in comparing groups, risk is measured as 'relative risk' (RR) that is, the ratio of the risk of an adverse event in the experimental group (EER) compared to that of the control group (CER), 'RR=EER/CER' (Badenoch & Heneghan 2002, Myles & Gin 2000). Note in epidemiology there is no reference to the baseline risk, nor consideration of the potential size of an adverse event impact to individuals or the population studied.

Perioperative risk is known to clinicians as the likelihood that a patient will suffer a complication such as organ injury, disability, or death as the result of having surgery and anaesthesia (Shinall 2019, Selb 2018, ISOS 2016, Allman 2015, NCEPOD 2011, NCEPOD 2010). In developed countries, of all patients admitted to hospital, the risk of major complications ranges between 3% and 16% for permanent disability while mortality remains low between 0.4% and 0.8% (Weiser 2008). Concealed within this population, is a subset of high-risk high-cost complex care patients (ISOS 2016, LHD 2015b p19, NCEPOD 2011). Internationally, in the UK, 12.5% of patients constitute 80% of perioperative deaths (NCEPOD 2011). Locally, high-cost complex surgical patients are projected to have more than double the average length of stay, 10.7 days versus 3.9 days for all other acute inpatients, by 2027 (LHD 2015b p19). For this high-risk subpopulation, the likelihood of injury has been shown to be higher in the postoperative phase of care, rather than in the shorter duration intraoperative phase when monitoring and expertise for resuscitation is maximal (Shinall 2019, Selb 2018, Minto & Biccard 2014, NCEPOD 2010, Jhanji 2008, Khuri 2005).

Contributing factors that have been associated with an increase in a patient's perioperative risk of an adverse outcome, have been classified into four areas. Namely, patient comorbid factors, surgery, anaesthesia and organisational system factors (Diagram 1.1) (Pinto 2019, Shinall 2019, ISOS 2016, Minto & Biccard 2014, NCEPOD 2011). The risk factors can interact to influence a patient's risk of adverse outcomes and can do so dynamically throughout the perioperative episode of care (Pinto 2019, Hall 2017, Talmor & Kelly 2017, Allman 2015, Minto & Biccard 2014, NCEPOD 2011, Ravikumar 2010, NCEPOD 2010, Khuri 2005). Hearteningly, Gaba (2000), Hall (2017) and Ravikumar (2010), show that high risk can be, and has been, ameliorated using multipronged strategies – these include institutionalising patient safety as an area of multi-professional responsibility, continual patient risk monitoring and mitigation for the perioperative continuum, critical incident monitoring and analysis, incorporating new technologies, standards and guidelines, and addressing latent and human errors systematically.

Diagram 1.1 Factors influencing perioperative risk



1.2.4 The importance of understanding the context where policy is enacted

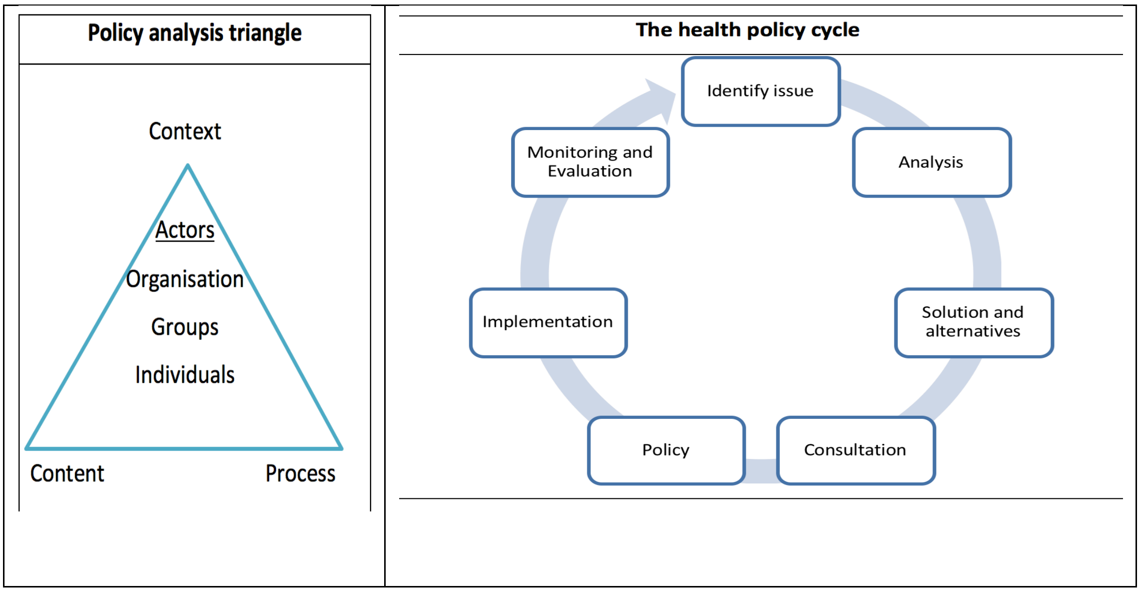
The fourth reason is the imperative to understand the current environment of clinical care as experienced by patients, clinicians and managers (Dopson 2008, Grol 2007, Greenhalgh 2004). Attention to the interplay between addressing growing public demand and finite resources has been a fundamental concern of perioperative policy makers for decades (MacLellan 2012, MacLellan 2008, NSW_ACI_PSP_2004). Decades of past perioperative policy merged with nascent policy, can give rise to the increasing number and complexity of hospital systems and processes, for high-risk surgical patients and staff, to have to navigate (Grocott & Mythen 2015, Fulop & Mark 2013, Suter 2013, Dopson 2008, Porter & Teisberg 2006). It is important to untangle the historical antecedents, to enable the change, innovation (Dopson 2008, Greenhalgh 2004), and productivity enhancing reform required (PC 2017a), whilst ensuring the well-being of the perioperative workforce (PC 2017a). A 'wicked problem' can be embedded deep in context (Greenfield 2010, Rittel & Webber 1973). A wicked problem is a problem that is difficult or impossible to solve because of incomplete, contradictory, contested and changing requirements that are often difficult to recognise (Head 2008b). It refers to an idea or problem that cannot be fixed, where there is no single solution to the problem (Head 2008b). After decades of policy enactment driven by public demand and targeting efficiency, a wicked problem may well be embedded in the perioperative context. Understanding perioperative context is integral to achieving a modern value-based financing aspiration for surgical services

1.2.5 Evidence-based health policy

The fifth and last significant reason for the research relates to how to derive and implement evidence-based health policy. Evidence-based health policy is defined as the interaction between Evidence-Based Medicine (EBM) and Health Policy (HP). EBM is the practice of applying valid evidence and data to a specific clinical question engendered during patient care (Sackett 1997). Evidence based health policy (EBHP) extends the construct to encompass governance for populations of patients and is defined broadly as encompassing courses of action or inaction, that government may initiate that affect the set of institutions, organisations, services, and funding relationships of the health system (Buse 2011 p6). Importantly, health policy is constructed through the interplay of content, context, actors and process (Buse 2011) (Diagram 1.2). The policy process is described as the way in which policies are initiated, developed or formulated, negotiated, communicated, implemented and evaluated (Buse 2011).

Diagram 1.2 The policy analysis triangle and the health policy cycle

(Buse 2011 p8 and p4, respectively).



In analysing policy Buse 2011 asserts that analysis needs to go beyond the *"what"* or subject area content - the details of a particular policy aims, constituent parts, implementation strategies, outcomes. Fully understanding context *"where"* the policy is enacted, the actors *"who"* and the process *"how"* – is critical to sustaining improvements and further advancing a policy area (Buse 2011).

To understand perioperative policy a pragmatic broad view of the evidence influencing resources and health policy is adopted (Huckel Schneider 2016, Buse 2011, Head 2008a). There are, as Head (2008a) rightly points out, distinct advantages to acknowledging the disparate perspectives and negotiated social order relevant in modern policy development (Diagram 1.3). The three perspectives include scientific evidence, practice evidence and politics and/or political judgement. By examining all three perspectives, the historical local context that underpins this research can be revealed. This may lead to insights into stakeholder influences in a manner not accessible by just simply exploring the empirical papers in a systematic literature review, when assessing a specific question or a new model of care in isolation (Huckel Schneider 2016, Buse 2011, Head 2008a).

Diagram 1.3 Three lenses of evidence-based policy (Head 2008a)

The politics or political judgment lens of Head's three lenses, that is the role played by different stakeholders – the public, patients, multi-professional healthcare providers, media, lobby groups and career politicians - should not be underestimated in their active and dynamic contribution to enacting EBHP (Buse 2011, Head 2008a). The significance of politics in enacting EBHP is emphasised in other theoretical policy underpinnings for example, the central role of actors in the health policy triangle previously presented in Diagram 1.2 and expanded by the concept of Kingdon's health policy window (Buse 2011). Policy windows are discrete points in time when the opportunity arises for an issue to be taken seriously by government with a view to action (Buse 2011).

1.3 How the case for the research was established

To thoroughly establish the rationale for the research, a novel approach for interrogating the literature was necessary. This is presented comprehensively in Chapter 2 Literature Review. In making the case for the research, the literature review is innovative incorporating scoping and systematic parts that continues through to the mixed methods methodology (Chapter 3). In the literature review, a qualitative, iterative perspective complements an epidemiological viewpoint. Part A, the scoping review, uses inductive reasoning (Brown 2012, Brien 2010, Levac 2010) whilst Part B, the systematic literature review, serves a deductive purpose (Petticrew 2013a, Rychetnik 2002).

The reasons for the research, the development of the research questions and the methodological approach for the research were achieved through a complementary two-stage process. Initially, a scoping review of the grey literature was done to frame the local context and define the challenges facing the research setting (Brown 2012, Brien 2010, Levac 2010). To elucidate the drivers for change and innovation in perioperative healthcare delivery the review included: past and present national, state and district health policy; media words capturing public opinion, advocacy groups, and expert economist commentary; and reports and documents from government review and advisory bodies (Huckel Schneider 2016, Buse 2011, Head 2008). The scoping review included empirical peer reviewed papers direct from the research setting, and internationally including Australia, to situate the problem, locally and globally (Brown 2012, Brien 2010, Levac 2010). The systematic literature review was employed to discern what is thought to be the best next step for surgical services provision and sustainability (Petticrew 2013a, Rychetnik 2002).

The findings of the scoping and systematic literature reviews incorporate emerging models of care of highest hierarchical evidence quality – randomised controlled trials, prospective controlled before and after, and interrupted time series trials. The literature review reveals two main points that drive an appropriate approach to this research. First, context shapes what people think, do, and learn. Second, there is a need to address methodological limitations that do not consider the impact of context. New models of care - linear or non-linear, hierarchical or not – shaped practice. This was influenced by existing clinical teams with the following characteristics: pragmatically self-organising and evolving existing structures and processes of care; crossing physical or phase of care or multi-level boundaries in order to reach the high-risk patient; adapting current roles or taking on new roles; forming new multidisciplinary or interdisciplinary teams; enhancing monitoring of patient health outcomes and mitigating adverse events at the clinician – patient interface; and, being influenced, or not, by intervention mediators such as managerial moderators or audit and feedback.

Methodological limitations in the empirical papers were identified. These included single centre studies (rather than multisite interventions in a variety of hospitals and geographical locations) limiting generalisability. Studies with small sample numbers limiting associations between intervention and serious adverse outcomes. Bundled interventions not allowing knowledge of which element led to the improved outcome. Highly resourced, multilevel, multidisciplinary, controlled and integrated interventions that limit transferability. Studies that focus on short term outcomes, rather than sustainability. Research using high level, national or state accessed outcomes in registry data, that lacked granularity for understanding change processes in hospitals.

Study design alone, based on traditional criteria for hierarchical levels of evidence quality, and statistical analysis, was insufficient for the understanding of the context of these interventions and the transferability of research findings. In considering context, there was a lack of 'a priori' use of qualitative methods outlined in the study methods section e.g. concurrent observation, interviews, surveys, to provide a rich description of the context of change and sustainability. Methodological limitations are further addressed in Chapter 2 Literature Review section 2.4.1 The impact of context and 2.4.2 Context is under-researched.

1.4 The thesis aim and research questions

The aim of the thesis is to improve our knowledge of the impact of context, particularly how in practice - clinicians and managers understand risk, and how this influences their work and use of resources when caring for patients having surgery and anaesthesia. The study addressed three research questions:

1. What has been the impact of health policy on the organisation and practice of perioperative care?

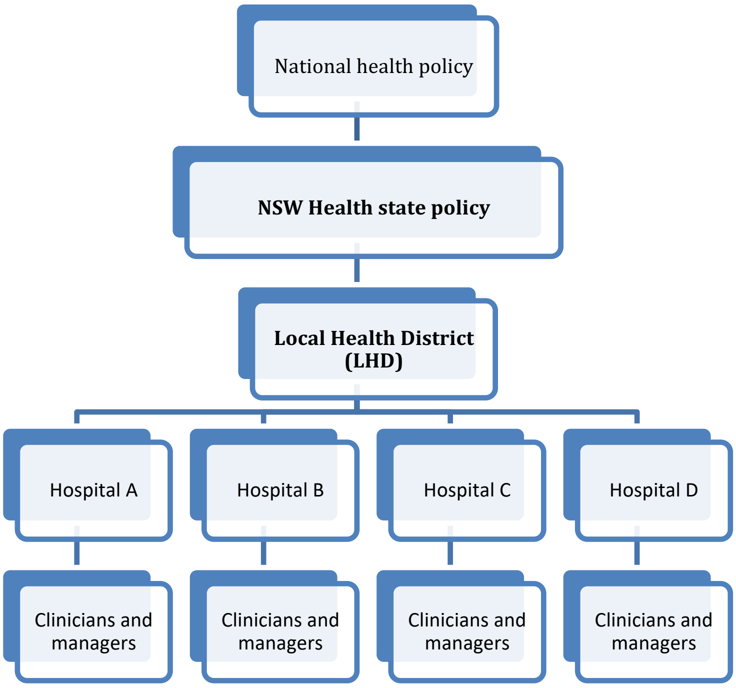
2. How is perioperative work practice organised around low, intermediate and high-risk patients?

3. What do individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient?

1.5 Research setting and method

The setting of the research is the four adult university teaching hospitals in one metropolitan local health district (LHD), in the public health system of New South Wales (NSW), Australia (Diagram 1.4). The four hospitals are under the governance of the one LHD, and that LHD is one of 15 under the governance of the state NSW Ministry of Health. The LHD has a population size of around 1 million and includes the Sydney central business area. Adopting a mixed-methods approach, the research identifies how, over decades, local work practices have adapted to the stress progressively placed on existing systems and teams and, provides a representation of the forces affecting change and innovation.

Diagram 1.4 The research setting



The methodological approach to the research arises from the research questions, and pragmatically considers the methodological strengths and limitations of the empirical papers of the literature review. This process is described in detail in Chapter 3. The study used a mixed methods approach including observation, secondary documents, interviews and survey. Purposive sampling targeted 129 clinicians (doctors, nurses, allied health and pharmacy) and managers in their workplace. As this evaluative research into perioperative systems had not been done previously, tools have been purpose designed for data collection (Appendix C – Perioperative study tools) (O'Leary 2014, Braun & Clarke 2013). Data collection and analysis was by a parallel convergent design using thematic analysis and descriptive statistics (Cresswell & Plano Clark 2011).

1.6 The structure of the thesis

The structure of the thesis is outlined in Diagram 1.5. The thesis contains eight chapters organised into five parts. Section A lays the foundations for enquiry and consists of the Introductory chapter followed by the Literature Review chapter, which establishes the research questions. A systematic review of randomised controlled trials examining high-risk patients, major adverse outcomes, and emerging models of perioperative care, reveals that context may consistently act as a moderator of change (see Chapter 2).

Section B comprises Chapter 3 describing the methods and approach to the research. Section C contains Chapters 4, 5 and 6 presenting the empirical findings to the research questions, respectively. Section D of the thesis provides a synthesis of the research findings in the Discussion Chapter 7. In Section E the thesis concludes in Chapter 8 where the implications of the research, its limitations and recommendations for further research are presented.

Diagram 1.5 The structure of the thesis

Section	**Chapter and purpose**		
A	1. Introduction		
	2. Literature review		
B	3. Methodological approach to the research		
C	Results chapters		
	4. **Impact of Policy** (addressing Research question 1)	5. **Work practice and organisation around risk** (addressing Research question 2)	**6. Individuals, teams, and the organisation in high-risk perioperative models of care** (addressing Research question 3)
D	**7.** Discussion of findings		
E	**8.** Conclusion		

1.7 Conclusion

This chapter has provided an overview of the thesis, with a broad discussion of the concerns facing the sustainability of surgical services. The situation today is the challenge from an increasing number, and complexity of both, medically high-risk patients, and the systems and processes they navigate. The focus of the thesis is on the impact of context, and how health care organisations and their workforce continue to respond to the threefold challenges of, meeting public demand for safe quality surgical care; managing resource constraints; and identifying and managing the high-risk high-cost patient cohort. The aim and significance of the research have been introduced. Chapter 2 Literature Review will use a scoping review of the grey literature to initially illuminate the setting of the research, and empirical papers to situate the local challenges globally. This is followed by a systematic literature review, analysing, synthesising and critically evaluating the nascent empirical perioperative research, searching for the best next step.

Chapter 2 Literature Review

2.1 Introduction

This chapter reports the findings of a novel two-stage process of literature review used to establish the rationale for the research and develop the research questions. The literature review utilised two complementary methods – scoping review (Brown 2012, Brien 2010, Levac 2010) and systematic literature review (Petticrew 2013a, Petticrew 2013b, Rychetnik 2002). This novel approach for interrogating the literature was necessary to thoroughly establish the rationale for the research. In the scoping literature review, a qualitative, iterative perspective was used to elaborate the challenges in the research setting. In the systematic literature review, an epidemiological perspective was used to analyse emerging perioperative models of care of the highest hierarchical evidence. The scoping review used inductive reasoning (Brown 2012, Brien 2010, Levac 2010) and the systematic literature review served a deductive purpose (Petticrew 2013, Rychetnik 2002). Inductive and deductive reasoning processes both endeavour to make logical and valid arguments in approaching understanding about a phenomenon. Inductive reasoning develops from specific representations or instances related to the phenomenon, noticing patterns and moving towards a generalised conclusion (Brown 2012, Brien 2010, Levac 2010). Deductive reasoning progresses from applying general epidemiology principles that are known to be valid to draw specific conclusions (Petticrew 2013, Rychetnik 2002). The following sections sets out in detail the reasoning, processes and results of the scoping (Section 2.2) and systematic (Section 2.3) literature reviews, followed by a synthesis of the key issues that led to the research aim and questions (Section 2.4)

2.2 Scoping literature review

This section comprises an initial scoping review of the grey literature, to define the problem in the local research context and, conclude that this challenge is a global one (Brown 2012, Brien 2010, Levac 2010). The combination of this material illuminated the challenges faced in the research context over the past 30 years. Additionally, it showed how local and international hospital systems for surgery have, in some ways, successfully evolved to safely achieve efficiency and other measures of care quality. The scoping review found that innovation has been achieved for low and medium risk patients, and in doing so it exposed the challenge today, as one to address, increasingly medically complex high-risk patients in an increasingly complex hospital system.

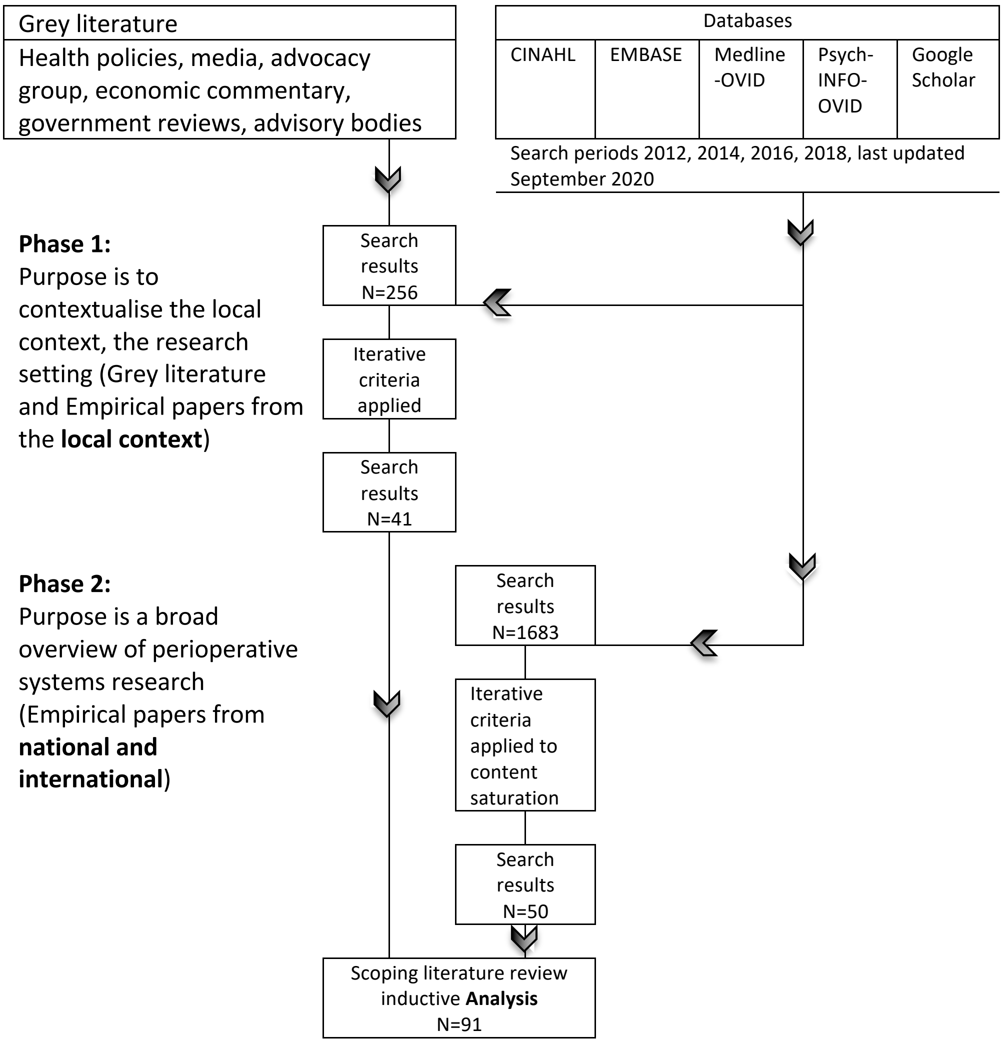
2.2.1 Search strategy

The methodology was used for three reasons. First, the approach facilitates access to diverse perspectives on one area of study (Brown 2012, Mays 2001). Second, studies rich in content, relevance and resonance to perioperative policy, organisational and clinical risk, workforce and patient safety, are methodologically complex and diverse. These studies are often not randomised, quantitative or, comparative, and, therefore are not easily amenable to a more precise traditional systematic review or meta-analyses (Brown 2012). Third, within health services research perioperative healthcare is a multidisciplinary specialty. As such, sources of useful information extend beyond traditional biomedical and clinical journals to, for example, the domains of education, psychology, health policy, organisational and implementation science (Brown 2012).

The scoping method involves six steps, including: initially implementing questions 'framing' the research context that are often broad rather than focused; inclusion and exclusion selection criteria that are iteratively developed; initially not applying quality filters; synthesis of extracted data as more often qualitative rather than quantitative; clarifying the working definitions of a field; and identifying a framework for future research by identifying gaps in the current body of literature and clarifying the conceptual boundaries of a topic (Brien 2010, Levac 2010). Considering the purpose of the scoping review – to define and explore how perioperative risk, systems and policy overlap as concepts when operationalised to the local research context – a 'systematic' inductive scoping review approach was appropriate and useful (Peters 2015). This approach is similar to that previously used for patient safety research (Brown 2012), health system report cards (Brien 2010) and nurses' workarounds (Debono 2014).

The search strategy for the scoping review employed processes for generating and organising ideas such as brainstorming and concept mapping to decide a priori on which sources of literature to initially interrogate (Figure 2.1). This was achieved by enlisting the expertise of the study supervisors and specialist university librarians. Initially this review framed the local context and defined the challenges facing the research setting. Then evidence from the local setting illuminating the research context was considered and extended to national and international empirical studies to situate the local experiences more broadly.

Figure 2.1 Scoping literature review process



2.2.2 Study selection

To elucidate the drivers for change and innovation in perioperative healthcare delivery the review included past and present national, state and district health policy; media words capturing public opinion, advocacy groups, and expert economist commentary;

and reports and documents from government review and advisory bodies. The scoping review was then extended to empirical papers directly from the research setting, and nationally and internationally to situate the context, locally and globally, to content saturation for risk, systems and policy.

2.2.3 Analysis

Three health policy analysis frameworks introduced in Chapter 1 (Diagrams 1.2, 1.3) were used in the narrative analysis of the scoping review. First, the policy analysis triangle of context, content, process, and actors (organisation, groups, individuals) (Buse 2011 p8) was adopted to illuminate the drivers for change and innovation in the delivery of surgical services for patients in the local context. Second, the health policy cycle (Buse 2011 p4) was used to analyse the mechanisms of policy making in the local context across perioperative levels of policy enactment and across time. Third, the three lenses of evidence-based policy: scientific evidence, evidence from practice and politics or political judgement (Head 2008a) are used to situate challenges in the local setting for example, the high-risk high-cost surgical patient, to problems and solutions, globally.

2.2.4 Results

This section presents the findings of the scoping review. The narrative begins with evidence from the local setting illuminating the research context, and then uses national and international empirical studies to situate the local experiences more broadly. For surgical services, the drivers for change are first elucidated then the principal challenge of the high-risk high-cost complex care surgical patient cohort is explored.

2.2.4.1 Drivers for change and innovation in surgical services

Evidence directly from the research setting is important because it is in the local context that decisions must be made, and policy enacted (Lewin 2009). Evidence, over three decades, directly from the research context, is presented in Table 2.1. The evidence points to the drivers for change in the delivery of surgical services for patients.

Table 2.1 Evidence framing the problem in the local research context

Type of evidence	Finding	Source
Peer reviewed empirical - experimental evidence from clinical trials	Scoping and systematic literature papers in this chapter	See references in the accompanying text
Statistical models	Local Health District * Directorate of Planning, Population Health and Equity - Technical papers for hospital redevelopment. ***"By 2027 the cost of care for 'high cost complex care patients' is expected to increase by around 30% in bed days equating to an extra 117 beds with a doubling in average length of stay to 10.7 days."*** This is consistent with reports AIHW ESWT 2017-2018, AIHW AH 2018	*LHD 2015a, *LHD 2015b
Applied research peer reviewed model of care	Model of care – introduction of day of surgery admissions for elective surgery at two NSW hospitals	*Kerridge et al 1995, *Caplan et al 1998, *Board & Caplan 2000, *Caplan et al 2002
Applied research descriptive case studies	The effects of NSW Health perioperative guidelines policy on the clinical floor of a tertiary referral university hospital * in Sydney. Namely, reduced length of stay for lower risk patients has led to the following barriers to further change:	*Yap & Chacko 2006. *Ethnographic descriptions I, II, III (Chapter 4)
Economic feasibility studies and Government reports	Australian Productivity Commission forecasting the impacts of advances in medical technology and costs (2005) and introducing competition and informed user choice (2017) Australian Institute of Health and Welfare reporting health expenditure, elective surgery waiting times, admitted patient care – surgery	PC 2005, PC 2015 PC 2017a, AIHW AH 2018
Preferences – public consultation	Public preference and lobby groups demanding timely access to elective surgery – the public, patient advocacy groups, medical associations, and politicians responding with announcements of more beds	Media – SMH 2005a, SMH 2005b, SMH 2019, AMA 2019
Preferences – Government policy National Health Policy	Australia – Commonwealth Department of Health and Aging National Hospitals Demonstrations Program (NDHP) NDHP-1 (1995) was funded to overcome clinically inappropriate waiting times for elective surgery. Project teams facilitating lead hospitals to support collaborating hospitals to re-engineer existing practice Collaboration between political, managerial and professional groups	*Alexander 2000
Preferences – Government policy NSW Health State Policy	*NSW Health Predictable Surgery Program (2004), The Pre-Procedure Preparation Toolkit (2007), The Perioperative Toolkit (2018) - please see text for description of perioperative policy and systems	*NSW_ACI_PSP_2004; *PPPT_2007, *PT_2018

Key: *Evidence directly from the setting of this research

For our elected representatives and in government policy (Buse 2011, Duckett 2008, Dugdale 2008), health service goals have as their central focus the need to address: the growing public demand for timely surgery (AMA 2019, SMH 2019); access to care through state management of national Elective Surgery Waiting Times (ESWT) and, National Elective Surgery Targets (NEST) since at least 1995 (AIHW ESWT 2017-2018, AIHW 2000); and to control costs, for example by improving care and limiting length of stay in hospital (PC 2017a, PC 2017b, PC 2015, PC 2005, NSW_ACI_PSP_2004). These are the primary drivers for change and innovation in perioperative models of care. Table 2.1 shows from multiple perspectives, using different types of evidence important to health policy (Huckel Schneider 2016, Buse 2011, Head 2008) that NSW for decades has been endeavouring to meet public, press and lobby groups demands for timely elective surgery (AMA 2019, SMH 2019, SMH 2005a, SMH 2005b).

However, despite significant reductions in surgical length of stay (MacLellan 2012, Lee 2011, MacLellan 2008, Caplan 2002, Caplan 1998, Kerridge 1995) and increasing spending on acute hospital services over that of economic growth (AIHW AH 2018, Dugdale 2008, Duckett 2008), the public's perception is not aligned with the gains made. Instead, intermittently over the decades, the view is one of health services under siege (O'Connell 2008), public hospital crises (AMA 2019), operation waiting list crises (SMH 2019, SMH 2005b), chronic shortages in trained nurses and hospital beds (SMH 2005b), funding shortfalls for hospitals (AMA 2019, SMH 2019, O'Connell 2008, SMH 2005a, SMH 2005b), and the need for more funding for 'unacceptable' public hospitals (Chapter 1, Figure 1.1 – AMA 2019) (SMH 2019). Media reports of threats to access and sustainability are substantiated by government reports from the AIHW (Chapter 1 p9, AIHW ESWT 2017-2018 p.iv), and communicated to the public through lobby groups such as the Australian Medical Association (Chapter 1 Figure 1.1, AMA 2019 p8).

Statistical modelling of the Local Health District Directorate of Planning, Population Health and Equity - Technical papers for a tertiary hospital of this research Redevelopment (LHD 2015a, LHD 2015b) provide further evidence of challenges to sustainability. The pertinent points are, the predictions made from trends up to and in 2013/14:

> "*People 70 years and older accounted for more than 30% of surgical separations and more than 40% of bed days … In terms of rising healthcare costs there is small cohort of hospital 'high-cost complex care patients' defined as NWAU 3 or higher. In 2013/14, of these 'high-cost and complex patients', more than 98% were surgical patients, more than 60% were planned admissions. Patients 70 years and older accounted for nearly 40% of the admissions and 90/390 (23%) beds … By the year 2027 cost of care for 'high-cost complex care patients' is expected to increase by around 30% in bed days equating to an extra 117 beds with a doubling in average length of stay to 10.7 days*" (LHD 2015b p19).

The modelling is consistent with national reports from the AIHW (AIHW AH 2018, AIHW EWST 2017-2018, AIHW EDC 2017-2018) and international peer reviewed publications from the U.K. (NCEPOD 2010)**,** Europe (Pinto 2019), and the U.S.A (Hall 2017).

Concurrently, evidence from the local setting (Table 2.1 and Box 2.1) shows leadership and multilevel collaborative initiatives to address the public's concerns. The way hospitals care for patients having surgery has changed significantly over the last three decades. Locally and internationally hospital stay has declined through efficiency gains, particularly pre-operatively (Lee 2011, Kerridge 1995), and by increasing day-only surgery (Mathis 2013, Lafortune 2012, MacLellan 2012). This has occurred in the context of escalating healthcare costs, for a growing and aging population, with rising expectations for high technology care, and an increasing prevalence of chronic complex multisystem disease (AIHW AH 2018, AIHW ESWT 2017-2018, AIHW EDC 2017-2018, PC 2017a, PC 2017b, PC 2015, Dugdale 2008, PC 2005, SMH 2005a, SMH 2005b).

Box 2.1, an amalgamation of secondary documents, presents the levels of policy (micro, meso, macro) set out against the passage of time (1993 to present). The health policy cycles for perioperative change and innovation are illustrated. The arrows link the text boxes that describe change initiated at the hospital-clinician interface with subsequent national and state departments of health top-down leadership and facilitation, to spread adoption of the innovation. The text boxes are referenced with evidence from the local research setting and exposes the challenge today, as one to address, increasingly medically complex high-risk patients in an increasingly complex hospital system. As indicated in Box 2.1 through the decades, crossing multiple levels of policy at the national, state and local level, were two main health policy cycles. During these periods, there has been leadership, collaboration, change and innovation development.

Box 2.1 Levels of perioperative policy and timeline of changes in NSW, Australia 1993-present

Policy level	**Years**				
	1993-5	**1995-2000**		**2000-2015 and beyond**	
Federal		National Demonstration Hospitals Program (NDHP) (Alexander 2000)			
State				NSW Health Predictable Surgery Program **(2004**) including The Pre-Procedure Preparation Toolkit NSWGL2007_018 **(2007),** The Perioperative Toolkit NSWGL2018_004 **(2018)** *NSW_ACI_PSP_2004; *PPPT_2007, *PT_2018	
Local Health District (LHD)				***"The high cost complex care patient"*** LHD 2015a, *LHD 2015b	
Hospital – clinician patient interface	Lead hospital for reengineering services for low risk surgical patients (Kerridge et al 1995)		A tertiary hospital of this research (and other hospitals) learning with NDHP (Caplan et al 1998, Board & Caplan 2000, Caplan et al 2002)	A re-engineered tertiary hospital of this research (and other hospitals) learning and developing beyond NDHP (Yap & Chacko 2006).	**? Best next step**

At the federal level access to elective surgery, activity, healthcare expenditure and projected future costs for medical advances, are monitored continuously and benchmarked against other jurisdictions (AIHW_AH_2018, AIHW ESWT 2017-2018, PC 2015). At federal and state levels, for over 20 years there is evidence of project collaboration to re-engineer elective surgery processes of care at hospital level (PT_2018, PPPT_2007, NSW_ACI_PSP_2004, Alexander 2000, Kerridge 1995).

Systemic change and innovation in perioperative models of care started with the Australian Commonwealth Department of Health and Ageing, National Demonstration Hospitals Program Phase 1 (NDHP1) 1995 (Alexander 2000). This policy initiative influenced the direction and resourcing of many hospitals. The program addressed clinically inappropriate waiting times for elective surgery by funding project teams to facilitate lead hospitals in supporting the transfer of their innovative models of care to collaborating hospitals (Alexander 2000). In the research setting of the LHD, a tertiary hospital of this research was a receiving hospital to the perioperative model of care. In 1995 the tertiary hospital began reengineering elective surgery services (Caplan 2002, Board & Caplan 2000, Caplan 1998). At the tertiary hospital, site visits and networking enabled learning from NDHP lead hospitals in Sydney (Alexander 2000, Kerridge 1995) and Melbourne (Alexander 2000). Hospitals and similar models of care in the USA were also visited.

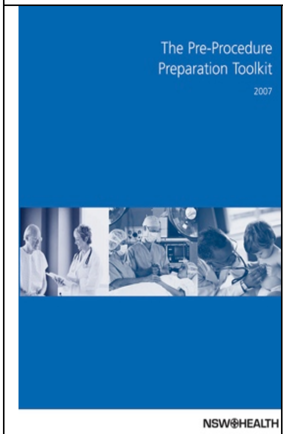
This learning enabled reduced hospital length of stay for low risk patients and this was achieved safely with minimal cost to the community (Caplan 2002, Caplan 1998). Reengineering and standardising perioperative processes further reduced costs by eliminating unnecessary pre-operative investigations, blood and other testing by junior medical staff (Board & Caplan 2000). The local evidence of success in reducing surgical costs for lower risk patients was consistent with international reports from a systematic review of similar single-centre preoperative models of care (Lee 2011). Other countries that have developed very similar models of care with similar empirical results included: decreasing length of stay pre-operatively (USA, Canada, Australia, The Netherlands, Germany); no increase in rate of postoperative complications in patients admitted on the day of surgery (USA, Australia); less cancellations on the day of surgery meaning less inconvenience to patients (USA, Australia, The Netherlands, Norway), and avoiding unnecessary duplication of processes of care (USA, Canada, Australia); less number of preoperative tests in anaesthesia-led clinics (USA, Canada, Australia); less specialty physician consults (USA, Canada, Australia); and, no increased cost to the community (Australia), or to patients' family and carers with reduced length of stay pre- and post-operatively for relatively well patients having lower stress surgery (Australia); and patient satisfaction with the new system (Australia) (Lee 2011).

Locally, bed days saved meant that the work of multiple wards at two hospitals servicing multiple operating theatre complexes was reduced in 2004 to one ward, the Perioperative Unit (Yap & Chacko 2006) at a tertiary hospital of this research. The Perioperative Unit co-located surgical waiting list (ESWT) management, bookings and admissions processes with pre-admission clinics (PAC), day of surgery admissions (DOSA), day-only surgery (DOS), extended day-only surgery (EDO) and eventually high-volume short stay surgery (HVSSS) (Yap & Chacko 2006).

The experience and model of care from a tertiary hospital of this research, with that of clinicians from other lead hospitals, then helped inform further iterations of state-wide policy. They contributed specifically as part of The Predictable Surgery Program (2004) (NSW_ACI_PSP_2004) the Pre-Procedure Preparation Toolkit (2007) (PPPT_2007) (Appendix A) and its successor The Perioperative Toolkit (2018) (PT_2018) (Appendix B). Box 2.2 presents the front pages of key components of NSW Health state policy and its iterative development over the last two decades. They were designed to re-engineer clinical processes across the state of New South Wales at the LHD and hospital levels (References in chronological order – NSW_ACI_PSP_2004; PPPT_2007, MacLellan 2008, MacLellan 2012, PT_2018).

Three decades ago, it was tradition to admit patients to hospitals at least the day before surgery. It is now proven practice that lower risk patients do not need to spend time in hospitals immediately before and after surgery and anaesthesia. MacLellan the then chief health bureaucrat managing *The Predictable Surgery Program* (NSW_ACI_PSP_2004), justifiably points out that advances in less invasive surgery and short acting anaesthesia can be leveraged to manage escalating waiting lists by reducing length-of-stay (MacLellan 2012, MacLellan 2008). The redesign solutions are contained in the policy documents and what is said to be needed is clinician compliance to enact the tools and processes, and "strong managers to ensure their implementation", and a "robust performance management system" (MacLellan 2008 pS26). That is a linear hierarchical approach to policy implementation.

Box 2.2 NSW Health state-wide perioperative policy

<table>
<tr><td colspan="4">Predictable Surgery Program (2005 to present)</td></tr>
<tr>
<td>
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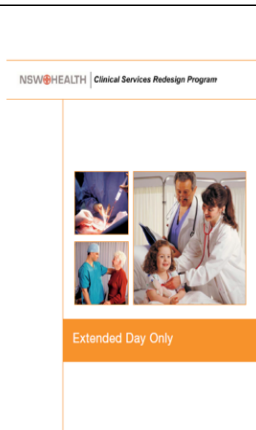
<td>
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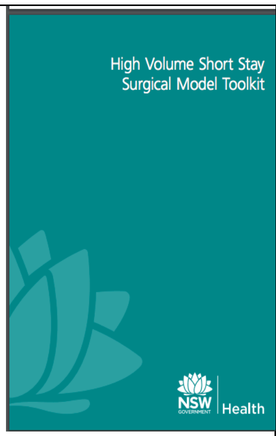
<td>
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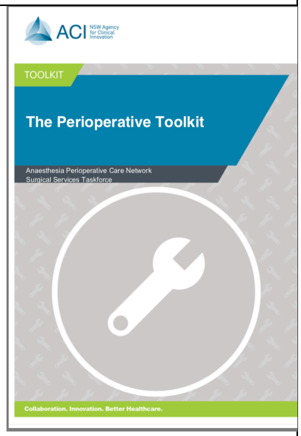
<td>
</td>
</tr>
<tr><td>2007</td><td>2007</td><td>2012</td><td>2018</td></tr>
</table>

The Pre-Procedure Preparation Toolkit (2007) (Appendix A) and its successor *The Perioperative Toolkit (2018)* (Appendix B) bookend policy with time-based names. For example, Extended Day-Only (EDO) where patients stay one night in hospital after surgery and High-Volume Short Stay Surgery (HVSSS) where patients stay for less than 72 hours in hospital after surgery. Key performance measures are published monthly for all hospitals on the Surgical Services Taskforce (SST) Surgical Dashboard (MacLellan 2012, NSW_ACI_PSP_2004,). The key performance indicators for surgery are all process measures and include the National Elective Surgery Targets (NEST) for clinical time to surgery (targets for clinical urgency within 30, 90 or 365 days), day of surgery admissions DOSA rate (target 90%), day-only surgery DOS rate (target 60%) and cancellations on the day of surgery (target < 2%) (MacLellan 2012, NSW_ACI_PSP_2004). The state policy is aligned with National Health Policy and reports (AIHW ESWT 2017-2018). Subsequently, through perioperative policy cycles, this investment in perioperative systems and processes has resulted in ever greater efficiency (MacLellan 2012, NSW_ACI_PSP_2004).

MacLellan and colleagues are to be commended for the breadth and detail of their program. However, the argument can be made that they do overstate the achievements in their conclusion. The results presented are focused on achieving waiting list targets efficiently, with references to safely reducing length-of-stay by DOSA, DOS, EDO, HVSSS for lower risk patients (MacLellan 2012, MacLellan 2008). The results of the scoping review reveal two major omissions in their macro-level evaluation of the impact of NSW state perioperative policy. First, the impact of context found in other studies on implementation of similar policy, is not mentioned (Table 2.2). Second, the "high-cost complex care patient" highlighted as a primary challenge to future surgical services sustainability (LHD 2015a, LHD 2015b), is not mentioned (MacLellan 2012, MacLellan 2008).

First, for the purpose of this research, context is defined as the circumstances or conditions that form the setting for perioperative policy enactment, and in terms of which policy enactment can be fully understood. Whilst not examined in NSW perioperative policy evaluation to date, the moderating role of context was a recurring theme in studies evaluating similar models of care (Table 2.2). Even for lower risk processes for example, Lee et al (2011) systematic review literature for pre-operative organisational change and LaFortune et al (2012) review for day surgery, considerable variance in implementation was observed for Asia delayed adopters compared to western countries (Lee 2011) and across OECD countries (LaFortune 2012). LaFortune et al concluded that this:

> *"may reflect different appreciation of possible risks of complications after the operation but they may also simply reflect traditions"*
>
> (LaFortune 2012 p38)

Table 2.2 The moderating role of context in high volume, lower risk processes

Author	Subject	Methods	The influence of context
Lee et al 2011	Pre-operative processes	Systematic review	Pre-operative processes well established for decades in hospitals in USA, Canada, Europe, Iran, Australia, New Zealand but implementation new to many jurisdictions in Asia

Author	Subject	Methods	The influence of context
Lafortune et al 2012	Day-only surgery	OECD review	Monitoring the development of day surgery in different countries, variations in clinical practice for the same procedure, for example cataract and tonsillectomy, caesarean section, were noted.
Seim et al 2009 (Norway and USA)	Cancellations on the day of surgery	Comparative study – hospital administrative data analysis	Causes for cancellation on the day of surgery are multifactorial, and whilst there are similar classifications of root causes, the results for one tertiary institution (Norway) cannot be transferred to another tertiary institution (Boston) for quality improvement.
Rycroft-Malone et al 2012 (UK)	Perioperative fasting times – duration of fluid fast and food fast beyond agreed guidelines	Cluster randomised trial -mixed methods Investigating three interventions of guideline implementation	In 19 UK hospitals, although evidence for fasting practice was well accepted, three interventions had no significant effect on improving fasting times. Practical challenges to implementation include interprofessional challenges, and lack of authority for decision making and responsibility

The impact of context is evident in the detail of perioperative policy. Cancellation on the day of surgery is the key performance indicator for The Pre-Procedure Preparation Toolkit (PPPT_2007) and it is benchmarked by NSW state government agencies (NSW_MOH_2021, NSW_ACI_SST_2021). Seim et al (2009) in a comparative study of two university hospital administration databases, in Norway and Boston, USA found that whilst the root causes for the cancellation could be classified similarly, the differences between the two hospitals were significant. So different that most findings of causes at either of the two hospitals could not translate easily to the other for joint quality improvement projects (Seim 2009). Supervision of patients self-managing their fasting times for anaesthesia is a core element in preoperative processes (PPPT_2007). Rycroft-Malone et al (2012) in a comprehensive study of nineteen hospitals in the UK, comparing three implementation intervention strategies, found no significant effect of any of the three interventions on fluid or food fasting times, despite clear and uniformly accepted guidelines. The mixed methods research did find other changes for example, to local policies, attitudes and practice, but challenges to improving the primary outcome included tensions between the different professions with unclear lines of authority and responsibility (Rycroft-Malone 2012).

The impact of context is evident in the breadth of perioperative policy (Donabedian 1988). Table 2.3 presents two Australian papers (Lowthian 2011, Ben-Tovim 2008) and a European study (Vos 2010) researching the implementation of new process-orientated care delivery across the length of hospital stay.

Table 2.3 Linear process orientated studies, findings and evaluation methods

Authors	Method	Findings	Limitations
Ben-Tovim et al 2008 Single, tertiary hospital, Adelaide, South Australia	Before and after study - single whole-of-hospital logistics change for perioperative and emergency patient flows	Using 'Lean thinking' methods developed in the manufacturing industry (Toyota motors), efficiency gains in length of stay and staff time achieved by eliminating non-value-added steps and, adding process pull factors to push factors for bed management	Focus on efficiency gains Case complexity not delineated other than elective or emergency surgery, and patient risk and health outcomes not discussed
Lowthian et al 2011 Single, tertiary hospital, Melbourne, Victoria, Australia	Before and after study five years logistics change for perioperative patient flows (2005-2010) retrospective single centre study using administrative data	Reduced waiting times for elective surgery, reduced hospital-initiated postponement (30% to 1%, decreased length of stay (4.8 to 2.3 days), facilitating increasing surgical throughput and 100% satisfaction with the new pre-admission process	Focus on efficiency gains Case complexity not delineated other than elective or emergency surgery, and patient risk and health outcomes not discussed
Vos 2010 Multiple, tertiary hospitals, The Netherlands	Comparative case study using mixed methods - using observations, simulated cases, experiments implementing new processes and case mix based reimbursements	Replication of process orientated care delivery across setting was difficult because hospitals do not always prioritise efficiency, improvement occurs in fragmented units not across the whole of hospital, and individual patient's health status and clinicians' responses are complex.	Implementing new process – orientated care delivery across Hospitals not achievable in part due to individual patient's health status and clinicians' responses are complex.

A linear Deming approach to quality improvement was adopted whereby, through appreciating a system and reducing process variance, efficiency was achieved (Lowthian 2011, Ben-Tovim 2008). As for industrial processes, patients were regarded as abstract homogenous units, and risk stratification was little or not applied to the change process (Lowthian 2011, Ben-Tovim 2008). Importantly, the two Australian papers demonstrated that significant efficiency gains could be achieved across all phases of the hospital perioperative processes (pre-intra-post-operative), for the majority of patients presenting for surgery, using a linear Deming model for quality improvement. However, in contrast to these single hospital linear logistics studies, Vos (2010) researching similar process orientated care delivery in the Netherlands, reported that replication across settings was difficult. In a comparative case study using mixed methods, Vos (2010) made three main findings regarding context. First, hospitals cannot or do not fully implement process-orientated logistics concepts because in the institutional context hospitals did not always prioritise efficiency. Second, instead of taking an entire-hospital-systems view for improvement, hospitals tried to perfect individual care processes in fragments, with the resultant 'transfer points' causing breakdowns in the coordination of care. Finally, healthcare delivery in hospitals is complex due to the number of different illnesses, treatments and preferences of patients and their medical professionals, and oftentimes patients may have more than one problem requiring different kinds of services, sometimes simultaneously (Vos 2010).

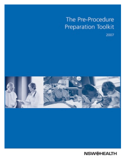
Tables 2.2 and 2.3 summarise the papers that show that even for the lower-risk processes associated with the Pre-Procedure Preparation Toolkit (PPPT_2007) local context can have a significant moderating role. Yet, this phenomenon has not been explored locally in the MOH policy evaluations of MacLellan et al (2012), MacLellan et al (2008). This is problematic because at the request of end-users, frontline clinicians and clinician-managers, the Pre-Procedure Preparation Toolkit (PPPT_2007) has been updated and replaced by The Perioperative Toolkit (PT_2018) (Box 2.2), followed by state-wide dissemination to all LHDs for implementation. The complete Pre-Procedure Preparation Toolkit (PPPT_2007) is Appendix A. Box 2.3 presents the original guideline and outlines its key principles, tools and processes.

The Perioperative Toolkit (2018) was a response to a 2013 survey of key stakeholders, principally end users. The survey was conducted by the NSW Agency of Clinical Innovation (ACI) (PPPT_Survey_2013, PPPT_SurveyRRs_2013). Fourteen out of fifteen LHDs/ Specialty Networks (7 metropolitan and 7 rural/regional) indicated utilisation of The Pre-Procedure Preparation Toolkit (PPPT_2007) and its tools and that there was the need to update The Pre-Procedure Preparation Toolkit (PPPT_Survey_2013, PPPT_SurveyRRs_2013). General feedback and recommendations from the state-wide survey included "revising the tools based on feedback", "updating the reference list", "releasing it as an electronic document", that the ACI to "discuss future projects to look at perioperative models of care in more detail", "the possibility of follow-up site visits", and to include "relevant health care information for Aboriginal and Torres Strait Islander people" ((PPPT_Survey_2013 pp1-7, PPPT_SurveyRRs_2013 pp1-2).

Box 2.3 NSW Health Pre-Procedure Preparation Toolkit (2007)

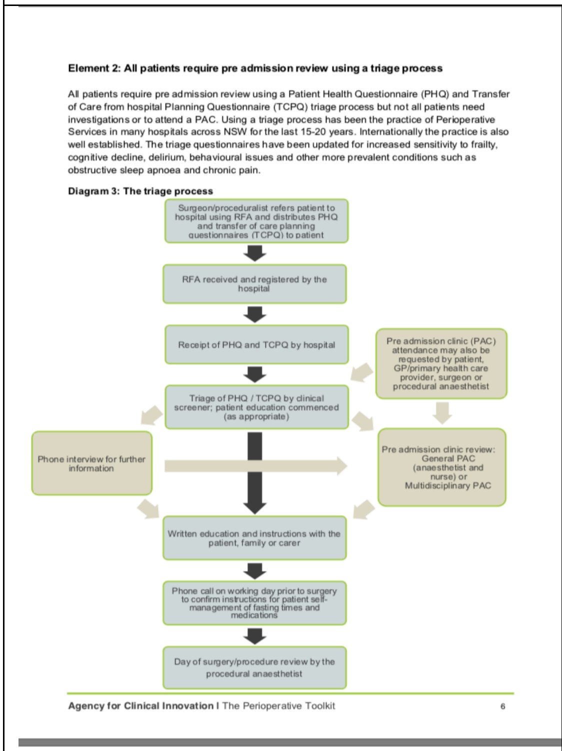
Pre-Procedure Preparation Toolkit (2007) – Appendix 1

Introduced Principles 1- 5



Effective pre-procedure preparation processes depend on the following key principles (p4):

1. Preparation of the patient and carer for the whole surgery journey
2. All patients require pre-admission review using a triage process
3. Risk optimisation coordinated through pre-admission clinics
4. Multidisciplinary team-based care
5. Effective clinical and corporate governance underpins the pre-procedure preparation process

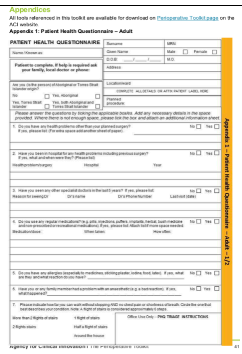


Element 2: All patients require pre admission review using a triage process

All patients require pre admission review using a Patient Health Questionnaire (PHQ) and Transfer of Care from hospital Planning Questionnaire (TCPQ) triage process but not all patients need investigations or to attend a PAC. Using a triage process has been the practice of Perioperative Services in many hospitals across NSW for the last 15-20 years. Internationally the practice is also well established. The triage questionnaires have been updated for increased sensitivity to frailty, cognitive decline, delirium, behavioural issues and other more prevalent conditions such as obstructive sleep apnoea and chronic pain.

Diagram 3: The triage process

Agency for Clinical Innovation I The Perioperative Toolkit 6



Appendices

All tools referenced in this toolkit are available for download on Perioperative Toolkit page on the ACI website.

Appendix 1: Patient Health Questionnaire – Adult

PATIENT HEALTH QUESTIONNAIRE

Name / Known as:

Patient to complete. If help is required ask your family, local doctor or phone:

Are you (is the person) of Aboriginal or Torres Strait Islander origin? No / Yes, Aboriginal / Yes, Torres Strait Islander / Yes, both Aboriginal and Torres Strait Islander

Surname | MRN | Given Name | Male | Female | D.O.B | M.O. | Address | Location/ward | COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE | Planned procedure:

Please answer the questions by ticking the applicable box/es. Add any necessary details in the space provided. Where there is not enough space, please tick the box and attach an additional information sheet.

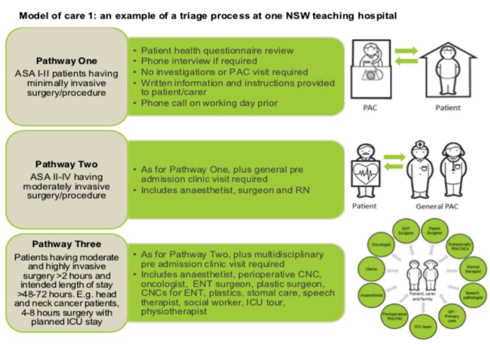
1. Do you have any health problems other than your planned surgery? If yes, please list. (For extra space add another sheet of paper). No Yes
2. Have you been in hospital for any health problems including previous surgery? If yes, what and when were they? (Please list) No Yes
   Health problem/surgery | Hospital | Year
3. Have you seen any other specialist doctor/s in the last 5 years? If yes, please list No Yes
   Reason for seeing Dr | Dr's name | Dr's Phone Number | Last visit (date)
4. Do you use any regular medications? (e.g. pills, injections, puffers, implants, herbal, bush medicine and non-prescribed or recreational medications). If yes, please list. Attach list if more space needed. No Yes

7. Please indicate how far you can walk without stopping AND no chest pain or shortness of breath. Circle the one that best describes your condition. Note: A flight of stairs is considered approximately 6 steps.
   More than 2 flights of stairs | 1 flight of stairs | 2 flights stairs | Half a flight of stairs | Around the house

Office Use Only – PHQ TRIAGE INSTRUCTIONS

Appendix 1 – Patient Health Questionnaire

41



Model of care 1: an example of a triage process at one NSW teaching hospital

The Perioperative Toolkit was designed to aid in the continuous quality improvement of perioperative structures, processes and outcomes for patients having surgery/ procedure and anaesthesia (PT_2018 p.iv Executive Summary). This is achieved by facilitating effective knowledge sharing between key members of the multidisciplinary perioperative team for patient-centred care (PT_2018 p.iv Executive Summary). The Perioperative Toolkit was prepared by a multidisciplinary working group of clinician leaders, managers, health bureaucrats and other key stakeholders (PT_2018 p.iv Executive Summary). It is based on local and international evidence, and state-wide user feedback (PT_2018 p.iv Executive Summary).

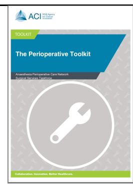
The elements and tools found in The Perioperative Toolkit (PT_2018) are presented in Box 2.4. The Perioperative Toolkit (2018) builds upon the state-wide policy work of The Pre-Procedure Preparation Toolkit (PPPT_2007). It is an evidence-based attempt to address the complete episode of care for the high-risk, high-cost surgical patient, building upon previously developed local resources, systems and processes. Box 2.4 compares the toolkits the new elements are presented in bold.

Box 2.4 NSW ACI The Perioperative Toolkit (2018) compared with its predecessor

The Perioperative Toolkit (2018) - Appendix 2

Updated Elements 1,2,3,4, and now 9.

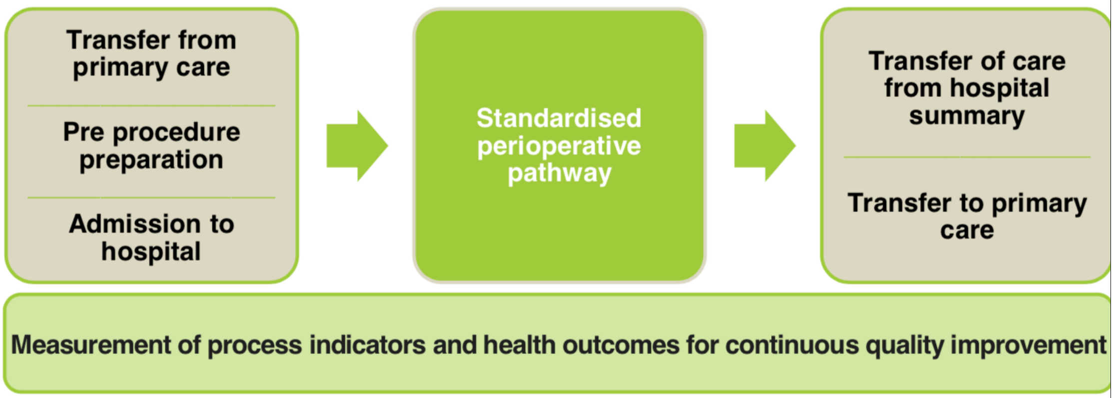
Added Elements 5, 6, 7, 8 **(in bold)**



Effective perioperative care is reliant on the following key elements (abbreviated):

1. Preparation for the whole surgery journey
2. All patients require pre-admission review using a triage process
3. Risk optimisation
4. Multidisciplinary team-based care
5. **Planned standardised perioperative pathway**
6. **Measurement for quality improvement, benchmarking and reporting**
7. **Integration with primary care**
8. **Partnering with patients and carers, shared decision making**
9. Effective clinical and corporate governance underpins the perioperative process

Diagram 1: The perioperative process



The emphasis on the high-risk patient, is applied through the four new elements and associated tools (Box 2.5). The four new elements each addresses a specific new aim for complex systems change (Box 2.5).

Box 2.5 The Perioperative Toolkit – new elements, tools and aims

Element number	Element	Tool	Aim
5	Each patient's individual journey should follow a planned standardised perioperative pathway (p20)	Standardised Perioperative Pathway (SPP) (p56)	To establish an expected pathway, individualised to each patient's comorbid status, to allow early diagnosis of variance to planned care for example due to a complication. Standardisation of care is achieved through applying Enhanced Recovery or Clinical Pathways for the surgery or procedure
6	Measurement for quality improvement, benchmarking and reporting should be embedded in the perioperative process (p23)	Measurement Framework (p23) *Related to element 9 – Governance* (p33)	The perioperative process aims to ensure that patients receive the correct surgery within an appropriate timeframe and that complications are minimised. Data collection and learning from outcomes should be embedded in the perioperative process to know to what the degree these aims are being achieved. It is essential at every level of governance, macro-meso-micro and including the patient, family and carer, that there is a common understanding of 'what success looks like' *Related to element 9 – Effective clinical and corporate governance underpins the perioperative process*
7	Integration with primary care optimises the patient's perioperative wellbeing (p26)	Data/ information initiated from the primary healthcare provider (p49)	Collaboration with primary healthcare provider(s), for care that encompasses long-term patient centred care, familiarity with family, carers and community services. Integrating hospital and primary care for shared decision making, prehabilitation and optimisation prior to surgery, and rehabilitation and convalescence to maximal independence after surgery.

Element number	Element	Tool	Aim
8	Partnering with patients, family, carers optimises shared decision making for the whole perioperative journey (p29)	Perioperative patient information Booklet, Checklist and Shared Outcomes Tool (p52-55)	Collaboration with the patient, family and carer as active members of the perioperative healthcare team. To ensure that care is respectful of and responsive to individual patient preferences, needs, values. This includes enhancing health literacy and use of decision support tools for example the new shared outcomes tool and a perioperative outcomes framework

The distinct advantage of the policy was building on investment, based locally, in the existing structures and processes for perioperative care already established in NSW hospitals for the majority of patients. However, the first major omission of the MOH macro-level evaluation (MacLellan 2012, MacLellan 2008), is not examining the impact of past policy namely, The Predictable Surgery Program (2004) (Box 2.2), this is problematic.

It is evident from the description of the new elements and aims (Box 2.5) that significant restructure of work practices, human resources and technology are required for successful implementation. For example, Enhanced Recovery Pathways (ERP) are integral to Element 5 the Standardised Perioperative Pathway (SPP) expected for the individual patient (PT_2018). An ERP is a multimodal bundled care package, initially studied in major abdominal surgery to accelerate postoperative recovery and reduce morbidity, mortality and decrease length of stay (Ljungqvist 2017). ERP for major orthopaedic joint surgery, major abdominal, urology and gynaecology surgery are widely reported (Ljungqvist 2017). The four key clinical elements of the ERP approach are: comprehensive preoperative evaluation and preparation including preventing prolonged fasting and sometimes, use of a preoperative carbohydrate drink (and/or avoiding bowel preparation for major abdominal surgery); optimising anaesthesia (e.g. haemodynamic targeted fluid therapy) and minimally invasive surgery (e.g. avoiding large incisions, laparoscopic); appropriate postoperative management of vital signs and physiological parameters e.g. vital signs and pain score; early removal of drains and tubes, early mobilisation and early return to normal diet (Ljungqvist 2017, Liu 2017, Nelson 2016). Multi-professional teamwork and continuous audit are important for implementation (Ljungqvist 2017, Liu 2017, Nelson 2016).

Stone et al (2018) in a systematic literature review demonstrated that local context has an active role in mediating the implementation of ERPs (Table 2.4).

Table 2.4 The moderating role of context implementing Enhanced Recovery Pathways

Author	Method	Findings, Recommendations	Limitations
Stone et al 2018	Systematic review	For ERP implementation, key facilitators were adapting the program to fit local contexts, achieving and demonstrating early wins, gaining by-in from both frontline clinicians and hospital leadership, having a strong ERP team that met regularly, leveraging supporters and full-time ERP staff. The major barriers were meeting resistance form frontline clinicians, inadequate resources and external factors such as patient complexity or rural location	Papers included mix of qualitative descriptions, of implementation aspects, or experience, including peer reviewed reports, and observational studies. A variety of settings were included including single centre ERP or larger health system. Also, papers from around the world that may be affected by external factors e.g. payer structure Exclusion criteria very limited – conference proceedings, reviews, articles not available on-line or in English

There is accumulating evidence indicating that local context can significantly moderate future perioperative policy implementation. This local and international evidence on policy implementation is a concern for a number of reasons. First, Tables 2.2 and 2.3 summarises the evidence showing that context is a mediator of change, even for the lower-risk processes associated with the Pre-Procedure Preparation Toolkit (PPPT_2007). Yet, this phenomenon has not been explored locally in the MOH macro-level policy evaluations (MacLellan 2012, MacLellan 2008). This is problematic because at the request of end-users, frontline clinicians and clinician-managers, the Pre-Procedure Preparation Toolkit (PPPT_2007) has been updated and replaced by The Perioperative Toolkit (PT_2018) (Box 2.2), followed by state-wide dissemination to all LHDs for implementation.

Second, the evidence indicates that failure to examine the context for implementation is a significant opportunity loss and a potential opportunity cost. In particular for NSW MOH because a distinct stated advantage of the successor toolkit, the Perioperative Toolkit (PT_2018), is that it is to build on investment based locally, in the existing structures and processes for perioperative care, already established in NSW hospitals for the majority of surgical patients.

Third, the Perioperative Toolkit (PT_2018) emphasises care for the high-risk patient as applied through the four new elements and associated tools (Box 2.5). As policy it is a far greater and more complex undertaking than the ambition of its predecessor policy that addressed linear systems and efficiency. Table 2.4 summarises a systematic review of empirical papers on implementing Enhanced Recovery Pathways and replicates the findings of others that, the major barriers to improvement are: meeting resistance from frontline clinicians, inadequate resources, patient complexity and other contextual issues (Stone 2018, Lafortune 2012, Rycroft-Malone 2012, Lee 2011, Vos 2010).

This gap in the enactment of evidence based health policy leads to research question 1.

Research Question 1: **What has been the impact of health policy on the organisation and practice of perioperative care?**

2.2.4.2 The "high-risk high-cost complex care" surgical patient cohort

The second major omission of the MOH macro-level evaluation of perioperative policy was that the "high-cost complex care patient" highlighted as a primary challenge to future surgical services sustainability, in local strategic planning documents (LHD 2015a, LHD 2015b), is not mentioned in the policy work of MacLellan et al (2012, 2008). The oversight is significant because through policy success, by 'picking off the low hanging fruit' and repeatedly removing from hospitals the next lowest risk patients to achieve efficiencies, a new challenge has emerged. The high-cost complex care patients are now the only ones staying overnight in hospital wards beyond three days. At the macro level of government reporting, the focus on outcomes remains fixed on access for performance, mainly, access to surgery and waiting times for both state (NSW_BHI_2021, NSW_MOH_2021, NSW_ACI_SST_2021) and federal (AIHW AH 2018,

AIHW 2018, AIHW ESWT 2017-2018, AIHW EDC 2017-2018) jurisdictions. The following section presents the results of the scoping review aimed at identifying the high-risk high-cost complex care patients that is both a concern to hospital clinicians and clinician-managers (PT_2018), and a threat to surgical services sustainability (LHD 2015a, LHD 2015b).

Locally and internationally, there is a concealed subpopulation of surgical patients that have high perioperative risk, they require complex care, are more likely to have a postoperative complication, and incur a high cost for marginal benefit (LHD 2015b, Lawson 2013, NCEPOD 2011, Vonlanthen 2011, NCEPOD 2010). The process of care for this subpopulation of patients can threaten the sustainability of surgical services (LHD 2015b, NCEPOD 2011, NCEPOD 2010). In the local context, this evidence has been presented in Section 2.2.4.1. Internationally, for example in the UK, 12.5% of patients identified as 'high-risk' on administrative case-mix adjusted data, having major non-cardiac surgery, make up the approximately 80% of in-hospital deaths (Pearse 2012, NCEPOD 2011, Jhanji 2008).

Overall, it is safe to have surgery and anaesthesia. In surgical populations like that of Australia, Noordzij et al (2010) using The Netherlands national database over 15 years found 3.7 million unselected patients having selective surgical procedures had a postoperative all cause death of 1.85%, similar to the around 1.6% found in the UK National Confidential Enquiry into Patient Outcome and Death (NCEPOD) 2011 report on perioperative care. However, the subpopulation of "high-risk patients" in the UK have an over ten-fold hospital mortality rate of approximately 10-15% (NCEPOD 2011). Across many countries, this small cohort of patients utilise a disproportionate amount of both hospital and community resources because not all die in hospital (ISOS 2016, Merkow 2015, Pearse 2012, NCEPOD 2011, Story 2010, Jhanji 2008, Khuri 2005). Yet the ability to successfully identify this cohort of high-risk patients prospectively in practice is challenging and remains a work in progress (Pinto 2019, Shinall 2019, Minto & Biccard 2014, Pearse 2012, NCEPOD 2011, NCEPOD 2010).

This section of the scoping review results is presented in three sections. First, the cost of a high-risk patient suffering a postoperative complication. Second, the challenge of identifying the high-risk surgical patient cohort prospectively, prior to an adverse event or postoperative complication. Third, a synopsis of studies on clinical handover, escalation of care, failure to rescue and medical emergency teams.

First, for the high-risk patient the adverse effects of a perioperative complication are long-term and can be experienced for some months and years beyond the period of hospitalisation or episode of surgical care (Shinall 2019, Khuri 2005). Khuri et al (2005) in a landmark study, changed the way surgeons and anaesthetists thought about a post-surgery complication. Previously it had been “almost counterintuitive to surgeons” (Khuri 2005 p337) to consider the impact of surgery on patients, beyond mortality within 30 days of surgery (Table 2.5). Significantly, Khuri et al (2005) identified the presence of any complication (except superficial wound infection) within the first 30 days postoperative, as an independent important predictor of both short and long-term survival (Table 2.5). Complications such as pneumonia, deep wound infection and pulmonary embolus, even after apparent recovery, still shortened lifespan (Khuri 2005). This was independent of the patient’s preoperative risk, and intraoperative variables were not as important as sustaining a complication (Khuri 2005). A postoperative complication increased the risk for 30 days mortality by ten-fold, one-year mortality by four-fold and five-year mortality by two-fold (Khuri 2005).

This small cohort of high-risk patients that suffer a postoperative complication utilise a disproportionate amount of both hospital and community resources (Pearse 2012, NCEPOD 2011, Jhanji 2008, Pearse 2006, Khuri 2005). Vonlanthen et al (2011) made a cost analysis for a high volume tertiary surgical centre in Zurich examining 1200 patients and found an up to a five-fold increase in cost for a similar operation, should a patient develop a severe postoperative complication. Vonlanthen et al (2011) specified that the best predictor of escalating costs is the high-risk gastrointestinal surgery patient who develops a severe postoperative complication.

Table 2.5 The impact of a postoperative complication on mortality up to 5 years

Khuri et al (2005) **VA- NSQIP Determinants of long-term survival after major surgery** USA multicentre, prospective study linking 2 databases NSQIP and BIRLS, for 120 Veterans Affairs surgical hospitals; 105,951 Adult patients		
8 operations – Vascular (non-ruptured AAA, Infra-inguinal vascular reconstruction, carotid endarterectomy), General (colectomy, open and laparoscopic cholecystectomy), Cardiothoracic (lobectomy, pneumonectomy), Orthopaedic (total hip replacement)		
Types of postoperative complications - Cardiac (arrest, myocardial infraction – heart attack), Pulmonary (pneumonia, unplanned intubation, failure to wean), Neurologic (stroke, coma, neuro-deficits); Renal (progressive renal insufficiency, acute renal failure, urinary tract infection), Thromboembolic (deep vein thrombosis, pulmonary embolus), Wound complication (superficial or deep wound infection, dehiscence), Sepsis. # Mortality increased further if complication is in patient having more major surgery		
The impact of a postoperative complication after major surgery		
	Complication	No complication
30 day mortality	13.3%	0.8%
1 year mortality	28.1%	6.9%
5 years mortality	57.6%	39.5%

Lawson et al (2013) added that patients who sustain a postoperative complication have a higher predicted probability of 30 day readmission to hospital (around 12.5%) and a higher cost of readmission. The authors claim that preventing all NSQIP defined complications would prevent 41,846 readmissions, saving $620.3 million per year (Lawson 2013). Interestingly, Jencks et al (2009) find in the US Medicare program, patients re-hospitalised within 30 days after a surgical discharge were readmitted for a medical condition; that is, related to an organ system complication for example, postoperative heart attack, stroke or pneumonia rather than surgical site related.

Second, identifying and collectively managing the high-risk surgical patient cohort prospectively, prior to an adverse event or postoperative complication, is the modern challenge, both locally (PT_2018, LHD_2015b) and internationally (Pinto 2019, Shinall 2019, Grocott & Mythen 2015, Pearse 2012, NCEPOD 2011, Ravikumar 2010). Perioperative risk is dynamic, from the intraoperative intervention through to the postoperative phases of hospital care, and onto the long-term community care including the potential hospital care readmission that may be required (Shinall 2019, Merkow 2015, Lawson 2013, NCEPOD 2011, Vonlanthen 2011, Jencks 2009, Jhanji 2008, Pearse

2006, Khuri 2005) Perioperative risk is dynamic, multiple risk factors may interact to give rise to a perioperative complication, that of itself will increase perioperative risk of another form of postoperative complication for example, malnutrition, sarcopenia, falls, cognitive decline. To minimise suffering and costs, it is the responsibility of all key stakeholders involved with perioperative care to improve systems to minimise the incidence and impact of perioperative complications (Pinto 2019, PT_2018, NCEPOD 2011, Khuri 2005). To this end the factors that give rise to perioperative high risk need to be better understood.

The factors that influence perioperative risk have previously been encapsulated and presented in Chapter 1 Diagram 1.1. This section presents the evidence for four interrelated and interacting factors that influence high perioperative risk (Pinto 2019, Minto & Biccard 2014). First, surgical factors such as the type of surgery, its associated physiological stress and its urgency. Second, anaesthetic factors requiring active resuscitation and the management of vital signs. Third, patient factors such as chronic medical conditions and functional status. Fourth, organisational system and process factors.

In addressing perioperative risk, distinction is given to the impact of the type of surgery particularly the physiological stress it incurs, its duration and urgency (Pinto 2019, Shinall 2019, Minto & Biccard 2014, Allman 2015, Schilling 2010, Khuri 2005). The reason for the distinction is evident from the definition of surgery provided in Chapter 1 Background, and as it relates to '*primum non nocere' (Latin* - first do no harm). Surgery and anaesthesia are significant medical interventions that can impact on a patient's short and long-term health. Gaba (2000), an anaesthetist and pioneer in patient safety astutely identified healthcare as a high hazard industry because patients do inadvertently come to harm during service delivery. In developed countries, of all patients admitted to hospital having surgery, the risk of major complications ranges between 3% and 16% for permanent disability while mortality remains low between 0.4% and 0.8% (Weiser 2008).

Table 2.6 shows, from two empirical papers (Schilling 2010, Khuri 2005) and two expert consensus guidelines (ACC/AHA 2014, NICE 2016) that surgical risk is related to a risk endpoint or complication rate for example, percent likelihood of 30 day mortality, cardiac complication, or other organ systems injury. Table 2.6 lists the types of surgery that are considered low, intermediate and high surgical risk. The evidence presented indicates that surgical risk of complication is least for superficial body surface and extremity surgery, and highest for open intracavity surgery. Less invasive surgery, for example laparoscopic surgery or endoluminal vascular surgery, is lower risk than extensive operations.

Table 2.6 Type of surgery influencing perioperative risk

Author / Population	**Risk endpoints** and Types of surgery		
	LOW RISK	INTERMEDIATE RISK	HIGH RISK
1.			
Khuri et al 2005 USA 120 VA hospitals, 105,951 patients	**30-day mortality < 1%** Laparoscopic cholecystectomy 0.55%	**30-day mortality < 1-5%** Non-ruptured AAA repair 4.45% Infra-inguinal vascular 3% Open cholecystectomy 2.87% Carotid endarterectomy 1.23% Total hip replacement 1%	**30-day mortality > 5%** Colectomy 6.51% Lobectomy/ pneumonectomy 5.3%,
2.			
Schilling et al 2010 USA	Not assessed	34% of surgical volume **6% complications** **< 1% excess hospital days**	44% of surgical volume **62% of complications** **54% of prolonged LOS**
121 hospitals 129,233 patients	Not assessed	General - outpatient cholecystectomy, breast procedures, thyroidectomy, parathyroidectomy, outpatient inguinal hernia repair	General - colectomy (24% of complications), small bowel resection (8% of complications), inpatient cholecystectomy, ventral hernia repair, appendectomy, pancreatectomy, bariatric procedures, proctectomy, lysis of adhesions and liver resection

Author / Population	Risk endpoints and Types of surgery		
	LOW RISK	INTERMEDIATE RISK	HIGH RISK
3.			
ACC/AHA 2014 USA (Expert consensus guideline – multi-disciplinary)	**Cardiac risk < 1%**	**Cardiac risk 1-5%**	**Cardiac risk > 5%**
	Ophthalmic Dental Plastics Breast Thyroid Minor orthopaedic Minor urological Minor gynaecological	Vascular surgery (carotid) Endovascular aneurysm Elective body cavity (abdominal, pulmonary, neurosurgery, urology, gynaecology) Orthopaedic (arthroplasty) Major Head and neck dissection surgery	Vascular surgery (open aortic, major vascular, peripheral vascular) Urgent body cavity surgery
4.			
NICE 2016 UK (Expert consensus guideline – multi-disciplinary- for pre-op. tests	Low risk of complications	Intermediate risk	High risk of **complications**
	Excision skin lesion Drainage of breast abscess	General (primary repair inguinal hernia) Vascular (varicose veins excision) Tonsils and adenoids resection Arthroscope – knee	Colonic resection Total abdominal hysterectomy Transurethral resection of prostate Lumbar discectomy Lung operations Total joint replacement Radical neck dissection Thyroidectomy

This evidence has been confirmed using the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) data base review of 250,000 patients having low stress day-only surgery over five years finding that day surgery is low risk, the rate of early (within 72 hours) morbidity or mortality is around 0.1% (Mathis 2013). Even advanced age is not an independent predictor of day surgery morbidity and mortality (Mathis 2013). Types of surgery that are more invasive and of longer duration, for example more than two hours, are higher risk (NICE 2016, ACC/AHA 2014, Schilling 2010, Khuri 2005). Urgency of surgery has higher risk for complications (ACC/AHA 2014, Schilling 2010).

Associated with the surgical risk factors influencing perioperative risk are anaesthetic factors. Fundamental to the practice of anaesthesia is a thorough understanding of how the human body reacts to both the medications used to provide anaesthesia and the impact of surgery (see Chapter 1 for the definitions). This understanding must encapsulate how the patient's physiological stress responses are altered by their pre-existing comorbid conditions and changing health status (ANZCA webpage 2021, Pinto 2019). Anaesthetic factors that influence perioperative high risk include: inadequate optimisation of the patient's physical status pre-operatively; inadequate optimisation of cellular respiration intra- and post-operatively, through resuscitation and active management of, the vital signs (heart rate, blood pressure, respiratory rate tidal volume, oxygenation, pain management); and, the pathophysiological stress response of surgery including any major adverse events such as major haemorrhage (Pinto 2019, Allman 2015, Minto & Biccard 2014)

For a patient offered surgery and anaesthesia, their chronic medical conditions and functional status is the third set of risk factors contributing to overall perioperative risk. The physiological stress associated with surgery and anaesthesia can cause comorbidity, or diseased organ system function, for example heart, lungs, kidney, or liver, to decompensate, resulting in a postoperative complication (NCEPOD 2011, Story 2010). Table 2.7 summarises the findings associating patient comorbidity with postoperative complications, for varying levels of operative stress.

Table 2.7 Patient comorbid factors influencing perioperative risk

Author / Population	**Comorbidity**	**30-day Mortality**	**Longer term Mortality**	**Notes**
Story et al 2010 Australia and New Zealand 23 hospitals 4158 Patients	70 years and older 68% patients had pre-existing comorbidities Pre-existing comorbidities associated with mortality included advanced age 80-89 years, worsening ASA physical status, ASA 4, serum albumen < 30 g/dL (and patients having emergency surgery)	5%	Not assessed	**Complications at 30 days** 20% patients had complications including acute renal impairment, systemic inflammation, ICU admission – 9.4% patients (half planned, half emergency) Average increase LOS 1 week for patients with complications
NCEPOD 2011 UK Multisite 13513 patients	Liver cirrhosis	8.9%	Not assessed	The significant impact of severe comorbid organ disease e.g. documented liver cirrhosis and congestive cardiac failure on perioperative risk The significant impact of severity of the same disease e.g. Diabetes on insulin or not
	Congestive cardiac failure	8.2%		
	Cardiac arrhythmia	5.7%		
	CVA – stroke	4.4%		
	Diabetes (on insulin)	4.1%		
	Ischaemic heart disease	3.8%		
	Cancer	3.8%		
	Respiratory disease	3.7%		
	Diabetes (non-insulin)	2.9%		

Author / Population	**Comorbidity**	**30-day Mortality**	**Longer term Mortality**		**Notes**
Shinall et al 2019 USA Multisite 432, 828 patients 8.5% frail 2.1% very frail	Frailty – mean age 61 years SD 12.9 years. Frailty was assessed using Risk analysis index. Results presented for moderate risk surgery e.g. laparoscopic or open cholecystectomy	**30 Day**	**90 day**	**180 day**	For the same disease (and the same degree of surgical stress) - the significant impact of the degree or severity of the disease e.g. 'frail' compared to 'very frail'
	Frail	5.1%	11%	16.2%	
	Very frail	18.7%	34%	43%	

A tertiary hospital of this research contributed data, as one of 23 hospitals across Australia and New Zealand, to a prospective observational study on comorbidity and complications in 4158 patients 70 years and older (Story 2010). A majority of patients had pre-existing comorbidity (68%), a fifth of patients had a serious postoperative complication (20%) and a small but significant group had 30 day mortality (5%) (Story 2010). Suffering a complication was associated with an average extra one-week length of stay in hospital, however no further follow-up of patient health outcomes was studied (Story 2010). Pre-existing comorbidities associated with mortality included extreme age 80-89 years, poor physical status defined as a worsening American Society of Anesthesiologists (ASA) physical status score or ASA 4 (for definition, see Table 2.8).

A larger prospective UK study using administrative data based on 13513 patients was able to make an association for 30-day mortality with comorbidity (NCEPOD 2011). The study found that major organ failure for example, heart failure (8.2%) or liver failure (8.9%) was associated with significant mortality compared with more benign controlled chronic conditions such as diabetes mellitus (NCEPOD 2011). Further, for the same comorbidity, the more difficult to control the disease the higher the mortality for example, diabetes mellitus on insulin (4.1%) compared with not on insulin (2.9%).

The third study from Table 2.7 was a large USA retrospective cohort study on 432, 828 patients (Shinall 2019). In the study 'frailty' was defined as "a global syndrome of decreased physiological reserve" and was quantified using a previously validated Risk

Analysis Index (Shinall 2019 pE2). For the same surgery type, increasing patient frailty led to significantly greater incremental mortality at 30, 90 and 180 days.

The challenge of quantifying patient comorbid risk factors has led to greater refinement in the tools currently used to predict risk of adverse outcomes (Table 2.8). The diagnostic endeavour is becoming more refined, it is moving beyond the ASA score for assessing and communicating fitness for surgery to the use of more sophisticated risk scores, biomarkers and exercise tests (Table 2.8) (Pinto 2019, Talmor & Kelly 2017, Wijeysundera 2016, Minto & Biccard 2014).

Table 2.8 Patient comorbid factors - risk scores, biomarkers, exercise tests

Physical status classification - American Society of Anesthesiologists (ASA) Suffix 'E' denotes an emergency	
ASA 1	A healthy patient with no systemic disease
ASA 2	A patient with mild to moderate systemic disease
ASA 3	A patient with severe systemic disease imposing functional limitation on patient
ASA 4	A patient with severe systemic disease which is a constant threat to life
ASA 5	A moribund patient who is not expected to survive with or without the operation
Risk scores: NSQIP risk calculator (ACS American College of Surgeons); SORT Surgical outcome risk tool (NCEPOD UK); P-POSSUM (Portsmouth – Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity); Euroscore; Frailty assessment – Rockwood, Risk Analysis Index; ASA score (American Society of Anaesthesiologists Physical status score)	
Biomarkers: (NT) proBNP, Hs-troponin for major for major adverse cardiac events	
Functional capacity - 6 minutes walk test, Cardiopulmonary exercise testing (CPET)	

Risk stratification may begin with fitness for surgery but risk re-stratification throughout the perioperative episode of surgical care is now advocated (Pinto 2019, Talmor & Kelly 2017, Wijeysundera 2016, Minto & Biccard 2014). Future research is being directed towards examining how pre-operative estimates of risk can be updated with information from the intraoperative period (e.g. blood transfusion needed for haemorrhage, haemodynamic instability) and postoperative period (e.g. haemodynamic instability or wound infection requiring antibiotics) (Pinto 2019, Talmor & Kelly 2017, Wijeysundera 2016, Minto & Biccard 2014). The process for diagnosing the 'high-risk' patient prospectively in practice remains a challenge (Pinto 2019, Talmor & Kelly 2017, Minto & Biccard 2014, NCEPOD 2011). However, in predicting post-operative complications, the use of most risk scores provides at best moderate accuracy (Talmor

& Kelly 2017). The number of risk scores being adapted for surgical patients, biomarkers, functional assessments, and aspirations for artificial intelligence, and genotype testing, to improve predictive ability, are all responses to the same challenge (Pinto 2019, Wijeysundera 2016, Minto & Biccard 2014).

The evidence for the three risk factor classifications presented thus far, that interact to influence a patient's perioperative risk, may be considered in the following way. Surgery and anaesthesia risk factors relate to the medical interventions that can have an impact on a patient's health beyond successful treatment of the surgical pathology or incident disease. The interplay of patient risk factors indicates that many patients do not present for surgery and anaesthesia with just the incident disease. Patient risk factors arise from how patients are functioning in the community prior to surgery being offered, patient's comorbidities, chronic medical disease and their level of control or stability.

The fourth and last set of risk factors influencing perioperative risk, is organisational system factors. Table 2.9 presents four studies on organisational system factors associated with major postoperative complications and mortality. The four papers, using three large administrative databases for 24,192 patients/ 123 USA hospitals (Schifftner 2007), 84,730 patients/ 186 USA hospitals (Ghaferi 2010, Ghaferi 2009a) and 44,814patients/ 474 international hospitals (Kahan 2017, ISOS 2016) to understand organisational system factors associated with major postoperative complications and mortality. Schifftner et al 2007 found that structure measures such as larger hospital size and greater complexity resulted in increased 30-day postoperative morbidity, whilst patient and clinician factors such as pre-operative risk factors accounted only moderately, and intra and post-operative processes were not associated. Ghaferi et al 2009a found that overall postoperative complication rates were similar across 186 hospitals, but the mortality rate varied widely (16-fold for post-pancreatectomy complications).

Table 2.9 Postoperative complications and problems identifying organisation systems factors using (retrospective) administrative data remotely

Authors	Method	Findings	Limitations
Schifftner et al 2007 USA	National Surgical Quality Improvement Program (NSQIP_VA) (Veterans Affairs Hospitals) data base and surveys	24,192 patients having major surgery in 123 VA hospitals, preoperative risk factors account only moderately, and intra-operative and post-operative processes were not associated, with 30-day post-operative morbidity. Rather structure measures were primarily associated - university affiliation, increased complexity and size of a hospital result in an increase in 30 days postoperative morbidity. Possible reasons - patient care complexity beyond preoperative risk, inter-hospital transfers, turnover of junior surgeons and communication and coordination issues in more complex organisations	Need to better define relationships between processes, structures and outcomes of healthcare. Data collected on structure and processes was remote by survey rather than in the context where processes and structures of care delivered. Measures for individual patients may be more precise allowing targeted recommendations
Ghaferi et al 2009a USA	National Surgical Quality Improvement Program (NSQIP) database – retrospective analysis	84,730 patients, rates of death for inpatient general and vascular surgery vary widely between hospitals from 3.5% to 6.9%; although the 186 participating hospitals had the same overall and major complications rates. Other than avoiding complications, inpatient surgical mortality may be reduced by timely recognition and management of postoperative complications	Remote comparison of hospital care by examination of complication rates and death.
Ghaferi et al 2010 USA	As above (same authors)	After pancreatectomy - mortality rates varied 16-fold across hospitals; lower failure to rescue rates were associated with hospital teaching status, hospital size > 200 beds, increased nurse-to-patient ratios and high hospital technology	A large fraction of failure to rescue left unexplained due to the method used - database predetermined hospital characteristics.
Kahan et al 2017, (ISOS 2016) Inter-national	International Surgical Outcomes Study (ISOS) database – and complex mathematical risk modelling	44,814 patients in 474 hospitals, from 27 mostly high income countries, found an in-hospital (1 or more) complication rate of 16.8% (1 in 6) and mortality rate of 0.5%, for all adult elective inpatients (average length of stay 4 days) enrolled in the 7 days cohort study (ISOS 2016). Despite the high incidence of adverse events (16.8%) and mortality as a result of complications (2.8%) no survival benefit could be found from critical care unit (CCU) admission after surgery. Poor selection or triage of patients to critical care as opposed to ward care	Data provided on individual critical care facilities was limited e.g. compared to ward care, no mention of Nurse: Patient ratios, availability of Intensive care specialists, collaboration with surgeons, size of unit. Routine versus planned CCU admission not distinguished

Analysing the same dataset Ghaferi et al (2010) found that structure and process measures associated with better failure to rescue rates included hospital teaching status, larger hospitals, increased nurse-to-patient ratios and high hospital technology. Kahan et al (2017) found that for 27 mostly high-income countries, an in-hospital complication rate of 16.8% and a 2.8% mortality rate due to complications. However, for the high incidence of adverse events, no survival benefit could be found from critical care intensive care admission after surgery (Kahan 2017). The three datasets from Schifftner et al (2007), Ghaferi et al (2010) and Kahan et al (2017) appear to be providing inconsistent conclusions.

All authors highlight the limitations of administrative data to develop targeted recommendations for organisational systems improvement (Kahan 2017, ISOS 2016, Ghaferi 2010, Schifftner 2007). This is particularly the case for retrospective administrative data where database predetermined characteristics limit interrogation and conclusions (Kahan 2017, ISOS 2016, Ghaferi 2010, Schifftner 2007). Using administrative "big data", the research papers were unable to associate poor postoperative outcomes and mortality with specific correctable recommendations for structures and processes of perioperative care (Kahan 2017, ISOS 2016, Ghaferi 2010, Schifftner 2007). The researchers have all noted lack of clinical and contextual granularity as limitations in their methodologies to pinpointing action that may be remedial on the clinical floor (Kahan 2017, ISOS 2016, Ghaferi 2010, Schifftner 2007). Remote surveys of structures and processes, retrospective review using predetermined characteristics on pre-existing administrative databases, no outcome measures for specific individual patients all limit understanding and recommendations for quality improvement (Kahan 2017, ISOS 2016, Ghaferi 2010, Schifftner 2007). The critical findings from these landmark articles are twofold. First, for populations similar to the local context of our research, they show large numbers of high-risk patients with 30-day serious complications, morbidity and mortality. Second, the authors ask for limitations of their research to be addressed - specifically, the remote examination of context of care – through posted survey (Schifftner 2007), 'database predetermined hospital characteristics' (Ghaferi 2010) and 'complex mathematical risk modelling' (Kahan 2017) by more rigorous examination within the context of care. Hence, research papers relying on retrospective analysis of large administrative data collected for other purposes are excluded from the systematic literature review.

Interestingly, using perioperative administrative data prospectively, the implementation science literature from the U.K. describes three recent large scale quality improvement initiatives for a specific group of high-risk patients. Namely, the National Emergency Laparotomy Audit (NELA 2013-present), the enhanced perioperative care for high-risk patients (EPOCH 2014-2015) trial focusing on emergency laparotomy surgery and the Emergency Laparotomy Collaborative (ELC 2015-2017) (Stephens 2019). These quality improvement initiatives (QI) also used mixed methods – programme activity process data, exit interviews for QI leads and ethnographic data collection to study the enablers and barriers to care pathway implementation (Stephens 2019). However, unlike the studies presented in Table 2.9 that studied perioperative mortality and morbidity retrospectively for all surgical patients (Kahan 2017, ISOS 2016, Ghaferi 2010, Schifftner 2007), the emergency laparotomy studies focused on one type of general surgery and its attendant context (Stephens 2019). Focus on implementation for a particular group of high-risk patients may have unintended impact on other surgical patient groups, and their context of care, that may not be studied using implementation science methodology. In the U.K over 1.53 million patients undergo inpatient surgery each year, of these 25,000 patients undergo emergency laparotomy surgery (Stephens 2019). Nevertheless, research papers using prospective analysis of large administrative data for example, NELA are included in the systematic literature review (Oliver 2018).

This concludes section two of the scoping review results. The challenge of identifying the high-risk surgical patient cohort prospectively and comprehensively, prior to an adverse event, has been presented, including, a four-way classification for risk factors contributing to perioperative risk. The following section is the third and last section of the scoping review results. In addressing the high-risk patient, this section provides a synopsis of studies on perioperative clinical handover, escalation of care, failure to rescue and medical emergency teams.

Three systematic review articles have found that high-risk surgical patients staying postoperatively in hospital, can be exposed to problems in information transfer and communication (Moller 2013, Segall 2012, Nagpal 2010). Table 2.10 presents the research on clinical handover problems in a surgical episode of care. Perioperative handovers were characterised as complex work practices where information transfer failures were common (Moller 2013, Segall 2012, Nagpal 2010). Handovers were challenged by interruptions, time pressure and the lack of a supporting framework (Moller 2013, Segall 2012, Nagpal 2010). No standard communication tool has been established even for a single phase of clinical handover (Moller 2013, Nagpal 2010).

Table 2.10 Clinical handover problems in a surgical episode of care

Author	Method	Findings, Recommendations	Limitations
Nagpal et al 2010	Systematic review	Information transfer failures are common in the hospital setting in the fields of surgery and anaesthesia and are distributed across the continuum of care -pre, intra, postoperative. Most studies have focused on only one phase of care especially the operating room. No standard tool has been developed even for a single phase to improve communication and evaluate its effectiveness. Use of standardised communication through checklists and improved technology have improved the information transfer process.	Limited by the consistency and quality of empirical research papers only 2 randomised control trials. Heterogeneity of methods and information tools made comparisons difficult. Hospital to primary care communication not reviewed Limited link communication failures with patient outcome data
Segall et al 2012	Systematic review	Broadly supported recommendations from the papers reviewed were: • Standardise processes through checklists, protocols • Complete urgent clinical tasks before handover • Allow only patient – specific discussions during verbal handover • Provide team training in handover	Only studied intra to post-anaesthesia care unit or intensive care unit; not to hospital wards or further. Only 4/31 studies interventional, most were cross sectional descriptive studies. Limited link communication failures with outcomes data
Moller et al 2013	Systematic review	Postoperative handovers were characterised as complex work practices challenged by interruptions, time pressure and lack of a supporting framework Interventions – standardised handover tools need to address the local setting and customise change to that specific context, and acknowledge the role of non-technical skills e.g. collaboration and teamwork	Heterogeneity of methods. Outcome measures when used were surrogate measures, not patient-specific outcomes. Intervention studies were in main short-term research-based studies rather than quality improvement cycles

The need for standardisation of communication, and a long-term supporting framework that recognises the need for education around collaboration and teamwork, is recommended for clinical handover (Moller 2013, Segall 2012, Nagpal 2010). Serious adverse events can result from a failure in escalation of care (FEOC), defined as a failure to recognise and communicate patient deterioration to a senior colleague (Johnston 2015). FEOC can lead to failure to rescue (FTR) defined as death after a complication (Ghaferi 2009b).

Table 2.11 presents the evidence on FEOC and FTR. Two papers are retrospective reviews (Greenberg 2007, Johnston 2015), two are prospective, observation (Johnston 2014) and face-to-face survey (Rotella 2014).

Table 2.11 The moderating role of context in failure in escalation of care

Author	Methods	Findings	Limitations
Greenberg et al 2007 USA	Surgeon review of 444 malpractice claims from 4 liability insurers – thematic analysis	60 cases involved 81 communication breakdowns occurring in the pre (38%), intra (30%) and post (32%) operative periods. The majority were verbal (92%) and between 1 transmitter and 1 receiver (64%) Senior surgeon was the most frequent team member involved 43% were handoffs, or change in patient's location (39%) Status asymmetry (74%), ambiguity about responsibilities (73%), junior doctors failing to inform senior surgeon and senior to senior surgeon handoffs were common associated factors	Use of retrospective malpractice claims as a surrogate measure for patient safety – communication problems with the senior surgeon will be over-represented, as they are the most likely team member to be named in the lawsuit. Other important systems failures may not be identifiable e.g. beyond change in patient's location, errors in multiple phases of care
Johnston et al 2015 UK	Systematic literature review	The reported incidence of FTR is between 8-16.9%. FTR is inversely related to hospital volume and nursing staffing levels. Delayed escalation of care (EOC) to senior doctors / clinicians was associated with greater mortality. Causes of delayed escalation include hierarchy and communication failures Interventions aimed at the surgical wards found escalation protocols result in decrease intensive care admissions and in one study decrease mortality	The role of human factors, communication and teamwork were evaluated with EOC but not FTR Most papers in review involve retrospective methodology using administrative data for FTR rather than direct frontline observation to develop targeted interventions

Author	Methods	Findings	Limitations
Johnston et al 2014 UK	Ethnographic observations in surgical wards in 3 London hospitals. Survey on risk assessment Group consensus meeting to validate hazard scores Multidisciplinary analysis of hazardous failures	Mapping of escalation of care (EOC) process (33 steps) and identifying hazardous failures associated with steps (18) allowed failures to be systematically identified and interventions to be tailored to root cause of failure. Adequately controlled failures (3/18), (15/18) thus had root cause analysis finding that old communication technology, understaffing, hierarchical barriers a problem. Participant recommended interventions based on these findings included defined escalation protocols, human factors education, enhanced communication technology, improved clinical supervision	The role of systems, human factors, communication and teamwork were evaluated with EOC and not FTR; and the nature and severity of the “deteriorations” were not specified Limitations of healthcare failure mode effects analysis (HFMEA) include subjectivity of participants and their potential ‘blind spots’ in proposing process failures
Rotella et al 2014 Australia	Face to face questionnaire Junior doctors self-reported attitudes to EOC	63.3% felt they were able to diagnose a deteriorating patient, they were more likely to escalate if not familiar with the patient clinically, and less likely to escalate if the handover process was seen to be adequate. 36% said they were concerned about waking seniors at night, 12% agreed that they limited EOC due to fear of criticism or conflict with a senior colleague, 6% feared EOC overnight would affect their future career prospects. Junior doctors identified clear handover with documented goals of treatment as improving EOC processes.	The role of systems, human factors, communication and teamwork were evaluated with EOC and not FTR

The methodological constraints of retrospective review to diagnose the causes for FOEC and FTR led authors to stress the importance of addressing the local context for customising change, including education for non-technical skills such as teamwork and communication (Johnston 2015, Johnston 2014, Greenberg 2007). In contrast, face-to-face questionnaire with frontline clinicians (Rotella 2014) and observations, mapping of care processes and using a multiple methods examination of the clinical floor (Johnston 2014), allowed recommendations specific to the local context. For example, Rotella et al 2014 found that for junior doctors in the local context, status asymmetry negatively influenced their willingness to consult seniors, whilst clear goals of treatment improved EOC communication. By mapping the EOC process in the local context, Johnston et al 2014 could systematically identify and address points where FEOC arose for example, using old communication technology, understaffing and hierarchical barriers. A significant limitation of the three papers focusing on local context, human factors, communication and teamwork, was that FEOC was examined without relation to FTR or patient outcome data (Johnston 2015, Johnston 2014, Greenberg 2007).

Medical Emergency Teams (MET) have been established to address FTR and the deteriorating patient in hospital wards (Hillman 2005) (Table 2.12). Despite research using methodology for the highest level of evidence, a multi-hospital cluster randomised controlled trial, the effectiveness of the Medical Emergency Team (MET) system could not be proven (Hillman 2005). This was despite effectiveness being established in multiple non-randomised smaller single centre studies showing reduction in cardiac arrests, ICU admission and mortality (Hillman 2005). Implementing a MET system is a complex intervention and multiple local contextual factors may be postulated to explain why when patients' condition fulfilled MET call criteria, in only 30% of cases was the MET called. For example, the standardised implementation of the MET system across the intervention hospitals may have been impeded by the withdrawal of the implementation team after initial education of the MET system was provided, leaving individual hospitals to maintain the system for the research period (Hillman 2005).

Table 2:12 The moderating role of context in proving the effectiveness of the Medical Emergency Team (MET) system

Author	Subject	Methods	The influence of context
Hillman et al 2005 Australia	Medical Emergency Teams (MET)	Cluster randomised control trial - numerical analysis	23 Australian hospitals, all had > 20,000 admissions per year. Effectiveness established in single centre hospitals, but this large multicentre trial failed to demonstrate an effect on cardiac arrest, unplanned ICU admission or death with Introducing MET to hospitals compared with control group hospitals providing standard ward care

Empirical results from the scoping review namely, the high cost of the high-risk patient suffering a postoperative complication, the dynamic interacting nature of perioperative risk factors, and communication failures, failure to rescue lead to research questions 2.

Research Question 2:

How is perioperative work practice organised around low, intermediate and high-risk patients?

2.3 Systematic literature review

This section describes a systematic literature review searching for empirical papers of highest hierarchical research quality (Petticrew 2013a, Petticrew 2013b, Rychetnik 2002) pointing to the best next step for addressing the challenges exposed by the scoping review.

The purpose of this systematic literature review was to capture and analyse emerging perioperative models of care. This was conducted to gain a more complete understanding of how high perioperative risk is conceived, and what individuals, teams or organisations do, to mitigate the risk of a patient adverse outcome. Based on the scoping review findings, this systematic review accepted the assumption that addressing the challenges of the high-risk, high-cost patient having surgery requires an evolution of perioperative care towards more interprofessional or team-based approaches. The analysis of the review focuses on complex interventions, health service interventions that are clinical and require multiple potentially active interacting interdisciplinary parts (Petticrew 2013a). It studies the needed change in work practices, communication, and interprofessional relations of the perioperative care team (Petticrew 2013a). Adding a context perspective, adapted from public health interventions research, enabled critical examination of complex interventions in the context of the perioperative setting (Petticrew 2013a, Rychetnik 2002). Important to note, complex interventions are not specific clinical interventions primarily focused on a new drug or a new intraoperative technology or technique (Petticrew 2013a). The systematic literature review will show that study design alone, based on traditional criteria for hierarchical levels of evidence quality, is insufficient for the understanding and transferability of health service research findings (Petticrew 2013a, Petticrew 2013b, Rychetnik 2002). The following section makes explicit the identification, selection, analysis and results of empirical peer reviewed research.

The scope of the systematic review was to synthesize research with two foci. First, research on high-risk patients, these are defined as those patients at risk of adverse events that threaten or result in major organ failure e.g. heart, cardiovascular, brain, lung or kidney failure as observed as an intra-operative or post-operative complication. Second, to examine models of care provided by evolving interprofessional teams designed to mitigate and manage these patient adverse events. The systematic literature review endeavours to achieve five learning objectives, that is: to characterise the proposed intervention; identify the team or organisational constituents; identify the process of care and tools used for team interaction in implementing the intervention; identify the research methods and tools used to evaluate the intervention; and critically examine the research outcomes in relation to the intervention, methods and context.

2.3.1 Search strategy

The search strategy for the systematic literature review is outlined in Figure 2.2. The contents detail the data sources accessed, time periods the searches were conducted, the terms used and the inclusion/ exclusion criteria for the systematic literature review. For the systematic literature review, processes for generating and organising ideas such as brainstorming and concept-mapping where employed to decide, a priori, on appropriate academic databases, search terms, limiters, inclusion and exclusion criteria. This was achieved by enlisting the expertise of the study supervisors and specialist university librarians. Iteratively, through reviewing key references, the search strategy, terms and key words were confirmed. The search strategy advanced through using key papers to initially compile key words on the electronic databases selected. Search terms became more precise through iteratively reviewing the outputs of preliminary key words searched in the databases. The Medical Subject Headings (MeSH) terms from key articles were used to make the search thorough. The reference lists of retrieved seminal publications were also reviewed to identify further studies that met the review selection criteria. All data sources were interrogated using the search terms listed. In addition, the 'snowball method' with bibliographic reference checking was used. Studies identified by this approach up until September 2020 are included in this analysis. The main challenge in capturing all published empirical papers on perioperative risk, organisational systems and learning was that the research area is broad rather than focused. While every endeavour was made to regularly and iteratively capture all relevant nascent studies, with the assistance of a specialty university librarian, using systematic and comprehensive search strategies, some papers may have been missed

2.3.2 Study selection

Electronic databases and available abstracts were screened to identify articles for full text review. In consultation with study supervisors, paper selection was developed a priori and by an iterative process during the research. Reference lists of included articles were in turn interrogated for added citations. The selection process and outcomes are shown in Figure 2.3.

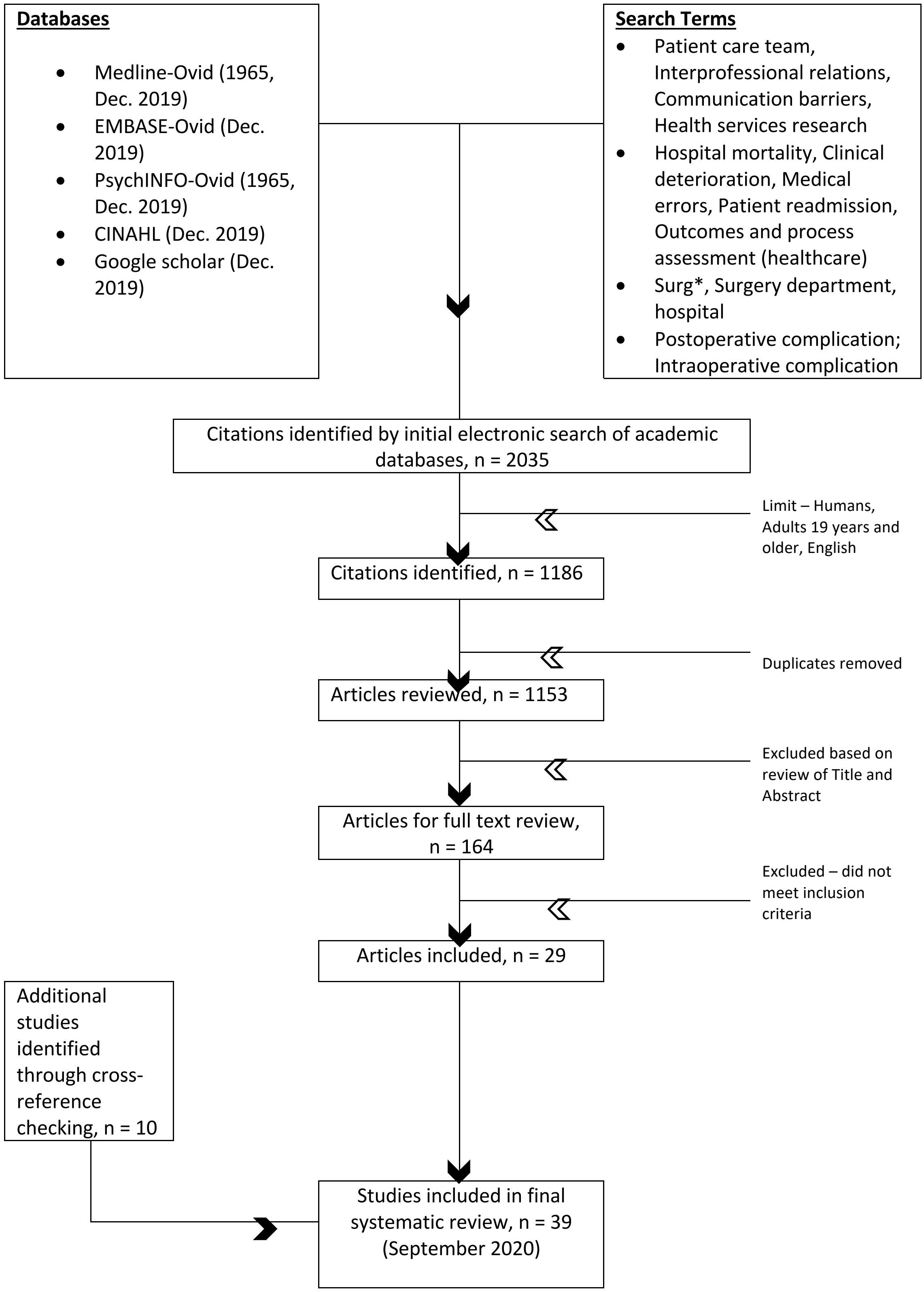
Figure 2.2 Systematic literature review - Search strategy

<table>
<tr><td>Data sources accessed</td><td colspan="2">Medline-Ovid (1965, September 2020)
CINAHL (September 2020)
EMBASE-Ovid (September 2020)
PsychINFO-Ovid (September 2020)
Google Scholar (September 2020)</td></tr>
<tr><td>Search periods</td><td colspan="2">2012, 2014, 2016, 2018, last updated September 2020</td></tr>
<tr><td colspan="3">Search steps</td></tr>
<tr><td>A</td><td>C</td><td>B</td></tr>
<tr><td>Hospital mortality OR Clinical deterioration
OR Medical errors ae, pc, sn
(adverse events, prevention and control, statistics and numbers) OR Patient readmission OR Outcomes and process assessment (healthcare)
AND
Surg* Surgery department, hospital</td><td rowspan="3">AND</td><td rowspan="3">Patient care team
OR
Interprofessional relations
OR
Communication barriers
OR
Health services research
OR
Allied Health occupations</td></tr>
<tr><td>OR</td></tr>
<tr><td>Postoperative complication di, ep, et, pc OR
Intraoperative complication di, ep, et, pc
diagnosis, epidemiology, etiology, prevention and control</td></tr>
</table>

Systematic review – inclusion / exclusion criteria

Inclusion criteria	Exclusion criteria
• Addresses or analyses major patient adverse events that threaten or result in major organ failure as observed as an intra-operative or post-operative complication • Describes new work practices of a perioperative patient care team and their communication • Single centre randomised control trials (RCT), prospective cohort studies, and prospective case series describing novel team based care • Articles related to humans published in English	• Did not address a major life-threatening complication related to having surgery and anaesthesia • Primarily focused on a new drug, or new intraoperative technology or technique • Single centre studies primarily focused on one unique enhanced recovery after surgery (ERAS) pathway • Did not study change in work practices, communication, interprofessional relations of the perioperative care team • Studies with retrospective chart or registry database reviews that can introduce reporting bias (through omissions, voluntary reporting, variable accuracy of documentation)

Figure 2.3 Systematic literature review - Consort diagram for search terms, selection process and outcomes



The 2035 citations identified through the initial electronic search of the academic database were screened for possible inclusion in this review. Of these, 164 were judged to require full text review. A further 10 references were identified by reference checking of seminal papers. An open approach was adopted, and borderline peer reviewed papers were included rather than excluded. A total of 39 studies were eligible for inclusion.

2.3.3 Analysis

Data was extracted and analysed systematically using the analysis framework below (Table 2.13). The data extraction process was via a template providing a structure that ensures that articles included for review were evaluated in a consistent manner (Petticrew 2013a, Rychetnik 2002). The information obtained from the included articles were recorded on a data extraction form consistent with Table 2.13 Analysis framework.

Table 2.13 Systematic literature review - Analysis framework

Citation, Year paper published, Country

Research Aim and Design

<u>Characteristics of complexity</u>

Intervention - Study Setting

- o Multiple organisational levels (macro, meso, micro)
- o Multiple interacting components - Participants - Team
- o Degree of flexibility of intervention permitted
- o Self-organisation, adaptability and evolution over time

Intervention's causal pathway

- Intervention - Disease, Complication and/or Clinical Specialty specific
- Linear input-out relationship or non-linear relationships, phases
- Communication method and/ or tools, information technology
- Mediators, moderators, feedback loops
- Results – Primary outcome and other outcomes

Conclusion, Recommendations and Limitations of study

2.3.4 Results

The results of the systematic literature review are now presented. Table 2.14 is a synopsis of the selected papers design, policy levels of the intervention and country of origin. For a detailed description, an extensive review can be found in Appendix 3, presented in four tables (Tables 2.1_SLR to 2.4_SLT), applying the headings of the Analysis Framework (Table 2.13).

Papers designed to provide the highest level of hierarchical evidence were selected with 15 randomised (controlled) clinical trials and 15 prospective controlled before and after trials. Selected papers originated from around the globe including the USA (13), Europe (12), UK (7), Australia, New Zealand (6) and Asia (1).

Table 2.14 Synopsis of systematic literature review papers - methodology

Classification	Subclassifications	No. of papers
Research design	Cluster randomised (controlled) trial	4
	Randomised controlled trial	11
	Prospective controlled before and after trial	15
	Prospective cohort study	7
	Prospective survey	2
Country	United States of America	13
	United Kingdom	7
	Australia (and New Zealand – one combined paper)	6
	Canada, Denmark, Norway	2 each
	France, Ireland, Poland, Spain, Sweden, Taiwan, The Netherlands	1 each

2.3.4.1 Nascent models of perioperative care

Table 2.15 provides a synopsis of the emerging perioperative models of care and their interventions. Care providers included specialty nurses; doctors including hospitalists, surgeons, anaesthetists, pain, respiratory, infectious diseases, geriatric and critical care medicine specialists; allied health staff including physiotherapists, dietician-nutritionists, occupational therapists and pharmacists; hospital managers and quality improvement specialists (Appendix 3 Table 2.1_SLR Study setting).

Table 2.15 Synopsis of systematic literature review papers – focus of intervention

Interventions	No. of papers
Preoperative Prehabilitation – exercise and nutrition	1
Pre-operative comprehensive geriatric assessment and optimization	1
Pre and/or post-operative surgery - exercise programs, early mobilisation and chest physiotherapy	6
Communication, oral hygiene, nutrition and early mobilisation	1
ERAS – perioperative pain management, mobility, nutrition and patient engagement	3
POSH-MDT -preoperative risk assessment and modification, mobility, functional status, nutrition, hydration, pain management, advanced care planning aligned to patient goals (+postop daily geriatrician review*)	1
Medical* team intervention in hospital wards (hospitalists; surgeons; pain, respiratory, geriatric medicine and critical care physicians)	7
Nurse-led intervention in hospital wards	2
Medical team intervention post-discharge from hospital	1
Intermediate or critical care ward beds	4
Surgical site infections quality improvement programme	5
Emergency abdominal surgery quality improvement programme	1
Remote formal education for non-technical skills	1
Remote survey on patient safety culture	1
Checklists for surgical ward processes – audit and feedback	1
Sharing surgical process and outcomes data	2
Remote analysis of structures, process, outcomes	1

The interventions outlined in Table 2.15 can be classified into four groups. First, pre- and post-operative multidisciplinary initiatives to keep patients functioning as well as they can before and after the operation in terms of eating, drinking, breathing, moving, thinking. Physical exercise programs (Barakat 2016, Barberan-Garcia 2018, Bhatt 2017, Jensen 2014, Liu 2017, McDonald 2018, Minella 2018, Nelson 2016) optimisation of nutrition (Chen 2017, Kabata 2015, Liu 2017, McDonald 2018, Minella 2018), early enhanced mobilisation postoperative, (Chen 2017, Bhatt 2017, Jensen 2014, Liu 2017, McDonald 2018, Silva 2013) communication to improve mental cognition (Chen 2017, Liu 2017, McDonald 2018) oral (Chen 2017)and respiratory hygiene, chest physiotherapy

(Boden 2017, Silva 2013). ERAS – type pathways bundle a number of these interventions for the whole episode of care (De Vries 2010, Liu 2017, McDonald 2018, Nelson 2016).

The second group of interventions include medical (Bellomo 2004, Cull 2013, Hall 2017, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, Peden 2019, Ravikumar 2010) or nursing (Eliott 2008, Peden 2019, Story 2004) specialists assuming new leadership roles beyond the ERAS pathway bundle. Physical examinations were done on high-risk patients on the clinical floor to assess for risk and pre-empt postoperative complications (Bellomo 2004, Cull 2013, Eliott 2008, Hall 2017, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, Peden 2019, Ravikumar 2010, Story 2004). Four such studies introduced new forms of clinical review with intermediate (Prestmo 2015, Vester-Andersen 2015, Ravikumar 2010) or critical care level ward beds (Bellomo 2005, Ravikumar 2010). In addition, one study targeted care beyond discharge from hospital (Berggren 2019).

Third, two national multi-level comprehensive quality improvement programmes attempting to reduce postoperative complications. One targeting surgical site infections (SSI) was evident in five papers across the USA (Cima 2012, Gorgun 2018, Wick 2012) UK (Chiwera 2018) and Norway (Lower 2013). The other targeting emergency abdominal surgery (Peden 2019).

The fourth and last group of interventions were six papers assessing the interplay between structures, processes, outcomes, culture and education. Providing team-based education for checklist implementation (Duclos 2016, Peden 2019). Use of checklist process indicators for audit and feedback (De Vries 2010). Assessing safety culture in relation to surgical site infection rates (Fan 2016) and sharing state-wide outcomes data to inform quality improvement (Guillamondegui 2012). Using between-hospitals variation in survival after emergency abdominal surgery and remote analysis of organisational structures and processes to explain outcomes (Oliver 2018). For the complete literature review data see Appendix 3 Table 2.2_SLR Research intervention.

The primary outcomes achieved were reduced incidence of serious postoperative complications (Barakat 2016, Barbaren-Garcia 2018, Bellomo 2004, Bhatt 2017, Boden 2017, Chen 2017, Chiwera 2018, Cima 2012, Eliott 2008, Gorgun 2018, Huddleston 2004, Iberti 2016, Kabata 2015, Liu 2017, McDonald 2018, Nelson 2016, Partridge 2017, Ravikumar 2010, Wick 2012), reduced length of stay (Barakat 2016, Barbaren-Garcia 2018, Bellomo 2004, Bhatt 2017, Chen 2017, Kabata 2015, Liu 2017, McDonald 2018, Nelson 2016, Partridge 2017, Ravikumar 2010) and fewer admissions to short term nursing home care (Prestmo 2015).

Studies that were unable to prove their intervention resulted in a reduction in serious adverse events included the national quality improvement programme for emergency abdominal surgery (Peden 2019), introduction of a high dependency unit (Bellomo 2005), or intermediate care unit (Vester-Anderson 2015) for high risk surgical patients; critical care nurse outreach (Story 2004); pre- and post- operative physical exercises and enhanced mobilisation (Jensen 2014); exercise and nutrition prehabilitation (Minella 2018); improving senior surgeon supervision and escalation of care procedures (Johnston 2018); geriatric interdisciplinary home rehabilitation (Berggren 2019); team-based training (Duclos 2016). Surprisingly for SSI other than rate reduction other associated outcomes such as LOS, unplanned return to theatre of critical care, or 30-day readmission not reported (Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012). For the complete literature review data see Appendix 3 Table 2.3_SLR Primary and other outcomes.

In terms of change processes and implementation there are three findings common to the 39 papers. First was research pragmatism, allowing for self-organisation and evolution of existing models of care over time; the sole exception was a remote research study on safety culture and SSI (Fan et al 2016). The second common finding of the papers was evidence of boundaries crossing across multiple facets of clinical care and governance (Table 2.16). For complete data see Appendix 3 Table 2.1_SLR Study setting.

Table 2.16 Evidence of staff crossing boundaries in new perioperative models of care

Boundaries crossed	**Papers**
Levels of care (macro, meso, and micro)	Barakat 2016, Chiwera 2018, Cima 2012, De Vries 2010, Duclos 2016, Gorgun 2018, Guillamondegui 2012, Iberti 2016, Liu 2017, Lower 2013, Nelson 2016, Oliver 2018, Peden 2019, Ravikumar 2010, Story 2004, Vester-Andersen 2015, Wick 2012
Phases of care (pre-intra-post-operative)	Barakat 2016, Boden 2017, Chiwera 2018, Cima 2012, De Vries 2010, Eliott 2008, Gorgun 2018, Guillamondegui 2012, Hall 2017, Liu 2017, Lower 2013, Nelson 2016, Oliver 2018, Partridge 2017, Peden 2019, Wick 2012
Physical hospital structures	Barakat 2016, Barbaren-Garcia 2018, Bellomo 2004, Berggren 2019, Chiwera 2018, Cima 2012, Eliott 2008, Gorgun 2018, Guillamondegui 2012, Hall 2017, Liu 2017, Lower 2013, Nelson 2016, Oliver 2018, Peden 2019, Prestmo 2015, Ravikumar 2010, Story 2004, Vester-Andersen 2015, Wick 2012
Across professions through communication and collaboration	Barakat 2016, Barbaren-Garcia 2018, Bellomo 2004, Bhatt 2017, Chiwera 2018, Cima 2012, De Vries 2010, Eliott 2008, Gorgun 2018, Guillamondegui 2012, Hall 2017, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, Liu 2017, Lower 2013, McDonald 2018, Minella 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Ravikumar 2010, Symons 2013, Vester-Andersen 2015, Wick 2012
Within existing professional roles	
Nurses	Berggren 2019, Chen 2017, Chiwera 2018, Cima 2012, De Vries 2010, Eliott 2008, Gorgun 2018, Guillamondegui 2012, Hall 2017, Liu 2017, Lower 2013, McDonald 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Ravikumar 2010, Story 2004, Symons 2013, Vester-Andersen 2015
Doctors	Barakat 2016, Barbaren-Garcia 2018, Bellomo 2004, Bhatt 2017, Berggren 2019, Chiwera 2018, Cima 2012, Cull 2013, De Vries 2010, Gorgun 2018, Guillamondegui 2012, Hall 2017, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, Liu 2017, Lower 2013, McDonald 2018, Minella 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Ravikumar 2010, Symons 2013, Vester-Andersen 2015
Physiotherapists	Barakat 2016, Barbaren-Garcia 2018, Boden 2017, Hall 2017, Jensen 2014, Liu 2017, Minella 2018, Ravikumar 2010, Silva 2013, Symons 2013
Dietician-Nutritionist	Kabata 2015, Liu 2017, Minella 2018, Ravikumar 2010
Pharmacists	Cima 2012, Liu 2017, Ravikumar 2010, Wick 2012
Social worker	Partridge 2017
Occupational therapist	Partridge 2017, Ravikumar 2010, Symons 2013
Managers, Quality improvement advisors e.g. project engineers, data analysts, educators	Barakat 2016, Chiwera 2018, Cima 2012, De Vries 2010, Duclos 2016, Gorgun 2018, Guillamondegui 2012, Iberti 2016, Liu 2017, Lower 2013, McDonald 2018, Nelson 2016, Peden 2019, Ravikumar 2010, Wick 2012

The third prominent finding was that nascent models of perioperative care may operate as linear, non-linear, or mixed systems. For the complete literature review data see Appendix 3 Table 2.2_SLR Relationships and Table 2.3 Research intervention mediators. For the purposes of this research linear and non-linear models of care are defined as follows. Linear models of care systems tend to have standard, fixed components, for example staffing, and are focused on specific pathways and outcomes. Non-linear models of care are complex adaptive systems, capable of reorganising and reacting to changes in patients' medical conditions for their resource deployment. Table 2.17 presents the papers for models of perioperative care that operate as linear, non-linear complex adaptive systems or mixed systems.

Table 2.17 Linear, non-linear and mixed systems of perioperative care

System	Paper
Linear	Barakat 2016, Barbaren-Garcia 2018, Bellomo 2005, Berggren 2019, Bhatt 2017, Boden 2017, Chen 2017, Chiwera 2018, Cima 2012, De Vries 2010, Duclos 2016, Gorgun 2018, Hall 2017, Jensen 2014, Kabata 2015, Liu 2017, Lower 2013, Minnella 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Silva 2013, Vester-Andersen 2015, Wick 2012
Non-linear Complex adaptive systems	Bellomo 2004, Cull 2013, Guillamondegui 2012, Johnston 2018, Kabrhel 2016, Ravikumar 2010, Story 2004, Symons 2013
Mixed systems	Eliott 2008, Huddleston 2004, Iberti 2016, McDonald 2018

Linear systems have standard, fixed components, for example the intervention or staffing, and are focused on specific pathways and predetermined outcomes. Linear models across levels of care that were hierarchical, were well supported, sustained and specific to a major complication or surgical subspecialty. Surgical site infection (SSI) rates were monitored at a national level in five papers studying comprehensive programmes across phases of care for targeting SSI, from the USA (Cima 2012, Gorgun 2018, Wick 2012), UK (Chiwera 2018) and Norway (Lower 2013). In these hierarchical models there was consistent evidence of regulation or intervention mediators - moderators, regular audit and feedback loops (Cima 2012, Chiwera 2018, Gorgun 2018, Lower 2013, Wick 2012). There was engagement of local multidisciplinary teams of clinical experts supported by hospital executive and quality experts (Chiwera 2018, Cima 2012, Gorgun 2018 Wick 012). Additionally, there was evidence of evolution of service

e.g. across phases of care (Chiwera 2018, Gorgun 2018, Cima 2012, Wick 2012) including post-discharge surveillance (Lower 2013) and change of focus to higher risk surgeries - appendix to colon (Lower 2013), colorectal (Cima 2012, Gorgun 2018, Wick 2012), cardiac (Chiwera 2018, Lower 2013), orthopaedic (Lower 2013). They also show multiple methods of communication and information technology support (Cima 2012, Chiwera 2018, Gorgun 2018, Lower 2013, Wick 2012). The three papers reporting rapid large-scale implementation of ERAS - like protocols or checklists, across a geographical region had similar linear hierarchical implementation features to the SSI interventions. Namely, elective colorectal surgery and emergency hip repair in California, USA (Liu 2017), colorectal surgery in Alberta, Canada (Nelson 2016), and comprehensive surgical patient safety system for entire surgical pathway in The Netherlands (De Vries 2010)
Another paper reporting large-scale implementation of a complex care pathway for emergency abdominal surgery across a geographical region had similar linear hierarchical implementation features to the SSI and large-scale ERAS interventions (Peden 2019). Less hierarchical linear models of care implemented components of an ERAS bundle (Barakat 2016, Barberan-Garcia 2018, Bhatt 2017, Boden 2017, Chen 2017, Jensen 2014, Kabata 2015, McDonald 2018, Minella 2018, Silva 2013) or had established new structures or units to receive predetermined high-risk patients for care (Bellomo 2005, Prestmo 2015, Vester-Andersen 2015). Linear models were used for team education (Duclos 2016) and risk stratification for frailty (Hall 2017).

In contrast, non-linear models of care were complex adaptive systems, designed to be capable of reorganising and reacting to changes in patients' medical conditions for their resource deployment. Non-linear models were designed to better react to a deteriorating ward patient through a new model of team working for junior doctors' supervision and escalation of care (Johnston 2018), a designated senior surgeon of the week to be present on the wards (Cull 2013), critical care nurse outreach (Eliott 2008, Story 2004), medical emergency team (Bellomo 2004), dynamic risk stratification and mitigation using ward rounds with hospitalists for intermediate risk patients and intensivists for higher risk patients (Ravikumar 2010). Rather than a linear ERAS-style pathway or process checklist for implementation, non-linear models of care rely on surveillance and deploy resources based on a patient's clinical need. This was considered particularly useful when best practice using new technologies required multidisciplinary knowledge sharing and negotiation as with the pulmonary embolus rapid response team (Kabrhel 2016).

Two papers used continual surveillance of surgical process and outcomes data, combined with regular multidisciplinary review to deploy resources based on addressing shortfalls in care (Guillamondegui 2012, Symons 2013). A single audit of between-hospitals survival after emergency abdominal surgery found that four components: perioperative care pathways, emergency surgical units, consultant-delivered intra-operative care and postoperative geriatrician review for older patients were associated with improved survival (Oliver 2018). Considerable change in work practices and organisation of care would be required for full uniform implementation of the four components across the UK (Peden 2019, Oliver 2018). Four papers adopted mixed linear and non-linear systems. Linear perioperative care pathways were augmented by non-linear surveillance and as needed escalation of care by senior doctors, Hospitalists (Huddleston 2004, Iberti 2016) and ICU liaison nurse (Eliott 2008) in the surgical ward and Geriatrician daily review (McDonald 2018).

Table 2.18 details the methodological limitations of the papers from the systematic literature review. For complete data see Appendix 3 Table 2.4_SLR Limitations of study. Table 2.18 will show that study design alone, based on traditional criteria for hierarchical levels of evidence quality, is insufficient for the understanding and transferability of health services research findings (Petticrew et al 2013, Rychetnik et al 2002).

Table 2.18 Context and the methodological limitations of the systematic review papers

Methodological limitation	Details and examples	References
Single centre intervention studies with small sample numbers may be underpowered for major complications, or affected by associated other complications	Small sample numbers (n < 150) may limit associations between interventions and serious adverse events because they are underpowered for major complications For example: small sample numbers for postoperative pulmonary complications may have been affected by other associated complications such as bowel anastomotic leak or cardiac complications (Silva 2013)	Barakat 2016, Barberan-Garcia 2018, Bhatt 2017, Jensen 2014, Eliott 2008, Kabata 2015, Minella 2018, Silva 2013, Symons 2013

Methodological limitation	Details and examples	References
2. Longitudinal, and also often single centre, studies with no control or comparison group may introduce bias in analysis as the intervention naturally evolves	No control or comparison group may introduce bias in the assessment of interventions, serious adverse events and other outcomes. For example: concomitant change in hospitals during the pre-post-study period – this included becoming part of new hospital-wide Quality Improvement initiatives (Berggren 2019, De Vries 2010), Iberti 2016)	Bellomo 2004, Bellomo 2005, Berggren 2019, Chiwera 2018, Cima 2012, Cull 2013, De Vries 2010, Eliott 2008, Gorgun 2018, Iberti 2016, Johnston 2018, Kabrhel 2016, Lower 2013, Ravikumar 2010, Story 2004, Symons 2013, Wick 2012
3. Single centre studies using randomised controlled trial (RCT) design may introduce bias in masking assessors or due to possible contamination of control arm	RCT design in single centres may have ethical problems and difficulties with possible contamination of the control arm and observational biases e.g. non-masked assessors, non-standardisation of risk (e.g. low risk cohorts), non-reporting of risk factors, non-standardisation of intervention For example: single centre study – masking of patients, staff and assessors not possible and may have effected performance- based tests and questionnaires for both arms (Prestmo 2015)	Barakat 2016, Barbaran-Garcia 2018, Berggren 2019, Chen 2017, Huddleton 2004, Jensen 2014, Kabata 2015, Minella 2018, Partridge 2017, Prestmo 2015, Silva 2013
4. Single centre studies with unique hospital or geographical settings may limit generalisability	Unique hospital or geographic settings may limit generalisability compared with multisite studies with a variety of hospitals Majority of studies are single centre, urban, large university teaching hospitals For example: Vascular senior surgeon hospitalist model may not be generalisable to smaller subspecialty units with 8 senior surgeons or less (Cull 2013)	Barakat 2016, Barbaran-Garcia 2018, Bellomo 2004, Bellomo 2005, Berggren 2019, Bhatt 2017, Chen 2017, Cull 2013, Eliott 2008, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, McDonald 2018, Partridge 2017, Prestmo 2015, Ravikumar 2010, Silva 2013, Story 2004, Symons 2013, Vester-Andersen 2015, Wick 2012
5. Comprehensive multilevel multidisciplinary integrated interventions may limit their transferability to less resourced and integrated settings	For example: National surgical site infection (SSI) reduction programs (USA, UK, Norway)	Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012
	National quality improvement programme for emergency abdominal surgery (UK)	(Oliver 2018, Peden 2019)
	State health service - large scale ERAS implementation program (Canada)	Nelson 2016
	Highly integrated private healthcare system - rapid large-scale ERAS implementation (USA)	Liu 017
6. High level (national or state) outcomes studies lack the granularity needed for understanding changes at the clinician-manager-patient micro system level	National surveillance module for SSI for cardiac, colon, hip surgery	Lower 2013
	Survey on patient safety culture	Fan 2016
	National emergency laparotomy audit (NELA) database – restricted set of processes, remote access to data	Oliver 2018, Peden 2019
	State regional peer scrutiny of patient outcomes data	Guillamondegui 2012

Methodological limitation	Details and examples	References
7. Bundled interventions and MDT - unclear what elements of the intervention bundles add to improved outcomes	National SSI reduction programs (USA, UK, Norway)	Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012
	ERAS pathways	Liu 2017, Nelson 2016
8. Over reliance on quantitative methods and statistical analysis to prove implementation success without 'a priori' use of qualitative methods to understand intervention success, failure	National SSI reduction programs (USA, UK, Norway)	Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012
	National emergency laparotomy audit (NELA) database – restricted set of processes, remote access to data – in part determined by coding, self-reporting	Oliver 2018
	Critical care outreach – Examining staff attitudes to activating MET via interviews or survey not considered 'a priori'	Eliott 2008, Story 2004
9. Theoretical perspectives and logic models not generally applied to implementation process	Theoretical perspectives not considered beyond biomechanical theory (Boden 2017) or structure-process-outcomes systems theory (Oliver 2018)	All papers

The moderating role of context is evident within the research setting of studies. For example, longitudinal studies with no comparison group were affected by other new hospital-wide quality improvement initiatives arising in their research settings (Berggren 2019, De Vries 2010,). Single centre studies utilising RCT design considered the introduction of bias with difficulties assuring masking of assessors, and avoiding cross-contamination of the control arm, due to the confined communal space of the clinical floor (Barakat 2016, Barbaran-Garcia 2018, Berggren 2019, Chen 2017, Huddleton 2004, Jensen 2014, Kabata 2015, Minella 2018, Partridge 2017, Prestmo 2015, Silva 2013).

The moderating role of context is evident in the transferability of study interventions. Single centre studies with unique hospital characteristics or geographical settings can limit transferability compared with multisite studies with a variety of hospitals (Barakat 2016, Barbaran-Garcia 2018, Bellomo 2004, Bellomo 2005, Berggren 2019, Bhatt 2017, Chen 2017, Cull 2013, Eliott 2008, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, McDonald 2018, Partridge 2017, Prestmo 2015, Ravikumar 2010, Silva 2013, Story 2004, Symons 2013, Vester-Andersen 2015). High and multi-level, well-resourced comprehensive multidisciplinary interventions that allow rapid implementation, also have limited transferability to less well-resourced and integrated settings (Chiwera

2018, Cima 2012, Gorgun 2018, Liu 2017, Lower 2013, Nelson 2016, Peden 2019, Wick 2012).

On global analysis of the results of the systematic literature review papers, four observations are made. First, the ambition of the emerging models of perioperative care addressing the high-risk high-cost complex care surgical patient. Second, the diversity of the interventions and implementation strategies. Third, the considerable change in work practice and organisation of care needed from managers and clinicians of all perioperative professions. Fourth, the impact of local context. The four observations interwoven together lead to research question 3.

<u>Research Question 3</u>:

What do individuals, teams and organisations require to implement emerging models of perioperative care for the high-risk patient?

The following section provides a synthesis of the key issues arising from the results of the scoping and systematic literature reviews. The key issues are the challenge of the high-risk patient, the impact of context and how best to study the influence of context.

2.4 Synthesis of key issues, thesis aim and research questions

2.4.1 The challenge of prospectively identifying and collectively managing the "high-risk high-cost complex care" surgical patient

The modern challenge is the threat to surgical services, and broader healthcare sustainability, posed by the cohort of high-risk high-cost complex care patients having surgery. These patients are difficult to identify prospectively and manage collectively.

From the scoping review (Section 2.2.4.2), the evidence of this cohort of patients comes from strategic planning documents of the Local Health District (LHD 2015a, LHD 2015b) and is supported by accumulating national (Story 2010) and international evidence (Lawson 2013, Pearse 2012, NCEPOD 2011, Vonlanthen 2011, NCEPOD 2010, Story 2010, Jhanji 2008). This cohort of patients are more likely to suffer serious postoperative complications (Pearse 2012, NCEPOD 2011, Jhanji 2008. The adverse effects of which are long term, months and years beyond the episode of surgical care (Shinall 2019, Khuri 2005). This small cohort of patients utilise a disproportionate amount of both hospital and community resources because not all die in hospital (Merkow 2015, Pearse 2012, NCEPOD 2011, Jhanji 2008, Khuru 2005). Identifying and collectively managing this cohort of patients prospectively, prior to the adverse event is challenging (Tables 2.9-2.12) (Pinto 2019, Shinall 2019, Kahan 2017, Grocott and Mythen 2015, Johnston 2015, Johnston 2014, Minto & Biccard 2014, Rotella 2014, Pearse 2012, NCEPOD 2011, Ghaferi 2010, Nagpal 2010, Ghaferi 2009b, Schifftner 2007, Hillman 2005). Ability to identify these patients is challenging, despite much evidence for four interrelated, interacting risk factor groups – surgical, anaesthetic, patient comorbidity and organisational risk factors – that make up a patient's perioperative risk of a complication (Chapter 1 Diagram 1.1) (Pinto 2019, Minto and Biccard 2014). Ability to identify these patients is challenging, despite multiple derived risk scores, biomarkers, exercise stress test based on current understanding of risk factors (Table 2.8). Perioperative risk is dynamic and additive; it may begin with fitness for surgery but re-stratification throughout the episode of surgery care is advocated to include intraoperative and postoperative events such as haemodynamic instability or adverse events (Pinto 2019, Talmor & Kelly 2017, Minto & Biccard 2014, NCEPOD 2011).

From the systematic literature review, emerging models of perioperative care that adopt a non-linear or mixed systems approach (Section 2.3.4.1, Table 2.16) further attest to the challenge of rescuing this cohort of patients once a postoperative complication is evident (Johnston 2018, McDonald 2018, Iberti 2016, Kabrhel 2016, Cull 2013, Symons 2013, Guillamondegui 2012, Ravikumar 2010, Bellomo 2004, Huddleston 2004, Story 2004). For the purposes of this research, non-linear models of care are complex adaptive systems designed to be capable of reorganising and reacting to changes in a patient's medical condition for their resource deployment

2.4.2 The impact of context

Scoping review papers indicate contextual factors at hospital level such as individual work practices and interprofessional relations, that confound the implementation of best practice for example preoperative fasting times (Table 2:2) (Rycroft-Malone 2012), process orientated care delivery across hospitals (Table 2.3) (Peden 2019, Vos 2010), enhanced recovery pathways (Peden 2019, Stone 2018), and medical emergency teams systems (Table 2.12) (Hillman 2005). The moderating role of context influenced what individuals think and do when caring for surgical patients at higher perioperative risk, this was evident in clinical handover problems in a surgical episode of care (Table 2.10) (Nagpal 2010), failure in escalation of care (Table 2.11) (Johnston 2014, Rotella 2014), and in the cluster randomised control trial of medical emergency teams (Table 2.12) (Hillman 2005).

Context was also identified as an important constituent in the systematic literature papers. Context frequently acted as a moderator of change and innovation, influencing what individuals, teams and organisations think and do and how they interact and learn. In discussing the limitations of their research and making recommendations for future enquiry, authors frequently referred to both the unanticipated modulating influence of local context, and the limitations of their study design that inhibit fuller understanding and generalisability (Appendix 3 Table 2.4 SLR Limitations of study, recommendations, conclusions). For example, with respect to the well-resourced nation-wide, multi-level, comprehensive innovation for SSI reduction a patient safety culture survey of seven hospitals found that the 9 out of 12 dimensions that were associated SSI rates were teamwork across units, teamwork within units, organisational learning, communication openness, manager-supervisor expectations, feedback and communication about error, frequency of events reported, non-punitive response to error (Fan 2016). These nine elements were also described in the implementation strategies of the five papers showing successful reduction in SSIs (Chiwera 2018, Gorgun 2018, Lower 2013, Cima 2012, Wick 2012). Quality of teamwork, communication, feedback and error management were also considered integral to successful, rapid ERAS implementation, across widely divergent populations in 20 hospitals (Liu 2017) and successful establishment of a surgical continuum of care workflow redesign for 'real-time' dynamic risk mitigation (Ravikumar 2010). In another recent nation-wide, multi-level, comprehensive innovation for emergency abdominal surgery, the authors concluded that their findings show that the context of quality improvement is far more complex than previously thought, especially in large national programmes (Peden 2019). Undue emphasis on success stories from small early studies might lead to an underestimation of the requirements for successful quality improvement interventions for example, whilst there was good engagement with the QI programme, local staff had limited time and resources to implement change (Peden 2019).

Similarly, for programs with less control, a consistent finding was that local contextual factors could confound understanding of implementation success or failure (Table 2.18). For example, Iberti et al (2016) describe a mixed linear non-linear Hospitalist vascular surgery co-management model for high-risk ward patients. As the study was part of an evolving hospital wide quality improvement program, the authors were unsure of the effect of hospitalist model on serious adverse outcomes. Symons et al (2013) in an observational study found that process failures moderating patient outcomes and efficiency are common in the postoperative ward and form the background against which surgeons work. Johnston et al (2018) in an observational study using surveys and interviews found that contextual factors influencing supervision of junior doctors could be systematically determined and improved.

Context confounders can affect randomised control studies particularly single-centre studies with contamination of the control arm as previously discussed (Barakat 2016, Barbaran-Garcia 2018, Berggren 2019, Chen 2017, Huddleton 2004, Jensen 2014, Kabata 2015, Minella 2018, Partridge 2017, Prestmo 2015, Silva 2013). For example, despite unacceptably high complication rates post discharge from hip fracture, a geriatric interdisciplinary home rehabilitation intervention failed to improve on standard care (Berggren 2019). This was thought to be related to problems with randomisation within the context of a single hospital study, despite outreach to residential care facilities and ordinary homes (Berggren 2019). Further, as with Iberti et al (2016), researchers using higher hierarchical randomised control trial design also found their studies captured within other hospital-wide initiatives. For example, Jensen et al (2014) postulated that the introduction of a less invasive laparoscopic technique for radical prostatectomy just prior to their physical therapy intervention limited its impact on decreasing LOS and major adverse events. Berggren et al (2019) faced a similar issue finding that geriatric interdisciplinary home rehabilitation did not result in better outcomes up to 12 months compared to recently implemented conventional, in-hospital geriatric care and rehabilitation.

In an international cluster randomised trial of 31 hospitals, Duclos et al (2016) providing intraoperative crew resource management education, found no difference in reducing major surgical events. The authors questioned the application to inappropriate contexts, where there was lack of support from local leadership and administrators, that led to participant non-attendance and negative staff attitudes to the artefact - the surgical safety checklist, may have devalued the education intervention (Duclos 2016).

Similarly, due to contextual factors Boden et al (2017) found that the New Zealand hospital had less reduction in postoperative pulmonary complications (PPC) compared with the Australian sites. On site covariate analysis, the authors found that there was use of less experienced physiotherapists, a later start to postoperative ambulation due to already established local ERAS pathways, more epidurals used, and less intraoperative fluids given (Boden 2017). Interestingly, whilst also studying PPC in a single centre RCT, Silva et al (2013) studying physical therapies found that PPCs arising secondary to other serious complications such as surgical anastomotic leak or heart problems may have confounded their study outcomes. In this instance, for the patients suffering more than one complication, the other complications confounded the study results by augmenting the adverse effect of the primary complication (PPC) studied.

2.4.3 Context is under-researched

Despite using evidence of the highest hierarchical research quality in the systematic literature review, the papers' over-reliance on statistical analysis gave rise to two main challenges. First, questions with respect to single centre studies using quantitative methods alone. For single centre randomised controlled trials, bias was often said to be introduced in the practice setting through inadvertent contamination of the control arm. Longitudinal before and after studies embedded in simultaneous, larger hospital-wide quality improvement initiatives, could not isolate the impact of their study intervention. Second, it was difficult to understand what individuals, teams and organisations actually do and learn in context, day-to-day on the clinical floor, limiting the transferability of the emerging models of perioperative care (Table 2.18).

From the scoping review, studies show that even for the lower-risk processes associated with the *Pre-Procedure Preparation Toolkit* (PPPT_2007) local contextual factors can have a significant moderating role (Table 2.2). However, this phenomenon has not been explored locally in the state policy evaluations of MacLellan et al (2012), MacLellan et al (2008) prior to the release of its successor policy, *The Perioperative Toolkit* (PT_2018). The latter has four new elements, tools and aims (Box 2.5) similar to the interventions found in the systematic literature review (Table 2.14). Considerable change in work practices and organisation of care are needed from managers and clinicians of all perioperative professions for implementation success (Table 2.15). The research gap is significant as, for example all authors of ERAS-type pathways, recommend that a key facilitator for implementation success was adapting programs to fit local contexts (Stone 2018, Liu 2017, Nelson 2016).

The adoption of multiple methods of enquiry addresses the methodological limitations for studying context, found in the systematic literature review (Table 2.17) (Forero 2018, Cresswell & Plano Clark 2011, Lincoln & Guba 1986, Guba & Lincoln 1982). Mixed methods methodology affords the different perspectives needed when examining practice in the local context and enables research rigour (Forero 2018, Cresswell & Plano Clark 2011, Lincoln & Guba 1986, Guba & Lincoln 1982). Practice in the local setting is the focus of this research because it is where change and innovation are needed to address the challenges to the sustainability of surgical services. The theoretical perspective adopted for this research is evidence-based health policy (Chapter 1 Section 1.2.5) (Huckel Schneider 2016, Buse 2011, Head 2008a).

2.4.4 Integrated gaps in the literature, thesis aim and research questions

The two literature reviews undertaken have identified significant gaps in our knowledge. The aim of the thesis is now to address these gaps. Through addressing the research questions identified, this study will improve our knowledge of the impact of context, particularly how in practice - clinicians and managers understand risk, and how this influences their work and use of resources when caring for patients having surgery and anaesthesia.

The study addresses three research questions:

1. What has been the impact of policy on the organisation and practice of perioperative care?

2. How is perioperative work practice organised around low, intermediate and high-risk patients?

3. What do individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient?

2.5 Conclusion

This chapter through a scoping review has provided a background trajectory over three decades of perioperative policy for the local research setting. It has positioned this thesis to address the current major challenge to the sustainability of healthcare systems for surgery - the high-risk, high cost, complex care patient. Local and international evidence point to the increasing number and complexity of both, our medically high-risk patients, and the systems and processes they must be navigated through by dispersed multidisciplinary clinical teams. The systematic literature review critically examined how high perioperative risk is conceived and researched, and what teams and organisations are doing to mitigate the risk of an adverse patient outcome. To address the situation today, novel solutions need to go beyond simple linear models for coordinating care in hospitals. The high-risk patient does not fit into the homogenous process mould of lower risk patients. Historical antecedents and local context moderate desired change processes in ways unexpected or unidentifiable with current research approaches. The next chapter, Chapter 3 Methodological approach to the research, aims to understand practice in the local context through multiple perspectives, using a mixed methods approach to address the three research questions.

Chapter 3 Methodological approach to the research

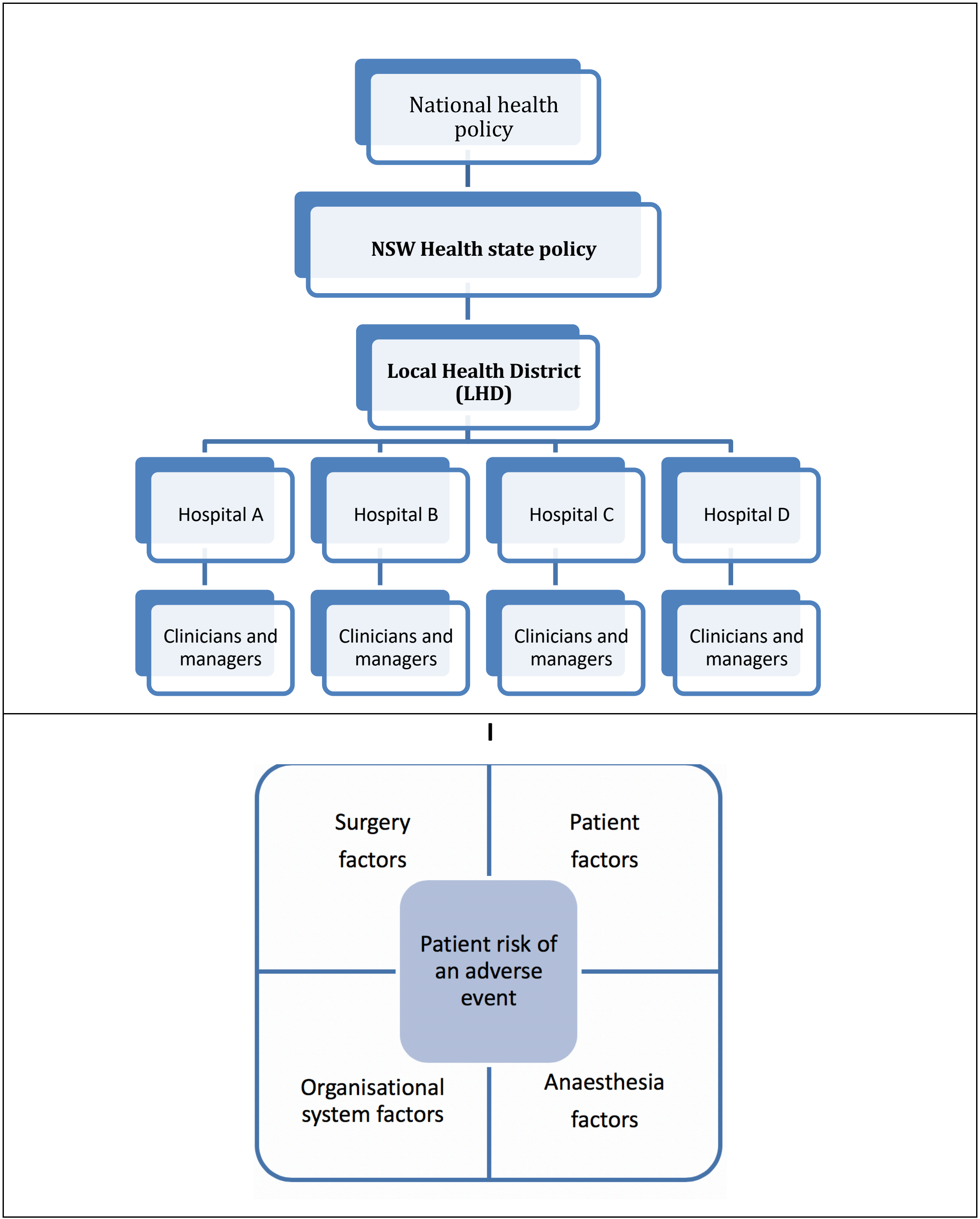
3.1 Introduction

The thesis examines how in practice, hospital-based clinicians and managers understand risk, and how this influences their work and use of resources when caring for patients having surgery and anaesthesia. This chapter presents the methodology undertaken to address the thesis aim and research questions. The research questions, setting and participants (Section 3.2) were investigated using a mixed methods approach of parallel convergent design, where the qualitative paradigm took priority (Section 3.3) (Cresswell & Plano Clark 2011). The methodological strengths and limitations of the peer-reviewed empirical papers in the literature review (Chapter 2) were pragmatically considered. The strengths and weaknesses of each method used, their sequencing, relationship, and integration were analysed and the contribution of each, explained (Section 3.4). As this evaluative research into perioperative systems has not been conducted previously, tools have been purpose designed giving due consideration to establishing validity (Section 3.5). Data collection (Sections 3.6), analysis and presentation processes (Section 3.7) are explained, including a rationale for thematic analysis and descriptive statistical analysis. The rigour of the research is addressed (Section 3.8) using the four dimensions framework of trustworthiness and the associated strategies for validity (Forero 2018, Lincoln & Guba 1986, Guba & Lincoln 1982). The chapter concludes with regard to the methodological limitations (Section 3.9) and ethical considerations (Section 3.10) of the study. The underpinning ontological and epistemological approach of the research is constructivism (Cresswell & Plano Clark 2011). Constructivism is characterised by understanding of phenomena formed through multiple participant views and meanings, that have been developed through social and historical construction (Cresswell & Plano Clark 2011).

3.2 Research Setting and Participants

In mixed methods research, sampling strategies need to be rigorous and systematic because they have direct implications for the generalisability or transferability (external validity) of the research (Lincoln & Guba 1986). It is important to determine, select and gain access to relevant data sources from which, using appropriately chosen methods, research data will be generated (Lingard 2008, Pope 2006, Giacomini 2000a and Giacomini 2000b). Figure 3.1 shows the research setting and participants, and the work of the research. The rationale for the research setting relates to how “top-down” federal (Australian) and state (NSW) health policy is enacted in Australian hospitals. The local health district (LHD) was chosen because the LHD is the business entity where NSW Health perioperative policy is enacted.

Figure 3.1 Research setting, participants and research focus on high-risk



The LHD covered 7 Local Government Areas including the Sydney central business area and had a population size of around 1 million (NSW Health Stats 2019), that included the most affluent and the more disadvantaged in the nation. Population characteristics included: even distribution male and female gender; 25% of population were under 25 years of age; 15% of population were older than 65 years; Aboriginal people made up 1% and people from culturally and linguistically diverse backgrounds 40% of which 30% were from a mainly non-English speaking country (information derived from the Australian Bureau of Statistics).

The need to evaluate context, that is, in the setting of the LHD, in a study into medical practice is advocated:

> *"… the medical field has inherited structures from an era when medical practice was less complex and more individualistic."*
>
> (Porter & Teisberg, 2006 p154)

The research setting involved four hospitals (Hospitals A, B, C, D) and three levels of analysis (participants from the clinical floor, hospital managers, LHD) as well as considering policy from state and national health departments (Figure 3.1). This approach allowed within hospital and cross-hospital analysis. All four general adult hospitals within one LHD were chosen because they are the most prevalent type of hospital, serving the community, and as represented in the systematic review (Chapter 2). The LHD and its four hospitals provided a breadth of cases (Table 3.1) to generate the complexity of data needed to provide a convincing representation of the local context where NSW Health perioperative policy is enacted (Yin 2009), in the dimensions of credibility and transferability (Section 3.8.1).

Tables 3.1 and 3.2 set out the characteristics of each university affiliated hospital (AIHW MyHospitals 2021). Table 3.1 shows the number of beds and types of surgery performed at each of the hospitals. It can be seen that Hospital A and Hospital C were the larger hospitals providing all subspecialties of surgery, with some additional subspecialisation within the LHD; for example, Hospital A provided renal transplantation and interventional neuroradiology and cerebral clot retrieval, whilst Hospital C was a major trauma centre. Hospital B was a state-wide quaternary referral hospital for eye and hand surgery. It was the smallest hospital of the research setting, specialising in lower risk surgery. Hospital B did not have an intensive care unit, or high dependency unit, and its medical wards and emergency department did not function at the same clinical acuity level as the other three hospitals. Hospital D was a smaller community-based facility, compared to Hospitals A and C, and offered a narrower range of subspecialty surgical procedures. However, in contrast to Hospital B, it did care for a broad range of surgery and for intermediate to high-risk patients. Hospitals A and B were sister hospitals and support transfer of patients between hospitals based on surgical procedure and equipment or clinical risk. A similar arrangement existed for Hospitals C and D, for example, Hospital C being a major trauma centre focused on emergency orthopaedic surgery primarily; elective and emergency orthopaedic surgery was done at Hospital D.

Table 3.1 Research setting – Hospitals, bed numbers and surgery performed

Hospital	Number of beds	Types of surgery
A	440	Ear, nose and throat; Eye surgery; Cardiothoracic; Dental and maxillofacial; General surgery including upper gastrointestinal tract, colorectal, oncology; Interventional neuroradiology, Neurosurgery; Orthopaedic surgery; Plastic and reconstructive surgery; Renal transplant; Urology; Vascular surgery
B	113	Quaternary hospital for Eyes and Hand surgery
C	547	Largest hospital in LHD, leading centre for Trauma surgery; Ear, nose and throat; Eye surgery; Cardiothoracic; Dental and maxillofacial; General surgery including upper gastrointestinal tract, colorectal, oncology; Neurosurgery; Orthopaedic surgery; Plastic and reconstructive surgery; Trauma surgery; Urology; Vascular surgery
D	360	Ear, nose and throat; Eye surgery; General surgery; Orthopaedic surgery; Plastic surgery; Urology; Vascular surgery

Table 3.2 details for each hospital the departments that care for surgical patients, across the patient journey from surgery booking, pre-admission processes or pre-admission clinics (PACs), day of surgery admissions (DOSA), day-only (DO), extended day-only (EDO), high volume short stay surgery (HVSSS) wards, the operating theatres and post-anaesthesia care unit (PACU), (post-operative and sometimes pre-operative) hospital

surgical wards, high dependency unit (HDU), intensive care unit (ICU), and emergency department (ED).

Table 3.2 Hospitals and departments providing care for surgical patients

Hospital	Hospital Departments									
	ESWT Admns Office	PACs	DOSA	DO, EDO, HVSSS	Operating theatres	PACU	Surgical Wards	HDU	ICU	ED
A	Yes	Yes	Yes	Yes	Yes	Yes	4	Yes	Yes	Yes
B	Yes	No	Yes	Yes	Yes	Yes	2	No	No	Yes, small
C	Yes	Yes	Yes	Yes	Yes	Yes	6	Yes	Yes	Yes
D	Yes	Yes	Yes	Yes	Yes	Yes	3	Yes	Yes	Yes

Table 3.3 characterises the research participants - the different professions and number of participants for each hospital and at the local health district head office. The research participants comprised a cohort of 129 staff from the four hospitals – 37, 27, 34, and 31 clinicians and managers from Hospital A, B, C and D respectively; and four participants from the LHD head office. Some of the LHD participants were based at the hospitals and had dual hospital and LHD roles. Fifteen participants were primarily work based at the hospitals and attended regular meetings at the LHD. Of the 129 participants, a number occupied dual roles for example, clinician and manger and in a handful of cases, three roles that is clinician and manager and LHD Board member. In total there were 129 participants working in 167 roles. The number of staff participants is equivalent or greater than that of similar studies found in the literature review (Chapter 2) and in health services research more broadly. Of the interdisciplinary participant cohort, the same distribution of professions was selected across the four hospitals for example there were more nurses compared to doctors compared to allied health – physiotherapists, dieticians, speech therapist and pharmacists, and more clinicians to managers. Participants were selected by purposive sampling initially as typical of their profession and articulate, as noted by colleagues or managers (O'Leary 2014, Braun & Clarke 2013). In later stages of the research, purposive sampling was directed to content saturation (O'Leary 2014, Braun & Clarke 2013). Participants had varying degrees of expertise on the clinical floor. Senior doctors were either, consultants having obtained their specialist professional qualifications, or trainees working towards their specialist

qualifications. Junior doctors were undifferentiated and not part of a specialist training program. The experiences of staff from novice to expert and time working in the setting was comparable across the four hospitals. The participants were appropriate to develop explanations of structures and processes in context, as well as seek historical antecedents and contradictory experiences.

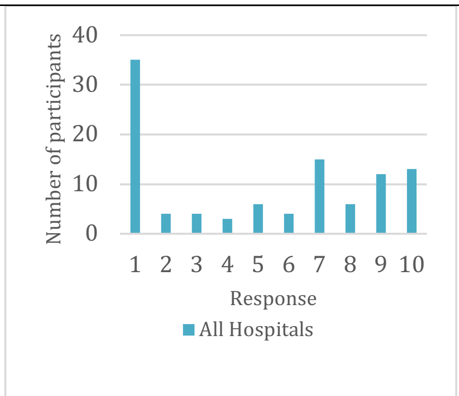
Table 3.3 Research participants – by LHD, hospital, profession and level of experience

Key: Snr senior; Jnr junior; PT Physiotherapist; DT Dietician; Sp.T Speech therapist; Pharm. Pharmacist; Mx. Managers.
Note: Four participants have dual hospital or dual hospital-LHD roles

Facility	Surgeon		Anaesthetist		Nurse		Physician		Allied Health				Mx	Total
	Snr	Jnr	Snr	Jnr	Snr	Jnr	Snr	Jnr	PT	DT	Sp.T	Pharm.		
LHDHO													4	4
Hospital														
A	2	1	1	2	15	2	4	1	1	1	0	1	6	37
B	2	2	2	0	9	2	1	3	1	1	0	1	3	27
C	1	3	3	1	17	0	2	0	1	1	0	1	4	34
D	2	3	4	2	10	0	4	0	1	1	1	0	3	31
Total	7	9	10	5	51	4	11	4	4	4	1	3	16+4	129+4

The participant sample was sufficient to provide a saturated range of responses appropriate to develop explanations for the care of high-risk patients (Figure 3.2). They all understood the concept of the high-risk patient and in forty-one percent of cases were able to influence the decision making on the need for critical care resources.

Figure 3.2 SDS: Participants involved in decision making for high-risk surgical patients



Responding to the question that the participant was involved in decision making about whether patients need to have postoperative HDU or ICU:

- 41% (46/113) agreed or strongly agreed
- 41% (46/113) disagreed or strongly disagreed

3.3 Mixed methods research rationale and research design

A mixed methods approach was selected to achieve the work of the thesis. This decision was made through an intensive interrogation of evidence, in particular the methodological limitations of the empirical papers of the systematic literature review. A mixed methods approach was adopted because a single method or data source is inadequate to explain how to address the high risk, high-cost complex care patient in context; and, the impact of decades of perioperative policy at the clinician-patient interface (Cresswell & Plano Clark 2011). Through the use and interplay of multiple methods (Cresswell & Plano Clark 2011), a picture of the local context where policy is enacted was developed, and the forces affecting change and innovation in particular, for the high-risk, high-cost patient was elucidated. Mixed methods have been tested and validated in the surgery and anaesthesia field to answer similar research questions (Wren 2010, Young 1997). Trustworthy qualitative and quantitative data has the ability to offer insights into complex social processes (Foy 2011, Dopson 2008, Greenhalgh 2004). It was determined that to provide a rich description of context a mixed methods approach had been used very successfully in this setting (Young 1997).

Mixed methods allowed evidence to be drawn from different levels of policy, for example hospitals versus LHD head office versus State Ministry of Health (MOH) (Cresswell & Plano Clark 2011). Different perspectives were examined using qualitative and quantitative methods to explain the research phenomenon (Cresswell & Plano Clark 2011). Together, the approach provided a comprehensive data set that enabled description of patterns and comparisons of practice across the multiple settings (O'Leary 2014, Cresswell & Plano Clark 2011). The qualitative and quantitative studies were combined together to provide a holistic understanding of the research setting (Table 3.4) (Cresswell & Plano Clark 2011).

Table 3.4 Complementary aspects of study methods

Criteria	Data type	
	Quantitative	**Qualitative**
Purpose	Limited understanding of participant	In depth understanding of participant
Strengths/ limitations	Large samples, compare attitudes of many individuals in a population, trends, increasing generalisability	Small samples, too few participants for generalisability

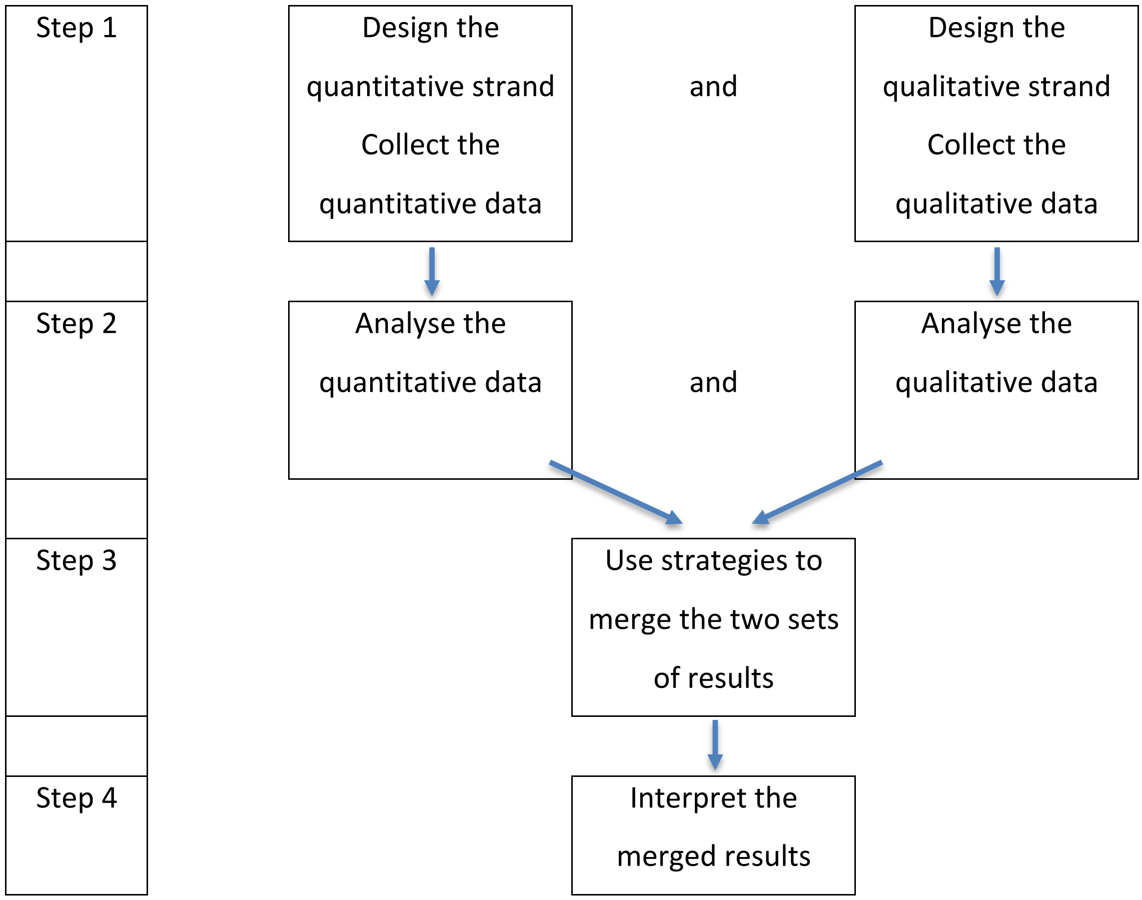
Qualitative methods and paradigm took priority in this research (Cresswell & Plano Clark 2011). This focus was taken because the research aim was to explore new approaches of how risk is understood at the clinician–patient interface and how this influences the use of finite resources. To explore this aspect, clinicians and managers participants' voices must be heard and their work practices observed, their multiple diverse points of view and experiences conveyed, leading ultimately, to mapping the complexity of care at the perioperative clinical floor (O'Leary 2014, Braun & Clarke 2013). The quantitative component of the research comprised a survey of staff attitudes using a Likert scale. This allowed quantifying the percentages of staff attitudes and work practices, with key process indicators and health outcomes. The objective was to obtain and describe the mechanism of quantitative trends in more detail using the detailed voices, experiences and perspectives of participants (Cresswell & Plano Clark 2011).

3.3.1 **Research design**

A parallel convergent design was selected where each method led to different data being gathered, thus providing triangulated complementary or contradictory results on a single area of study (Cresswell & Plano Clark 2011). A convergent mixed methods design was utilised to develop insight of the local context, through both collecting quantitative and qualitative data, as each methodological paradigm gave a partial view (Cresswell & Plano Clark 2011). A parallel convergent mixed methods design collects quantitative and qualitative data in parallel, analyses the different data separately and then, merges the data and interprets findings (Cresswell & Plano Clark 2011). By triangulating the methods, direct compare and contrast of quantitative descriptive statistical data may be more completely explained, corroborated or validated with in depth qualitative results (Cresswell & Plano Clark 2011). This research adopted the pragmatic "umbrella" philosophical paradigm of Cresswell & Plano Clark (2011) to merge the quantitative and qualitative approaches into a more comprehensive holistic understanding of the research questions (Figure 3.3).

Figure 3.3 Flowchart for mixed methods of parallel convergent design

(Adapted from *Flowchart of the basic procedures in implementing a convergent design* Cresswell and Plano Clark 2011 p79 Figure 3.3)



3.4 Methods rationale

Four methods were used in this research. That is: observation, secondary documents analysis, interviews – individual and group, and a survey. All four methods were applied across the four hospitals and two methods - secondary documents analysis and interviews – individual - were applied at the LHD level. In the following sections the rationale, strengths and weaknesses of the multiple methods selected, their sequencing, relationship, and integration are analysed and the contribution of each attested.

3.4.1 **Observation rationale**

Observation is useful where little statistical difference appears to exist (O'Leary 2014, Braun & Clarke 2013). The use of qualitative methods, such as site observation, can bring out important differences, nuances and patterns otherwise not expected (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011). Observation as a primary data collection method allowed the researcher to systematically see and describe the perioperative systems, processes, work practices, work conditions and behaviours first hand (O'Leary 2014). Receiving the evidence through participants explaining things in interviews was not the same. In any social situation there may be a divergence between what people think they do and what they actually do or limits to what they know as happening and what is actually happening (O'Leary 2014). Observation allowed the collection of verbal and non-verbal data (O'Leary 2014). Site observation is research conducted in the real world, not in a constructed research setting (O'Leary 2014). This was particularly important when the purpose of the research is to advance practice. Value based perioperative healthcare for the high-risk patient is a challenging and complex endeavour. Diagnosis and risk mitigation strategies were complicated requiring multiple steps, and also complex often requiring networks of clinicians to function in the clinical setting (Braithwaite 2017, Reeves 2008, Weiss 1998). Observation (with field interviews and collection of supplementary artefacts) could tease out the patterns of thought and behaviour of the clinician and manager participants on the clinical floor, where perioperative policy was enacted (O'Leary 2014, Braun & Clarke 2013, Young 1997). In this research, observations took both the *emic perspective,* or insider perspective (interviews and survey), seeking to see the context from the clinician and managers point of view as well as the *etic perspective,* or outsider perspective (site observation and supplementary documentation) as the non-participant observer, to build holistic understandings of the research questions (O'Leary 2014).

The significant advantages of observation as a method needed to be tempered by continual reflection on observer biases. The clinical settings and non-clinical policy levels where perioperative policy is enacted cannot be fully apprehended (O'Leary 2014, Weiss 1998). The observations were constructed understandings that were limited by what could be taken in by the observer and processed, filtered, structured through limited socialised frameworks (O'Leary 2014, Weiss 1998). Sources of bias included history, interests, beliefs, social connections, expectations (O'Leary 2014). In the case of this research the sole observer is a clinician - anaesthetist with over 25 years of experience in the perioperative setting of one of the four hospitals and the chairperson of two of the toolkits of *The Predictable Surgery Program (2004)* namely, *the Pre-Procedure Preparation Toolkit (2007)* (Appendix A) and its successor *The Perioperative Toolkit (2018)* (Appendix B) (Section 1.3.1.2).

The generation of trustworthy data was a primary responsibility of the researcher. Recognising biases included using brainstorming and testing preconceived ideas and expectations in addition to purposeful consideration of alternatives including with the research supervisors (O'Leary 2014). Biases were also controlled for through systematic research design and planning, purpose designed and piloted tools for data collection (Section 3.6), employing strategies to ensure rigour (Section 3.8), including reflexivity and audit trail and confirmation through use of other methods for example, supplemental artefacts, interviews and a survey.

3.4.2 **Documents analysis rationale**

Documents analysis is the observant collection and cross-examination of supplemental artefacts, situated in context, in order to help answer the research questions (O'Leary 2014). Documents are data that were found in multiple places with many purposes, for example paper and electronic medical records, documents, files, local communication tools, posters, minutes of meetings, entries onto the electronic medical record, organisational documents, data and communication (O'Leary 2014). The collection of supplemental artefacts was used to confirm, extend or challenge data extracted by other methods (O'Leary 2014).

Key policies are organisational documents that inform perioperative work organisation and practice. Key policies selected for analysis were based on five criteria related to policy scope. First, the policy goal determines broad scale perioperative system functions. Second, the policy arises or is maintained at a national or state level. Third, the policy applies across organisations, across the state, LHD and hospitals. Fourth, the policy applies across teams of healthcare workers, clinicians and managers. Last, whilst also critical to safe quality care, the key policies selected are not micro-system policies such as, addressing individuals in hand-washing policy.

Clinical medical record documents reify patient care and inform perioperative work organisation and practice. Key clinical documents selected for analysis were based on patient clinical complexity and risk. Equal numbers of documents for low, medium and high clinical risk patients were initially sought at the four hospitals. Thereafter, the number reviewed was proportionate to their prevalence in actual practice. The analyses of the clinical documents when presented as vignettes of patient care, are that of composite actual patient cases. Composite cases illustrate perioperative organisation and practice whilst protecting the confidentiality of patients, participants, and the health care organisation.

3.4.3 **Interviews rationale**

3.4.3.1 Individual field interviews rationale

Field interviews are an interactive qualitative method where the researcher seeks open-ended answers related to the research questions (O'Leary 2014, Braun & Clarke 2013). Interviews are useful for exploring understanding, construction, perception and practice type questions (Braun & Clarke 2013). Interview participants were selected because they were typical and are uniquely positioned for an analytical purpose - to help the researcher understand what happens, what things mean, how meaning is achieved, what was valued and devalued and why (O'Leary 2014, Braun & Clarke 2013). Informal semi-structured technique had the advantage of the ability to obtain the information intended, while allowing interesting and unexpected data to emerge (O'Leary 2014, Braun & Clarke 2013).

3.4.3.2 Group interviews rationale

Group interviews are an interactive qualitative research method. Normally used with around 4-12 people where the interviewer generates a group discussion rather than conducts an interview in a question and answer format (O'Leary 2014, Braun & Clarke 2013). The objective is to draw out through facilitating rich discussion, a depth of different opinions that may not arise from direct questioning of individuals (O'Leary 2014, Braun & Clarke 2013). Social interaction is the distinguishing feature of groups from the other methods of data collection (O'Leary 2014, Braun & Clarke 2013). Group discussion data can reveal the ways the meaning of a subject is negotiated among different professions and seniority levels, how elaboration of details come about through debate, justifications and collective sense making (Braun & Clarke 2013).

In planning the research with an idea of conducting focus group interviews, it became apparent this was not possible for the following reasons. Firstly, environment and work practices meant that this could not occur at senior hospital or LHD levels. Many of the key interdisciplinary stakeholders, such as heads of departments of surgery; anaesthesia; senior nurse leads, heads of allied health, pharmacy, safety and quality, clinical governance initially intended for purposive sampling for the group interviews, were not available at the same time. Secondly, at the hospitals they did not meet to discuss advancing perioperative care, but rather focused on providing surgical or anaesthetic or operating theatres services and, meeting key performance indicators of the LHD, state or federal health department and related standards setting bodies. Thirdly, at the LHD, the surgeons and anaesthetists did not meet together at all, although they did share a LHD senior manager. These three unexpected discoveries were in themselves research findings, on the nature of perioperative teams (please see Chapter 6, Table 6.4 and the accompanying text). Consequently, 'group interviews' were adopted as individual interviews with senior clinician-managers interviewed about their usual work practices (all as individuals, with one paired involving the same group, the Administrative and Academic Heads of Anaesthesia, Hospital A).

In contrast, 'group interviews' did arise from the clinical floor at the request or through organisation by the participants. For example, Allied Health Dietician, Speech therapist and Physiotherapist at Hospital D, junior doctors in groups of two to four in Hospitals B, C and D; senior nurses in groups of two to four on several occasions in Hospitals A, B, C and D; a pair of consultant and junior anaesthetist in Hospital D; and pairs in Acute Pain Management of senior nurse and pain physician (Hospital A), and senior nurse and anaesthetic trainee (Hospital C). These opportunistic 'group interviews' provided data through discussion that revealed the ways the meaning of 'high-risk' and 'teamwork' were negotiated among different professions and seniority levels.

3.4.4 **Survey rationale**

A survey offers a quantitative strategy by which to collect data not available by qualitative methods, for the triangulation of research findings (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011). A survey is a research method using a questionnaire to collect from a range of individuals, answers to the same questions related to their characteristics, work practice and attitudes (O'Leary 2014). Surveys can provide data where there are differences between the four hospitals or groups (O'Leary 2014). A cross-sectional survey was conducted on a sample of 113 participants representative of the target population where NSW Health perioperative policy is enacted (Table 3.3) (O'Leary 2014). The number of survey respondents for Hospital A was 32, Hospital B was 24, Hospital C was 29, Hospital D was 28; the sum total was 113. The surveys provided data for description of context, for example, participant's attributes, opinions and attitudes to work practices, teamwork and innovation.

Selection bias in interviews (129 participants) and survey (113 participants) were mitigated by selecting representatives with high face validity. The participants were selected using purposive sampling for knowledgeable clinicians and managers (129) who view the perioperative phenomenon from diverse and independent perspectives. The participants included organisational actors from different hierarchical levels, and functional or geographical groups (Table 3.3) (O'Leary 2014, Braun & Clarke 2013)

3.5. Purpose designed tools for data collection: rationale and explanation

As this evaluative research into perioperative systems has not been done previously, tools have been purpose designed for data collection (Appendix C – Perioperative study tools) (O'Leary 2014, Braun & Clarke 2013). Consideration of validity ensures both good quality in data collection and in interpretation of results (O'Leary 2014, Cresswell & Plano Clark 2011). The content validity of a data collection tool is based on showing that the topics being studied are a sample within the phenomenon of interest (O'Leary 2014). For content validity, the purpose designed tools were initially drafted from the scoping review of the grey and empirical literature relating to the local context, in particular the cycles of national and state perioperative policy and the LHD strategy and planning reports (Chapter 2 Literature Review). The proposed topics were then reviewed considering the systematic literature review focusing on the: high-risk, complex care patient; strengths and limitations of the methods used to study the new and emerging models of care, teams and communication; and, theories informing this research (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011). Tools were drafted, reviewed, ideas were tested, and tool topics developed further after discussion with supervisors, and professionals from the fields of health, education and health policy, as a co-construction process (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011).

Face validity is the extent to which a tool is subjectively viewed as effective in capturing the concept it claims to measure, the authenticity or relevance of a tool, as it appears to individuals with experience in the field (O'Leary 2014, Braun & Clarke 2013). The tools were tested with colleagues working outside the LHD, but similar to future LHD participants and working in the perioperative policy domain (O'Leary 2014). Many of the ideas developed for the research tools were made in the field over years, for example through multidisciplinary collaboration in state perioperative policy writing (Appendix A and B) (O'Leary 2014). Co-designing the topics of the tools with people similar to but not the actual future research participants provided face validity to the tools, and confidence that participants would share the same construct of work practices (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011). For construct validity - that the tools measure what they are intended to measure, and feasibility, the tools were piloted at different sites with a multidisciplinary cohort, testing issues such as: ease of use and comprehension; time to complete; and, to confirm that participants could understand the questions and share the same construct of work practice (O'Leary 2014).

Pragmatic and ethical considerations were also considered. A single researcher with finite resources and a specified timeframe required that validity, as well as focus, be embedded in the design of the data collection tools. Thus, the ethical considerations to minimise the impact of data collection on participants were simultaneously addressed (O'Leary 2014, Cresswell & Plano Clark 2011).

The Perioperative study tools (Appendix 4) (Table 3.5) present the seven research tools used in two groups.

Table 3.5 Perioperative study tools

Group 1 Research Methods – PERIOPERATIVE SITE AUDIT TOOL The perioperative site audit tool is designed for efficiently collecting information about each hospital's case-mix, organisation and systems - structures, processes and outcomes, their perioperative service resources, work practices and the documents they use to facilitate this work. A1. Perioperative site audit sheet
A2. Document collection checklist
A3. Field interviews question sheet
A4. Staff attitudes survey
A5. Group interview question sheet
Group 2 Research methods – LOCAL HEALTH DISTRICT (LHD) POLICY TOOL B1. LHD Document collection checklist
B2. LHD Group interview question sheet

The first group tools A1 – A5 were applied in each of the four hospitals, for the staff and perioperative systems. The second group tools B1 and B2 were applied to the LHD head office, its staff and related policy from the MOH, adapted from the MOH, or other. Study tools A1-A4 were applied concurrently with B1, followed by the 'group interviews' applied to individual managers, first A5 at each of the four hospitals, then B2 at the LHD head office.

3.5.1 Perioperative Site Audit Tool

The Perioperative site audit tool is a bundle that comprises five items. Each is explained below.

3.5.1.1 A1. Perioperative site audit sheet

The perioperative site audit sheet was designed to be used at the hospitals during site observation. The sheet's purpose was to guide data collection, for the mapping of structures, processes, and outcomes for low, medium and high-risk patients having surgery looking for patterns (O'Leary 2014, Braun & Clark 2013, Young 1997). This included systematically facilitating the making of observations for important differences or nuances in work practices, work conditions and behaviours, in the various social clinical settings (O'Leary 2014, Braun & Clark 2013, Young 1997). The perioperative site audit sheet is made up of five categories of the information sought: (A) hospital demographics including number of surgical subspecialties, operating theatres, surgical wards and beds; (B) hospital structure including characteristics of: the surgical units, - their co-location or separation; and the staff - professional disciplines, numbers, experience levels and work practices; (C) hospital processes relative to patient risk particularly in relation to clinical decision making and clinical handover; (D) hospital process indicators and health outcomes for the patient journey, how they are collected, maintained and the timeliness and process for feedback; and, (E) governance – how is variance to expected care managed. There was also space for (F) questions and (G) additional notes.

3.5.1.2 A2. Document collection checklist

The document collection checklist was designed to be used at the hospitals during site observation. The checklist has two purposes. First, to guide the collection and cross-examination of communication tools or artefacts, and other paper or electronic based information, used by staff in the perioperative care of low, medium and high-risk patients having surgery. The sequencing and number of the communication tools or entries provides information on the expected and unexpected perioperative progress of each patient. Second, to discover governance through the collection of hospital data sheets, paper or electronic, for the collation, analysis and discussion of process indicators and health outcomes. The collection of supplemental artefacts can be used to confirm, extend or challenge data collected from interviews (O'Leary 2014). The document collection checklist is made up of two categories of the information sought: (A) sequencing of communication tools used perioperatively, or solely pre-operatively, intraoperatively or postoperatively; and, (B) governance, evidence of process indicators or health outcomes being discussed for example in the minutes of meetings.

3.5.1.3 A3. Field interviews question sheet

The field interviews question sheet was designed to be used at the hospitals during interviews conducted with participants in offices on the clinical floor. The sheet's purpose was to guide questioning in a semi-structured manner on five topics related to each participant's understanding, construction and perception of perioperative risk and its communication (O'Leary 2014, Braun & Clark 2013). The question sheet facilitated an informal semi-structured interview technique that has the dual advantage of obtaining the information intended, while allowing interesting unexpected data to emerge (O'Leary 2014, Braun & Clark 2013). The topics to be considered were: the artefacts, paper and electronic, each participant uses - derives meaning from, or communicates to others through; the artefacts outside the scope of each participant's work practice and devalued; the quality of each participant's interaction with the communication tools; how each participant interprets risk, particularly high risk, in their day-to-day work, and how this is knowledge is developed and communicated; and, the downstream utility of the risk stratification tools and information obtained pre-operatively. The field interviews question sheet is made up of five categories of the information sought: (A) sequencing and connections between the documents, paper or electronic; (B) boundaries of each individual's work involvement with the complete document sequence for each patient; (C) experience of each staff member in applying the tools or documents; (D) evidence of risk stratification for low, medium and high-risk patients having surgery or a procedure and anaesthesia; and (E) impact of perioperative policy. There was also space for (F) questions and (G) additional notes.

3.5.1.4 A4. Staff attitudes survey

The staff attitudes survey was designed to be applied at the hospitals to participants in offices on the clinical floor. The survey's purpose was to collect from a representative range of individual clinicians and managers across the whole spectrum of perioperative care answers to the same questions on participant attributes and work practices. The survey sought to establish what might shape and form these work practices, for example, knowledge of historical antecedents or patient outcomes, participant attitudes to teamwork and improving perioperative patient care. The survey could provide information where there are differences between hospitals or groups (O'Leary 2014). The survey used Likert scales (1-2 strongly disagree, 3-4 disagree, 5-6 neutral, 7-8 agree, 9-10 strongly agree) to capture quantifiable data, and allowed space for additional information or comments to ensure that the survey was not only getting answers to questions thought to be asked (O'Leary 2014). The survey is made up of three categories of the information sought: (A) individual clinician and managers demographics and attributes; (B) current work practice – length of time or phase(s) of patient care where the participant is involved with providing care, the tools used, risk stratification and decision making around required resources, each participant's work practice team; and, (C) participant's opinions of perioperative best practice, what should be done compared with what is actually being done currently; participant's knowledge of how their work environment has changed over time, of key process measures and patient outcomes including serious complications; participant's attitudes to quality improvement and the utility of outcome measures and extending team based care. There was also space for (D) additional information or comments.

3.5.1.5 A5. Group interview question sheet

The group interview question sheet was designed to be used in each of the four hospitals. Its purpose was to guide semi-structured questioning of a multidisciplinary team of senior clinician - managers (O'Leary 2014, Braun & Clarke 2013) in five areas where risk management may be improved. First, the sequencing of hospital perioperative tools and, whether there are any explicit boundaries, physical, professional or other, to forms that could be accessed; or, if any explicit artefact boundaries demarcating low, intermediate, high-risk patients exist. Second, to discuss the enablers and barriers to risk knowledge development and sharing. Third, to consider the impact of policy generally and for example The Predictable Surgery Program (2004), Pre-Procedure Preparation Toolkit (2007). Fourth, to relate the hospital's perioperative system and its performance with process indicators and health outcomes, and how this knowledge is shared. Lastly, to consider the hospital's perioperative system and its dynamic capacity to adopt new models of care; for example, The Perioperative Toolkit 2018 by establishing standardised pathways, measuring outcomes for managing improvement, integration with primary care, shared decision making with complex high-risk patents.

The group interview question sheet is made up of five categories of the information sought: (A) sequencing of tools and professional or risk demarcation; (B) enablers and barriers to knowledge development and sharing; (C) the impact of policy; (D) current hospital perioperative system and its association with process indicators and health outcomes; and, (E) current hospital perioperative system and its dynamic capacity to evolve into new models of care. There was time for (F) questions and (G) to add notes.

3.5.2 LHD policy tool

The perioperative policy tool is a bundle that is designed to be used at the LHD and comprises two items. Each is explained below.

3.5.2.1 B1. LHD Document collection checklist

The LHD document collection checklist has two purposes: to guide the collection of LHD perioperative policy endorsed at the LHD; and related policy from, or adapted from, the MOH and the planned governance arrangements around each policy in terms of process indicators, health outcomes and resourcing. The collection of supplemental artefacts can be used to confirm, extend or challenge data collected from interviews (O'Leary 2014). The document collection checklist is made up of two categories of the information sought: (A) LHD endorsed policy or documents related to perioperative care; and, (B) LHD governance for example, governance structures, demographic data of the hospitals, performance measures, service agreements, and minutes of meetings.

3.5.2.2. B2. LHD Group interview question sheet

The group interview question sheet's purpose is to guide semi-structured questioning (O'Leary 2014, Braun & Clarke 2013) in three areas: discussing associations between the four hospitals perioperative systems and LHD, MOH process indicators and health outcomes; deliberating on the four hospitals perioperative systems and each hospital's dynamic capability and capacity to meet LHD, MOH policy and new models of care; and, more generally how may MOH-LHD-hospitals governance may be improved. The interview question sheet was designed to gain insight into what happens at the LHD, what things mean, how meaning is achieved, what is valued when improving perioperative healthcare and why (O'Leary 2014, Braun & Clarke 2013). The LHD group interview question sheet is made up of three categories of the information sought: (A) hospital performance against process measures and health outcomes; (B) hospital dynamic capability and capacity; and, (C) governance. There was also space for (D) questions and (E) additional notes.

3.6 Data collection

The healthcare organisations were entered with a well-defined purpose and aim, using ethics approved, piloted, purpose designed tools to collect specific types of data systematically and consistently. Data was collected at four adult general tertiary referral, teaching hospitals and the LHD head office. The research was conducted as planned over three cumulative days for each of the four hospitals and one cumulative day for the LHD head office. However, data collection at the hospitals spanned 20 months, September 2017 to June 2019, due to constant interruptions and time pressures on the multidisciplinary staff who were purposively sampled for the interviews and survey. Day-to-day work commitments (including for the part-time researcher), secondments, the challenges of two redevelopments (Hospital C and D), and staff leave impacted on data collection. Completed interviews collected on a typical day ranged from one to six, with an average of three to four. Single interview days were to be expected towards the end of data collection seeking out individuals. The data collection process was time and resource intensive, considering also the commute time driving to-and-from each hospital. However, the unplanned advantage for the data collection was that the extended timespan led to opportunistic observations whilst waiting in the clinical settings. Data collection was made rigorous by: the pragmatic design for the researcher familiar with the perioperative context of the four hospitals perioperative wards and the LHD head office; the use of purpose designed tools, with semi-structured content; the high level of consistency in the way information was collected, administering the same tools in the same repetitive manner across all the different settings and participants; and, the balanced participant numbers across the professions across all the different settings (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011).

Following ethics protocols, approved by the LHD and UNSW (Section 3.10 Ethics approval) using official channels, participant recruitment for interviews and survey were conducted, using gatekeepers and insiders (O'Leary 2014, Braun & Clarke 2013). Indirect recruitment occurred via email through a hospital principal site manager or local managers and leaving doors open for further communication on the progress of the research (O'Leary 2014, Braun & Clarke 2013). Of the around 150 potential participants only three formally declined citing lack of time. Access to Executive staff also allowed a representative sample including General Managers, Directors of Nursing, Directors of Clinical Services, Quality and Safety Managers. Table 3.6 presents the research methods, tools (A1-A5, B1-B2), participant numbers and time per activity alongside the research questions and expected outcomes (Findings chapters 4-6).

Table 3.6 Methods, tools (A1-A5, B1-B2), participant numbers, time per activity

<table>
<tr><th rowspan="2">Research question (RQ)</th><th colspan="4">Method – Tool – Participants
1 LHD (1 day*),
4 Hospitals (4 sites, 12 days, 3 days*/site)
Key * Cumulative days</th><th rowspan="2">Research outcome</th></tr>
<tr><th>Observation</th><th>Document analysis</th><th>Interviews</th><th>Survey</th></tr>
<tr><td>RQ1.
What is the impact of policy on the organisation and practice of perioperative care?</td><td rowspan="3">Four Hospitals
Walk around and site audit

Tool A1 _Perioperative site audit sheet</td><td rowspan="3">Four Hospitals
Site - ward or unit audit

Tool A2 _Document collection checklist

One LHD

Tool B1 _ LHD Document collection checklist</td><td rowspan="3">Four Hospitals
Ward or manager's office

Tool A3 _Field interview question sheet
Multi-disciplinary staff at each hospital - up to 30 participants (20 minutes per participant)

Tool A5 _Group interview question sheet
A subset hospital group of 8-10 participants (30 minutes per participant)

One LHD

Tool B2 _ LHD Group interview question sheet
- up to 12 participants (up to 30 minutes per participant)</td><td rowspan="3">Four Hospitals
Ward or unit office

Tool A4 _Staff attitudes survey
Multi-disciplinary staff at each hospital - up to 30 participants (10 minutes per participant)</td><td><u>Chapter 4</u>
Assessing historical antecedents from past policy cycles, current work practices and work conditions; unpacking 'high risk' and untangling the nature of 'complex care'; delineating teams, team communication and governance.</td></tr>
<tr><td>RQ2.
How is perioperative work practice organised around low, intermediate and high-risk patients?</td><td><u>Chapter 5</u>
Unpacking participants understandings of 'high risk'. Mapping the structure, processes, outcomes for low, intermediate and high-risk patients having surgery as linear, non-linear or mixed models of care. Examining knowledge of patient health outcomes.</td></tr>
<tr><td>RQ3.
What do individuals, teams and organisations require to implement emerging models of perioperative care for high risk patients?</td><td><u>Chapter 6</u>
Determining how high-risk knowledge is developed, shared and communicated.

Uncovering drivers, enablers and challenges to learning and innovation.</td></tr>
</table>

3.6.1 Observation data collection

In systematic data collection the observer was non-participant, whilst physically being at the clinical sites, attempts were made to be unobtrusive. Observations were conducted in a candid manner, as the nature of the research was fully disclosed as an ethics requirement (O'Leary 2014). Using the tool *A1 Perioperative site audit sheet* to guide observation, mapping of each hospital site was completed. These maps show the details of the sites, the different units and wards that make up the perioperative episode of care for the surgical patient, their layout, their relation to one another and their position within the larger hospital system. In two of the hospital settings, Hospital C and D, redevelopment of the hospital and clinical units-wards meant that these maps changed in the 20 months of observations. These components of day-to-day work of perioperative healthcare delivery, provides context to the clinician and manager participant's work experience. Observations were done concurrently, on the same day, with document data collection, field interviews and surveys.

The researcher walked around and observed activities in the various spaces of the different units and wards. This was undertaken during various times and days to understand the daily routine and functioning of units and wards. Observations were made of staff based on the ward for a full shift (principally nurses and junior doctors); colleagues simultaneously available to a number of areas but also based on the ward (principally senior trainee surgeons accompanied by junior doctors, and Allied Health), and other staff acting as consultants to patients on the wards (principally specialist senior doctors) was undertaken. The researcher also attended: working walking ward rounds with perioperative teams for example, the acute pain team, and acute surgery team; geriatrician ward round, standing daily "safety huddles" meetings of ward nursing and allied health staff; and, working sitting multidisciplinary discharge planning meetings. The researcher after one cumulative day of observations per hospital had a basic understanding of general routines, routines in collaborative work, patient flows and workflows, schedules and, staff relations and networks. During review of initial observation data, it became apparent as a recurrent theme, that for Hospitals A, B, C and D, particular wards, units and ward rounds aggregated patients at high-risk. Subsequent observations focussed on work practices in these settings.

3.6.2 Documents data collection

Documents data collection (paper artefacts and electronic) was conducted during walk arounds, using tool *A2 Document collection checklist* at the four hospitals and was completed using tool *B1 LHD document collection checklist* at the LHD head office. Information gained from observations and field interviews facilitated access to further finding of documentation and communication through paper and the electronic medical record. The sequencing and numbering of communication tools and documentation following a patient's perioperative path through hospital care was actively sought, as an attempt to represent them in an aggregated form was deemed important for seeing expected and unexpected patterns of care for low, intermediate and high-risk patients. The medical records of 151 patients had detailed clinical review – 49, 23, 46, 33 at Hospitals A, B, C, D, respectively. Also, in relation to this research, internal and external sources of data at the various levels of policy – clinical floor, hospital departments, hospital executive, LHD, MOH was actively sought; this was an attempt to represent them in aggregated form and deemed important from an implementation perspective. A clearly aggregated comprehensive set of patient health outcome measures for all patients receiving perioperative care, could not be located readily at the hospitals or LHD or LHD intranet during the research period.

3.6.3 Interviews data collection

The interviews were consistently conducted in the practice setting of participants' workplace, in a private area, in an informal manner to establish rapport, trust and open lines of communication. The interviews were semi-structured, starting with a defined question plan, tool *A3 Field interviews question sheet*, but shifted to allow a natural flow of information allowing interviewees to converse tangentially in expressing their knowledge, understandings, uncertainties and perceptions. Field interviews were conducted with individuals predominantly (97) or with groups of two (10)) or four (3) individuals either from the same profession or work area. When participants were interviewed together, this was their preference, allowing interviewees to hear and add to each other's responses. Care was taken to ascertain that all participants felt heard, particularly at the conclusion of the interview.

The field interviews occurred face-to-face, always in an office, most often just off the clinical floor. Only one interview with one participant took place via telephone (a senior nurse about to go on leave) and the call took place only after several face-to face meetings during site observation on the surgical ward. Field interviews were conducted with an multidisciplinary cohort of clinicians and managers across the four hospitals (Table 3.3) using a semi-structured technique and tool *A3 Field interviews question sheet*. The first three interviews, all recorded, were with confident well-regarded senior clinician managers, two specialist doctors and a nurse manager all working at different hospitals. During these interviews it became apparent that the physical presence of the audio-recorder and backup recorder visibly changed the interaction with the participants, distracting if not intimidating the participants and inhibiting their responses. The dynamics of the researcher-and-participant communication reverted to the pre-audio-recorder interaction as soon as the offer to turn off the devices was made, and the devices removed from view. Hence, a decision was made to abandon audio-recording further interviews. Handwritten notes were made at the time of the interviews.

Contrary to the advice of qualitative research educators (Braun & Clarke 2013 p92), it was much easier to establish rapport, open lines of communication and make written notes. Written notes as the record of the interview were found to be rich in detail, and certainly richer than attempting audio-recording. Even in private protected areas of the clinical setting, including managers in their offices. The concern that written field notes of the interviews would miss important information was allayed when transcribing interviews as soon as possible post-interview. It was noted that notetaking while interviewing and listening may be a preliminary form of analysis as the researcher can be making decisions on what to record. A conscious decision was made to record everything and use the opportunity to clarify understanding of participants responses.

This latter process was made easier by the relative brief duration of the field interview, generally 30 minutes.

Also, during the research data collection period, the four hospitals were at various stages of transition from a paper to an electronic medical record (eMR). And, in the case of critical care units a further transition to a different unit-specific eMR platform. As such the strategy of the semi-structured question sheet *A3 Field interviews question sheet*, to tease out learning and knowledge of risk, collaborations and teams first through paper artefacts took on a more background support function. Brought to the foreground, starting the interviews were the questions exploring the participants' general understanding of risk, how they learn about risk as individuals, in one-to-one communications or relationships, and in teams. Only after this interaction, was their use of the eMR and paper artefacts examined, to tease out the participants' work experiences. The field interviews concluded as per tool A3 with questioning around the knowledge of perioperative policy, process indicators and patient health outcomes, and the enablers and barriers to providing or further developing perioperative care. Within the first five field interviews, the slightly modified backgrounding and foregrounding of the content and rhythm of the interview questions was well established, and consistently applied throughout the research.

The informal semi-structured interviews in the participant's work setting had three advantages: the ability to obtain the information intended; allowing interesting and unexpected data to emerge through exploring understanding, construction, perception of high-risk and work practice; and, physical access to supplementary artefacts from the workplace. The field interviews lasted around 30 minutes, and at the conclusion participants voluntarily offered the researcher the opportunity to clarify or ask further questions anytime.

Group interviews at hospitals using tool *A5 Group interview question sheet* and LHD head office using tool *B2 LHD group interview question sheet*, did not proceed as anticipated. During the course of data collection using tools A1- A4 and B1 it became apparent that the anticipated group membership needed to inform the research. had never met together as a group, or do not meet together at all to discuss high-risk high cost complex care surgical patients. The minimum intended group membership planned for each of the four hospitals were heads of departments or programmes (medical, nursing, business manager) for surgery, anaesthesia, critical care and the head of the hospital performance unit. A similar cohort was anticipated for the LHD head office. At the LHD the department or programme heads of the 4 hospitals - surgeons and anaesthetists have never met together, rather, they meet separately within the LHD surgery and perioperative stream and share a LHD Stream Manager of nursing background. This important research finding is addressed in findings chapters 4-6.

It was decided with my supervisors that group members, were to still be interviewed with the same semi-structured group interviews template tools A5 and B2, but in their natural social formations. Ethics LHD HREC was consulted on this unanticipated change in plans and it was decided as the same participants would be studied for the same burden of time (60-90 minutes) the only extra burden would be carried by the researcher. The latter was deemed ethically acceptable thus not requiring a written amendment to the research protocol.

3.6.4 Survey data collection

The *A4 Staff attitudes survey* was administered face-to-face, always in an office, immediately following signing the written consent form and prior to conducting the field interview, on the same day as hospital observation. This was to promote a high response rate, allow rapport and clarification, and minimise the burden of time for participants (O'Leary 2014). This process meant that all but sixteen of the 129 clinicians and managers that were interviewed completed the questionnaire survey (n-113). The sixteen participants that did not complete the survey were full-time managers or physician doctors that do not work exclusively in perioperative care for example consultant physicians. The one exception was the nurse interviewed via telephone. The survey took participants around 10 minutes to complete. Around 20% of participants chose to write on the comments section or more often on the margins of the Likert scale near a particular question or questions grouping. Most surveys were completed singularly, occasionally two to three participants completed their surveys alongside each other but always as individuals. When completing the questionnaires in the presence of others, each participant was unaware of other's responses. The researcher was largely unaware of the participant's survey responses. The questionnaire survey with interviews allowed the participants self-expression of their work practices, work conditions and attitudes to perioperative healthcare delivery, and contributed to establishing rapport prior to the interviews.

3.7 Data analysis and presentation

This section describes in detail the data analysis process and outlines the manner in which research findings from each of the four methods of data collection will be displayed in the results chapters 4, 5 and 6.

The data collected was systematically and iteratively interrogated and interpreted using a reflexive data analysis approach (O'Leary 2014). Whilst staying close to the data the following were continually considered (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011): the research aim and study questions (Chapter 1); methods limitations (Sections 3.5 and 3.6). and findings from the literature review (Chapter 2). The two objectives were to: develop expected and unexpected findings by repeatedly asking if the findings can be interpreted in different ways; and, to draw conclusions on the implications of the findings for the overall thesis.

To maximise research rigour through triangulation of results, data analysis proceeded using a mixed method of parallel convergent design (Figure 3.3) through three phases of data analysis detailed in Table 3.7 (Cresswell & Plano Clark 2011). For both quantitative and qualitative research methods the objective was the same to process raw data into meaningful conclusions (O'Leary 2014, Cresswell & Plano Clark 2011). In Phase 1 data analysis, analysis of the qualitative results (site observation, secondary data analysis and interviews) was done separately to the quantitative data (survey results). In qualitative analysis using inductive and deductive reasoning in turn, themes that run through the raw data were actively discovered or uncovered respectively, and their meaning interpreted with respect to the research questions (O'Leary 2014, Braun and Clarke 2013). In quantitative analysis this was achieved through coding data then applying descriptive statistics (O'Leary 2014).

Table 3.7 Data analysis – mixed methods parallel convergent design

Phase of analysis	**Mixed methods procedure for convergent design data analysis** (From Cresswell and Plano Clark 2011 p79 Figure 3.3)
1	Analysis of qualitative data and quantitative data remain separate
2	Apply strategies to merge the two sets of results, for example: • Identify content areas represented in both data sets and compare, contrast, and synthesise the results in a table or discussion • Identify differences within one set of results based on dimensions within the other set of results and examine the differences in a table organised by the dimensions • Develop procedures to transform one type of result into the other type of data e.g. turn themes into counts and relate the data numerically
3	Interpret the merged results: • Summarise and interpret the separate results • Discuss to what extent and in what ways results from the two types of data converge, diverge, relate to eachother, and provide a more complete understanding

The following sections present the Phase 1 analysis undertaken for the 3.7.1 qualitative data, 3.7.2 quantitative data and, 3.7.3 the presentation formats arising for the separate qualitative and quantitative data (Tables 3.8.1 and 3.8.2).

3.7.1 Analysis of the Observations, Secondary Documents and Interviews

Each of the qualitative methods (site observations, secondary data analysis and interviews) were analysed separately and the results for each hospital were initially analysed separately (Table 3.8.1). Content saturation was achieved when no new ideas were forthcoming from each qualitative method (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011). In analysing qualitative data (Diagram 3.3) the process was iterative and interweaved compared to the process for analysing quantitative data (O'Leary 2014, Braun & Clarke 2013, Cresswell & Plano Clark 2011). It was recognised that in managing qualitative data, data analysis is concurrently undertaken because the decisions made in grouping or organising the data effected the analysis (O'Leary 2014, Braun & Clarke 2013).

Table 3.8.1 Qualitative data analysis and presentation format

Method	**Data collection sample and time taken to obtain**	**Data analysis Tools and time taken for iterative review**	**Data presentation format**
Observations	**Total number of field notes = 30 Per Hospital (8/5/11/6) *Total number of hours cumulative = 40 Per Hospital (10/6/16/8)*	*Multiple iterations of multiple Field notes – derived from walking around the organisations and being in the care context documenting and mapping of structures, processes, common work practices, use of technology and historical antecedents from talking with long-term senior staff *Microsoft WORD, NVIVO; sticky notes, highlighters, white board *Time analysing = 3 months*	(i) General observations (GO) (ii) Ethnographic descriptions (ED) (iii) Clinical vignettes (CV) (iv) Business process models (BPM)
Secondary documents	**Total number of documents (paper and emr), n= 146; Per Hospital (53/22/40/31) *Hours collecting (included in time for observations)*	**Sorting by type, topic, chronological order, by Hospital and Profession, by relatedness, noting duplicates, origin, dates for review, authors, attendees or email recipients. Analysing, summarising, combining content *Microsoft WORD *Time analysing = 6 weeks*	(i) Amalgamation of secondary documents (DA)
Interviews	**Total number of interviews, n=129 Per Hospital (37/27/34/31) *Hours collecting = 64 Per Hospital (18/13/17/16)*	**Transcribing, analysing – iterative thematic analysis and quantifying subthemes *Microsoft WORD, NVIVO; sticky notes, highlighters, white board *Time analysing = 6 months*	(i) Interview data sheets (IDS) (ii) Thematic displays of exemplar quotes (TDEQ0 (iii) Systematic text condensations (STC) (iv) Exemplar quotes (EQ)

Recognising that continual generous engagement with the raw data (reading-rereading-reviewing-re-engaging with), and that the data collected is fundamental to process, the non-linear iterative cyclic steps taken to do qualitative data analysis were as follows (O'Leary 2014, Braun & Clarke 2013, Lingard 2008, Pope 2006): noting and neutralising bias; reducing and coding into themes; searching for patterns and interconnections; mapping and building themes; drawing conclusions and implications for the thesis.

Other tools used in qualitative data analysis included a research log and a writing journal. A research log served as a record of activity, to keep track of qualitative data collection – data source, hospital site, participant (using de-identification alpha-numeric code), collection date. A writing journal was maintained with continual reference to the research aim and study questions, notes on literature review and methods, and had three sections for the research findings for chapters 4-6. The findings sections of the writing journal allowed a variety of notes and mind-mapping to decide on the best way to classify and organise the data collected. In addition, separate folders were maintained for data collected from each of the four hospitals and the LHD head office, with dividers for grouping like sources, aided by stationery items such as sticky-notes, highlighters, 'white-boards'.

3.7.2 Analysis of the Survey

The spreadsheet software program Microsoft Excel was used to create a dataset to build a complete database for simple statistical analysis of the results from the surveys (O'Leary 2014). Data was systematically entered into the spreadsheet as it was collected, and analysis took place after complete data entry (O'Leary 2014). Quantitative data analysis was achieved through coding data then applying descriptive statistics (O'Leary 2014). Descriptive statistics was used to summarise and present the findings of the quantitative survey data (O'Leary 2014). Specifically, consideration was given to central tendency and dispersion of the data (O'Leary 2014).

Table 3.8.2 Quantitative data analysis and presentation format

Method	**Data collection sample and time taken to obtain**	**Data analysis Tools and time taken for iterative review**	**Data presentation format**
Survey	**Total number of surveys n= 113 Per Hospital (32/24/29/28)* **Hours collecting 19 hours*	**Data coded and database spreadsheet created consisting of survey data sheets* n= 54; *for simple statistical analysis, descriptive statistics applied* **Microsoft EXCEL spreadsheet* **Hours analysing = 16 hours*	(i) Survey data sheets (SDS)

3.7.3 Presentation of data

In results chapters 4, 5 and 6 the data is presented in the following consistent manner for each of the themes, subthemes and their relatedness and, for data from each of the study methods – observations, secondary documents, interviews and survey. To manage the multiplicity of the sites, the diversity of the participants and the complexity of the issues, a range of different presentation formats were used with distinct purposes. The method, presentation format and purpose are shown in Table 3.9. The four methods collected data that when analysed created ten presentation formats of data. Secondary documents analysis and survey analysis each produced one format of data presentation being developed. Observations and interviews however, each led to four data presentation formats being derived.

Table 3.9 Data presentation formats - examples for each method, and purpose

<table>
<tr><th>Method</th><th>Data presentation format and purpose</th></tr>
<tr><td>Observation (a)
General Observation</td><td>The purpose of a general observation box is to contain phenomena observed occurring on the clinical floor that applied across settings. For example:

Box 4.6 Observations during field interviews in offices in the wards as evidence for CTS
<table>
<tr><th></th><th colspan="4">NUMBER OF OBSERVATIONS</th></tr>
<tr><th>Observation</th><th>Hospital A</th><th>Hospital B</th><th>Hospital C</th><th>Hospital D</th></tr>
<tr><td>It was evident generally and most noticeable during the field interviews in offices in the wards, at all four hospitals, how time poor clinicians and managers on the clinical floor are. The interruptions from other nurses, doctors, bed managers, wards; from telephone calls; from patients needing immediate care or communication, were significant in number and multiple in nature. Over one-third of field interviews had at least one interruption, more often the interruptions were multiple from different sources</td><td>25/37</td><td>14/27</td><td>23/34</td><td>17/31</td></tr>
<tr><td>- and on twelve occasions interviews were aborted and concluded at a later time.</td><td>8</td><td>0</td><td>3</td><td>1</td></tr>
<tr><td>On three occasions, potential participants two senior nurses and one senior pharmacist, declining to arms-length recruitment for the research, cited constant lack of time. Their responses were supported by field observations of their work practices over the 18 months</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Observation (b)
Ethnographic description</td><td>The purpose of an ethnographic descriptions box is to contain the spoken accounts of chronological work practice changes over decades, as recollected by long-term senior staff across the multiple professions and sites. For example:

Box 4.2 Ethnographic description I: Decades of policy and CTS for clinical staff

At Hospitals A, B, C and D, on the day of surgery multidisciplinary clinical staff can now have as little as two shared hours to get to know and prepare patients for surgery in the DOSA unit.

Twenty years ago, clinical staff had a minimum of 15 hours to do the same jobs. The norm was that all patients would arrive the day before surgery and stay in hospital at least the night before surgery. This was to receive pre-operative nursing care and be available for doctors to review. There would be ample time for the doctors to meet their patients and think about the cases before them for the next day. There would be time for nurses to admit patients to a hospital ward bed without rushing or needing to coordinate their care around doctors competing for time with patients. The nurses had ample time to prepare patients and be ready to transport patients to the operating theatres the next morning…</td></tr>
</table>

<table>
<tr><th>Method</th><th>Data presentation format and purpose</th></tr>
<tr><td>Observation (c)
Vignette of clinical care</td><td>The purpose of a vignette of clinical care box is to contain field observations relating to common work practices, typical episodes of care and treatment of ‘actual’ patients, across the multiple professions and sites. For example:

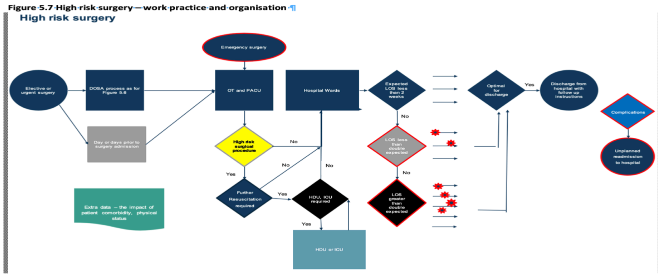
Box 5.3a Vignette of clinical care for high risk surgery
<table>
<tr><th>Patient factors</th><th>Surgery/ Anaesthesia</th><th>Postoperative Medical notes</th></tr>
<tr><td>Patient 1:
70 years old male, ASA 2
Dysphagia, weight loss, 5 cycles of chemotherapy for oesophageal cancer.
Previously well, on antacid only</td><td>Oesophagectomy (open abdomen, open chest)
GA and local blocks
Time in operating theatre X hours XX minutes
Planned postop. ICU admission 5 days</td><td>Discharge home after 2 weeks.
Review by surgeon in 2 weeks.

In hospital course was standard and with expected ‘complications’:

Five days in ICU; airway ETT extubated Day 1; no inotropes required; daily blood tests monitoring and correction of fluid and electrolytes; postoperative pneumothorax (expected) chest catheters inserted intraop., daily chest xray monitor until resolved.

Postop reconditioning: postop nutrition commenced on IV TPN feeding whilst nil by mouth, progressing to</td></tr>
</table>
</td></tr>
<tr><td>Observation (d)
Business process model</td><td>The purpose of business process models is to map the structures, processes and physical flows for patients’ episodes of surgical care based on patterns for example, their surgical risk and other risk factors. For example:
Process model key: circles – events; rectangular boxes with rounded corners – tasks; diamonds – decision points; connecting arrowed lines: solid line is a task transfer, dashed line is a message transfer, dotted line is an association.

Figure 5.7 High risk surgery — work practice and organisation



</td></tr>
<tr><td>Secondary documents

Documents amalgamation</td><td>The purpose of documents amalgamation is to correlate secondary documents such as minutes of meetings, memos, architectural plans, posters, state-wide perioperative policy, with the year of introduction of new and sustained structures and processes for perioperative care. For example:

Box 4.3 Documents amalgamation: Hospital A – CTS, from policy to compressed physical structures and processes
<table>
<tr><th colspan="2">Timeline for Hospital A perioperative systems development (1995-2019):</th></tr>
<tr><td>1995</td><td>Planning and resourcing a new department called the Perioperative Unit</td></tr>
<tr><td>1996</td><td>Introduction of pre-procedure preparation (PPP) and day of surgery admissions (DOSA)</td></tr>
<tr><td>1997</td><td>Incorporation and expansion of day-only surgery (DOS). 1997-2004 Increasing percentage of patients admitted as DOSA (90%) and DOS (60%)</td></tr>
<tr><td>2004</td><td>Refurbishment of Perioperative Unit to allow overnight stay – one night 23 hours ward (23HW), extended day-only surgery (EDO) and high volume short stay surgery (HVSSS) for 72 hours or less stay in hospital
The result: The work of multiple wards in 2 hospitals is now done in one Perioperative Unit, the size of one ward, the Unit staff utilise the technique of “hot-bedding” where multiple patients use the same bed sequentially cleaned, throughout the 24 hours day.</td></tr>
<tr><td>2005</td><td>Pre-admission clinic anaesthetists asked to provide the same pre-anaesthetic consultations to hospital ward inpatients (as for day of surgery admit patients) as the ward patients are sicker with multisystem disease and requiring more acute surgery</td></tr>
<tr><td>2007</td><td>Release of the NSW Health Pre-Procedure Preparation Toolkit</td></tr>
<tr><td>2013</td><td>Staggering of patient arrivals on DOSA to 2 hours pre-operative</td></tr>
<tr><td>2018</td><td>Release of the NSW Health The Perioperative Toolkit</td></tr>
</table>
</td></tr>
</table>

Method	Data presentation format and purpose
Field interviews (a) **Interview Data Sheet**	Field interviews are presented in four formats. The purpose of interview data sheets is to quantify the number of respondents across the four hospitals and the multidisciplinary professions to show where there was agreement and where differences occurred for the key elements of subthemes leading to themes. For example:

Table 6.1 IDS: High-risk knowledge development in professions- Clinician and managers' experiences

Theme	Subtheme	Key concepts	Number and % respondents for each concept by Hospital participant. Total (n=129)								Number and % respondents for each concept by roles. Total (n=167)							
			Hospital A (n=37)		Hospital B (n=27)		Hospital C (n=34)		Hospital D (n=31)		Doctor (n=56)		Nurse (n=61)		Allied Health (n=12)		Manager (n=38)	
			No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Knowledge development —as an individual	**Workplace experience and exposure**	Personal work experience and exposure was of paramount importance	37	100	27	100	33	97	31	100	56	100	61	100	11	92	38	100
		Time needed participating in the practice context to learn what was standard and normal or not	37	100	27	100	34	100	31	100	56	100	61	100	12	100	38	100
	Professional qualifications	Professional training and qualifications, continuing professional development	31	84	23	85	28	82	26	84	56	100	40	66	8	67	38	100
	Immersion in profession	Importance of 'scaffolded' learning, gaining greater independence from exposure to increasingly challenging cases within a profession	25	68	18	67	23	67	16	52	37	66	37	61	7	58	27	71
		Time needed to gain familiarity with complicated new procedures with increased precision demand	29	78	20	74	28	82	21	68	43	77	42	69	7	58	0	0
		Learning from juniors' questions; or for new technology 'expert-novice reversal'	8	22	3	11	8	23	6	19	17	30	8	13	0	0	0	0
	Peer Learning	Within profession discussion of challenging cases	33	89	21	78	31	91	23	74	43	77	48	79	12	100	26	68

Method	Data presentation format and purpose
(b) **Thematic display of exemplar quotes**	The purpose of a thematic display of exemplar quotes is to present together participants' exemplar quotes from across the four hospitals and multiple professions to enable direct comparison of experiences or attitudes. For example:

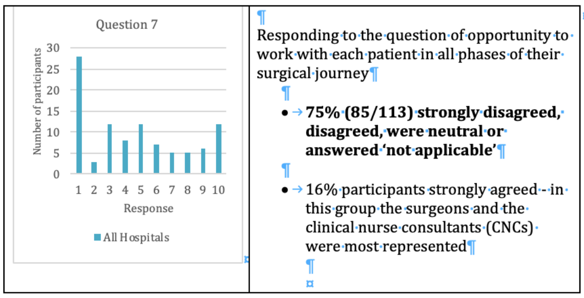
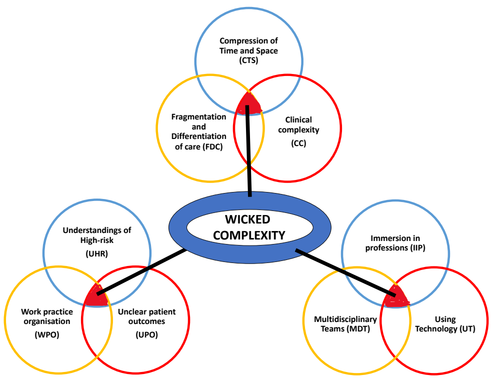
Table 6.1.1 TDEQ: Knowledge development in professions—Workplace experience and exposure

Subtheme - Workplace experience and exposure	Profession (and Hospital)			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Key concepts				
Personal work experience and exposure in the practice context was of paramount importance	*"Learn from caring for the patient … and practice …* Anaesthetist (2), Hospital A *"Clinical experience—learn to pre-empt problems"* Surgeon (1), Hospital A *"Learning focusing on the care of the patient … a normal part of our practice …* Anaesthetist (5), Hospital B *"RACS (College of Surgeons) training, and I have been at Hospital C, since a medical student, so done all the jobs over the years"* Surgeon (7), Hospital C *"Learning from previous role … and tapping into what already exists"* Physician (9), Hospital C *"Learn from the patients I care for"* Anaesthetist (10), Hospital D	*"Postgraduate certificate but mainly practical, on the floor doing everyday … Learning from making mistakes and reflecting"* Nurse (43), Hospital D *"Learn "by being here", "learn from mistakes", "hands-on", trial-and-error" because with (major) trauma (and brain injury) "every individual patient is different, can't learn from a book".* Nurse (30), Hospital C *"Experiencing a new case (a case new to me)"* Nurse (16), Hospital A and C *"Day-to-day managing …"* Nurse (21), Hospital B *"Original studies at nursing school … but acquiring experience is of much greater in importance. Learning how things work in the everyday …* Nurse (6), Hospital A	*"Years of experience and exposure to increasingly complex patients … from the various wards to ICU … to help you develop your assessment, to predict disasters before they happen and prevent them."* Dietician (4), Hospital A *"Experience based 80-90%, going through the physiotherapy rotations"* Physiotherapist (3), Hospital B *"50:50 Formal studies and … Experiential for learning—rotate through general surgery ward versus orthopaedic ward versus etc"* Physiotherapist (2), Hospital C *"Learning how to prioritise what is best for the patient as an individual, including in case conferences with other Allied Health specialties"* Dietician (1), Hospital D	*"Learning from doing in 3-5 different settings"* Manager (1), Hospital A, B; LHD *"Trial and error, numbers of exposure to different problems …* Manager (2), Hospitals A,B,C,D and LHD *"Learning—being in roles and dealing day-to-day with situations, develop and grow and expand your focus.* Manager (11), Hospital A *"Eighty percent from experience, the people that you work with…Twenty percent postgraduate studies…"* Manager (12), Hospital B *"Experience, trial and error …* Manager (6), Hospital C *"Experience through work training and completing fellowship"* Manager (5), Hospital D

Method	Data presentation format and purpose
(c) **Systematic text condensation**	The purpose of systematic text condensation box is to present the diverse collection of individual participants that expressed the same experience or attitude. For example:

Box 4.9 STC: Surgical ward rounds are very fast

CTS on surgical ward rounds	Participant
"… the ward round with the surgical senior… is very, very fast…"	Junior doctors: (1) Hospital A; (5) and (6) Hospital C; (7) and (8) Hospital D Senior surgeons: (1) and (2) Hospital A; (7) Hospital C; (8) Hospital D Physician (3), Hospital A; (9) Hospital C Nurse (3), (9), (11) Hospital A; (21), (22) and (23) Hospital B; (30), (31), (34) and (37) Hospital C; (43), (45) and (51) Hospital D Physiotherapist (2) Hospital A and B; Physiotherapist (3) Pharmacist (3) Hospital C; Physiotherapist (4), Dietician (4), Speech therapist (1) Hospital D

Method	Data presentation format and purpose
(d) **Exemplar quote**	The purpose of individual exemplar quotes is to present in the text, using italics in an indented paragraph that identifies the speaker, profession and workplace by numerical code, a full expression of a participant's experience or attitude. For example: *"in times gone by …before DOSA I could see (follow-up my) postop patients in my preop round the night before surgery (as pre-and post-op. patients would be in adjacent beds in the hospital wards) … we are now churning through patients … got to hammer through cases … so how am I going to follow-up? …(DOSA) solved a lot of problems but new problems still came through"* Anaesthetist (13), Hospital D
Survey **Survey Data Sheets**	The purpose of a survey data sheet is to present graphically in a histogram participants' aggregated response to a survey question. For the histograms, the x-axis represents the Likert scale numbers, one-to ten, where 1-2 = strongly disagree, 3-4 = disagree, 5-6 = neutral, 7-8 = agree, 9-10 = strongly agree. The y-axis represents the number of participants for each Likert scale number. The light blue bar charts represent participant numbers for each response. In addition, the key message is contained in the box to the right of each graph. Where there is a difference in response related to Hospital or Profession this is noted in the key message. For example: **Figure 4.2 Work practice fragmentation across phase of care** 
Themes and their interactions **Diagrams**	The purpose of diagrams is to depict the themes and the relationship or interactions between the main themes. For example: the intersection of main themes answering research questions 1, 2, 3 

3.7.4 Merging results and the interpretation of mixed results

After analyzing the qualitative and quantitative results independently in Phase 1, in Phase 2, merging of the data analysis proceeded to compare and contrast results from the different methods (Figure 3.3) using strategies as outlined in Table 3.7 (Cresswell & Plano Clark 2011). The data analysis decision making at this stage was to determine (Cresswell & Plano Clark 2011 p215) how the two data sets were to be compared. For example, considering the scope of information selected for compare and contrast; how the combined analysis was to be presented; and data transformation. Data transformation involved quantifying the qualitative data (in particular the interview data) and then using qualitative analysis methods to analyse both the quantitative data from survey, and the quantified qualitative data from interviews, observations and secondary documents. In the design of this mixed methods study, a number of strategies were adopted to minimise validity threats when merging and interpreting the data (Table 3.10) (Cresswell & Plano Clark 2011 p240).

Table 3.10 Strategies to minimise threats to validity when merging data

Stage	Strategy to maximise validity
Data collection	• The qualitative and quantitative samples at the four hospitals were drawn from the same population to make the results comparable • A similar number of cases were used for qualitative and quantitative samples at the four hospitals (proportionate to clinical complexity) • Data collection occurred concurrently and independently so that one method did not bias or influence the other
Data analysis	• Once the quantitative data collection was completed and analyzed separately, a joint display of quantitative descriptive statistics and qualitative themes was presented ensuring that each form of data was equally represented • Quotes from thematic analysis were found to match the statistical results • Data transformation was kept simple for example counting number of respondents at each hospital reporting on a particular subject in similar, or different ways
Data interpretation	• Specifically addressing each research question • Divergent findings from qualitative and quantitative samples were resolved by re-analyzing collected results through each of the multiple methods, further data gathering and evaluating the method of data gathering • Return to the literature review to add to the knowledge and understanding of perioperative healthcare and provide recommendations for policy and technology development • Relate findings to research questions 1-3 to each other, and to the thesis aim • Work with my interdisciplinary supervisors to evaluate the overall aim, methods and results and negotiate a common understanding of the best get ‘truth’

Table 3.11 shows the combination of different methods used as the merged data sources, marked by the symbol 'X', that created forty-four key elements (A1-K7) leading to eleven subthemes (A-K).

Table 3.11 Merged data to derive key elements of subthemes

Subthemes and key elements			Method			
			Observation	**Documents**	**Interviews**	**Survey**
#	**A**	**No time**	**X**	**X**	**X**	
1	A1	Feeling rushed to complete work and stressed to not delay process			X	
2	A2	Appearing rushed, multiple interruptions during work and interviews	X			
3	A3	Needing to physically be in multiple places at the same time	X		X	
4	A4	Inability to attend ward rounds	X	X	X	
5	A5	Lack of time to teach			X	
6	A6	Feeling short staffed			X	
	B	**Hospital has 'no beds'**	**X**	**X**	**X**	
7	B1	Structures and processes to manage patient flows, beds and 'no beds'	X	X	X	
8	B2	'No beds' so patients in outlier wards	X		X	
	C	**Discontinuity or fragmentation in care**	**X**	**X**	**X**	**X**
9	C1	Phases of perioperative care	X	X	X	X
10	C2	Within professions	X	X	X	
11	C3	Between professions	X	X	X	
	D	**Clinical complexity**	**X**	**X**	**X**	**X**
11	D1	Sicker, more complex patients now compared to past decade		X	X	
12	D2	New complicated technology, procedures with increased precision demand	X	X	X	
13	D3	More multidisciplinary input required now	X	X	X	X
	E	**Organisational complexity**	X	X	X	
14	E1	Competing priorities – 'beds', redevelopment, NEAT and other policy	X	X	X	
	F	**"High-risk" understanding**			**X**	
15	F1	Work practice knowledge of 'high-risk'			X	
16	F2	Predicated on adverse patient outcome			X	
17	F3	Multiple risk factors			X	
18	F4	Interacting nature of risk factors			X	
	G	**Work structures,processes for surgical risk**	**X**	**X**	**X**	
19	G1	Linear, predictable, reliable processes	X	X	X	

20	G2	Less predictable, more complicated processes	X	X	X	
21	G3	Reactive, complex adaptive systems	X	X	X	
	H	**Patient health outcomes**		**X**	**X**	**X**
22	H1	Limited particularly, including for patients they have treated			X	
23	H2	Lack of access			X	X
24	H3	Incidental			X	
25	H4	Professional standards			X	
26	H5	Policy standards		X	X	
27	H6	From the literature		X	X	
28	H7	No clinical multidisciplinary team-based patient health outcome(s)			X	
	I	**High-risk knowledge development**			**X**	
29	I1	Workplace experience			X	
30	I2	Professional qualifications			X	
31	I3	Profession immersion, novice-expert			X	
32	I4	Professional peer learning			X	
33	I5	Professional novice-expert reversal			X	
	J	**High-risk knowledge sharing/ non-sharing**	**X**	**X**	**X**	
34	J1	Disciplinary, multidisciplinary, interdisciplinary sharing/ non-sharing	X	X	X	
35	J2	Regular teams or ‘one-off’ groupings	X	X	X	
36	J3	Working for the ‘here and now’ or for ‘planning and doing for the future’	X	X	X	
37	J4	Knowledge brokers	X	X	X	
	K	**High-risk knowledge and using technology**	**X**	**X**	**X**	
38	K1	emr implementation whilst working	X	X	X	
39	K2	emr – paper hybrid	X	X	X	
40	K3	Integration of information, place, time, processes	X	X	X	
41	K4	Decision support and data queries			X	
42	K5	Bulky, draws clinician and attention away from the patient before them to the patient ‘in’ the emr	X		X	
43	K6	Separation from different IT platforms	X	X	X	
44	K7	Electing not to learn new technology (emr)	X		X	

Table 3.12 lists the eleven subthemes (A-K), the forty-four key elements (A1-K7) that lead to the nine main themes and the three findings chapters of the research.

Table 3.12 Key elements of subthemes leading to themes and findings chapters

<table>
<tr><th colspan="2">Subtheme key elements</th><th>➞</th><th>Themes</th><th>Findings Chapter</th></tr>
<tr><td>A</td><td>No time</td><td></td><td rowspan="7">1. Compression of time and space
• A1 - A6 and
• B1 - B2, plus
• K3
• K7</td><td rowspan="19">Chapter 4
The impact of health policy

Themes
1,2,3</td></tr>
<tr><td>A1</td><td>Feeling rushed to complete work and stressed to not delay process</td><td></td></tr>
<tr><td>A2</td><td>Appearing rushed, multiple interruptions during work and interviews</td><td></td></tr>
<tr><td>A3</td><td>Needing to physically be in multiple places at the same time</td><td></td></tr>
<tr><td>A4</td><td>Inability to attend clinical ward rounds</td><td></td></tr>
<tr><td>A5</td><td>Lack of time to teach</td><td></td></tr>
<tr><td>A6</td><td>Feeling short staffed</td><td></td></tr>
<tr><td>B</td><td>Hospital has ‘no beds’</td><td></td><td rowspan="6">2. Fragmentation of care
• C1 - C3, plus
• A1 - A5
• B2
• I2 - I4
• J1 – J3
• K2, K5, K6</td></tr>
<tr><td>B1</td><td>Structures and processes to manage patient flows, ‘no beds’</td><td></td></tr>
<tr><td>B2</td><td>‘No beds’ patients in outlier wards</td><td></td></tr>
<tr><td>C</td><td>Discontinuity in care</td><td></td></tr>
<tr><td>C1</td><td>Phases of perioperative care</td><td></td></tr>
<tr><td>C2</td><td>Within professions</td><td></td></tr>
<tr><td>C3</td><td>Between professions</td><td></td><td rowspan="6">3. Clinical complexity
• D1 - D3, plus
• A3
• B2, E1
• C1 – C3
• F1 - F4
• G3
• H1 – H7</td></tr>
<tr><td>D</td><td>Clinical complexity</td><td></td></tr>
<tr><td>D1</td><td>Sicker, more complex patients now compared to past decade</td><td></td></tr>
<tr><td>D2</td><td>New complicated technology, procedures with increased precision demand</td><td></td></tr>
<tr><td>D3</td><td>More multidisciplinary input required now</td><td></td></tr>
<tr><td>E</td><td>Organisational complexity</td><td></td></tr>
<tr><td>E1</td><td>Competing priorities – ‘beds’, redevelopment, NEAT and other policy</td><td></td><td rowspan="7">4. Understandings of ‘high-risk’ and risk factors
• F1 - F4
• G2 – G3
• H1 - H7
• I1 – I4
• J1 – J3
• K5</td><td rowspan="8">Chapter 5
Understanding work practice and organisation around risk
Themes
4,5,6</td></tr>
<tr><td>F</td><td>“High-risk” understanding</td><td></td></tr>
<tr><td>F1</td><td>Working knowledge of ‘high-risk’</td><td></td></tr>
<tr><td>F2</td><td>Predicated on adverse patient outcome</td><td></td></tr>
<tr><td>F3</td><td>Multiple risk factors</td><td></td></tr>
<tr><td>F4</td><td>Interacting nature of risk factors</td><td></td></tr>
<tr><td>G</td><td>Work organisation for surgical risk</td><td></td></tr>
<tr><td>G1</td><td>Linear, predictable, reliable processes</td><td></td><td></td></tr>
</table>

Subtheme key elements		➞	Themes	Findings Chapter
G2	Less predictable, more complicated processes		5. Work practice organisation around surgical risk • **G1 - G3, plus** • D1-D3	Chapter 5 **Understanding work practice and organisation around risk** Themes 4,5,6
G3	Reactive, complex adaptive systems			
H	**Patient health outcomes**			
H1	Limited particularly including for patients they have treated			
H2	Lack of access			
H3	Incidental		6. Unclear patient outcome measure • **H1 - H7, plus** • F1 - F4 • J1 – J3	
H4	Professional standards			
H5	Policy standards			
H6	From the literature			
H7	No clinical multidisciplinary team-based patient health outcomes			
I	**High-risk knowledge development**			
I1	Workplace experience		7. Professional immersion for high-risk knowledge development • **I1 - !5, plus** • H1 - H7 • J1 – J3 • K5	Chapter 6 **Workforce learning, communication and collaboration for high-risk surgical patients** Themes 7,8,9
I2	Professional qualifications			
I3	Profession immersion, novice-expert			
I4	Professional peer learning			
I5	Professional novice-expert reversal			
J	**High-risk knowledge (non)-sharing**			
J1	Disciplinary, multidisciplinary, interdisciplinary (non)-sharing		8. Perioperative teams and high-risk knowledge sharing • **J1 - J4, plus** • I1 - I5 • H7	
J2	Regular teams or ‘one-off’ groupings			
J3	Working for the ‘here and now’ or for ‘planning and doing for the future’			
J4	Knowledge brokers			
K	**High-risk knowledge using technology**			
K1	emr implementation whilst working			
K2	emr – paper hybrid		9. Using technology for high-risk knowledge sharing • **K1 - K7, plus** • D2 • I5	
K3	Integration of information, place, time, processes			
K4	Decision support and data queries			
K5	Bulky, draws clinician and attention from patient before them to the patient ‘in’ the emr			
K6	Separation from different IT platforms			
K7	Electing not to learn new technology (emr)			

3.8 Research rigour

Mixed methods researchers select a variety of strategies to reveal the trustworthiness of their research data and the inferences drawn from the data (Cresswell & Plano Clark 2011, Lincoln & Guba 1986, Guba & Lincoln 1982). This is important because we do not live and work in a scientific rational world but in a world of contested "facts" (Lincoln & Guba 1986, Guba & Lincoln 1982). This is a context where our understanding, based on our conclusions, are inferred from our self-selected observations ("real data") and past experiences ("we only select real data") (Senge 1994). Senge (1994) in their work on systems and the learning organization propose a "ladder of inference" to test the veracity of data and drawing conclusions, through each individual's and each team's reflection on preconceptions, transparency of reasoning, further inquiry and independent verification. In a similar vein, Guba and Lincoln (1982) explain the epistemology and methodological basis of qualitative or mixed methods research "how we know what we know" when we adopt this approach and stress the importance of differentiating between trustworthy and inadequate research. The aim is to get to the best attempt at the 'truth' achievable (Cresswell & Plano Clark 2011, Senge 1994, Lincoln & Guba 1986, Guba & Lincoln 1982).

3.8.1. The four dimensions of trustworthiness

Lincoln and Guba (1986) "the Four-Dimensions Criteria" of trustworthiness is used to demonstrate the rigour of the research which forms the basis of the thesis (Forero 2018). This approach to rigour in research has been used in a number of similar settings (Forero 2018). The four dimensions of trustworthiness that establish research rigour (and their *equivalent quantitative research terms*) and the related strategies that were used in this research are presented in Table 3.13 (Forero 2018, Lincoln & Guba 1986, Guba & Lincoln 1982). A full description of the strategies applied is provided in the following text. Notably, dependability or reliability in reproducing the research under the same conditions in the same context by the same researchers is provided by the clear exposition of data collection and analysis methods in Sections 3.6 and 3.7 (O'Leary 2014).

Table 3.13 Four Dimensions of Trustworthiness and the strategies used

Dimension of Trustworthiness *(Quantitative research equivalent)*	**Definition**	**Strategy applied to this research**
Credibility *(Internal validity)*	The degree that the data and inferences, from the viewpoint of the participants is true, and that their realities have been represented accurately	• Triangulation • Prolonged engagement and persistent observation • Data saturation and reporting of disconfirming information • Member checks and peer review • Secondary data analysis documentation
Transferability *(External validity, Generalisability)*	The degree that the data and inferences can be transferred or generalised to a receiving context in a different setting	• Thick descriptive data • Theoretical / purposive sampling • Data saturation • Triangulation
Dependability *(Reliability)*	The degree that the data and inferences can be repeatable or reconstructed if the research was conducted in the same settings, with the same participants and researchers	• Rich descriptions of the study methods and tools • Reflexivity and audit trail
Confirmability *(Objectivity)*	The degree that the data and inferences can be confirmed or corroborated by other or external researchers	• Triangulation • Practicing reflexivity

3.8.2 Triangulation and other strategies

Triangulation has been the principal strategy applied to ensure the rigour of this research. Credibility, transferability and confirmability were ascertained through using triangulation as a research strategy (Cresswell & Plano Clark 2011, Lincoln & Guba 1985, Guba & Lincoln 1982). Triangulation is a mathematical approach to verifying the location of an object by combining independent measures of its distance in relation to three or more independent fixed landmarks (Braun & Clarke 2013). In research, a variety of data sources, perspectives and theories contest each other and cross-check the data and inferences with the aim to get the best attempt at the 'truth' achievable (Cresswell & Plano Clark 2011, Lincoln & Guba 1985, Guba & Lincoln 1982).

3.8.2.1 Credibility through triangulation at multiple research stages and context levels

Credibility (or internal validity) was ascertained through applying triangulation at multiple stages of the research and at multiple contextual and research levels (Cresswell & Plano Clark 2011, Lincoln & Guba 1985, Guba & Lincoln 1982). To maximise rigour this research has applied triangulation to the: literature review; study settings - four hospitals in one LHD; participants' professions and experiences; different methods for data collection, including prolonged engagement and persistent observation (Section 3.6); different methods for data analysis, including supporting artefacts, data content and content saturation; also, reporting of disconfirming information as some deviation from positive information should be expected in real life settings (Section 3.7.1); different standpoints of researcher and supervisory team (anaesthetist, intensivist, and two social scientists); and external perioperative site visits – four hospitals in Melbourne (October 2018).

3.8.2.2 Transferability and confirmability through triangulation

Transferability (or external validity) and confirmability were ascertained through applying triangulation in the following manner: the diverse professional grounding of the research team (anaesthetist, intensivist, and two social scientists); the research supervisors work outside the research LHD; and, towards the end of the data collection the investigator made external site observations of perioperative systems at four tertiary referral university affiliated hospitals interstate in Melbourne (October 2018).

Credibility was further enhanced by using the strategies of member checking and peer review. Member-checking for qualitative validity is used to assess whether information resulting from qualitative data collected is accurate. This is done by the researcher taking summaries of findings back to key participants in the research and asking them whether the findings, codes or themes are an accurate reflection of their experiences (Cresswell & Plano Clark 2011). Member checks for data collection information accuracy, were also confirmed using triangulation of data obtained from several sources (different hospitals, professions) and multiple methods (Cresswell & Plano Clark 2011).

Peer review through asking others to examine the data, who have content knowledge of qualitative research or the clinical context, and also individuals not affiliated with the research who may interrogate the data using their own criterion, adds to the validity of the research (Cresswell & Plano Clark 2011).

Transferability (external validity or generalisability) of the research results and inferences into a perioperative context in another different setting is enabled by: thick rich descriptions of the research context in answering the three research questions (Chapters 4,5,6); purposive sampling of participants informed by local policy, empirical papers, *a priori* theory, and iteratively through data collection and analysis for the six qualitative methods of this research (Section 3.6); data content saturation (Section 3.7); and, triangulation (Section 3.8.2)

Reflexivity is a means of signposting to readers what is happening while research is being conducted, making explicit the direction of the research and purposefully addressing researcher biases (O'Leary 2014, Koch & Harrington 1998). Practicing and documenting reflexivity assures research rigour in the dimensions of dependability (or reliability) reproducibility in the research context with the same participants by the same researchers and confirmability (objectivity) reproducibility in the research context by other or external researchers (O'Leary 2014, Koch 2006, Koch & Harrington 1998).

3.9 Research limitations

An early limitation in the design of the research was addressing the social reality of a complex research setting pragmatically, a clinical setting known to have limited resources and time constraints on participants. A second limitation is in the conduct of the research by a single researcher; the PhD process imposes limitations, including imposed timelines and limited resources.

A further limitation is potential bias that may arise from mapping the context, through observation using components and principles determined a priori (from pre-existing state-wide policy which I have been involved in writing) whilst other previously non-considered phenomenon pass unnoticed. This and the fact that I am also a clinician working in the perioperative field, required that I remain vigilant and aware of the impact of my preconceptions. To remain open to the evidence and minimise preconceived bias, I was conscious to remain reflexive and question the influence of my beliefs and implicit knowledge whilst in the process of research design, data collection and analysis. In addition, I consulted regularly with the research supervisory team who are all external to the research setting.

As a known, senior figure in the field, I was aware that participants may have 'polished' their initial responses to certain questions e.g. survey question 17 "I would like the opportunity to help improve perioperative patient care". This limitation was addressed by the construction of the purpose designed tools for data collection (Appendix 4). Each individual tool, the tools used collectively, and the multiple methods used together, were designed to explore in a uniform way, in increasing depth, the initial findings. To probe for example, the 'how and why' for a given attitude or action; the way each individual's 'high-risk internal rubric' was constructed; and, to examine the perceived and observed enablers and barriers to work practice improvement. I was conscious of the need to explore attitudes and behaviours to content saturation and in addition, I consulted regularly with the research supervisory team who are all external to the research setting. The possibility of researcher bias, that is as an actor rather than a neutral observer in the research setting, was mitigated by the strategy of separating clinical work time and space. Research was conducted on dedicated research non-clinical days. Observations, surveys and interviews were conducted at the participants' workplaces, that is distant to the researcher's primary place of work, for more than 90% of the data collection.

3.10 Ethics approval

Ethics approval for the research was granted by the NSW Health South Eastern Sydney Local Health District (SESLHD) Human Research Ethics Committee (HREC). The application project title and reference number are: *Evaluating perioperative policy for dynamic capability and capacity* referral, HREC ref no:16/160 (HREC/16/POWH/354).

The date approved was 24 August 2016. Subsequently site-specific ethics approvals were gained from the research office at the four participating hospitals and SESLHD district head office on 2 August 2017. The University of New South Wales HREC was a ratifying HREC. In terms of ethics as a process, reflexivity and ongoing discussions with my supervisors and academic and clinical colleagues kept me observant of potential ethical issues throughout the research (Guillemin & Gillam 2004).

3.10.1 Ethical considerations

A number of ethical issues that required consideration during the conduct of this research are presented and were also addressed within the ethics application process. On the issue of coercion, possible participants were recruited via an arms-length approach through a local manager, via an email communication describing the research with an attachment copy of the participant information sheet, consent form and revocation of consent. Participants who agreed to be approached, engaged in the research on a voluntary basis through reading and signing the consent form. The anonymity and confidentiality of participants was achieved through non-identification and de-identification of interview transcripts, surveys and secondary data analysis documentation. Participants were differentiated using an alpha-numerical code. Only the researcher had access to identifying data, transcripts, surveys, data analysis documentation and computer files. Data was stored securely. For anonymity, data was analysed and reported collectively for example, the hospitals were given pseudonyms and are not referred to by name beyond research supervision meetings. When data was reported on an individual level for example, in attributing personal experiences in responses and quotes from interviews and surveys, the participants were identified by their professional role, and not referred to by name at any time.

In terms of ethical practice, a significant limitation of this research is also the principal burden of this research on participants. This was the burden of time because of the inherent unpredictable nature of clinical work. This limitation was overcome by the use of purpose designed tools, drafted initially from the scoping and literature reviews then tested, co-constructed and piloted with people in the field. In addition to the same content, a structured routine repetitive process for administering the tools for data collection was developed. The tools were applied to participants in a balanced equivalent manner across the professions and level of experience, including in the research setting. Nevertheless, clinicians and managers are busy people with unpredictable demands on their time, as such interviews and focus groups needed to be conducted at times that were least intrusive to the participants. This resulted in multiple re-schedules, many interruptions and delays to the conduct of the research. This fieldwork finding was enlightening, and the research was conducted appreciatively in a respectful manner for the participants' time and insights.

3.11 Conclusion

In this chapter, I have provided and explained the context for the research, the purpose designed tools for data collection, the data collection and analysis methods, the formats for data presentation, and the framework and strategies to ensure research trustworthiness and ethical rigour. In the following three chapters, I will present the findings of the research.

Chapter 4 The impact of health policy

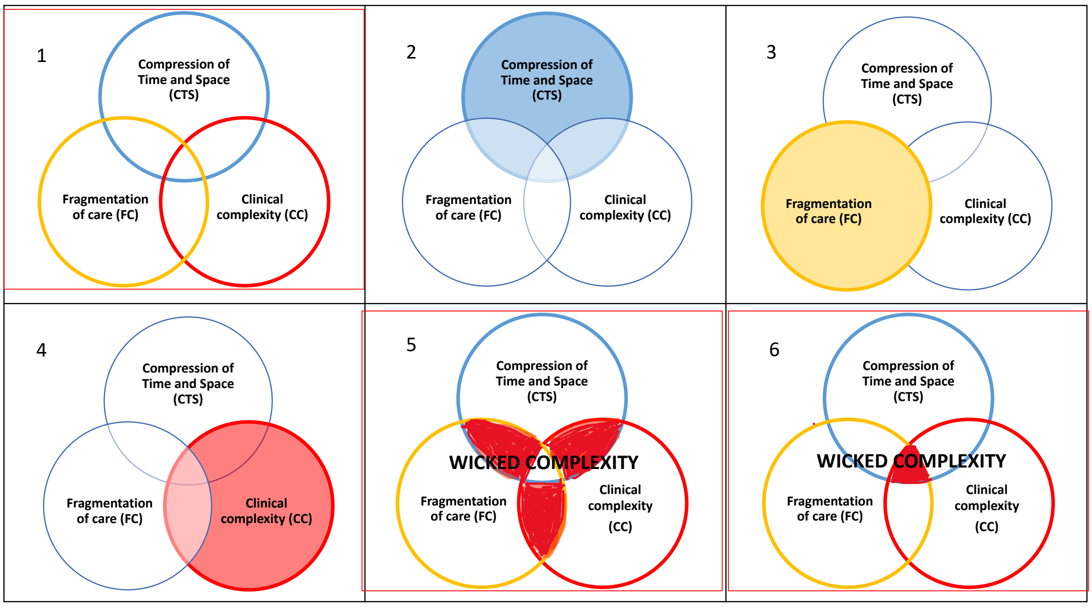
4.1 Introduction

The aim of this chapter is to answer research question 1: *What has been the impact of health policy on the organisation and practice of perioperative care?* The exposition describes the policy setting in which the research took place.

The structure of this chapter is based on the three main unintended consequences of health policy namely, compression of time and space (CTS), fragmentation of care (FC) and clinical complexity (CC). For the purpose of this research, CTS is defined as the perception that time and space availability, to simultaneously care for patients across multiple discrete locations in day-to-day practice, is limited and reducing. This was in part due to the reduction in both the number of hours patients physically now spent in the hospital and, the physical reduction in the numbers of beds and wards across the hospitals, over the years. FC is the separation of components of perioperative care into specialised but isolated, incomplete parts of the whole care process. CC is characterised by a complicated process requiring multiple interconnected steps, where the condition of the patient was unstable, rapidly changing or not easily understood by one medical specialty alone, and required multiple points of negotiated communication or discussion, between diverse members of the healthcare organisation, to arrive at the best next step. Evidence is then provided for a *"wicked complexity"* arising from the work environment that has a more extensive impact on clinicians and clinician managers, than CTS, FC, and CC impacting alone. Wicked complexity is examined at its intersections arising from the unintended consequences of policy that impact work organisation and practice, namely between any two and all three of CTS, FC and CC. That is, a new form of complexity, that was unintended but arises out of the wicked problem (Greenfield 2010, Rittel & Webber 1973) it is seeking to address.

The evidence is presented using the structure depicted in Diagram 4.1. Diagram 4.1 is a series of six Venn diagrams (VD). The three main themes are CTS in *blue*, FC in *yellow*, and CC in *red* circles (VD1). The following sections of this chapter examines each of the themes in turn (VDs 2 to 4) followed by a summary of what occurs at their intersections (VD5 and VD6). At the intersections of the main themes, a wicked complexity arises, that is, complexity that is unintended, unwarranted and promulgated by the behaviours of the practice environment. A wicked complexity in competing demands and competing priorities arising from the work pressure of dealing with the "here and now".

Diagram 4.1 The structure for presenting the evidence to answer research question 1



4.2 Policy in practice

The evidence for the intended consequences of perioperative policy on the local research context, namely safely reducing hospital length of stay for lower risk surgical patients, has been presented previously in Chapter 2 Literature review, point 2.2.4.1). In this section, health policy is defined broadly as encompassing courses of action or inaction, initiated by government that affect the set of institutions, organisations, services, and funding relationships of the health system (Buse et al 2011 p6). To address research question 1, the four key policies selected for analysis, met the five research criteria described in Chapter 3 Methodology, point 3.4.2. Of these policies, two, namely the National Elective Surgery Targets (NEST) and the NSW Predictable Surgery Program (PSP), were most relevant, as they specifically targeted healthcare provision for patients having surgery. The NEST propelled surgical patient throughput. The PSP provided models of care to organise and direct patient workflows and coordinate multidisciplinary clinicians and managers.

In addition, two other key policies whilst not exclusive to surgical patients, met the criteria and were found to have affected perioperative organisation and practice. These policies are, the NSW Emergency Treatment Performance (ETP), adapted from the Four-Hour Rule National Emergency Access Target (4HR/NEAT); and the National Safety and Quality Health Service (NSQHS) standards. Whilst not particular to surgical services, the 4HR/NEAT and NSQHS standards were known to, and often referred to directly by, multidisciplinary participants. The 4HR/NEAT is the emergency medicine counterpart to the NEST. Emergency patients screened by the Australasian Triage Scale (ATS) as 'ATS 1' require immediate hospital-level care, giving priority to clinical urgency (ACEM 2016). 'ATS 1' have priority access to hospital beds over that of waitlist elective surgery patients (ACEM 2016). In the case of the NSQHS standards, at the macro level there was a strong commitment to hospital accreditation, mandatory outcomes reporting and meeting the NSQHS standards. The standards were prominently displayed as posters during site observations and address high prevalence adverse events.

These policies, purpose, key elements and impact potential on clinicians and managers are described in Table 4.1.

Table 4.1 The four key policies with authority in the perioperative research setting

Policy	Purpose	Key elements	Impact potential on:	
			Managers	Clinicians
1.National Elective Surgery Targets (NEST) 2012	Reducing the number of elective surgery patients waiting beyond the clinically recommended time (CRT) for elective surgery	Patients waiting beyond the CRT by urgency category 1 – 30days, 2 – 90days, 3 – 365 days is expected to be 0,0,0.	Executive managers, perioperative clinician-managers and clinicians are required to work together, to meet the National Elective Surgery (waiting list) Targets. *A component of the National Partnership Agreement on improving public hospital services*	
2. Predictable Surgery Program (PSP) 2004	A framework of principles used to drive improvements on surgery in NSW	Include the component policies presented below - HVSSS, PPPT/PT, ESG	Executive managers are to meet NEST, ETP (NEAT) and balance a budget. PSP provides an implementation framework for investment in systematically reducing LOS for lower risk patients	Clinician-managers and clinicians are to work together to capitalise on new medical technologies and clinical risk reasoning to develop models of care for to reduce LOS

Policy	Purpose	Key elements	Impact potential on:	
			Managers	Clinicians
3. Emergency Treatment Performance (ETP) 2018 Formerly a Commonwealth target known as the **4HR/NEAT** (National Emergency Access Target) 2012	NSW MOH ACI-Emergency Care Institute state target Four-hour target to drive clinical service redesign and whole of hospital change, hospital Executive and LHD engagement and leadership	81% of all patients presenting to ED are expected to physically leave ED within 4 hours for admission to a hospital bed or another hospital for care or discharged home	Executive managers, are required to meet the Emergency Treatment Performance target for all patients – medical and surgical	Perioperative clinician-managers and clinicians are required to meet the Emergency Department Care targets for surgical patients
4. National Safety and Quality Health Service (NSQHS) Standards 2nd edition 2018 1st addition 2011	Eight standards to provide a nationally consistent statement about the level of care consumers can expect form health services. The standards cover high-prevalence adverse events	The eight standards are: clinical governance, partnering with consumers, preventing and controlling healthcare associated infection, medication safety, comprehensive care, communicating for safety, blood management, recognising and responding to the deteriorating patient	Executive managers and clinician managers are required to have systems in place to meet the eight NSQHS standards for all patients – medical and surgical. At accreditation health service organisations are assessed against the NSQHS standards (since 2013)	Perioperative clinicians work within the systems established and maintained for the eight NSQHS standards

The Predictable Surgery Program: This policy includes high volume short stay surgery (HVSSS), the perioperative toolkit (PT), and the emergency surgery guideline (ESG). In contrast to the other three key policies, the PSP provided models of care to organise and direct patient workflows and coordinate multidisciplinary clinicians and managers. The policy components of the PSP, their policy purpose, key elements and impact potential on clinicians and managers is summarised in Table 4.2.

Perioperative policy has been implemented and sustained through a hierarchical linear system throughout the LHD. Starting at the macro level, the evidence will show a culture where maintaining hospital care access, patient flows and workflows was considered important. The result of a strong policy commitment from the LHD to meeting both NEST and 4HR/NEAT.

Table 4.2 The Predictable Surgery Program (PSP) health policy

PSP components	Purpose	Key elements	Impact potential on:	
			Managers	Clinicians
2. Predictable Surgery Program (PSP) 2004	A framework of principles used to drive improvements on surgery in NSW	Include the component policies presented below - HVSSS, PPPT/PT, ESG	Executive managers are to meet NEST, ETP (NEAT) and balance a budget. PSP provides an implementation framework for investment in systematically reducing LOS for lower risk patients	Clinician-managers and clinicians are to work together to capitalise on new medical technologies and clinical risk reasoning to develop models of care to reduce LOS
2.1 High volume short stay surgery (HVSSS) 2012	A policy to release additional clinical capacity (including beds, staff and other resources) within hospitals for reinvestment in emergency or complex service needs. Nascent models of care and advances in medical technologies make HVSSS possible and preferable	Builds on MOH policies for day-only and extended day-only (2005). Aim is to concentrate suitable planned surgical cases in dedicated HVSSS units for LOS up to 72 hours. Business case is for 80% planned surgery to be HVSSS, of this 60% as day-only surgery	Executive managers rely on clinician managers to organise the work around HVSSS	Clinician-managers and clinicians are required to work together to extend the range of procedures that are suitable for a short stay environment, whilst juggling care for higher risk hospital patients
2.2 Perioperative toolkit (PT) 2018 Builds on MOH policy – Pre-procedure preparation toolkit (PPPT) 2007 (See Chapter 2 Literature Review Section 2.2.4.1)	To aid in the continuous quality improvement of perioperative structures, processes, outcomes by applying evidence and clinical reasoning to risk stratification and directing resources to clinical need.	Complete care perioperative course, beginning pre-admission; use triage, risk optimisation; multidisciplinary teams; individualised standardised clinical pathways; measurement for improvement; integration with primary care; partnering with patients; effective governance	Executive managers rely on clinician managers to organise the work around PPPT and support with resources the development of clinical leads and multidisciplinary teams for standardised clinical pathways	Clinician-managers and clinicians are required to work together to extend the range of procedures that are suitable for a short stay environment, whilst progressing models of care such as pathways and integrated care for higher risk hospital patients
2.3 Emergency surgery guideline (ESG) 2005	Measure and plan for the generally predictable emergency surgery workload for all specialties and allocate the necessary operating theatre time including immediate access for the most urgent emergency patients	Operating theatre resource allocation to match emergency workload Consultant surgeon-led models of emergency surgery care Standard hours scheduling where clinically appropriate	Executive managers rely on clinician managers to organise the work around emergency and elective surgery patients on a day-to-day basis	Clinician-managers and clinicians are required to work together to juggle the emergency and elective patient cohorts for all specialties of surgery.

Examining the impact of perioperative policy at the macro-meso-micro levels, this chapter adopts the following understanding of organisational culture. Culture is defined as a set of shared values and norms that guide the actions of people in their day-to-day work (Greenfield 2010). This chapter will further show that culture is also a product of an ongoing interactive process operating between individuals and the systems in which they work. At the macro level of policy implementation, the following two quotes from Executive Managers encapsulate the drivers that cause the phenomenon of compression, fragmentation and complexity to happen at hospital level.

> *"LHDs focus on … 'Media, Money, Flows'"*
>
> Anonymous (1), Ministry of Health

> *"In the Boardroom it is not down to the operational level. The risk is Finance, Budgetary, the implications of running a health system. Board subcommittees include patient safety and quality, finance, audit and risk management. Current organisational risks are an aging infrastructure in 3 hospitals for example $XX million worth … operating rooms, tables, equipment, …IT risks another 1-2 years of integration, fixing systemic flaws, upgrading …Performance also matters (for example) …the NSW Health targets – Elective surgery waiting times, Emergency department waiting times …"*
>
> Clinician - Manager (1)

The common purpose of the suite of perioperative policies is driving surgical patient throughput (NEST and 4HR/NEAT for surgical patients) by trying to achieve ever greater efficiency, through decreasing length of stay preoperatively (PT), and post-operatively (PT, HVSSS), and improving safe quality care (PT, HVSSS, ESG, NSQHS).

The next three pieces of evidence Box 4.1, Figure 4.1 and Box 4.2 establishes the interplay between Finance, Budgets, and policy performance for NEST and 4HR/NEAT that gave rise to the research findings of this chapter. From site observations of the LHD and its four adult public hospitals, Box 4.1 maps the LHD's sustained investment in existing structures and processes for surgical patients, to the key policies set out in Tables 4.1 and 4.2.

Box 4.1 Observation: Mapping hospital structures and processes to policy

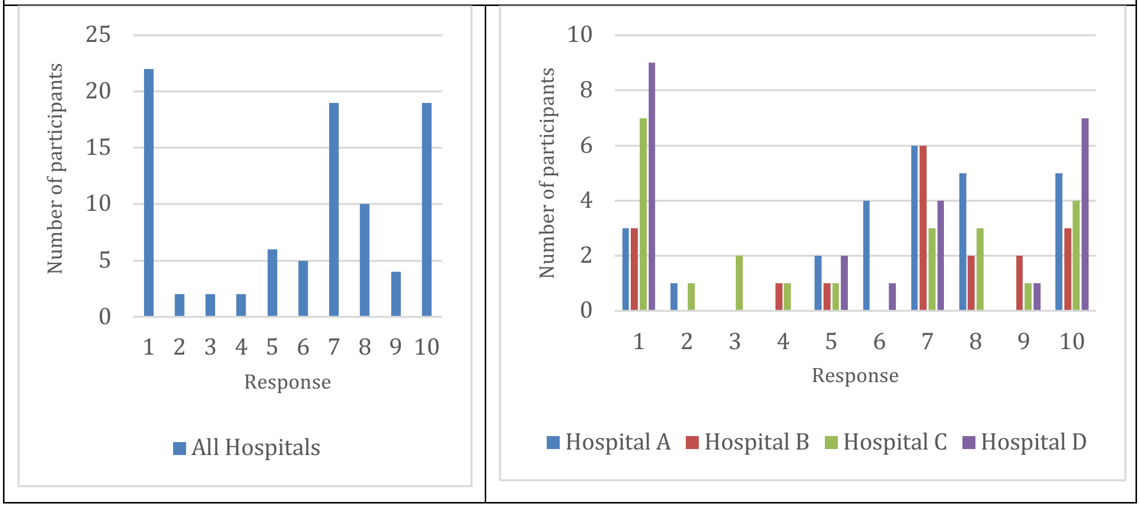
Policy	Structure	Process	**Hospital A**	**Hospital B**	**Hospital C**	**Hospital D**
NEST	Bookings - Admissions Office and Manager (Senior nurse)	NEST '0,0,0 targets' actively maintained daily and reported at senior management meetings	**Yes**	**Yes**	**Yes**	**Yes**
PT	Pre-Admission Clinic (PAC)	Triage process to PAC and Day of surgery admissions (DOSA) and day-only surgery (DOS)	**Yes**	**Yes but no PAC**	**Yes**	**Yes**
HVSSS	HVSSS Unit incorporating day-only surgery (DOS), extended day-only (EDO)	Dedicated units for 80% elective surgical patients to stay in hospital < 72 hours; may incorporate or stand alone with DO, EDO unit	**Yes**	**Yes**	**Yes**	**Yes**
ESG	Designated senior surgeon and dedicated senior nurse and junior medical team	Review emergency patients from the Emergency Department (ED) or hospital wards and expedite transfer to the operating theatres as per clinical need	**Yes**	**No**	**Yes**	**No**

Evidence of the impact of perioperative policy could be traced down to the microsystem level of clinical practice (Figure 4.1). From survey, policy artefacts or tools such as the Patient Health Questionnaire from the PT, PSP policy were familiar to over 80% of the participants. Multidisciplinary clinicians and managers were able to recognise and judge each tool based on its utility to the individual's work practice. The participants that responded not applicable (N/A) to the survey question on the PT tools were managers, or clinicians whose work practice was not specific to perioperative care, for example intensive care or emergency department clinicians.

Figure 4.1 SDS: Mapping clinician's work practice and organisation to policy tools

Responding to the usefulness of the patient health questionnaire (PHQ) for obtaining knowledge of the patient's medical condition and surgical risk:

- **The PHQ tool from the Perioperative Toolkit (PT) policy was recognised by**:
    - **80% or more participants across each of the four hospitals**
- Those participants were then able to comment on the usefulness of the artefact in their day-to-day work practice
    - 50% (52/113) agreed or strongly agreed that the PHQ was useful
    - 25% (28/113) disagreed or strongly disagreed



The LHDs responsibility for finance, budgets and health service performance for both the NEST and 4HR/NEAT policies, was observed to cause an interrelated, interdependent vortex of challenges at the meso and microsystem level of hospital care. The challenge was access to finite hospital beds. The 4HR/NEAT is the emergency medicine counterpart to the NEST. Emergency cases screened as requiring immediate hospital-level care had priority access to beds over that of waitlist elective surgery patients. As a result of the interplay between Finance, Budgets, NEST and 4HR/NEAT, Hospitals A, C and D were observed to invest human resources 24 hours a day, every day, to addressing patient flows and bed management (Box 4.2).

Box 4.2 Observation: Patient flows and bed management

Policy level	Structure	Process	**Hospital A**	**Hospital B**	**Hospital C**	**Hospital D**
Meso	Patient Flows office in the Hospital Executive	Executive oversight Director of Nursing Senior nurse managers	**Yes**	No	**Yes**	**Yes**
Meso-micro	Patient Flows nurse manager and Bed managers	Coordinating available beds for emergency department patients and elective surgery patients, including access to specific wards including the ICU	**Yes**	No	**Yes**	**Yes**
Micro	At least daily meeting Weekdays 0800 – Patient Flows nurse manager and Bed managers with wards nurse unit managers	Morning face-to-face meeting with ward nurse unit managers to discuss patient admissions and possible discharges from the day before and for the day ahead. Projection of likely beds for elective surgery patients that day	**Yes**	No	**Yes**	**Yes**
Micro	Electronic board (or whiteboard) in each ward displaying each patient's estimated length of stay	Nurse unit manager (NUM) or senior nurse delegate had multiple phone calls or visits from bed managers for potential discharges (NUM discuss with surgeons or nursing homes, respite care) or admissions to ward	**Yes**	Yes	**Yes**	**Yes**

The following sections of this chapter will link these findings, of decisions made at higher levels of implementing health policy (macro), to effects further down hierarchical levels of care (meso-micro).

4.3 Evidence of compression, fragmentation and clinical complexity

This section presents the evidence on the impact of policy on the organisation and practice of perioperative care. The impact of the suite of policies on the context of care and the people providing care is now thoroughly examined. The following paragraphs give the detail of the experiences of frontline clinician and managers.

4.3.1 **Compression of time and space** (CTS)

The first significant finding on the impact of perioperative policy on frontline clinicians and clinician-managers was the perceived reduction in time available in day-to-day practice to simultaneously care for patients across multiple discrete locations. This was in part due to the reduction in both, the number of hours patients physically now spent in the hospital and the physical reduction in the numbers of beds and wards across the hospitals, over the years. Participants' perceptions of this temporo-spatial reduction, for the purpose of this research, has been defined as CTS.

The evidence will show how and why: first, as a direct result of policies trying to improve efficiency, hospital clinicians and clinician-managers are now required to complete given tasks for their patients, in less time and less physical space. As will be shown shortly, hospital clinical work is both knowledge work and manual physical labour that requires a minimum amount of time to complete. Progressively over the last two decades, there has been less time and space, to provide the same necessary patient care tasks. Second, the efficiency gains in reducing length of hospital stay have been reinvested. Clinicians are still working the same eight-to-ten hours shifts. Time that has been saved by clinicians completing tasks more quickly for each patient, is spent on getting even more patients through the service, to achieve the NEST policy '0,0,0 targets'. Hospital staff are working faster and harder. Third, concentrating patients and care into discrete short stay units for 'HVSSS' has allowed hospital bed closures. Less bed space is required to care for the majority '80% HVSSS' of patients having surgery and anaesthesia. Last, CTS has also meant that previously sequential tasks have now become overlapping or parallel tasks for clinicians. Increasingly, clinicians are responsible for multiple patients in multiple places at different times.

The evidence for the theme of CTS will be presented through subthemes describing the lived work experience of the participants. Firstly, for all clinical staff together, responding to the sequential changes to perioperative policy. Then, in turn through the lens of senior and junior, doctors, nurses, allied health and managers. Each professional category experiences CTS somewhat differently.

4.3.1.1 General – clinical staff

During site observations, CTS was evident at all the four hospitals, for all professions and levels of seniority. CTS was particularly noticeable pre-operatively for all patients, arriving on the day, close to two hours before the start of surgery, the induction of anaesthesia and knife-to-skin time. This was called 'just-in-time care' and was considered the most efficient use of resources. Post-operatively low and intermediate risk patients left the hospital in the main, on the same day or, if the surgery was more extensive, stayed one or two nights in hospital. This was in line with the policies related to the PSP (PT, HVSSS). Box 4.3 Ethnographic description I describes how for over twenty years a number of simultaneous interdependent practice changes for clinicians, clinician managers, patients and carers, have been necessary, to actualise the current perioperative model of care.

Box 4.3 Ethnographic description I: Decades of policy and CTS for clinical staff

At Hospitals A, B, C and D, on the day of surgery multidisciplinary clinical staff can now have as little as two shared hours to get to know and prepare patients for surgery in the DOSA unit.

Twenty years ago, when patients were less sick and care less complex, clinical staff on surgical wards had a minimum of 15 hours to achieve the same tasks, that are now routinely completed through delegation to pre-admission clinics.

The norm was that all patients would arrive the day before surgery and stay in hospital at least the night before surgery. This was to receive pre-operative nursing care and be available for doctors, senior and junior surgeons and anaesthetists, to review. There would be ample time for the doctors to meet their patients and think about the cases before them for the next day. There would be time for nurses to admit patients to a hospital ward bed without rushing or needing to coordinate their care around doctors competing for time with patients. The nurses had ample time to prepare patients and be ready to transport patients to the operating theatres the next morning…

Nowadays, for example, procedural anaesthetists can meet for the first time, on average three to eight new patients, on the morning of surgery between 0730-0830. The procedural anaesthetist is the anaesthetist that provides the anaesthetic in the operating theatre Despite significantly imposed time limits with patients, the anaesthetists' pre-operative role and responsibilities remain the same or higher as iteratively described in professional college standards (ANZCA 2018). CTS similarly applied to the work organisation and practices of senior surgeons and junior doctors. For perioperative nurses the patient preparation, recovery and discharge caseloads were more rapid. Progressive perioperative policy pushed patient throughput in and out hospital in greater numbers, faster patient turnover in new HVSSS units that CTS.

Box 4.4 is a documents amalgamation that correlates for Hospital A, secondary documents with the year of introduction of new and sustained physical structures and processes for perioperative care. The secondary documents included minutes of meetings, memos, architectural plans, communication posters and state-wide perioperative policy.

Box 4.4 Documents amalgamation: Hospital A – policy driving compression of physical space and process time

Timeline for Hospital A perioperative systems development (1995-2019):	
1995	Planning and resourcing for a new department called the Perioperative Unit
1996	Introduction of pre-procedure preparation (PPP), pre-admission clinics (PAC) and day of surgery admissions (DOSA)
1997	Incorporation and expansion of day-only surgery (DOS). 1997-2004 Increasing percentage of patients admitted as DOSA (90%) and DOS (60%)
2004	Refurbishment of Perioperative Unit to allow patient overnight stay – one night 23 hours ward (23HW), extended day-only surgery (EDO) and high volume short stay surgery (HVSSS) for 72 hours or less stay in hospital **The result: The work of multiple wards in 2 hospitals was now done in one Perioperative Unit, the size of one ward. Rapid turnover DOS meant that multiple patients could sequentially occupy the same bed, repeatedly cleaned, over the course of a working day. A strategy called "hot-bedding".**

2005	PAC anaesthetists asked to provide the same pre-anaesthetic consultations to hospital ward inpatients (as for DOSA patients) as the ward patients were sicker with multisystem disease and required more acute surgery
2007	Release of the NSW Health *Pre-Procedure Preparation Toolkit*
2013	Staggering of patient arrivals on DOSA to 2 hours pre-operative
2018	Release of the NSW Health *The Perioperative Toolkit*

The end result of achieving efficiency through top-down policy in Hospital A was evidenced structurally in reductions in ward beds and nursing staff. The work of 14 surgical wards in two hospitals in 1995 (five wards in Hospital A and one surgical building with nine wards and 162 beds (18 beds per ward), in tertiary Hospital Z, that was amalgamated with Hospital A) was by 2004, compressed into 6 surgical wards including the Perioperative Unit in Hospital A. Cardiothoracic surgery and neurosurgery wards space were maintained. The specialty surgical wards that had reductions in surface area and nursing staff included general surgery, vascular surgery, orthopaedics, plastics, ear nose and throat surgery and ophthalmology. Patients spending less time in hospital had allowed and resulted in permanent closure of beds and cost savings calculated in recurrent costs for example, staff salaries, patient meals, utilities, facility maintenance.

> *"The nurses from Hospital Z have always said that, in moving from Hospital Z to Hospital A many ward beds fell off the truck driving along 'A-Z' Road."*
>
> Clinician-Manager (8), Hospital A

Concertina-like compression of process time had also resulted in previously sequential tasks becoming overlapping or parallel tasks for clinicians. Increasingly, clinicians were responsible for multiple patients in multiple places at different times. Specifically, whilst the physical hospital surface area for care of the majority of patients having surgery had decreased, clinicians could be required to be in multiple places, to perform different tasks, for different ones of their patients at different times. Box 4.5 shows an ethnographic description of details of the sequential and parallel nature of perioperative clinical work, across multiple locations, as the result of perioperative policy.

Box 4.5 Ethnographic description II: Compression of time and space (CTS) leading to sequential and parallel tasks for clinical staff

Operating theatres on average run from 0830-1630 hours. Twenty years ago, the procedural anaesthetist would have seen all their patients the day before surgery in the hospital wards. On the day of surgery, they would arrive directly to the operating theatres to start anaesthetising the first patient at 0830 hours and then care for subsequent patients, one at a time. Today, CTS has resulted in procedural anaesthetists being simultaneously responsible for patients under general anaesthesia in the operating theatre, other patients recovering in the post-anaesthetic care unit and, patients scheduled for later on the operating list requiring their pre-anaesthetic consultation.

This overlap of patients under their care due to work CTS applied equally to junior medical staff and nurses in HVSSS units. Surgical trainees were responsible for: pre-operatively, ensuring written informed consent for surgery and marking the surgical site; post-operatively for patients leaving theatres for care in the hospital wards or alternatively leaving the hospital for home, whilst also needing to act as assistant with the operation in operating theatre.

Nurses in HVSSS units needed to simultaneously admit new patients, give prescribed medications, answer questions from patients and carers, escort patients to the operating theatres whilst escorting other patients back from the operating theatres, further recover patients from surgery and anaesthesia, provide post-discharge education and follow-up appointments. The same nurses also needed to ensure through telephone education that patients for the next day, could arrive in hospital on time and properly prepared.

Over the years, patients and carers' have learned new behaviours in shared management with clinicians. For example, for fasting times before anaesthesia; for stopping, continuing or substituting medications before surgery; for managing post-operative pain and surgical wound care, post-discharge appointments and surveillance for postoperative complications.

It was the responsibility of clinicians to ascertain that these instructions had been communicated clearly, understood and actioned correctly. In this manner the change in work organisation and practice for clinicians and managers enabled DOSA, DOS, HVSSS policy.

CTS resulted in work organisation and practice where completing parallel tasks was observed to be the norm for clinicians and clinician managers in all four hospitals. Box 4.6 details observations made during formal field interviews with consenting participants in office rooms on the clinical floor. For each hospital, Box 4.6 quantifies the number of participant interviews where: there was at least one interruption to address work related matters, interviews were concluded at a later time or declined due to lack of time.

Box 4.6 Observation during field interviews in offices in the wards as evidence for CTS (interruptions; interviews aborted, delayed, declined)

	NUMBER OF OBSERVATIONS			
Observation	Hospital A	Hospital B	Hospital C	Hospital D
It was evident generally and most noticeable during the field interviews in offices in the wards, at all four hospitals, how time poor clinicians and managers on the clinical floor are. The **interruptions** from other nurses, doctors, bed managers, wards; from telephone calls; from patients needing immediate care or communication, were significant in number and multiple in nature. Over one-third of field **interviews** had at least one interruption, more often the interruptions were multiple from different sources	**25/37**	**14/27**	**23/34**	**17/31**
- and on twelve occasions **interviews were aborted** and concluded at a later time.	**8**	**0**	**3**	**1**
On three occasions, potential participants two senior nurses and one senior pharmacist, **declining to arms-length recruitment** for the research, cited constant lack of time. Their responses were supported by field observations of their work practices over the 18 months	**0**	**0**	**2**	**1**

Across the local research setting, CTS was the intended result of iterative policy cycles designed to drive efficiency and eliminate waste. In Chapter 2, Box 2.1 presented the policy cycles, Box 2.2 the front pages of progressive NSW Health perioperative policy and their year of release. In Chapter 3, Table 3.2 showed across the four hospitals, structures and processes of policy for example, for ESWT management, PACs, DOSA, DO, EDO, HVSSS embedded into the work organisation and practice. In this chapter, Table 4.1 placed perioperative policy alongside two concurrent national and state policies that also have authority over the research setting and its participants. Namely the 4HR/NEAT and the NSQHS standards. Box 4.1 provided the evidence mapping hospital structures and processes to policy and Box 4.2 extended the evidence at the meso and micro levels by describing implementation strategies in staff roles, coordination, communication.

The evidence now focuses on the unintended consequences of past and current policy. Evidence from observations and semi-structured interviews found that CTS has led to clinicians and clinician-managers feeling time-pressured, isolated, unable to be at multiple places at the same time, whilst anxious not to delay work processes downstream. As a result, clinicians and clinician managers were seen to be prioritising their time and resources, becoming more and more focused on the tasks immediately before them, whilst abandoning other important tasks such as teaching and multidisciplinary team engagement. This was a constant issue raised across the hospitals and the professions and is typified in the following interview quotes and observations in the following sections. Through the lenses of senior and junior, doctors, nurses, allied health and managers, CTS was experienced similarly and somewhat differently.

4.3.1.2 Doctors

For senior and junior doctors CTS was experienced in three ways. First, as performance pressures, anxious not to delay work processes downstream. Second, as being physically unable to be at multiple places at the same time, this was particularly the case for senior surgeons. Third, the result of CTS was foregoing other tasks they would have liked to have undertaken or received, such as teaching junior doctors on the wards.

As a result of policy, CTS on the day of surgery, was frequently encountered by medical staff. Particularly senior trainee surgeons, senior surgeons and anaesthetists who were often detained or required to be in the operating theatres, whilst simultaneously needed in multiple places at different times. A quote from Anaesthetist (13) epitomised the feelings of being time-pressured, unable to do the work that was possible in the past when patients were in the hospital longer, and reluctant to delay workflows.

> *"in times gone by …before DOSA I could see (follow-up my) postop patients in my preop round the night before surgery (as pre-and post-op. patients would be in adjacent beds in the hospital wards) … we are now churning through patients … got to hammer through cases … so how am I going to follow-up? …(DOSA) solved a lot of problems but new problems still came through"*
>
> Anaesthetist (13), Hospital D

Anaesthetist (4) depicts the importance of being present in the operating theatre.

> *"… a barrier (to perioperative care) … is TIME, no time to see patients pre- and post-op., and time is valued in the Operating Theatres by the surgeons, and financially"*
>
> Anaesthetist (4), Hospital B and A

The experience depicted by Anaesthetist (4) was confirmed through observations of the work practices of senior doctors in the operating theatres (Box 4.7). Box 4.7 provides an explanation for senior doctors feeling CTS.

Box 4.7 Observation: Doctors work practice in the operating theatres – sequential tasks and parallel perioperative responsibilities

At all 4 hospitals, whilst surgeons and anaesthetists were predominantly working on anaesthetised patients in the operating theatres, their other patients were simultaneously either leaving the theatre suite for the wards, or leaving the hospital after surgery, or arriving in hospital for surgery planned to begin in the next couple of hours.

Intraoperative clinical care was observed to be both knowledge work and manual work (for example, inserting drips, injecting drugs, ventilating patients, placing airways and other tubes, surgical cutting, removing tissue, stemming bleeding, sewing up) that required expertise, concentration and execution, with a minimum time to complete each physical task.

As a result of the key policies (NEST, PSP-HVSSS, PT, ESG), these doctors were providing intraoperative care and simultaneously thinking about how to meet upcoming demands for the day and the need to maintain patient flow.

Junior doctors do attachments on surgical and anaesthetic terms but are not on the surgical or anaesthetic training schemes. Junior doctors are not yet immersed in the professions of surgery or anaesthesia. CTS has led to junior doctors experiencing the practice environment as being extremely time pressured, both physically and emotionally isolated, for example, in the pre-operative ward, particularly at the principal HVSSS Hospital B. Patient safety and the pressure not to delay processes to the operating theatres that can affect the rest of the day, present as dual competing demands for junior doctors.

> *"Another risk is the pressure (of time) between 730 and 800 on the morning of surgery in the day procedure unit, the cases are elective but feel almost semi-urgent, there are usually seven patients for the junior doctor to review, clear for surgery and get up to the operating theatre by 800am … it is not ideal and if there is something new, like new ECG (heart electrical tracing) changes… and the procedure is elective (minor risk surgery) the junior doctor will need to seek another medical opinion … and there is no time…"*

Junior doctors (2) and (3), Hospital B

In the post-operative surgical wards in Hospitals A, C and D, that contain the higher risk and more complex patients, there was now less time for teaching.

"… I would like to do more bedside teaching (on the ward round), give junior doctors the opportunity to examine patients from when they are in their weeks 5-7 of their surgical term … when they are a little more experienced in the term … but there is no time"

Surgeon (2), Hospital A

The experiences of junior doctors on the wards are typified in the following quote.

"… the round with the registrar is very, very fast. The other day we saw 20 patients in 60 minutes, the registrar did the examining of the surgical site (no other examination) I got all the vital signs and investigations before the round and reported them, then just jotted down what happened in the round and what tasks were needed. After the registrar left, I typed into the eMR (electronic medical record) and completed the (tasks) list"

Junior doctor (7) Hospital D

The experiences of the junior doctors on the wards, as part of the surgical subspecialty team, is placed in context through observation in Box 4.8. This work organisation and practice was consistent across the four hospitals.

Box 4.8 Observation: Junior doctors work practice in the hospital wards

The surgical team comprises the consultant senior surgeon, the surgical trainees called Fellows (in their penultimate year of training) or registrars(trainees), the junior doctors and often the medical students. The surgical teams at all four hospitals generally do a morning ward round before proceeding to the operating theatres where knife-to-skin time is 0800 or 0830. The surgical teams are primarily based in the operating theatres for most of the day. However, on certain days they may be based in the pre-admission clinics or outpatient department seeing patients. Senior surgeons and surgical trainees seldom spend all day in the wards. The work of the wards is delegated to the junior doctors who have a number of tasks to complete, often delegated as a to-do list, after a busy morning ward round from 0700-0800.

The experience of CTS when working directly with senior surgeons, was echoed by junior doctors across the four hospitals, and was also experienced or observed by other participants working on the surgical wards (Box 4.9).

Box 4.9 STC: Surgical ward rounds are very fast

CTS on surgical ward rounds	Participant
"… the ward round with the surgical senior… is very, very fast…"	Junior doctors: (1) Hospital A; (5) and (6) Hospital C; (7) and (8) Hospital D Senior surgeons: (1) and (2) Hospital A; (7) Hospital C; (8) Hospital D Physician (3), Hospital A; (9) Hospital C. Nurse (3), (9), (11) Hospital A; (21), (22) and (23) Hospital B; (30), (31), (34) and (37) Hospital C; (43), (45) and (51) Hospital D. Physiotherapist (2) Hospital A and B; Physiotherapist (3) Pharmacist (3) Hospital C; Physiotherapist (4), Dietician (4), Speech therapist (1) Hospital D

Senior surgeons' and anaesthetists' attitudes and work practices indicated that their roles were most required in the operating theatres for clinical, educational and financial reasons. The self-reported, and observed, experiences of these senior doctors were that patients under their care were treated both: sequentially, one at a time proceeding to the operating theatres; and in parallel, simultaneously needing to care for their patients that had completed their surgery, recovering in the units and wards, whilst also caring for upcoming patients for the operating theatre. Perioperative work was characterised as requiring a certain minimum amount of time to physically complete. Work for both senior and junior medical staff was experienced as:

> *"very, very fast … we are now churning through patients … got to hammer through cases".*
>
> Anaesthetist (13), Hospital D

Time for teaching junior doctors in the hospital wards was limited. Access to senior surgeons, the key decision makers in patient care processes, in the hospital wards, was limited. As will be shown, this access was even more limited for non-medical staff. The following sections provides a synopsis of the experiences of CTS for non-medical staff.

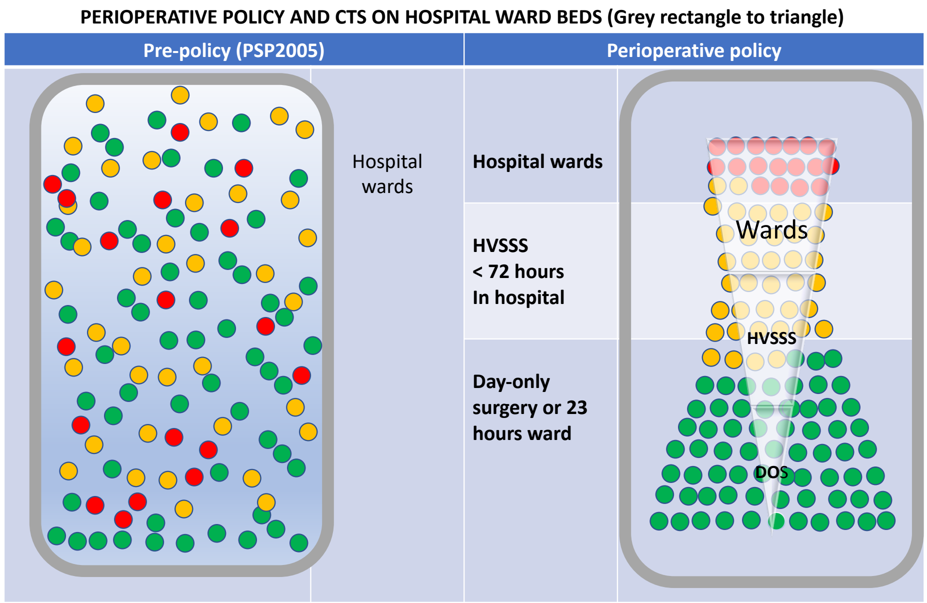
4.3.1.3 Nurses

Nurses were distinguished as the only professionals mainly based and immersed in the work of a single ward or department for all of their working day. Single departments were always walled off structures for example, a surgical ward, or a preadmission or outpatient clinic, or day procedure or perioperative unit, or the theatre suite or post-anaesthetic care unit (PACU), or the critical care unit. The departments were headed by the most senior nurse, the Nurse Unit Manager (NUM).

To fully appreciate the following evidence of CTS for nursing staff in the hospital wards, Diagram 4.2 summarises the evidence so far (Boxes 4.1 - 4.5) in illustrative form. Diagram 4.2 figuratively shows the impact of perioperative policy on hospital ward beds in a before and after format. The ‘hospital’ on the left represents ‘before’ where the hospital surgical wards are undifferentiated by policy. The hospital boundary is represented by the grey rounded rectangle. The coloured circles represent patients allocated to subspecialty surgical wards but randomly spaced with respect to time to discharge.

The ‘hospital’ on the right represents ‘after’ cycles of perioperative policy that have differentiated the wards by expected LOS for example day-only, HVSSS, hospital wards. The ‘hospital’ on the right has purposely and successfully grouped patients with respect to expected time to discharge. By successfully implementing policy, the hospital boundary, surface area and the number of beds is smaller. An impact of policy is that the original hospital boundary represented by the grey rounded rectangle is now the smaller grey transparent inverted triangle. Day-only patients (60% of all elective surgery) represented by the green circles are in and out of hospital same day. Only the sickest patients represented by the red circles occupy hospital ward beds for more than 5 days. CTS can be illustrated in the work practice of some senior nurses that had day-to-day roles in further accelerating patient throughput in and out of the hospital, in the right section of Diagram 4.2 (for example, nurses helping the yellow dots move downwards).

Diagram 4.2 CTS perioperative policy impact on ward beds



The evidence for CTS experienced by nurses is presented in the four sections. First, the impact on hospital ward nurses. Second, the impact of nurses that have roles in accelerating patient throughput in and out of the hospital (helping the yellow dots downwards). Third, the impact of nurses working in the pre-admission clinics. Fourth, the impact on nurses working in PSP policy units - DOSA, DOS, EDO, HVSSS, has been presented for general – clinical staff in Ethnographic descriptions (Box 4.3, 4.5).

First, the unintended consequence of CTS was most noticeable in the surgical wards and observed to be frequently encountered by ward nursing staff. The nurses provided step-by-step, one-on-one care for mostly post-operative patients. These patients were gradually recovering their physiological, physical and cognitive function after major surgery. There were also some acutely unwell pre-operative ward patients, most of whom had presented through the emergency department. In the past before the PSP - DO, EDO, HVSSS policy, high risk surgery ward patients were interspersed with more independent patients having less major surgery. That is patients that required less complex care (Diagram 4.2 on left). After decades of policy, some surgical wards at Hospitals A and C in particular, contained only patients having high-cost high-risk complex care (Diagram 4.2 on right, red dots).

Due to decades of policy, all ward patients in the postoperative wards of Hospitals A, C, D required skilled and arduous nursing care.

> *" … ten years ago we had patients with appendicectomies and lap. chole's in our beds now we have elderly, crumbly patients sometimes staying for weeks recovering from oesophagectomies, gastrectomies, Whipple's …"*
>
> Nurse (3), Hospital A

CTS was further evidenced by daily episodes of reprioritisation of resources. Care and time was directed to sicker, more complex and acute patients as typified by the interview quote from the following ward nurse manager; and supported by participants familiar with the setting (Box 4.10).

> *" … interruptions are par for the course, 30 patients to 8 nurses with a lot to do for each patient in the ward … and emergencies are further high risk because then there is little time for that patient, and even less time for other patients"*
>
> Nurse (2), Hospital A

Box 4.10 STC: CTS for surgical ward nurses

CTS on surgical Wards	Participant
"…we now have elderly crumbly patients …recovering from (major surgery) …" *" there is a lot to do"*	Nurse (2), (3), (7), (8), (9), (10), (11), (14) Hospital A; (30), (31), (33), (34) , (35), (37), (40) Hospital C; (43), (45), (49), (50), (51) Hospital D. Physiotherapist (4) (3) Hospital A; (2) Hospital C; (1) Hospital D. Pharmacist (4) Hospital A; (2) Hospital C. Dietician (4) Hospital A; (2) Hospital C, (1) Hospital D. Speech therapist (1) Hospital D Senior surgeons: (1) and (2) Hospital A; (6) and (7) Hospital C; (8) Hospital D. Physician (3) and (7) Hospital A; (8) and (9) Hospital C; (10) Hospital D Junior doctor (1) Hospital A; (5) and (6) Hospital C; (7), (8), (9) Hospital D Anaesthetist (6), (8) Hospital C; (13) Hospital D. Manager (11) Hospital A; (6) Hospital C.

Box 4.11 provides the evidence that explains surgical nurses' daily experience of CTS. Predominantly postoperative recovery and emergency surgery tasks consistent with those described in the observations of work practice are outlined below.

Box 4.11 Observation: Nurses work practice in the surgical wards

Unlike doctors (and clinical nurse consultants), ward nurses, nurse specialists, the ward nurse unit manager and nurse educator were based fulltime in specific wards or units in the hospital. CTS was most evident for nurses in the wards caring for patients recovering after major surgery whilst simultaneously preparing patients for emergency surgery. For example, this was witnessed in the general surgery, orthopaedics and neurotrauma-neurosurgery wards of Hospitals A, C and D, and also the trauma ward of Hospitals C.

CTS frequently led to the inability of ward nurses to physically attend ward rounds with doctors, for collaboration or clinical handover, for patients under their care. The doctors on ward rounds included for example, senior surgeons, alone or with their team; or the anaesthetist-pain physician and the acute pain management team. This was due to the heavy manual caseload for the other patients under their immediate care. A ward nurse could have 4 patients under their care during a work shift. Ward nurses were focused on the here-and-now.

Every patient in a general surgery ward bed required extensive nursing care which was often highly technical for example the management of surgical drains including chest drains. A series of these labour-intensive, time-consuming and complicated manual tasks for a single major surgery patient, could take one nurse nearly all day to complete. In this instance the nurse was assisted by other senior nurses. The observed tasks included 'taking vital signs' regularly, making other clinical observations for example 'falls risk', 'delirium screen', "bed sores, pressure injuries' and reviewing tests, managing and dispensing multiple medications, surgical wound care, the management of drains, lines, stomas; enabling eating, washing, toiletry, mobilisation, falls risk prevention, venous thromboembolism prophylaxis, risk mitigation for clinical deterioration, delirium, sepsis, notifying and participating in the active resuscitation of patients.

Ward nurses also spent time educating and answering questions from patients and their families; updating and being updated by senior nurses, various doctors and allied health staff; escorting patients to the operating theatres or for investigations e.g. radiology; and, attending ward meetings such as 'safety huddles' and clinical handover meetings at the beginning and end of their shifts.

The complicated technical work done by nurses, for patients having major surgery and complex postoperative recovery care, was reified in secondary documents used by the nurses. These included forms for 'enhanced recovery after surgery' (ERAS) clinical pathways, found as LHD and hospital produced secondary documents. These paper forms were sometimes used when caring for patients having major cancer surgery: specifically, oesophagectomy, gastrectomy, colorectal surgery with and without stoma, pancreatectomy, liver surgery, and peritonectomy. At other times the tasks were entered freehand by the nurses onto the patient's paper or electronic medical records, as having been completed during their shift (Box 4.12).

Box 4.12 Documents amalgamation: Ward nurses' documentation of complicated tasks completed for complex care patients in Hospitals A, C and D

Secondary documents were found as nursing entries made during each shift, particularly the day-time shifts, in the electronic medical record or paper record, typed as text.

There were also, some newly introduced paper formatted 'enhanced recovery after surgery' (ERAS) pathways, evident in use in Hospital C and D, produced by the LHD. The ERAS pathways were completed by nurses. Rather than writing text, an integrated sequential tasks checklist was initialled or ticked off, as each nursing care task was completed, as the patient progressed to recovery. For example, in the general surgery wards. Secondary documents for the patients who had had major cancer surgery: oesophagectomy, gastrectomy, colorectal surgery with and without stoma, pancreatectomy, liver surgery, and peritonectomy.

The artefacts outlined the day to day number of sequential manual technical clinical tasks that were needed to be completed after major surgery for each patient.

Second, simultaneous to the work practice of nurses in the surgical wards, other senior nurses called clinical nurse consultants (CNC) were observed to be driving workflow for greater efficiencies in the wards at Hospitals A, C and D, as typified in the following quotes.

> *"…my role is pushing people out safely (so other patients can have access to the ward) … problem is time constraints"*
>
> Nurse (7), Hospital A

Often these nurses, were observed to be in the role of clinical nurse consultants, they worked in new multidisciplinary teams driving efficiency to decrease length of stay using clinical pathways for specific surgical procedures.

> *"…aim of my job is to get (agreed cohorts of elective) patients out of hospital in a timely and safe way"*
>
> Nurse (11), Hospital A

> *"I provide education, audit, feedback merging agreed ERAS pathways with compliance and outcomes … empowering nurses and patients … and advocate for patients mainly with junior surgeons, I guess, when they are a bit cautious to take the next agreed step e.g. to upgrade a diet … Registrars need to refer to Fellows and Fellows to Consultant surgeons"*
>
> Nurse (34), Hospital C

Other clinical nurse consultants were observed to use their expertise, nursing networks and multidisciplinary team resources to help pull high risk patients out of the Emergency department, for more timely, surgical referral and tests in the hospital wards.

“the volume of patients coming through the Emergency department and lack of time, the clinical pressures, being very busy, things get missed and there is a delay in referrals for urgent surgical reviews”

Nurse (9), Hospital A

Third, even for the low risk preoperative period, CTS for nurses was observed, but experienced differently to that of the HVSSS and postoperative ward nurses. These front-end nurses were managing all elective surgery patients to meet the policy requirements - NEST ‘0,0,0 targets’ (Table 4.1, Box 4.1). They worked with both the increasing proportion of fast-track HVSSS (Table 4.2, Box 4.1) patients, and the patients presenting for elective major surgery (Table 4.2). New work practices to optimise patients prior to elective surgery are evidenced based to minimise complications and decrease LOS. The increasing list of initiatives included fully implementing relatively new best practice guidelines for example for stopping smoking, perioperative blood management, diabetes mellitus management, and frailty diagnosis, optimisation and management. A representative preoperative care nursing quote for CTS.

“the workload is like a wave you cannot get out of underneath from…it needs to be less rushed and more controlled”

Nurse (42), Hospital C

Fourth, even for low risk surgeries, CTS was reported as a problem. For example, for rapid turnover eye surgery in elderly patients, the number of clinical tasks needed for recovery from surgery is less, allowing early discharge. However, elderly patients are often frail at risk of falls, and particularly so, when their vision was further compromised, for example, blurry or eye-patched for the short term immediately following surgery.

“This is a high-volume turnover ward (average LOS 1.6 days, 23 hours ward 80% of patients) so (as a multidisciplinary team) we don’t get to know our patients well enough …that is a risk … especially with falls”

Nurse (21), Hospital B

The impact on nurses working in PSP policy units - DOSA, DOS, EDO, HVSSS, has been presented more fully in Ethnographic descriptions for general clinical staff (Box 4.3, 4.5).

Across the research setting, evidence from observations, secondary documents and semi-structured interviews found that CTS has resulted in nurses being physically very busy and feeling time pressured. In the pre-operative, DO and HVSSS units the volume of cases and the rapidity of turnover, left nurses feeling as though they had not had enough time to provide complete nursing care. In the postoperative wards, nurses when providing patient care, had to prioritise time for complex clinical tasks, over attending ward rounds with senior surgeons and other doctors.

4.3.1.4 Allied Health

This section presents the evidence for CTS for allied health staff whose work was mostly in the wards, working alongside nurses and junior doctors, providing post-operative care. Being fewer in number and often the sole representative of their profession on the postoperative wards, physiotherapists, dieticians, speech therapist and pharmacists, found it difficult to manage CTS and their multiple responsibilities. Allied health staff referred to heavy caseloads and staff shortages for their inability to delay the ‘here and now’ of patient care. The evidence describing CTS for Allied Health will be presented as quotes from individuals by profession and hospital, followed by a systematic text condensation across the participants (Box 4.13). For example, CTS for pharmacists.

> *“…resources are so stretched … there is no time to get the work done… we talk about risk stratification of the workload in the pharmacy department”*
>
> Pharmacist (3), Hospital A

As a result, the ability to progress other important aspects of the pharmacist role was compromised for example, pro-actively working to minimise medication errors on admission, and during and after hospitalisation for high-risk patients.

"Timely access to medications – dispensing, our workload is being dictated by this … so little or no time for medication reconciliation for high risk patients"

Pharmacist (1), Hospital C

It was recognised by Allied Health staff, that in the course of their hospitalisation high risk surgical patients could become malnourished, and physically deconditioned (Box 4.13). Dieticians, physiotherapists and other clinicians reported instances of high-risk patients losing lean muscle mass and becoming functionally physically less able to sit out of bed for long, stand up independently, mobilise and care for themselves (Box 4.13). As part of evidence-based best practice, dieticians and physiotherapists said they would appreciate more time to optimise and start treating their surgical patients earlier, for example, some weeks before the impact of surgery and hospitalisation (Box 4.13).

" … if we had more time pre-operatively to diagnose and treat underlying malnutrition (in high risk patients) …outcomes could be better"

Dietician (1), Hospital D

"Lack of time to implement nutritional support to decrease the risk of malnutrition before hospital and that which occurs in hospital"

Dietician (2), Hospital C

Allied health professionals frequently raised evidence that optimising physical function, strength and nutrition preoperatively, had been shown to minimise postoperative complications (Box 4.13). The extra work required from Allied Health and the cost to the hospital of managing postoperative complications when they arise, would also be avoided. For example, the need for more intensive chest physiotherapy for patients who get postoperative pneumonia and sepsis.

"There is evidence that preoperative physiotherapy education as 'prehab.' can decrease postoperative pneumonia, that will be better for patients and will decrease the need for intensive postop. Chest physiotherapy."

Physiotherapist (2), Hospital C

Across Hospitals A, C and D evidence from observations and semi-structured interviews found that CTS has resulted in physiotherapists, dieticians and pharmacists feeling short of manpower and time pressured, working reactively and almost exclusively in the postoperative wards. Allied Health staff were responding to the high-risk patient caseload before them, whilst seeking to work proactively to minimise postoperative complications and the associated extra workload and other costs

Box 4.13 STC: CTS for Allied Health staff

CTS on surgical wards	Participant
" … in high risk patients, if we had more time pre-operatively to 'prehab', educate, exercise, condition; … diagnose and treat underlying malnutrition; … reconcile medications …outcomes could be better" *"The pre-op. investment could pay for having to do less work postop. … managing complications …"*	Pharmacist (1) Hospital C; Pharmacist (3) Hospital A; Physiotherapist (1) Hospital D, (2) Hospital C; (4) and (3) Hospital A; Dietician (1) Hospital D, (2) Hospital C, (4) and (3) Hospital A Speech therapist: (1) Hospital D

The evidence has been presented for CTS as experienced by clinical staff collectively and by profession for doctors, nurses, and allied health staff. The impact of policy was observed to cause an inter-related and interdependent vortex of CTS for clinicians at the microsystem level of hospital care. The phenomenon was observed to result from two policy forces. First, the progressive iterations of perioperative policy leading to the CTS found in the ethnographic descriptions (Boxes 4.3, 4.5), observations (Boxes 4.7, 4.8, 4.11), documents amalgamation (Box 4.4, 4.12), interviews and systematic text condensations (Boxes 4.9, 4.10, 4.13).

Second, was the observed clash of two competing policies, the NEST and the 4HR/NEAT, on the day-to-day experience of participants. Whereby elective surgery and emergency patients competed for the contracted number of ward beds, in particular in Hospitals A, C and D (Diagram 4.2). The next section provides the evidence of CTS as experienced by Executive managers and clinician-managers, in addressing the two competing policies and the day-to-day challenge of access to contracted hospital beds.

4.3.1.5 Managers

Executive managers priorities were typified by the following quote.

> *"… operational, the day to day challenges through delegation includes patient access and flow, patients in and out in a timely manner, balance emergency and elective … whilst managing standards of care – professional competencies and credentialing of staff…and an appropriate culture for staff…"*
>
> Manager (14), Hospital A

The challenge of CTS being managed as "*patient access and flow"* was at times experienced by clinicians and labelled as *"no beds".* The experience for clinicians, their team and patients, was typified by the following quote by a senior consultant surgeon.

> *"…No HDU (high dependency bed) is a risk for very sick patients…we have beds, so we operate but then there are no beds, so the patient is pushed out earlier … they stay only one night (in HDU) … I don't find out until later, second-hand, but my team is contacted…some patients bounce back the same day (into HDU from the surgical wards) …I rely on my RMO, registrar, Fellow … the safety is in the team, … more defence mechanisms."*
>
> Surgeon (2), Hospital A

Executive managers at Hospitals A, C, D invested human resources 24 hours a day, every day to addressing patient access, flows and bed management. Box 4.2 presented the policy levels, structures and processes in place for managing patient flows and beds in Hospitals A, C, D. At the meso level, hospital Executive levels of Hospitals A, C and D a formal sign-posted office space was evident near or within the Executive Unit. The Executive oversight was the Director of Nursing and senior nurse managers with titles such as Patient Flows manager and Bed manager. The Patient Flows manager and Bed managers physically met with surgery Nurse Units Managers, at least daily. Early each morning plus were in phone contact throughout the day. Box 4.14 describes a typical bed management meeting. In addition to the structures and processes depicted in Box

4.2 and Box 4.14, Section 4.3.1.3 provided interview quotes from four clinical nurse consultants who had the role to move patients from their surgical subspecialty, through and out of hospital beds, as safely and as efficiently as possible.

Box 4.14 Observation: Patient flow and bed management meetings

0815 Weekday. Bed management meeting in a meeting room on the clinical floor. Chaired by Bed manager. In attendance Nurse Unit Managers from the HVSSS ward; Operating suite-Theatres, Operating suite-PACU, surgical wards; and the Patient Flow Manager.
On a good day, the following quote was recorded in field notes:
"You've got surgical beds we don't have to be here" Bed Manager

On other days, the usual process started with tabling the available beds that day for each ward, including the Critical Care Unit (HDU, ICU).
"We are expecting to discharge X number of patients this morning" NUM

The Operating suite-PACU where patients can occasionally have prolonged overnight stay patients. The PACU needed to clear all its beds for the influx of that day's patients from the Operating suite-Theatres. The suitability for the patient to return to the subspecialty ward of the surgeon was then discussed in terms of bed availability as well as patient suitability. "Patient #1 can't go back to ward 2Y because there are no beds, no patient discharges today … Patient #2 can't go back to ward 2X because they were confused post-anaesthesia…Patient #3 can go back but has MRSA (infection)… Patient #4 needs to have a Ketamine infusion for 5 days…"

The Operating Theatre list of the day was also simultaneously scrutinised for patients that needed to stay overnight in hospital after surgery, anaesthesia and PACU. Decisions were made on where each patient would go. Every effort was made to put patients in the ward of their subspecialty surgery. Patients that were not in the ward of their subspecialty surgery were called "outliers". If there was a shortage of beds, a follow-up meeting of all attendees was scheduled for later in the morning.

Of note, during the 18 months data collection period an injection of capital resources was evident in the planned or staged completion of the redevelopment of Hospitals A, C and D. Observations of the redevelopment processes for surgical services (Box 4.15) gave indication of anticipated and actual continuation of CTS, and that new team models of perioperative care were as required as the new 'bricks and mortar'.

Box 4.15 Observation: Impact of hospitals redevelopment for surgical services

During the research period, three of the four hospitals had either commenced (Hospital A) or had recently completed hospital redevelopment (Hospital C and D).

At Hospital A, according to planning documents and redevelopment communications, to be adequate, the expansion in ward bed numbers for higher risk patients, simultaneously required new perioperative models of care to be implemented to meet demand.

At Hospitals C and D, six months after completion of new surgical wards and beds, including critical care beds, indicators of continued CTS persisted. This was particularly so at the largest Hospital C. Multiple daily negotiations amongst senior managers for ward bed availability continued to be observed.

Interviews with senior managers (nursing and medical) at Hospitals C and D provided two explanations and two observations for the continued challenge of managing "no beds".

First explanation, LHD planning that projected demand for hospital services may have underestimated the population growth from local high-rise buildings. Second, the presence of physical beds in a new section of the hospital did not equate to increase in capacity, if the bed could not be "opened". To be "opened" beds needed to be appropriately budgeted and staffed, with adequately trained nurses and doctors.

First observation was improving productivity by doing more with existing resources through innovation was still needed to address demand. The second related observation was that it may be timely to begin to address public demand in particular with regard to the issue of non-beneficial surgery in elderly high-risk patients that spend weeks to months in high acuity beds trying to recover from major surgery.

4.3.2 **Fragmentation of care** (FC)

The second significant finding on the impact of perioperative policy on frontline clinicians and managers was FC. Fragmentation of perioperative care is the separation of components of care into specialised but isolated, incomplete parts of the whole care process. FC is presented in three sections; first, across the phases of perioperative care in pre-intra-post-operative units or wards; second, within professions; and third, between professions.

4.3.2.1 Across perioperative phase of care

FC by phase of care, was evident in the discrete physical units and wards that constituted perioperative care at the four hospitals (Box 4.16). In Box 4.16, the vertical classification of the units or wards corresponded sequentially to the work done for each phase of patient care, from initial pre-admission to surgical wards. All four hospitals had similar structures with similar names, with the sole exception of Hospital B not having a critical care unit. Mapping of the hospital floorplans found varying degrees of physical separation between each unit or ward, in their relation to the operating theatres (OTs). Their physical separation from the OTs ranged from having all components, relatively co-located on a single floor (Hospital D); in the same building but on a separate floor (Hospital B); to a mixture of closely adjacent structures with one ward in a separate older building (Hospital A); to having quite dispersed wards in another building and on a separate floor (Hospital C). The ICU/HDU critical care units were physically nearer to the operating theatres than the emergency departments.

Senior and junior surgeons and anaesthetists, and clinical nurse consultants were observed walking between the units several times a day to care for patients. General nurses tended to be ward based but were routinely seen escorting, walking or transporting patients on trolleys, between units, wards and the OTs. The Units with the most physical integration and collegiality were those units related to perioperative policy (NEST, PSP PT, HVSSS). The physical proximity of the different policy related units to each other and to the operating theatres, was observed to enable some staff at all four hospitals - senior nurses, admissions clerical staff, surgeons and anaesthetists to engage in serendipitous one-on-one work exchanges for preoperative planning.

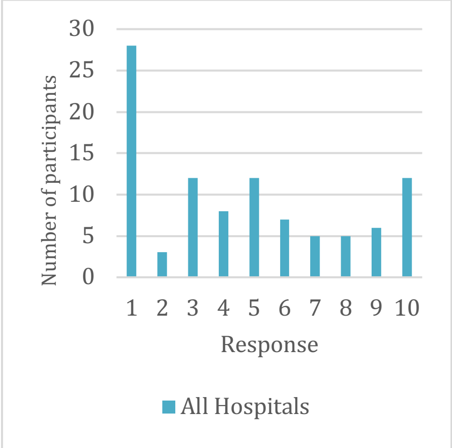
Box 4.16 Observation: Mapping FC by phase of care, hospital perioperative structures and their physical separation in relation to the operating theatres

Unit or ward in relation to OTs	**Hospital A**	**Hospital B**	**Hospital C**	**Hospital D**
Admissions Office	Adjacent	Same building, on a separate floor	Separate building, on a separate floor	All surgical services on the same floor and adjacent to one another, except the emergency department
PACs	Adjacent	Same building, on a separate floor	Separate building, on a separate floor	
DOSA	Adjacent	Same building, on a separate floor	Redevelopment plan to be adjacent *but temporarily adjacent building on a separate floor – during redevelopment*	
DOS	Adjacent	Same building, on a separate floor		
HVSSS	Adjacent and on the wards	Same building, on a separate floor and on the wards	Separate building, on a separate floor	
Hospital Wards	In another 2 buildings, on separate floors	Same building, on a separate floor	In another 3 buildings, on separate floors	
ICU/ HDU	Adjacent	No ICU/HDU	ICU/ HDU over 2 floors, same building, different floors	
Emergency department	In another building, on a different floor	Separate building	In another building, on a different floor	A floor below the surgical services units, wards

The Admissions office which contained the bookings office function and management of NEST '0,0,0 targets' were adjacent to the pre-admission processes-clinics (PAC) in Hospitals A, B and D, or was just downstairs for Hospital C. The day of surgery admission ward (DOSA) was the same as or immediately adjacent to the day-only (DOS) ward in all four hospitals. In contrast, at all four hospitals the operating theatre suite with PACU, the critical care unit (ICU/HDU) (not Hospital B) and emergency departments were walled-off self-contained departments, that required key-card access.

Perioperative structures observed as physically discrete and fragmentated units and wards was reflected in participants' experience of FC, in their work practice organisation. Perioperative patient care, provided by 75% of participant clinicians and clinician-managers, was noted to be fragmented and did not allow for involvement in the whole process of care (Figure 4.2).

Figure 4.2 SDS: Work practice fragmentation across phase of care

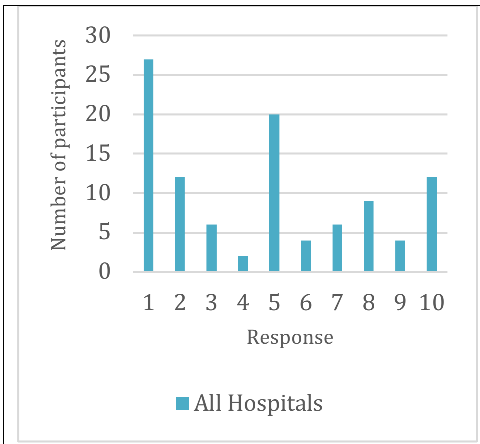


Responding to the question of opportunity to work with each patient in all phases of their surgical journey

- **75% (85/113) strongly disagreed, disagreed, were neutral or answered 'not applicable'**
- 16% participants strongly agreed - in this group the surgeons and the clinical nurse consultants (CNCs) were most represented

After a patient left the department or unit where the participant worked, over 73% of clinicians and clinician-managers had no knowledge of the patient's progress or outcomes (Figure 4.3).

Figure 4.3 SDS: Participants lack knowledge of a patient's progress after the patient leaves their department

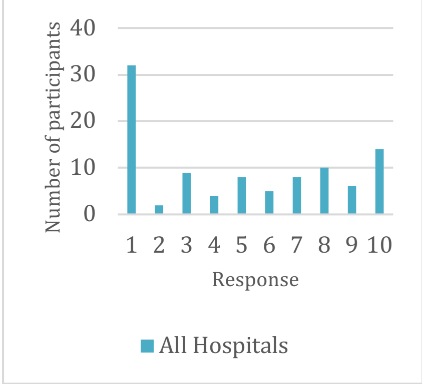


Responding to the question of having knowledge of their patients' progress and outcomes upon leaving their department:

- **73% (82/113) disagreed, were neutral or answered 'not applicable'**
- 14% (16/113) participants strongly agreed

The following three survey data sheets confirmed FC for participant's work organisation and practice by perioperative phase of care. Patient care fragmentation into care provided before day of surgery (Figure 4.4), care during surgery (Figure 4.5) and care after surgery (Figure 4.6)

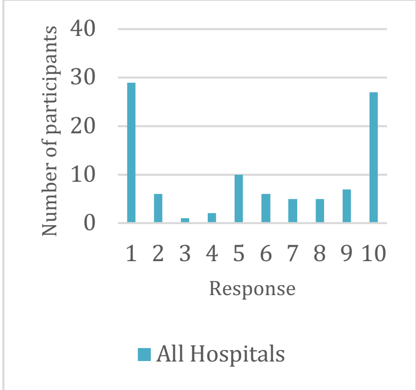
Figure 4.4 SDS: Care fragmentation to before the day of surgery



Responding to the question of the opportunity to work with their patients before the day of surgery:

- 43% either strongly disagreed (34/113) or found the question 'not applicable' (15/113)
- 18% (20/113) of staff strongly agreed

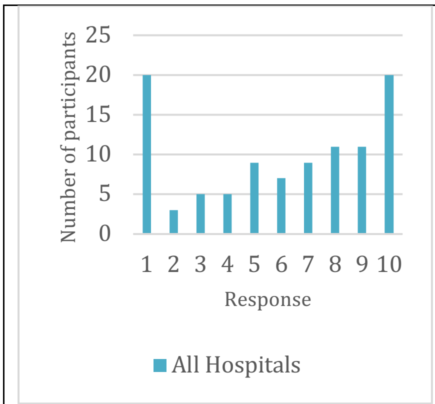
Figure 4.5 SDS: Care fragmentation to during surgery



Responding to the the question of opportunity to work with patients when they are having their surgery:

- 31% (35/113) strongly disagreed
- 32% (36/113) strongly agreed

Figure 4.6 SDS: Care fragmentation to after surgery



Responding to the the question of opportunity to work with patients the day after surgery:

- 45% (51/113) agreed
- 30% (33/113) disagreed; the participants were predominantly pre-admission clinic nursing staff, operating theatre nursing staff and anaesthetists

The evidence for FC has been presented in relation to phase of care in discrete surgical units or ward. The following section presents the evidence for FC within the professions working across the phases of perioperative care and a 24/7 work roster.

4.3.2.2 Within professions

Evidence for FC within the professions is presented in Box 4.17. The evidence will be presented in four parts. First the impact of policy for general clinical staff. Then in turn for anaesthetists, surgeons, nurses; the professions that have adapted new roles in response to policy.

Box 4.17 Observation: FC within professions

FC within professions was observed as, and characterised by, a 'relay pattern' of perioperative clinical care. Clinicians within each profession divided up care across phases of perioperative care and across time, for 24/7 in-hours and after-hours care. A composite example for general clinical staff, necessitated by early perioperative policy is described.

1. *The impact of policy for General clinical staff*

When DOSA was implemented, the solution designed to address the higher risk patients having intermediate to major surgery, was the introduction of pre-admission clinics (PAC) processes for anaesthesia, surgery and discharge planning (also called pre-procedure preparation). Working day PACs operated in parallel with working day operating theatres for elective surgery, and 24/7 emergency surgery and surgical ward care. In this manner, the perioperative care of patients became increasingly fragmented across phases of care, by necessity sharing work for the same patient. Namely providing a component of care, then handing the patient on, within professional silos.

FC commenced prior to hospitalisation for surgery. Usually one to two weeks before surgery, a team of PAC nurse, anaesthetists, surgeons and junior doctors would review the patients needing PAC, to assess and optimise the patients' medical condition.

The PAC anaesthetist and nurse would then communicate their assessment downstream to their professional counterparts, the operating theatre (OT) procedural team, designated to care for the patients on the day of surgery. This communication was documented. For more complex high-risk patients, direct communication by telephone, was also made between the PAC and OT clinicians, to discuss the case and address the concerns of the OT procedural team.

The fragmentation of roles within each profession is now considered.
<u>Anaesthetists</u>: The anaesthesia team, included the senior and junior (a) pre-admission clinic anaesthetist, (b) the anaesthetising OT procedural anaesthetist (c) the acute pain management anaesthetist in the post-operative surgical wards. Anaesthetists were not responsible for the ongoing medical management of high-risk patients, if the patient was stable after leaving the PACU of the operating theatres. For very high-risk patient who required post-operative critical care there may also be the intensivist-anaesthetist. A rotating roster of anaesthetists covered each of these anaesthetist roles. After hours and on weekends and holidays, anaesthetic trainees, manned the clinical floor. The trainees are supervised by a senior consultant anaesthetist that the trainee can call into the hospital as needed, to assist with challenging cases.

<u>Surgeons and the surgical team</u>: The junior doctors and surgical trainees attended the pre-admission clinics. Most high-risk patients' post-operative recovery occurred in the hospital wards. The hospital's junior doctors and the surgical registrar trainee under the supervision of the senior surgeon, managed the patients on the wards. The senior surgeon was available to patients for ward rounds and was otherwise employed in the operating theatres or working externally, outside the hospital. During working hours, a separate Acute Surgery or Trauma general surgeon and senior registrar trainee were available 24/7 for emergencies, on a weekly rotating roster. After hours and on weekends and holidays, surgical trainees, manned the clinical floor. The trainees are supervised by a senior consultant surgeon that the trainee can call into the hospital as needed, to assist with challenging cases.

<u>Nurses</u>: Most nurses were based in a discrete unit, operating theatre or ward. The exception was the surgical subspecialty clinical nurse consultant (CNC) whose work entailed case-managing their patients through their phases of care. Not every surgical subspecialty had a clinical nurse consultant.

There was little work-related interaction between the nurses working in the different wards. Nurses focused on providing care in their own ward. Nurses were often unaware of the operational nursing, and other functions of adjacent wards, even if the wards were in close physical proximity. Modular ward-based care was architecturally designed around a central clinical workstation in each ward.

Each ward had their own nurse unit manager (NUM), clinical nurse educator (CNE), clinical nurse specialists (CNS), registered (RN) and enrolled nurses (EN) performing different functions, specialty specific for their surgical ward.

FC for RNs working in general surgical wards has been described in Section 4.3.1.3. CTS for RNs providing labour intensive caring for postoperative high-risk surgery patients were not able to attend ward rounds with surgeons and other doctors. Ward rounds for their other patients were attended on their behalf, by a senior nurse e.g. NUM or CNS.

After hours and on weekends and holidays, mostly registered and enrolled nurses, manned the clinical floor of surgical wards.

The exception to the FC observation in Box 4.17 was for Hospital B, that did not have PAC, ICU/HDU, or anaesthetic trainees. The evidence for FC has been presented in relation to new work roles and a 'relay pattern' of handover of patient care within professions. The following section presents FC in the organisation of work for individual clinicians.

4.3.2.3 Between professions

FC due to individual clinician's work practices was not always the result of perioperative policy. For junior doctors and ward nurses, policy did have a direct impact on their work practices causing FC. For senior doctors namely surgeons, anaesthetists and physicians, whilst FC was evident in their work practices, it was not as a result of policy. Most senior doctor participants did not work full time at the one hospital.

Junior doctors' rostering and changes in shifts were reported and observed as FC within professions, and between professions.

> *"…the junior doctors called to the ward do not know the patients, are asked to admit many patients quickly in the morning and then go to the operating theatres, then the on-call junior doctors are different people and we don't often see them unless there is an emergency…"*
>
> Nurse (21), Hospital B

FC was less the case for the junior doctors at the larger Hospitals A, C and D where the turnover of patients after major surgery in the hospital wards was slower, being limited by the time patients needed for recovery and rehabilitation. Hospitals A, C and D's junior doctors had usually met the higher risk patients before the day of surgery in the preadmission clinics. Junior doctors allocated to the surgical subspecialty teams, based on the wards, were observed to be the go-between senior trainee surgeons, senior surgeons, ward nurses, allied health and other specialty doctors. Junior doctors were usually in their first or second years, post-graduation. However, FC was evident in all four hospitals afterhours for junior doctors. Unrelated to perioperative policy, the junior doctor caring for the patient was not the same as in the daytime (Box 4.18).

Box 4.18 STC: FC for junior doctors working afterhours

CTS on surgical wards	Participant
"…the junior doctors afterhours do not know the patients, are asked to … look after multiple wards of patients … and sometimes go to the operating theatres to assist… the doctors are different people (than in the day shift) and we don't often see them unless there is an emergency"	Junior doctor (1) Hospital A; (2), (3), (4), Hospital B; (5), (6) Hospital C, (7), (8) Hospital D). Nurse (2), (3), (8) Hospital A; (18), (21), (23) Hospital B; (43),(49),(50) Hospital D; Surgeon (3) Hospital A and B; (6), (7) Hospital C; Manager (4) Hospital C

The supervising senior surgeon, that the patient was admitted under, however remained constant after-hours.

Senior doctors from all four hospitals, surgeons, anaesthetists, physicians, routinely worked outside of the research setting hospital for some of the week. The senior doctors provided similar services at other hospitals and consulting rooms, in the public and private sectors. This added to the challenge for timely direct communication, and FC within professions, and between professions.

> *"…team or community of practice? … how to do it? … I am a VMO (*Visiting Medical Officer*) at a number of hospitals and not here 5 days per week"*
>
> Anaesthetist (10) Hospital D

> *"…I work Monday, Wednesday, Thursday …"*
>
> Physician (9) Hospital C

> *"…I am a visiting medical officer (VMO) I work two days one week, one day next week, alternating…"*
>
> Anaesthetist (7) Hospital C

> *" … You rely on YOUR team… your Fellow, senior registrar, intern … to let you know what is going on … for your patients in the wards … to keep you informed because you are not always physically here … (We are) working at other places"*
>
> Surgeon (2) Hospital A

Senior surgeons were observed to be very busy, proceeding purposely between engagements and locations. Often starting ward rounds in other hospitals before arriving at one of the hospitals of the research setting. Senior surgeons typically either started ward rounds very early in the morning, for example at around 0700 or at ad hoc times throughout the day and evening, time permitting.

> *"There is NO nursing engagement in surgical rounding. No nurses. There is supposed to be a Team Leader rounding but … (??? gesture) … are they in the tearoom? I round 7 days a week, 730-9am but the time varies, over 3 hospitals sometimes and I generally start with the sickest. The surgical registrar is available most of the time or the RMO. Even if there is ERAS they should come, they are caring for the patient and should know what is going on."*

Surgeon (8), Hospital A, B, C or D

At subsequent interviews an understanding was sought around the participant's comment about a nursing inability to attend ward rounds with senior surgeons. Allied Health professionals, physiotherapist, speech pathologist and dietician as well as nurses and other senior and junior surgeons from the hospital, and the other hospitals, said they could understand this experience of FC. However, the statement was inaccurate. A typical explanation was encapsulated in the following quotes from senior nurses and a dietician.

> *"The Team Leader nurse is not in the tearoom … but there are 5 registrars (or Consultants) for the surgical specialties at the same time in the ward – so maybe they should stagger the surgical specialty team rounds"*

Dietician (4), Nurse (21)

> *"The Team Leader nurse is not in the tearoom, everyone is working hard …the team leader does not need to round with medical outliers (a patient who may not stay in the ward for long) … the priority is for Home Team Rounds"*

Nurse (43)

Section 4.3.1.1 field observations, confirmed by secondary documents and interviews with senior nurse managers in the wards of Hospitals A, B, C and D, referred to heavy caseloads for nurses involved in direct patient care, and some staff shortages, as the reason for RNs inability to attend ward rounds. Ward nurses often cared for multiple, patients simultaneously. FC was evidenced in their inability to join clinical ward rounds where doctors, or multidisciplinary pain management teams, examined and discussed care plans with patients. This FC was notable for its frequency across all four hospitals. This was observed on multiple occasions for surgical ward rounds, pain management ward rounds and consultations by senior doctors. On some wards, the routine was that the senior nurse lead or manager would accompany the surgical ward round. The senior nurse would also encounter a problem, if two or more surgical teams rounded in the ward at the same time, as described in the exemplar quote. The time most likely for this example of FC, was observed to be in the early mornings.

To address FC between professions on the surgical wards, medical staff and visiting teams would leave a time-dated entry in the patient's medical record. This included observations, management plans and instructions that the ward staff – nurses and allied health, and other doctors, would read through later, to determine and contribute to the progress of a patient's care.

Senior surgeons were acknowledged by participants as the principal decision makers for marking the progress of patients through their perioperative courses. At times, they were observed to be consulting other specialty doctors, nurses caring for patients, and allied health.

> *"As a surgeon, we have a lot of influence over preoperative preparation, the execution of procedures and postoperative care. Where adequate mechanisms are lacking, we supplement them with our individual strategies"*
>
> Surgeon (8), Hospital A, B, C or D

However, opportunities to approach busy senior surgeons was observed by junior doctors, nurses and allied health to be limited. Most senior surgeons spent most of their time when they were in a hospital, in the operating theatres.

4.3.3 **Clinical complexity** (CC)

The third significant finding on the impact of perioperative policy on frontline clinicians and managers was CC. That is, surgical patients occupying hospital ward beds are now sicker, requiring greater assessment, treatment and ongoing care. Ethnographic description III (Box 4.19) outlines the policy impact of the Predictable Surgery Programme, by policy date of introduction, the strategy implementation name, and successive practice changes to minimise patients' length of stay in hospital.

Box 4.19 Ethnographic description III: CC 25 years of extracting the next lowest risk patients from the hospital wards

Policy date and strategy name (in bold)	**Practice change – Preoperative**
From 1996 – **DOSA** day of surgery admissions (target >90%, including **DOS**)	Patients no longer stayed in hospital the night prior to surgery. *Preoperatively with instructions, patients manage their own fasting times and medications*
From 2013, **staggering** of patients into hospital on the day of surgery	Patients only arrive in hospital 2 hours prior to surgery
	Practice change - Postoperative
1997 **DOS** same day or day only surgery (target 60%)	Lowest risk patients targeted to go home on the day of surgery
2004 **23 hours ward** (23HW)	Next lowest risk patients targeted to stay just overnight for observation, then go home the next morning
2005 **Extended day only** (EDO)	Next lowest risk patients targeted to stay less than 48 hours in hospital
2006 **High volume short stay surgery** (HVSSS)	Next lowest risk patients targeted to stay less than 72 hours
The result: Only the sickest patients are now filling up hospital wards beds before and after surgery	

The challenge of CC was only in part due to successive perioperative policy. Increasingly, older patients living with complex chronic multisystem disease were being offered and accepting major surgery. For example, major head and neck cancer surgery lasting over 10 hours for patients in their seventies with diabetes mellitus, heart and lung disease was observed on several occasions. New technology high-risk surgeries were observed being offered for the first time for example, robotic prostate cancer surgery or endoluminal abdominal aortic aneurysm repair, to patients in their eighties. An exposition of the patients that presented for surgery at the four hospitals during the research period will be presented in Chapter 5.

The challenge of CC for clinicians was observed to be distinguishable from complicated care. Complicated care involved performing single or multiple clinical tasks that required precision with equipment, involving multiple interconnected technical steps to be undertaken for the process to be completed. Complicated care was often laborious taking considerable time for a clinician to complete. Complicated care was characterised as being routine and standard care, that did not need negotiation between clinicians to initiate and complete. The evidence for complicated care giving rise to FC through CTS for nurses on surgical wards has been provided (Box 4.11 and Box 4.12).

In contrast, CC was characterised by a complicated process requiring multiple interconnected steps, where the condition of the patient was unstable, rapidly changing or not easily understood by one medical specialty alone, and required multiple points of negotiated communication or discussion, between diverse members of the healthcare organisation, to arrive at the best next step. The evidence describing CC is first presented for a typical patient case in the following clinical vignette (Box 4.20). Chapter 5 will present a more comprehensive range of clinical vignettes to evidence content saturation. Box 4.20 presents a typical composite clinical case of a high-risk patient proceeding for urgent cancer surgery.

Box 4.20 Vignette 1a: Clinical Complexity

Mrs AB was an 89 year old. lady, presenting for bowel resection of colon cancer. AB had rectal bleeding. *AB was seen in the preadmission clinic. The urgent intermediate risk surgery was planned for the following week. The surgeon wanted to give the anaesthetist a 'heads up' to assess the patient, provide an opinion on the suitability of surgery, and improve her comorbid condition if possible.* *AB was considered high-risk due to her extreme age, frailty and comorbid disease.*

AB had been an inpatient in the hospital recently, staying for 2 weeks.
AB had been brought in by ambulance after an unwitnessed fall.
In the Emergency department, AB was noted to have evidence of an acute heart attack, with lateral myocardial ischaemia on the ECG. AB was seen by a cardiologist.
AB was admitted to the coronary care unit (CCU) for heart monitoring.
AB was diagnosed and treated for three acute conditions - Takotsubo cardiomyopathy (a form of heart failure), delirium (acute confusion) and urosepsis (sepsis with a urinary tract infection).
Further heart tests included serial ECHO (heart ultrasounds) that showed mild improvement to mild-moderate impairment in systolic function (heart pump function).
AB was later transferred to the Aged Care ward to be managed by the geriatricians and their multidisciplinary team of specialty nurses and Allied Health.

Mrs AB's background medical history was long standing hypertension (high blood pressure), and significant coronary artery disease that needed opening up. AB had a history of past surgery coronary artery bypass grafts (CABG) in 1996, and further, a bare metal stent to the left main coronary artery in 2015.
Mrs AB, 89 years old was frail, previously independent and lived alone until recently. AB had a very supportive family nearby. Her daughter had recently moved in with her to help look after her.

The clinical impression of the surgeon, geriatrician and anaesthetist was that the patient should proceed with the cancer surgery. In the decision making, the PAC anaesthetist consulted a cardiologist. Mrs AB was considered by all doctors to be a very high-risk patient having intermediate risk cancer surgery. Elderly at 89 years of age, with significant risk of medical complications, such as her recent heart failure, or a heart attack, or delirium or infection. The cardiologist and geriatrician and their teams agreed to support the surgeon and the anaesthetist should complications occur in the operating theatre or in the postoperative ward.

The patient was booked as a non-DOSA, an overnight admission, so her fluid status could be monitored whilst she was having bowel prep to clear her colon. The patient was booked for a postoperative HDU bed for more monitoring and individual nursing care time.

4.4 Wicked complexity in competing priorities and demands

Evidence is provided for a "wicked complexity" arising from the work environment that has a more extensive impact on clinicians and clinician-managers, than CTS, FC or CC impacting alone. Wicked complexity is examined at its intersections with the unintended consequences of policy that impact the practice setting, namely between any two and all three of CTS, FC and CC. The evidence for the complexity arising at the intersections of CTS, FC, CC is presented in three parts. First, for teams caring for individual high-risk patients. Second, for hospital acute care unit such as the emergency department, operating theatres, operating theatres - PACU, general surgery wards and critical care units. Third, for the broader organisation. Then at the conclusion of this section, the complexity arising at the intersections of all three CTS, FC and CC will be summarised, defined and discussed as wicked complexity in competing priorities and demands.

4.4.1 Wicked complexity at the intersections of compression, fragmentation and clinical complexity

The following evidence shows that context was a background moderator of work practices for teams. The multidisciplinary teams caring for individual high-risk patients such as Mrs AB (Box 4.20) were simultaneously dealing with CC, alongside FC and/or CTS.

4.4.1.1 For individuals and teams caring for high-risk patients

Box 4.21 using Mrs AB's case as exemplar, describes CC as it was in the real-world setting. At the intersections of the impact of policy, the vignette reveals the choices clinicians made based on their work environment.

Box 4.21 Vignette 1b: Clinical complexity in the real world

CC intersecting with Fragmentation of care

Of the consultant medical team, patient AB had one surgeon, three anaesthetists, including one anaesthetist-cardiologist, two cardiologists, two geriatricians that were involved with her medical and surgical care.

Mrs AB's first and treating cardiologist during her recent hospital admission, was away overseas and was unaware of the rectal bleeding and bowel cancer. The patient was not known to the relieving cardiologist when the PAC anaesthetist telephoned with her history, and for advice and perioperative support. The second cardiologist was happy to help with perioperative cardiology support as needed. He queried the first cardiologist's diagnosis of Takotsubo, with the co-existing left main coronary artery disease. He thought the patient may be at significant risk of a heart attack but agreed that it was best to proceed to surgery as the patient had stopped aspirin (a blood thinner used in coronary artery disease) by the surgeon and geriatrician because of the rectal bleeding.

The PAC anaesthetist reviewed the anaesthetic chart of the anaesthetist that had given the patient a recent anaesthetic for the colonoscopy to diagnose the bowel cancer for information on how the patient had responded. The surgical Fellow, PAC anaesthetist with the GP and family, talked through a revised advance care plan and revised resuscitation plan. The procedural anaesthetist for the bowel resection was informed of the case via telephone by the PAC anaesthetist, whilst she was overseas (it was school holidays) and would meet the patient for the first time on the morning of surgery. In the operating theatre, the procedural anaesthetist took on the role of the cardiologist on managing the patient's heart and cardiovascular system.

CC intersecting with Compression of time and space
"No bed" 1. *Day prior to surgery admission was sought for the medical indications described in Box 4.20 but there was 'no bed'. The surgeon and procedural anaesthetist, with the patient and family, agreed to proceed as DOSA.* 2. *A postop HDU bed was negotiated – it took two attempts, once by a junior doctor, then the surgical Fellow was able to make the case.*

Work was observed to be complex, fragmented, compressed – driving individual clinicians to collaborate. It was through working as a dispersed, but interconnected teams, individuals were able to provide more comprehensive patient care.

4.4.1.2 For hospital acute care units

When the acute care units and wards, specialising in CC, were full to capacity with high risk complex care patients, CTS was described as reaching a tipping point that impacted patients and staff, both medical and nursing. Hospital acute care unit included the emergency department, operating theatres, operating theatres - PACU, general surgery wards and critical care unit.

> *"… when we are overcrowded, at maximal capacity or over capacity and the decision making of the team is overwhelmed. The ability to respond to deterioration … is diminished"*
>
> Physician (4), Hospital A

Box 4.22 STC: Acute care wards CC intersections with CTS and/or FC

Intersection CC, CTS, FC in acute care units	Participant
"… when we are full, no beds … the team is overwhelmed. The ability to respond to deterioration … is harder"	Physician (2), (4) Hospital A; (8) Hospital C; (11) Hospital D. Nurse (4) Hospital A; (19), (23), (26) Hospital B; (28) Hospital C; (43) Hospital D. Manager (6) Hospital A, LHD; (9) Hospital C

At the intersections of CC and CTS, seeking further FC is seen as a practical clinical and management strategy to deal with the continuous flow of patients.

> *"Not politically correct but once they are out of our care, they are out of our care. There is no capacity to follow beyond. No news is good care, no news is good news, bat on"*
>
> Manager (9), Hospital C

> *"… I only want to know about patients that have to come back (unplanned readmission), not interested in other outcomes because it would not change my practice … I don't have time … and I need to focus on my next (caseload of) patients"*
>
> Physician (2), Hospital A

Throughout this exploration, the evidence shows that practical limits were reached and that choices were made on where to place focus, and where to divert resources from. The organisational culture and context of care across the LHD has enabled clinicians and managers to focus immediately and efficiently only on the patients before them, to maintain safety and quality. However, for reasons provided by researching the participants and their work conditions, there was little capacity for broadening scope of practice, change and innovation.

4.4.1.3 For the organisation

For the organisation the intersections of CTS, FC and CC was observed as unwarranted wicked complexity due to competing priorities and trying to address a 'wicked problem' (Box 4.23). A 'wicked problem' can be embedded deep in context, dynamic, contested and caused by the very people involved with solving the challenges of running a health system (Rittel & Webber 1973).

Box 4.23 Observation Wicked complexity in trying to address a wicked problem

The LHDs responsibility for Finance, Budgets and health service performance for both the NEST and 4HR/NEAT policies was observed to cause an interrelated interdependent vortex of challenges at the meso and microsystem level of hospital care.

Experienced at the Executive Management level:

> *"Providing right - care, patient, time- whilst managing competing needs. Budgetary resource constraints so not going to match all potentialities. Decision making, resource allocation are priorities.* (Worked) *in a* (NSW) *hospital once* (not in the research setting) *where the Exec. thought to separate the goals on alternating weeks – 'save money, no surgery' then next week 'KPIs/ESWTs' - - - so team knew what the focus was for that week"*
>
> Manager (4), Hospital C

Impacting down to the clinical floor:
The challenge was access to a finite number of hospital beds in Hospitals A, C, D. Each hospital Executive invested 24/7 resources to address the challenge of access, patient flows and bed management (Box 4.2 and Section 4.3.1.5). There was the continual daily nursing team led focus on bed management, the push and pull of moving patients in and out of the hospital, or within different sections of the hospital.

*A **'wicked problem'** was most evident when there were consecutive days when "no beds" was declared in the hospital, when capacity to flex, expand and compress resources, in the daily bed management for surgery at Hospitals A, C and D, reached absolute capacity.*

To meet NEST targets, forward flow of surgical patients proceeding to theatre was still encouraged further by senior surgical managers, until a point in the day when patient flow was stalled.

In terms of bed block, patients in hospital ward beds blocked patients leaving the operating theatres recovery room, that in turn blocked patients from leaving the operating theatre. Only then could no new patient enter the operating theatre.
At that stage patients were pushed backwards. This resulted in 'cancellations on the day of surgery' the key performance indicator of the Perioperative Toolkit.

In striving to achieve NEST targets, senior managers would continue driving throughput, as vacant beds could appear. They adopted the strategy of using one ward as "the canary in the coalmine". This ward was usually the operating theatres - PACU or the day-surgery unit. Wards that should have no or minimal overnight patient stays were routinely filled with the overflow patients.

In terms of bed block, patients in hospital ward beds also blocked patients leaving the intensive care and high dependency units. High risk major surgeries then could not proceed for patients who needed postoperative critical care beds. The uncertainty of whether a patient would proceed to surgery led to patients' fasting times for surgery being prolonged beyond recommended guideline. Medication changes anticipating surgery had to be revise. Complex surgery started late in the day

Bed managers had to place patients in wards that were not intended for the patient. These patients were called 'outliers' that would hopefully be relocated to their subspecialty ward when a bed became available. The 'knock on' impact of 'bed block' on clinicians and managers would be further CTS, FC, and CC for example, should a patient suffer a postoperative complication in an 'outlier' ward. For doctors, needing to be in multiple places at the same time. For nurses and allied health, providing complicated care for unfamiliar procedures, waiting for doctors to attend patients in outlier wards.

That is, evidence of multiple decisions made at multiple levels to solve a 'wicked problem' created by the very people trying to address the challenges of the "here and now".

<u>Impacting on patient outcomes</u>:

'Bed block' was associated with a trend of increasing numbers of 'patients with acute condition for escalation' PACE calls per month. This data was collected by the LHD clinical emergency response system (CERS) committee. In terms of policy this was NSQHS Standard 8 "Recognising and responding to the deteriorating patient".

The unintended consequences of policy CTS, FC and CC, and their intersections during 'bed block' provides an explanation for this association with patient safety.

At the intersections of the main themes, at multiple levels of care, across all hospitals, across all professions, senior and junior, the evidence has shown that a wicked complexity embedded deep in context, arises and is maintained. Wicked complexity was a complexity that was unintended, unwarranted and promulgated by the behaviours of the practice environment. A wicked complexity in competing priorities and demands, in the policy setting, arising from the pressure of dealing with the "here and now".

4.5 Conclusion

Hospitals need to continue to meet the public demand for safe quality surgery whilst addressing resource constraints and improving productivity. To this end, unpacking the impact of over two decades of policy on the context of care and the people providing the care is important. In this chapter, the research evidence on the impact of past policy has been synthesised into three themes. Namely, compression of time and space, fragmentation of care, and clinical complexity. At their intersections, further complexity arises. There is an unwarranted wicked complexity in competing priorities and demands. The next chapter answers research question 2: *How is perioperative work practice organised around low, intermediate and high-risk patients?*

Chapter 5 Understanding work practice and organisation around risk

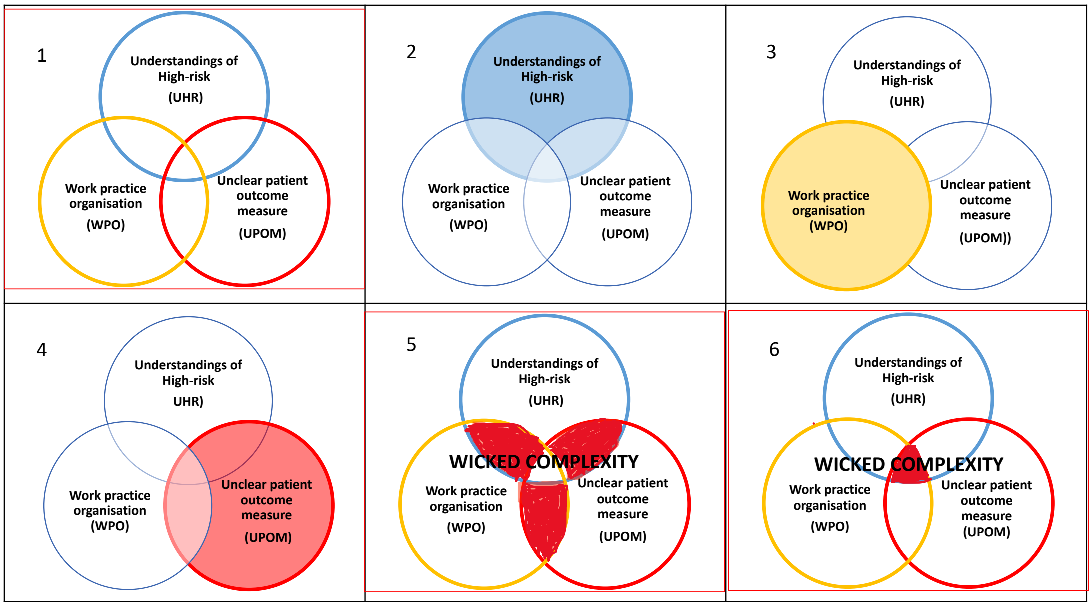
5.1 Introduction

The aim of this chapter is to answer research question 2: *How is perioperative work practice organised around low, intermediate and high-risk patients?* The exposition describes the practice setting in which the research took place.

The structure of this chapter is based on the three inter-related findings namely, clinicians' and managers' understandings of high-risk (UHR), perioperative work practice organisation (WPO) and unclear patient outcome measure (UPOM). Participants said high-risk was signified by the likelihood that a patient would suffer a perioperative adverse event or outcome. However, high-risk was conceptualised and understood differently depending on the person, their role and context, and operationalised in a range of different ways. Participants used similar terms, and thought they meant the same thing, but without a complete and common understanding, and no single discipline had the whole picture. Clinicians and managers reported multiple interacting risk factors that informed their understanding of high-risk and work practice. At all four hospitals, perioperative work practice was observed to be principally organised around surgical risk factors. Work practice organisation for low, intermediate and high-risk surgery is presented using business process maps and aggregated clinical data and vignettes. The evidence shows the progression from a predictable, reliable form of organisation for patients having lower risk surgery progressing towards an unpredictable, complex adaptive system for highest risk patients. Remarkably, both clinicians and managers reported that patient health outcome information was fragmented and unclear. The situation at the intersections of understandings of high-risk, work practice organisation and unclear patient outcome measure, gave rise to a new form of *"wicked complexity"*. That is, as perioperative work practice organisation progressed from linear systems towards complex adaptive systems, a wicked complexity in gaps in fully comprehending high-risk became increasingly apparent.

Diagram 5.1 presents the evidence in a series of six Venn diagrams (VD). The three main themes are UHR in *blue*, WPO in *yellow*, and UPOM in *red* circles (VD1). The following sections of this chapter examines each of the themes in turn (VDs 2-4) followed by what occurs at their intersections (VDs 5 and 6). At the intersections of the main themes, a wicked complexity arises, that is, a complexity that is unintended, modern and exacerbated by the behaviours of the practice environment.

Diagram 5.1 The structure for presenting the evidence to answer research question 2



5.2 Evidence of understandings of high-risk, work practice organisation and unclear patient outcome measure

This section presents the evidence on how clinicians' and managers' understandings of high-risk were described, and operationalised in work practice organisation, and also influenced by an unclear patient outcome measure. The following paragraphs provide the detail of participants' understandings of what constituted high-risk in their work practice environment.

5.2.1 Clinicians and managers' understandings of high-risk (UHR)

The first main theme for perioperative work practice and organisation around risk was the participants' conceptualisation of 'high-risk'. Clinicians and managers said that high-risk signified the increased likelihood that a patient would suffer a perioperative adverse event or outcome. In addition, clinicians and managers reported multiple interacting risk factors that informed their understanding of high-risk and work practice. With increasing seniority, articulation of risk factors became more specialised and specific. Critically, high-risk was conceptualised and understood differently depending on the person, their role and context, and operationalised in a range of different ways. Participants used similar terms, and thought they meant the same thing, but without a complete and common understanding, and no single discipline had the whole picture.

5.2.1.1 Perioperative risk

Participants, irrespective of profession and seniority, understood and related high-risk in the perioperative period to an increased possibility of a patient having an expected or unexpected clinical deterioration, adverse event, complication or suboptimal health outcome such as organ failure. Table 5.1 presents a thematic display of exemplar quotes across professions, seniority and hospitals demonstrating this common definition of 'high-risk'. For a detailed presentation of the interview transcripts in Table 5.1 see Appendix 6.

5.2.1.2. Multiple risk factors and their interacting nature

All participants also reported that they work with an individual understanding of 'risk of complications' based on the interacting nature of multiple 'risk factors':

"I have, …(I) use my own internal rubric"
Clinician-Manager (2), Hospital A

Clinicians and managers reported up to four interacting risk factors that informed their understanding of 'high-risk' and their work practice (Table 5.2). As numbered in Table 5.2 the key elements of risk factors, related to: (1) surgical risk factors including type of surgery and urgency or emergency, (2) anaesthetic factors, (3) patient comorbid health status risk, including patient's chronic medical conditions and age or frailty, and (4) organisational factors.

Table 5.1 TDEQ: How clinicians and managers defined 'high-risk'

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
'High-risk' was said to signify the increased likelihood that a patient would have clinical deterioration, a perioperative adverse event or poor outcome	*"High risk is predicting the likelihood of a negative or suboptimal outcome"* Surgeon (1), Hospital A *"High risk is 'outcome' related - Patient does not leave hospital in same condition as arrived that is decreased functional state. High risk is 'reason' related – so e.g. any organ dysfunction – brain, heart, lungs, kidneys…"* Anaesthetist (7), Hospital C *"High risk is high chance of bad consequences or deterioration, while patient in hospital, during operation or after procedure"* Junior doctor (7), Hospital D *"Complex intervention or procedure with significant negative impact on quality of life"* Physician (10), Hospital D	*"High risk - are 'red flags' for potential adverse events"* Nurse (51), Hospital D *"…all code blues…"* Nurse (24), Hospital B *"High risk is delay to attend or failure to recognise and treat clinical deterioration"* Nurse (8), Hospital A *"High risk is outcome from surgery not beneficial to the patient … a complication post-surgery or mortality up to 30 days post-surgery, also quality of life, how patient feels e.g. to lose an organ and function"* Nurse (17), Hospital A *"Obviously, my brain goes to patient high risk – age and comorbidities and the consequences of going ahead with surgery and then (unexpectedly) being in ICU. Was the surgery appropriate?"* Nurse (6) -Manager, Hospital A	*"Patients more likely to have a poor outcome, increased LOS, infections, problems with wound closure and leave hospital worse than when they come in, not getting their hopes"* Dietician (4), Hospital A *"Complications and poor outcomes, unexpected and expected, after particular surgery, operations and having a working understanding of those elements"* Speech pathologist (1), Hospital D *"Effect of surgery and all possible postop outcomes, decline in function and morbidity need a lot more consideration. Patients are individuals …"* Physiotherapist (3), Hospital A and B	*"Patient – somebody with a high probability of a poor outcome or less than ideal outcome from their procedure"* Clinician-Manager (4), Hospital C *"Complications – we work with risks of complications, but we cannot predict, a patient may or may not get the complication…"* Clinician-Manager (7), Hospital D *"Patients underlying general condition and complex surgery – potential for adverse outcomes … an acute problem and their consequences"* Clinician Manager (1), Hospital A, LHD *"Clinical high-risk … my aim is that no-one, no patient dies or loses an eye or a hand"* Manager (3), Hospital B

Table 5.2 IDS: Clinicians' and managers' understanding of perioperative 'high-risk', high-risk factors and their work practice

Theme	Subtheme	Key elements	Participant number and % for each element by Hospital. (n=129)								Number and % respondents for each element by roles (n=167)							
Understandings of High-risk			Hospital A (n=37)		Hospital B (n=27)		Hospital C (n=34)		Hospital D (n=31)		Doctor (n=56)		Nurse (n=61)		Allied Health (n=12)		Manager (n=38)	
			No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
	'High-risk' was connected to poor patient outcome	'High-risk' was said to signify the increased likelihood that a patient would have a perioperative adverse event or poor outcome	37	**100**	27	**100**	34	**100**	31	**100**	56	**100**	61	**100**	12	**100**	38	**100**
	Understanding of high-risk through risk factors	A *"working understanding"* or "*internal rubric*" of multiple risk factors was used to understand 'high-risk' and inform work practice	37	**100**	27	**100**	34	**100**	31	**100**	56	**100**	61	**100**	12	**100**	38	**100**
	"High-risk' was associated with multiple risk factors	1. Risk factors related to the surgery, a. type b. urgency, emergency	35 28	**95** **76**	26 26	**96** **96**	33 28	**97** **82**	30 25	**97** **81**	54 55	**96** **98**	60 50	**98** **82**	12 8	**100** **67**	33 24	**87** **63**
		2. Risk factors related to the anaesthetic	19	**51**	13	**48**	18	**53**	16	**52**	41	**73**	37	**61**	0	**0**	12	**32**
		3. Risk factors related to the patient a. chronic medical conditions b. age or frailty	33 32	**89** **86**	26 26	**96** **96**	34 34	**100** **100**	30 30	**97** **97**	56 56	**100** **100**	61 61	**100** **100**	12 12	**100** **100**	33 33	**87** **87**
		4. Risk factors related to the organisation	34	**92**	26	**96**	25	**74**	25	**81**	41	**73**	55	**90**	9	**75**	38	**100**

Table 5.2 shows that across the four hospitals and professions, all participants including those that hold both clinical and managerial roles, stated that ‘high-risk’ signified an increased risk for patients of an adverse event or poor outcome. High-risk was reported to be associated with six elements of risk factors. The least common high-risk factor key element in participants’ “working understanding” were (2) the anaesthesia related risk factors, with only around 50% (66/129) of participants mentioning them across the four hospitals (Table 5.2); they were mainly reported by doctors, nurses and those managers that also had clinical roles in anaesthesia, surgery, nursing in the PAC or operating suite. Consequently, only 58/129 participants considered all six categories. Surgical urgency (3) was the second least mentioned risk factor element at 83% (107/129) participants.

Further to this common definition of ‘high-risk’ was a common method for conceptualising or developing an understanding of what constituted ‘high-risk’. All participants said they had their own *“internal rubric”* or *“working understanding”* of multiple risk factors that they used to understand which patients were at ‘high-risk’ and inform their work practice.

> *“(UHR involves) Complications and poor outcomes, unexpected and expected, after particular surgery, operations and having a working understanding of those elements”*
>
> Speech pathologist (1), Hospital D

Table 5.3 quantitates number of participants with their reported aggregated number, of interacting risk factor key elements that they reason with, in their work practice.

Table 5.3 The interacting nature of high-risk factors

Aggregated elements	Interacting high-risk factors	Number of participants
6	1a + 2 +1b + 3a + 3b + 4	58
4	1a + 3a + 3b+ 4	110
2	1a + 1b	0
2	1a + 2	0
1	1a	0
1	4	5

Three important findings are derived from Table 5.3. The first significant finding on perioperative risk, the multiple risk factors and their interacting nature was that nearly all participants (110/129) routinely reasoned with four or more high-risk factor categories when considering perioperative high-risk. These categories were (1) type of surgery and urgency, emergency, (2) anaesthesia related factors, (3) patient's chronic medical condition and age or frailty, and (4) organisational risk factors.

The second significant finding was that no participant conceptualised perioperative 'high-risk' as being solely related to operative risk, that was the risk conceptualisation isolated to one or all of the following (1) type of surgery, alongside (2) anaesthesia [1a + 2] or (3) their urgency [1a + 1b}. Comorbid medical status was always, and organisational risk factors were often, also mentioned as presented in Tables 5.2, 5.3 and in the following paragraphs presenting richer data.

The third significant finding was that only a small minority of participants (5/129) focused their *"working understanding"* of high-risk, on a single key element that was (4) organisational risk factors. These participants were high-level Executive managers that have worked across all four hospitals and the LHD; namely: a General Manager, three Directors of Clinical Services (two Medical and one Nursing) and a Patient Safety Officer.

The following paragraphs will provide the evidence expanding on these three findings on the interacting nature of multiple risk factors in participants UHR. First, participants' accounts on what constituted the risk factor elements. Second, evidence of specialty specific detail on what constituted high-risk with increasing professional seniority and in the case of those working exclusively in management. Third, senior managers' experiential accounts of high-risk and WPO. Fourth, the differences in experiential encounters with high-risk and WPO, between senior managers and clinicians; using the examples of meeting KPIs, budgetary constraints, "no beds" and "skill mix". Fifth, participants expressed limitations in risk stratification and prediction of adverse outcomes. This was in part due to the interacting nature or interplay of multiple risk factors in context. Sixth, participants indicated that perioperative risk was dynamic, changing with time and conditions. Lastly, participants have connected their understandings of high-risk with adverse outcomes. Participant accounts of what constituted poor outcomes is presented later in section 5.2.3.

First, the participant accounts of what constituted the four high-risk key elements is summarised in Diagram 5.2. The four high-risk key elements are surgical, anaesthesia, patient comorbid health status and organisational.

Diagram 5.2 High-risk risk factor key elements and their reported constituents

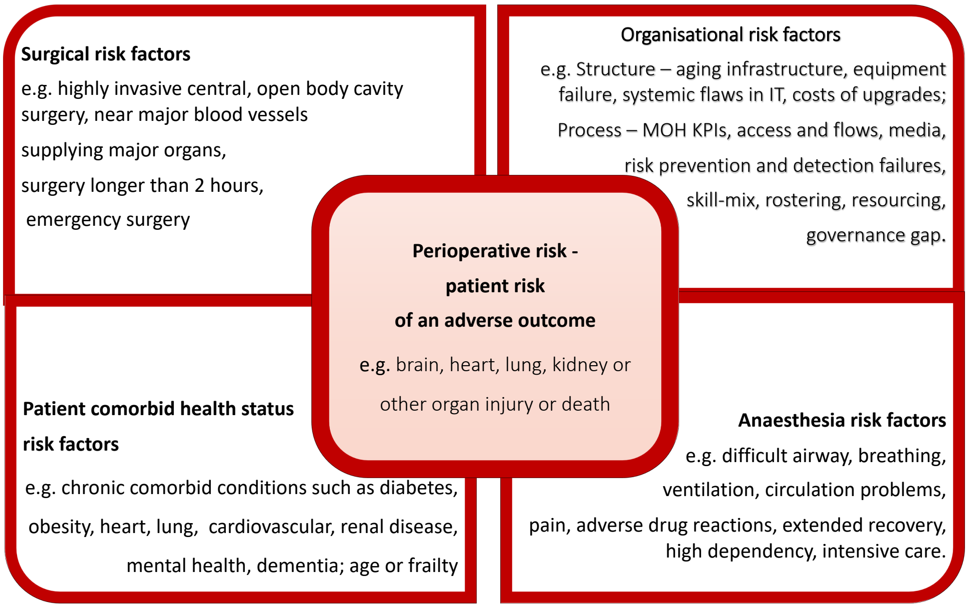


Diagram 5.2 briefly summarises and provides examples for the four risk factor groupings. Surgical risk factors were mentioned by almost all participants (124/129) and were principally related to anatomical features, technical difficulty and duration of surgery. Anaesthesia risk factors were mentioned by half of participants (66/129) and were related to acute physiology, vital signs and sustaining life using critical care equipment, drugs and routes of administration. Comorbid health status related to organ system diseases and physiological aging or frailty were mentioned by almost all participants (123/129; 122/129), respectively. Organisational risk factors were similarly mentioned by the vast majority of participants (110/129) and were related to systemic structural and process problems that will be presented in detail in the following sections.

Second, with increasing seniority for example, senior surgeons and managers, gave increasingly specialty specific detail on what constituted high-risk. Box 5.1 shows that for surgical risk factors, junior doctors on surgical teams could broadly articulate that the more invasive or urgent the surgery the higher the risk. Clinicians and clinician-managers from other professions were able to provide similar broad descriptions. In contrast, senior surgeons were able to fluently name the procedures, differentiating minor superficial short duration day-only surgery from major risk surgery. For a detailed description of the participants' responses see Appendix 6 Box 5.1

Box 5.1 STC: Increasing specialty specific knowledge for surgical high-risk

General knowledge of surgical 'high-risk'	**Participants**			
"High risk procedure – invasive e.g. open versus lap.chole, acute surgery or trauma versus elective" Junior doctor (1), Hospital A	Junior doctor Anaesthetist Nurse Allied Health Physician Managers	6 10 20 8 4 0	Hospital A B C D	 16 1 15 16
Specialty knowledge of surgical 'high-risk'	Senior surgeon All other professions	9 0	Hospital A B C D	 2 3 2 2
"Type of operation - Bowel resections are major surgery. Minor surgery anal, haemorrhoids, hernia, skin tags – day-only surgery. Length of surgery – major is more than 3-4 hours" Surgeon (2), Hospital A				
"Margin of error proportional to operation complexity and risk; low complexity less impact of complication, easier to rescue. Surgical procedure, anatomical, technical and if patient sicker e.g. Oesophagectomy higher than Lap. Chole; within procedure - high versus low oesophagectomy; cholecystitis if stent required. Patient factors e.g. bleeding risk" Surgeon (1), Hospital A				

Major surgery involved part removal of deep lying organs (in these examples of general surgery, oesophagus or bowel), often containing cancer, the need to form a bypass for gastrointestinal contents and the impact that has on alimentation and nutrition. High-risk surgery takes much longer to complete, that is "(high-risk surgery takes) *more than three or four hours*". There was further anatomical high-risk distinction within the same procedure for example, "*high versus low oesophagectomy*", or the risk impact of acute infection, inflammation, blockage *"cholecystitis if stent required".* Only senior surgeons and their senior surgical trainees offered this degree of detail on surgical high-risk.

Third, specialty specific detail on what constituted high-risk in terms of work roles and responsibilities, was most divergent between clinicians, clinician-managers and those working exclusively in Executive or senior management. Executive and senior managers *"working understanding"* or *"internal rubric"* of 'high-risk' focused predominantly on organisational risk factors in isolation to other risk factor key elements (Table 5.3). The duality between organisational managerial risks and clinical risks was well expressed by one participant that had roles as an LHD board member, surgery department head and senior surgeon.

> *"They are two different roles…*
>
> *In the Board room – not down to the operational level; risk is finance, budgetary, the implications of running a health system, Board subcommittees patient safety quality; finance; audit and risk management (strategy). Risk management committee -*
>
> *(i) Organisational risk – aging infrastructure ($10-15M worth, in 3 hospitals) e.g. operating tables, equipment*
> *(ii) IT risk – flaws in system, systemic flaws, 1-2 years of integration upgrading, episodes of 'crashing'*
> *(iii) Performance NSW Health targets – ESWT, ED*
>
> *Director of Surgery – where I am sitting now in my office – let's assume we are talking about patients – high-risk relates to underlying general condition or complex surgery and potential for adverse outcomes, preop general risk, chronic disease – cardiac, respiratory, an acute problem, and their consequences, and not necessarily age related."*
>
> Clinician-Manager (1), Hospital A, LHD Board

Detailed interview data found in Appendix 6 Table 5.4 shows the specialty specific knowledge and complexity of Executive and senior managers' "*internal rubric*" and the competing demands placed on them in their WPO. On further analyses, senior managers spoke of juggling seven main areas of responsibility, these are summarised in Box 5.2. A need to address the concerns of the Ministry of Health to "avoid things going wrong", "keep away from bad news stories" and meet key performance indicators such as NEST and NEAT/ 4HR were reported. The challenges were to address Finance and Budget constraints whilst delivering an expanding service. Resources were needed for meeting KPIs, addressing aging and new infrastructure, equipment, IT, new procedures, beds, workforce capacity and skill mix.

Box 5.2 STC: Constituents of senior managers organisational high-risk rubric

Organisational high-risk constituent		Participant
1.MOH, Media	*"Things more likely to go wrong …or there is a greater interest in the outcome for the Ministry of Health or local politics"*	Manager (2), Hospitals A, B, C, D; LHD; Clinician-Manager (1), Hospital A, LHD Board
2.KPIs, Access and Flows	*"Operational - day to day challenges - patient access and flow, patients in and out in a timely manner, balance emergency and elective".* *"Risk of breeching clinical priority, for surgery within 1,3,12 months"*	Manager (11), Hospital A; Manager (7) Hospital B; Clinician-Manager (8), Hospital A, LHD; Clinician-Manager (1), Hospital A, LHD Board
3.Money, capacity	*"Providing right (care, patient, time) whilst managing competing needs. Budgetary resource constraints not going to match all potentialities so decision making, resource allocation and priorities" "Financial risks – constraints in developing services, maintaining services"* *"Risk of no (or not enough) theatre time, a real problem"*	Clinician-Manager (8), Hospital A, LHD; Manager (4), Hospital C, Clinician-Manager (1), Hospital A, LHD Board; Manager (5), Hospital D
4.Aging infrastructure, Equipment, IT	*"Being able to provide a service. Aging infrastructure, 4 OTs 24 years old, older wards problem with air conditioning, leaks when rain etc. New building servicing issues and problems …"* *"Running operating theatres that are 35 years old because no rebuild, no new equipment, anaesthetic machines are 18 years old and not up to current Australian Standards"* *"IT risk – flaws in system, systemic flaws, 1-2 years of integration upgrading, episodes of 'crashing'"* *"*	Manager (4) and (6), Hospital C; Clinician-Manager (1), Hospital A, LHD Board; Clinician-Manager (5), Hospital D; Manager (5), Hospital D
5.No Beds	*"Patient access and flow, patients in and out in a timely manner"* *"Workforce risks – shortages and profiles e.g. ED puts servicing at risk"*	Manager (11), Hospital A; Manager (4) and (6), Hospital C; Manager (5), Hospital D
6.New procedures	*"An emerging risk is capacity and the ability to do a whole lot of stuff, interventions offered or imposed onto patients, families and their ability to make good judgments. The appropriateness of care"*	Manager (4), Hospital C; Manager (5), Hospital D
7.Skill-mix	*"Skill-mix, managing standards of care. 1200 nurses at Hospital A, how to make sure they are all competent"* *"A new procedure or uncommon patients e.g. paediatric patients are a risk – needs education, development, competency"*	Manager (11), Hospital A; Manager (7) Hospital B; Manager (4), Hospital C; Manager (5), Hospital D

Fourth, differences in experiential accounts of high-risk between senior managers and clinicians were reported. Clinicians spoke of the challenges to patient and staff safety resulting from the reactive day-to-day decisions made by Executive and senior managers.

Box 5.3 STC: Constituents of clinicians' organisational high-risk rubric

<table>
<tr><td colspan="2">Organisational high-risk constituent</td><td>Participant</td></tr>
<tr><td>MOH,
Media</td><td>"LHD – zero cancellation policy for the operating theatres for nurse staffing; so 'forced' overtime for nursing staff…work health and safety issues and patient safety issues"</td><td>Clinician-Manager (6), LHD; Manager (9) Hospital C; Nurse (4), (5), (12), (13), (16), (17) Hospital A; (28), (38), (39) Hospital C; (44) Hospital D</td></tr>
<tr><td>KPIs,
Access
and Flows</td><td>"Patient surge can be high-risk, they surge through the Emergency Department to the Operating Theatres and cause 'bed block' because these patients are harder to discharge than elective patients … I am thinking that 'surging' is a harder risk to manage than clinical, because need to look for staffing and skill-mix to resource the 'surge beds'… Staffing is the supreme high-risk"</td><td>Clinician-Manager (9), Hospital A; Physician (4) Hospital A; Physician (8) Hospital C
Nurse (2), (3), (4), (5), (6), (7), (8), (9), (13) Hospital A; (28), (29), (30), (31), (38), (39), (41) Hospital C; (43), (45), (46), (49), (50), (52), Hospital D</td></tr>
<tr><td>No Beds</td><td>"Risk can change over the course of a day – 'wing it' throughout the day as the clinical and hospital beds status changes e.g. if ED bursting at the seams, no to overnight stay for social reasons, that is no responsible adult at home"

"No HDU bed is a risk for very sick patients – have HDU bed so we operate, but then there is no HDU beds, and patients are pushed out (of HDU) earlier – have one night stay only, then some of these patients (deteriorate) and bounce back into HDU the same day".

"Acutely deteriorating patient e.g. from ED -is there something else going on for the patient to be so unwell? or ICU 'step-down' patients – is this the 'ideal' ward versus the 'allocated' ward?"

"Problem with 'build-it, fill-it' we need to question inappropriate care"</td><td>Surgeon (2), Hospital A; Clinician-Manager (9), (10), Hospital A; Physician (2) Hospital A; Physician (8) Hospital C; Physician (10) Hospital D;
Nurse (2), (3), (4), (5), (6), (7), (8), (9), (13) Hospital A; (28), (29), (30), (31), (38), (39), (41) Hospital C; (43), (45), (46), (49), (50), (52), Hospital D</td></tr>
<tr><td>Skill-mix</td><td>"High risk patient different set of precautions for each patient … High risk relates to (inadequate) skill mix of receiving ward"
"Outlier patients where ward staff are not familiar with their medications. Dealing with a whole lot of people who are inexperienced with high risk drugs and you can't really find an alternate or senior"

"Skill set of trainees, senior registrar versus junior registrar but also insight of risk and appropriate guidance seeking behaviour in the operating theatre"
"… bad risk (is a) junior surgical registrar not supervised"

"Timing of surgery for high risk patients e.g. Fridays for major abdominal surgery where physio and a lot of other care is required over the weekend, with less experienced staff on the wards. Important when things 'go awry'."</td><td>Clinician-Manager (6), LHD; Pharmacist (3), Hospital C
Nurse (2), (3), (4), (5), (6), (7), (8), (9), (13) Hospital A; (18), (19), (23), (24) Hospital B, (26); (28), (29), (30), (31), (38), (39), (41) Hospital C; (43), (45), (46), (49), (50), (52), Hospital D
Physician (Physician (2) Hospital A; (6) Hospital B; Physician (8) Hospital C; Physician (10) Hospital D

Surgeon (1), Hospital A; Clinician-Manager (4) (3) (2) Anaesthetist, Hospital C and A

Physiotherapist (4), (3), (2),(1), Hospital A; B, C, D</td></tr>
</table>

Management teams WPO were observed as addressing their competing demands of budgetary constraints and the need to provide a service. In their WPO, clinician-managers and clinicians spoke of the day-to-day pressures of having to react to resource constraints, such as: no beds, and balancing skill-mix, 'in-hours' versus 'afterhours' resources. Whilst simultaneously, for individual high-risk patients, having to apply their clinical internal rubrics of surgical, anaesthetic and, patient comorbid health status risks. Perioperative participants work experience in the hospital wards was well summarised in the following exemplar quote, explaining WPO and high-risk, that was provided by one clinician-manager participant.

> *" (High risk is) poor communication – contact you to do this and do this --- one-way communication … sometimes it is like,… seriously?*
> *…Focus on meeting targets rather than patients e.g. ETP new 4HR or new manager saying we must discharge 7 patients per day. This is more possible for general surgery where LOS may be 1,2 or 3 overnight stays (relatively predictable) but for vascular surgery this is all over the place. So, managing numbers rather than patients. The pressure is like the domino effect – MOH to Exec to --- down to the patient and then it effects patient care*
> *…This is a new ward for general surgery as there is now a new ward for medical patients in the 2018 completed new building; however, no extra beds have been created or staff employed, rather existing resources have been re-allocated. The ward has 24 beds that can surge to 28 beds (can open 4 extra beds in the ward) but currently, recently on the ward 7/28 patients are surgical. Around 20/28 beds are taken by Medical, GIT, Aged care, Cardiac patients with occasional elective orthopaedic. This is a risk because it is the ad hoc outlier ward, the medical staff for these patients come to this ward last because most of their patients are on their correct ward, and it is most efficient for everyone that they go there first and then HDU, ICU then here. Staff is stressed by the clinical load and mix*
> *…The communication is 'just go, take the patient to the PDU patient discharge unit (because) you need to take a patient from ED. Sometimes it makes sense, sometimes not."*

Clinician Manager (X), Hospital A, C or D

Nevertheless, clinical teams and management teams did acknowledge a joint responsibility for high-risk patient care. As represented by the following:

> *"Patient - clinician issue and poor outcome, organisation bares part of the responsibility"*
>
> Clinician-Manager (2), Hospital A

Fourth, with the acknowledgement that this was the current context of hospital high-risk patient care locally, and perceived to be the challenges across Australia generally, it was said that clinical processes of care could be beyond Executive hierarchical oversight.

> *"High risk - the stuff that makes me nervous …the stuff that keeps me up at night (is) assume, I have to assume, I have to rely on systems that are robust to provide good care for patients. I have to rely on, assume rather than can test it myself…High risk medical practice where clinicians have lost track of where the patient is"*
>
> Manager (1), Hospital A and B

Fifth, on the clinical frontline, identifying and responding to the four interacting high-risk key elements, was experienced as complexity in daily WPO. Participants said that there were inherent limitations to risk stratification and that the prediction of adverse outcomes was based on probability, and not certainty.

> *"Complications – we work with risks of complications, but we cannot predict, a patient may or may not get the complication…"*
>
> Clinician-Manager (7), Physician Hospital D, LHD Board

Clinicians found high-risk patients to be unique in the range of ways one patient could express their interacting comorbid health status risk factors distinctively to another.

> *"Patients are individuals – they can paradoxically have multiple comorbidities and be very high functioning as the opposite, and vice-versa, low comorbidity but poorly functioning"*
>
> Physiotherapist (3), Hospital B and A

> *"Comorbidities – medical background and age, in their 60s is okay, but then you can have your 'old,' 'sick' 70 year olds and 'young', 'well' 80 year olds for physical status. So actually 'eye-balling them' is more important for comorbid state"*
>
> Surgeon (2), Hospital A

Simple risk stratification focusing on one key element for example, the American Society of Anaesthetists (ASA) Physical status score focusing on patient comorbid health status risk, were considered fossilised, incomplete and inaccurate. All four key elements and their multiple high-risk factor constituents required identification and that alone was a challenge to conceptualise and learn. As a result, complications were inherently compounded.

> *"The ASA score is dated, an inaccurate guide e.g. it does not include time of surgery, situational awareness, actual human resources, presence of a senior clinician, who is operating, anaesthetising, geography and the process and health outcomes, complications - surgical or anaesthetic. Need to identify these cofactors. Hard to imagine how you would learn that, how to interpret that"*
>
> Clinician-Manager (3) Anaesthetist, Hospital A

Furthermore, clinicians in their WPO routinely responded to all four key elements and the interacting nature of each element's multiple high-risk factor constituents. In practice, senior clinicians again reported specialty specific characteristics that made some patients higher risk of adverse events than others. For example, for physiotherapists, musculoskeletal functioning was considered important. Deep breathing and coughing, sitting up, sitting out of bed, standing, walking, showering were important aspects for independence, and also to prevent complications such as pneumonia, blood clots and muscle wasting. The potential for an adverse event increased with inability to self-perform the normal caring tasks.

> *"Patients comorbidities, so for Physio – very high BMI, cardiovascular health hypotension, postural hypotension, CCF (heart failure), delirium and impulsiveness; preop decreased functional background - this impacts on physiotherapy services, more manpower required, increased assistance with mobilisation"*

Physiotherapist (4), Hospital A

Effective pain management was essential for mobilisation but not without problems. This, in turn, added a complication into the risk assessment rubric.

> *"High risk relates to outcome e.g. respiratory complications secondary to sedation side effects of pain medications or GA. Also, the geriatric patient can be high risk, sensitive to sedation, GA; cannot express pain or understand pain management goals"*

Physician (1), Hospital A

In helping patients regain their physical functional independence after surgery, physiotherapists were observed to be managing three clinical interacting risk factor key elements. Surgical risk such as deep wound healing and pain. Anaesthetic risks associated the side-effects of anaesthetic and pain medications on blood pressure, particularly low blood pressure on standing up, confusion and impulsiveness in sudden unexpected movements, increasing falls risk. Patients' comorbid health status risk factors such as morbid obesity and muscular deconditioning making physiotherapy and recovery more challenging. Furthermore, physiotherapists across all four hospitals reported managing organisational risk interacting with these three clinical high-risk key elements.

> *"Timing of surgery for high risk patients e.g. Fridays for major abdominal surgery where physio and a lot of other care is required over the weekend, with less*

experienced staff (referring to all clinical professions) *on the wards. Important when things 'go awry'. "*

Physiotherapist (4), Hospital A

Sixth, participants said that perioperative high-risk was dynamic. Risk changed with time and conditions.

"A lot of comorbidities to begin with and developing morbidity and mortality. Acute is high risk – from ED. And patient has not been worked up, prepared, due to omission or lack of time e.g. anticoagulants have not been ceased"

Junior doctor (1), Hospital A

Patients could start with high-risk comorbid health status, develop an acute progressive surgical pathology, be admitted from the ED where due to lack of time a blood thinner drug may not have been able to be stopped or due to rushed WPO an omission in clinical care was made.

However, patients' evolving pathology and the ongoing clinical care required alone, made the already imprecise process of perioperative risk stratification and prediction even more unreliable.

"Certain types of patients, e.g. 'crumbly' e.g. with infections, or wound problems or are diabetics or vasculopaths, and are 'frequent fliers' returning to the operating theatres multiple times … are 'high-risk'."

Clinician-Manager (12), Hospital A

"High risk is the deteriorating patient that needs further surgery or medical care intervention and then can decondition during prolonged stay"

Clinician-Manager (9), Hospital A

"Malnutrition status, recent percentage weight loss, significant reduction in oral intake, GIT malabsorption or obstruction for a prolonged period of time before

coming into surgery. The lack of time to implement nutritional support. Individualised diet upgrade and early diet progression postop. Non-functioning gut postop with respect to the extent of surgery, postop chemotherapy, complications, anastomotic leaks and patient on no diet …and that is crucial."

The organisational risk interacted with the three clinical high-risk in different ways each time. Each patient, clinician, team and care setting together presented a new, specific dynamic to be negotiated.

"Decrease unnecessary fasting for theatres or tests."

Dietician (3), Hospital C

"A low risk procedure going into the night then becomes high risk because of fatigue (after everyone has worked a long shift), fewer support services out of hours, blood facilities – blood bank is less ready to respond, people and services get slower, PACU, ICU less as good as a facility as during the day – this is a demonstrated factor globally"

Clinician-Manager (4), Hospital C

"Afterhours – there are more PACE calls and Codes afterhours and less experienced and less staff to attend. In the daytime this new position CNC is a protected position and supported by an ICU (and ED base), after hours there are 'floating' doctors …they are also responsible for and need to do other things... Patients having multiple PACE calls – usually have sepsis with hypotension, or respiratory failure."

Nurse (49), Hospital D

"High clinical risk … related to a final bad outcome … is something difficult to mitigate or change, it needs more than to rely on <u>an</u> individual to fix"

Manager (8), Patient safety officer, Hospital A, LHD

The evidence has shown that perioperative high-risk was conceptualised, understood and responded to differently depending on the person, their role and context. At any given time during an episode of perioperative care, four or more interacting risk factor key elements, each containing multiple constituents, existed. Participants used similar terms for high-risk, and thought they meant the same thing, without a complete and common understanding of what exactly constituted a poor outcome (detailed description in Section 5.2.3), and no single discipline had the whole picture.

The following section presents the evidence for the second theme, the structure and processes for how perioperative work practice was organised around risk at the four hospitals.

5.2.2 Perioperative work practice and organisation

The second main theme on perioperative work practice and organisation around risk was the structures and processes of the services. The perioperative system at Hospitals A, B, C and D were observed to be, an assemblage of work practice components across a perioperative continuum of pre-, intra-, and post-operative phases of care. Together the WPO components formed a complex and unitary whole, that for the purpose of this research, is termed a perioperative episode of care. At the four hospitals, individual patients having surgery were observed to traverse a perioperative episode of care. There were four distinguishable WPO components across an episode of care. First, preoperative contemplation of surgery in primary care and, outpatient risk assessment and optimisation through hospital pre-admission clinics. Second, care in the operating theatre suite for surgery, anaesthesia and recovery from anaesthesia. Third, postoperative acute care provided in the hospital wards. Fourth, post-discharge care that was anticipated as convalescence or further rehabilitation back in primary care.

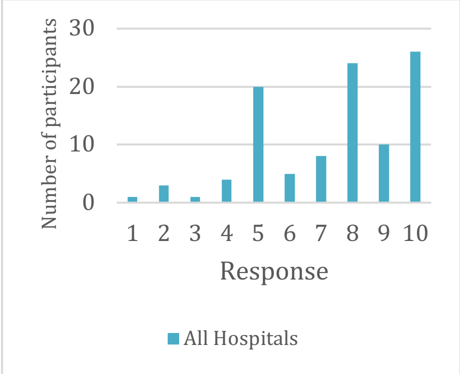
When things went to plan for an individual patient, a perioperative episode of care progressed along a linear continuum, that was the planned one-way passage through pre-, intra-, and post-operative phases of care. Alternatively, episodes of care for some high-risk patients were observed to ‘detour’ from, or ‘loop’ back into, an earlier phase on the perioperative continuum. These perioperative episodes of care contained unplanned events for example: when a patient had to be urgently returned to the operating theatres; or be admitted to critical care; or after discharge, admitted to higher level of care than home or be readmitted to hospital.

This section presents the evidence for how, the observed assemblage of work practice components across an episode of perioperative care, was predominantly organised around surgical risk factors. The evidence is presented in five parts. The preadmission process where patients' health information was first differentiated for surgical subspecialty, surgeon, surgical risk and other risk factors. Then in turn, the WPO around low, intermediate and high-risk surgery is presented. Last, complex adaptive systems (CAS) in times of crisis are described for unplanned events in the perioperative continuum. The evidence will show a progression starting from a highly predictable, reliable form of organisation for patients having low risk factor surgery. Then as surgical risk factors became greater and interacted with a patient's chronic health status, and the anaesthesia and organisational risk factors, a reliable but less predictable form of WPO emerged. Ultimately the evidence will show that at the larger Hospitals A, C and D, and even at Hospital B, the form of WPO would on occasion, veer towards an unpredictable, CAS for the highest risk perioperative patients.

5.2.2.1 Preadmission processes

Perioperative WPO began prior to hospitalisation, with preadmission structures and processes for all elective surgery patients, found at all four hospitals (Table 3.2). Hospital B utilised Hospital A's PAC to assess higher anaesthetic patient risk. Staff were familiar with the tools used for risk assessment and triage of care (Figure 4.1) including the Recommendation for Admission Form, Patient Health Questionnaire and Discharge Planning Questionnaire. Staff surveyed recognised that the preadmission process was a necessary part of work practice (Figure 5.1)

Figure 5.1 SDS: Staff attitude that all patients need a preadmission review using triage

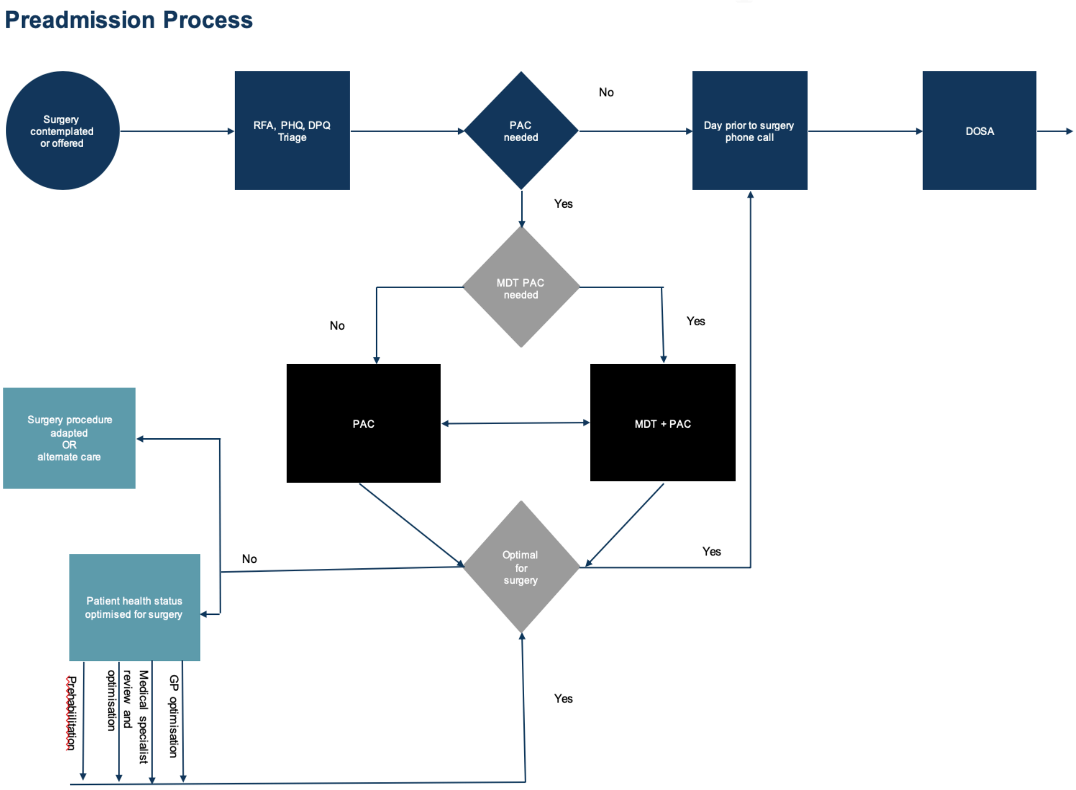


Responding to the question that all patients require preadmission review using a triage system:

- **60% (68/113) agreed or strongly agreed**
- 8% (9/113) disagreed or strongly disagreed

The same business process model (BPM) for preadmission WPO for elective surgery patients, was present at the four hospitals (Figure 5.2).

Figure 5.2 BPM: Preadmission work practice and organisation



For the purpose of this research, clinical reasoning is defined as “a context dependent way of thinking and decision making in professional practice to guide practice actions” for patient care (Higgs 2008 p4). Occasions of clinical reasoning and decision-making are represented by the diamond shape in the BPMs including Figure 5.2.

Clinical reasoning and decisions by anaesthetists with senior nurses using triage tools either directed patients to DOSA or for further preoperative workup. Either to a standard PAC staffed by an anaesthetist, surgical trainee, junior doctor and perioperative nurse, or included a multidisciplinary team - PAC with subspecialty surgical nurses and Allied Health therapists. Figure 5.2 is a multi-level BPM. For low risk surgery and patients with no or mild systemic disease comorbidity (ASA 1 and 2) only the top-level process of care was provided; patients were triaged straight to receive a phone call the day prior to surgery and proceeded to DOSA.

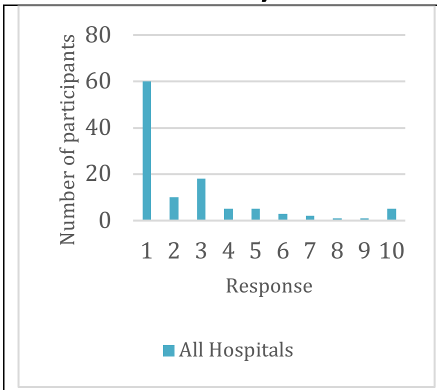
The clinical reasoning process that was observed in the PAC triage process in Hospitals A, B, C and D is conceptualised in Table 5.5. This is a contingency table presenting possible combinations of surgical risk factors, anaesthesia risk factors and patient comorbid health status risk factors. The matrix in Table 5.5 influenced decisions made about what further care was needed. This matrix is an explicit representation of the *"internal rubric"* or *"working understanding"* of high-risk described by participants previously in UHR.

Table 5.5 PAC clinical reasoning and decision-making matrix

Clinical reasoning matrix PAC		**Surgical procedural risk**		
		Low	Intermediate	High
Patient comorbid health status risk	ASA 1 and 2	Further care not required	Additional patient education regarding optimisation, pre-habilitation, recovery	Additional patient education regarding optimisation, pre-and rehabilitation
	ASA 3	PAC, further care not required if no modifiable risk factors	MDT + PAC, further care not required if no modifiable risk factors	MDT + PAC + collaboration with GP and medical specialists. Shared decision making, goals and ceilings of care considered
	ASA 4	PAC, further care not required if no modifiable risk factors	MDT + PAC + collaboration with GP and medical specialists. Shared decision making, goals and ceilings of care established	PAC + collaboration with GP and medical specialists. Shared decision making regarding benefits and risks of proceeding to surgery or alternate care

Differentiation of resource utilisation was based on a common understanding amongst clinicians and managers that patients having surgery and anaesthesia, were not all the same (82%, 93/113), but individuals, and unique in their perioperative risk and their care needs (Figure 5.3).

Figure 5.3 SDS: Strong agreement that surgical patients were not all the same in the amount of care they needed



Responding to the question that one patient having surgery is much the same as any other, in the amount of care they need:

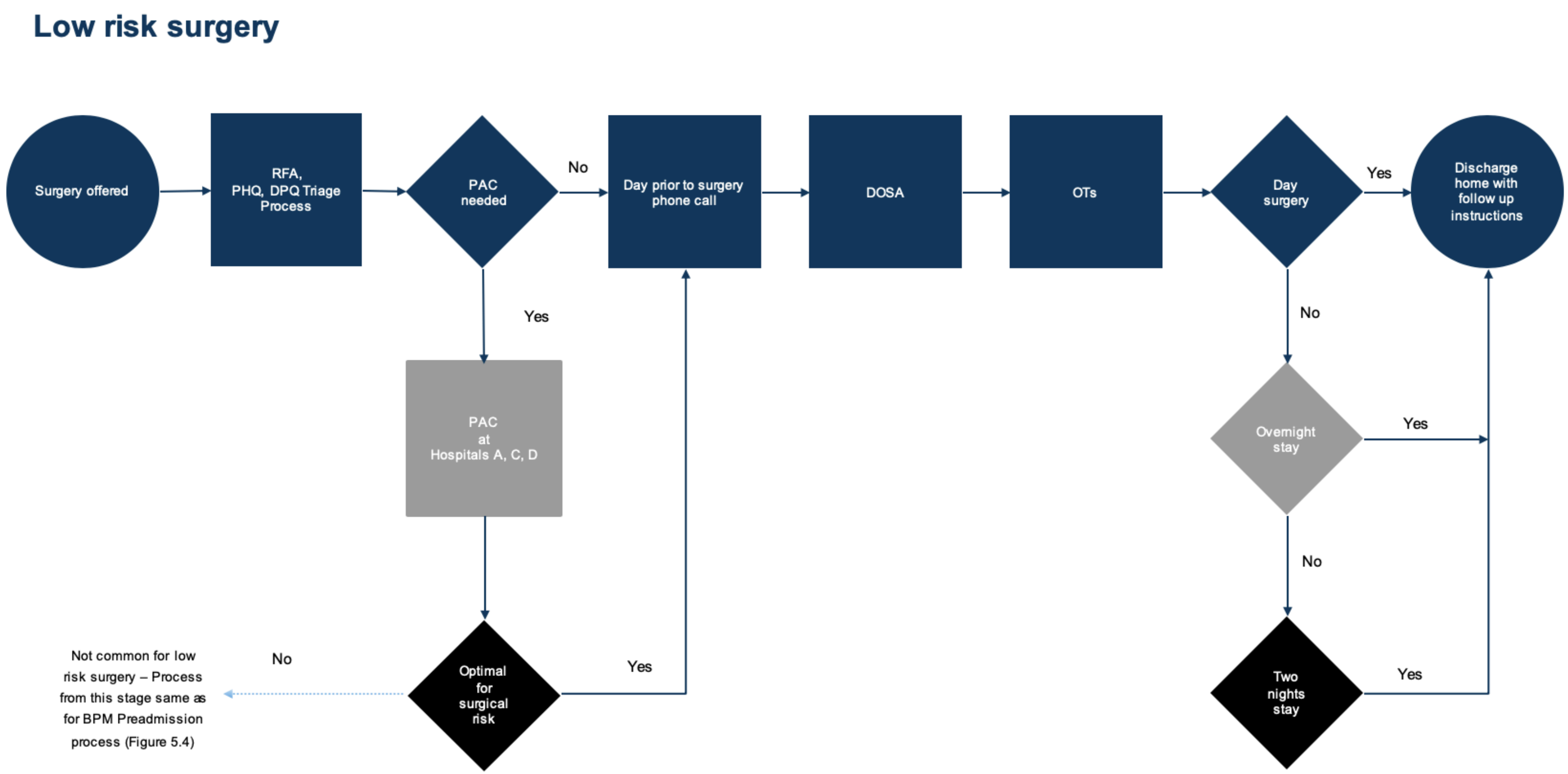
- **62% (70/113) participants strongly disagreed**
- 20% (23/113) disagreed

At the four hospitals, WPO was observed to be based around surgical risk factors as the standard strategy for patient risk management. The evidence of perioperative WPO around low, intermediate and high-risk surgery is now presented.

5.2.2.2 **Low risk surgery**

This section presents the findings for WPO for low risk surgery. The same BPM for low risk surgery was found at all four hospitals (Figure 5.4). For patients having low risk surgery with no or mild chronic health status risk factors only the top-level process of care was provided. Patients with greater chronic health status risk factors had PAC review. A 'MDT + PAC' was not considered necessary for low-risk surgery. Emergency low risk surgery patients, not specifically depicted on the BPM, presented to hospital through the ED and were transferred to the theatres either: from the ED, or via transfer to a ward bed, or more often were initially treated and sent home from ED to re-present as DOSA the next day. The WPO for low risk surgery was characteristically highly reliable and predictable. With few exceptions, patients proceeded from DOSA to have surgery and anaesthesia, and were discharged that day or the following day. Reports from follow-up phone calls by nurses, or from outpatient clinic reviews by surgeons and nurses, confirmed adverse events were infrequent.

Figure 5.4 BPM: Low risk surgery - work practice and organisation



For the four hospitals, the characteristics of low risk surgery and the patient population that presented to each hospital is detailed in Table 5.6. Taking Hospital B's WPO as the starting point, low risk surgery was characterised by two anatomical features and one anaesthetic feature. First, it was peripheral extremity surgery (e.g. hand surgery) and not central (e.g. spine or hip surgery). Second, it was superficial surgery (e.g. eye surgery and ENT), there was no deep incision into a body cavity (e.g. hernia repairs or scopes – endoscopic, cystoscopic surgery). The duration of surgery was short, less than one to two hours. The anaesthetic for low risk surgery was associated with these unique anatomical features; in most cases, local regional anaesthetic with sedation was the primary technique, and not general anaesthesia, particularly at Hospital B. Most patients were discharged directly home on the day of surgery or the following day. The WPO for Hospital B was uniquely focused on low risk surgery (Box 5.4).

Box 5.4 Focus on quaternary level, low risk surgery - the unique case of Hospital B

The WPO of Hospital B focused on quaternary low risk surgery that set it apart from the other three hospitals. Perioperative WPO was characterised by this exemplar quote from an Executive Manager from Hospital B:

> *"Organisational risk encompasses everything. Depends on the nature of the business, for us hands and eyes. No risk, no stress on beds. We have a 'wellness model'. Periop nursing is very process driven, can set up easily so service can thrive. Periop, DOSA, day surgery, 23HW landscape …*
> *A small organisation so, we need to challenge ourselves, not keep on doing the same thing"*

Manager (12), Hospital B

The 'wellness model' referred to two unique aspects of perioperative WPO that enabled highly predictable and reliable processes. First, concentrating state-wide expertise on patients for low risk surgeries ensured rapid HVSSS turnover so no hospital bed shortages. Second, Hospital B was intentionally physically isolated from intermediate to high risk surgeries, as there were systems in place to transfer patients requiring higher risk surgeries to Hospital A.

The patient comorbid health status risk factors for low risk surgeries often included age, elderly patients in their 70s and older, commonly frail with multiple comorbidities, stable or not acutely unstable. The volume and throughput of low risk surgeries at all four hospitals on any given day was high. The evidence presented in Table 5.6 demonstrated that across all the four hospitals, regardless of their size and complexity, and population of older and sicker patients, for the same types of low risk surgery, care could be provided to similar reliable standards.

Table 5.6 Characteristics of WPO for low risk surgery

WPO Low risk surgeries	**Hospital A**	**Hospital B**	**Hospital C**	**Hospital D**
Minimally invasive surgery – peripheral extremities or superficial surgery of short duration (less than one to two hours)	**Yes**	**Yes**	**Yes**	**Yes**
Examples site of surgery and surgical subspecialty Hospital A, C, D Procedures at Hospital B (at a much smaller volume) **<u>PLUS,</u>** **Face** (Plastics, General, Max-Fac), **Dental (**Dentist, Max-Fac), **Upper and lower Limbs** (Orthopaedic – scopes, soft tissues, fractures), soft tissues (General), **AV fistula** (Vascular) **GIT scopes** (Gastroenterologists, General) **Urology scopes** (Urologists) **Hernia, Lap.Cholecystectomy, Lap.Appendicectomy** (General) Radiology, minor vascular **radiology interventions** (Radiology, Vascular)	**Yes**	**Yes** **Eyes** (Ophthal-mology), **Hands** (Plastics, Orthopaedics, General) **Ear, nose, throat (**ENT)	**Yes** (Minimal elective orthopaedics)	**Yes**
Patients went home the same day or the following day in more than 90% of cases. The anticipated return to improved or normal function within two weeks of discharge	**Yes**	**Yes**	**Yes**	**Yes**
Included emergency and afterhours cases	**Yes**	**Yes**	**Yes**	**Yes**
Included a high proportion of elderly patients 70 years and older	**Yes**	**Yes**	**Yes**	**Yes**
Included patients with stable and not acutely unstable complex chronic multi-system comorbidities	**Yes**	**Yes**	**Yes**	**Yes**
Examples of patients more likely to have local anaesthesia and sedation, rather than general anaesthesia	**Yes Eyes, Limbs**	**Yes Eyes Hands (almost exclusively)**	**Yes Eyes, Limbs**	**Yes Eyes, Limbs**

Table 5.6 provides an overview of the characteristics of low risk surgery WPO for the majority of patients. There were exceptions for example, patients having eye surgery

for orbital cancers or serious infections; or major multispecialty surgical repairs for traumatic hand injuries. These patients were reported to be in the operating theatres for over 6 and 10 hours, had prolonged general anaesthesia, required extensive postoperative care. These surgeries would not be classified as 'low risk' but 'low-intermediate risk'. Notwithstanding some exceptions to the norm, WPO for low risk surgery was observed to be characteristically highly reliable and predictable. This characterisation was explained in an exemplar quote from a patient safety officer:

> *"Quality relates to high reliability – procedures, processes are applied to a good standard, everyone with the same problem gets the same thing, and the outcomes are of a good standard. Low risk is something that is easily applied across a variety of people and contexts"*
>
> Manager (8), Hospital A, LHD

Box 5.5 is a clinical vignette of a typical day, an amalgamated caseload of patients presenting for low risk surgery at Hospital A, (B), C or D. The clinical vignettes demonstrate that at all four hospitals regardless of patient comorbid health status risk factors, for low risk surgery, care could be provided efficiently as day surgery or overnight stay, to similar high standards. The characteristics that made low risk surgery reliable and predictable were observed to be interdependent. First, there was minimal deleterious impact from the surgery or anaesthesia on a patient's physiology and functional independence. This allowed safe early discharge out of hospital, usually directly back to home, and when postoperative rehabilitation was required, it was done as an outpatient or in primary care.

Box 5.5 Vignette of clinical care for low risk surgery

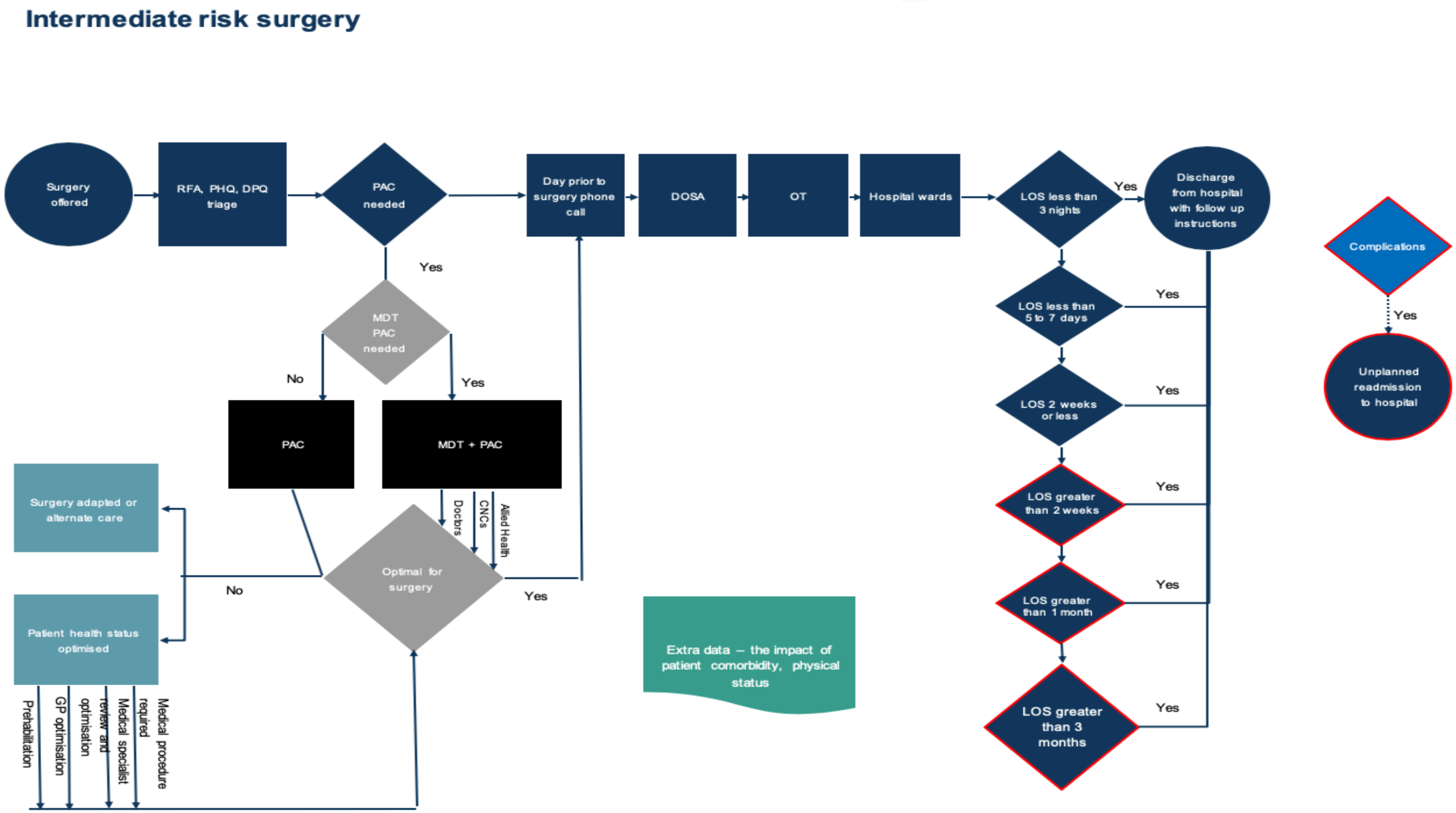
Patient factors	Surgery/ Anaesthesia	Postoperative
Patient 1: **53 years old male**, **ASA 1**	**Squint surgery both eyes** General anaesthesia (GA) Duration of surgery 90 minutes	Discharged home the next day Follow-up with surgeon in 2 weeks
Patient 2: **65 years old male, from regional NSW, ASA 1** PHQ triage, No PAC, DOSA	**Excision lesion face** and frozen section - pathology for cancer GA Duration of surgery 1hr 55mins	Discharged home day of surgery. Follow-up with GP at one week, follow-up with surgeon 6-8 weeks

Patient factors	Surgery/ Anaesthesia	Postoperative
Patient 3: **65 years old male, ASA 2** **Hypertension for 20 years, stable on medications** PHQ triage, No PAC, DOSA	**Nasal septum surgery** GA Duration of surgery 2 hrs 5 mins	Discharged home day of surgery. Follow-up with surgeon at 2 weeks
Patient 4: **71 years old male, ASA 2** **Obese, obstructive sleep apnoea** PHQ triage, PAC, DOSA	**Left inguinal hernia repair** GA Duration of surgery 1 hr 50 mins	Discharged home day after surgery Next day follow-up with surgeon.
Patient 5: **82 years old male, ASA 3-4** **Hypertension for 20 years stable'** **Recent fall and fractured hip requiring surgery and associated with deep venous thrombosis. On multiple medications.** PHQ triage, PAC, DOSA	**Biopsy of orbital lesion - possible cancer** LA and sedation Duration of surgery 1 hr 45 mins	Discharged home day of surgery. Follow-up with surgeon at four weeks.
Patient 6: **87 years old female, ASA 4** **Type 2 diabetes mellitus (DM) on insulin for 20 years, Hypertension for 30 years stable,** **Frail** walks with 4 wheel-walker, on ten different medications for DM, cardiovascular, thyroid and osteoarthritis and pain. PHQ triage, PAC, DOSA **New ECG changes early signs of heart block** noted in preadmission clinic 5 days earlier by anaesthetist, agreed with cardiologist and GP to manage after 'low risk' cancer surgery.	**Excision of cancer right upper arm** GA Duration of surgery 1 hr 20 mins	Discharged home with daughter day after surgery *with referral to community nurses for drain and wound care. Follow-up with surgeon in 2 weeks

5.2.2.3 **Intermediate risk surgery**

WPO for intermediate risk surgery was characterised as a heterogenous continuum. The evidence for intermediate risk surgery will demonstrate two interrelated phenomena. First, the broad range in types of surgery and surgical risk factors, intermediate risk surgery posed to patients. Second, the 'predictable to unpredictable' dimension of intermediate risk surgery, not evident in low risk surgery, that was dependent on a patient's clinical condition, that teams found at the time. The BPM continuum for intermediate risk surgery proceeded from a simple, linear direction to a more complex postoperative direction where multiple avenues potentially faced the team, with subsequent impact on resources (Figure 5.5).

Figure 5.5 BPM: Intermediate risk surgery – work practice and organisation



A similar BPM for elective intermediate risk surgery was observed to be present at Hospitals A, C, D (Figure 5.5) but not B. Two distinguishing features, one pre-operative and one postoperative, set intermediate risk surgery apart from low risk surgery WPO.

First, unlike low risk surgery, for intermediate risk surgery, few patients received only top-level process of care. The importance of pre-admission patient optimisation and preparation by the multidisciplinary team was evident in the three hospitals' triage processes and is represented by the two sets of 'swim-lanes' (parallel vertical lines) on the BPM. The one from 'patient health status optimised' depicts work practice observed to be done by medical teams (anaesthetists, surgeons, junior doctors with the GP and medical specialists) to assess and treat comorbid chronic medical conditions for example, heart lung disease or diabetes mellitus. The second set of swim-lanes from the 'MDT + PAC' depicts work practice done by senior nurses and the allied health team that physically prepared patients, carers and their home environment for the surgery and recovery using education, pre-and post-operative exercises, and nutrition.

The postoperative distinguishing feature of intermediate risk surgery is represented on the BPM by the column of diamonds (points of clinical reasoning and decision-making) from the hospital wards. The diamonds depict variable LOS depending on the type of surgery and the patient's condition found by teams at the time. Red borders in the BPM represent a serious complication because intermediate risk surgery was not expected to require a hospital stay of greater than 2 weeks or readmission to hospital. The supporting evidence for this statement was from secondary documentation on expected versus actual LOS as completed by surgeons on the RFA form, on the clinical pathways, displayed on electronic boards on the wards, and confirmed at interviews.

WPO for intermediate risk surgery was observed to either resemble low risk surgery WPO or alternatively, more resemble high risk surgery WPO. WPO for low-intermediate risk surgery was observed to be very reliable and predictable especially, for patients with no, mild and stable comorbid disease, and was in this regard, similar to low risk surgery. In contrast, WPO for high-intermediate risk surgery was observed to be reliable but significantly less predictable with regard to an individual patient's postoperative course of recovery. This was particularly the case for patients who presented as an emergency or suffered a significant postoperative complication.

The characteristics of intermediate risk surgery WPO and the patient population that presented to each hospital is detailed in Table 5.7. Intermediate risk surgery included large joint replacements (hips or knees), large incisions with entry into major cavities (abdomen or pelvis). There was surgical destruction or removal of major tissues for example: diseased bones, deeply placed organs with cancer, with major blood supply; and major fluid shifts were anticipated such as major blood loss that could require transfusion. The duration of surgery was around two hours for low-intermediate risk surgery and much longer, around four hours for high-intermediate risk surgery. General anaesthesia was predominantly provided, especially for high-intermediate risk surgery.

In contrast to low risk surgery, the broad range in types of surgery and surgical risk factors, intermediate risk surgery posed to patients is evident from Table 5.7. Patient LOS was typically three to five days for low-intermediate risk surgery or around seven days for high-intermediate risk elective surgery. However, advances in WPO could significantly shorten LOS just as an emergency presentation or a postoperative complication could significantly increase LOS. This important finding is depicted in Figure 5.5 BPM in the column of diamonds (points of clinical reasoning and decision-making) from the hospital wards, where variable LOS was seen to depend on the type of surgery and the patient's condition found by teams at the time.

Table 5.7 Characteristics of WPO for intermediate risk surgery

WPO intermediate risk surgeries	**Hospital A**	**Hospital B**	**Hospital C**	**Hospital D**
Intermediate risk surgery observed as **a continuum** of physiological stress. Compared with low risk surgery, more central location and greater depth of surgery: involving larger internal structures, near vital blood supply or nerves, on organs with specific functions e.g. thyroid and other hormone secreting organs. And longer duration of surgery. For example: Low intermediate risk (2 hours): Joint (hip, knee) replacement surgery; thyroid surgery High intermediate risk (4 hours): Bowel resection, Bladder resection	**Yes**	**Yes** **Limited to low intermediate** **Eyes** (Ophthalmology) **Hands** (Orthopaedic, Plastics)	**Yes**	**Yes**

WPO intermediate risk surgeries	Hospital A	Hospital B	Hospital C	Hospital D
Examples site of surgery and surgical subspecialty Hospital A, C, D Eyes – major infections or cancers, threat of intracranial spread Neck vascular – carotid endarterectomy, thyroid surgery Legs - Joint (hip, knee) replacement surgery Lumbar spine – orthopaedic or neurosurgery Intrabdominal – removal of organ e.g. Bowel (General), Kidney (Urology) or transplant e.g. Kidney (Vascular, General or Urology) Pelvis - removal of organ e.g. Bladder (Urology)	**Yes**	**Yes** **Limited to low intermediate** **Eyes** (Ophthalmology) **Hands** (Orthopaedic, Plastics)	**Yes** (Minimal elective ortho-paedics)	**Yes**
Patients went home within 3-5 days for low-intermediate and 5-7 days for high-intermediate in more than 80% of cases. Anticipated return to improved or normal function within 3-6 months of discharge	**Yes**	**Yes**	**Yes**	**Yes**
Predominately elective but included emergency and afterhours cases	**Yes**	**Yes**	**Yes**	**Yes**
Included elderly patients 70 years and older	**Yes**	**Yes**	**Yes**	**Yes**
Included patients with stable, not acutely unstable and unstable complex chronic multi-system comorbidities	**Yes**	**Yes**	**Yes**	**Yes**
Usually, examples of patients more likely to have local anaesthesia and sedation, rather than general anaesthesia	**No**	**No**	**No**	**No**

Box 5.6 is a clinical vignette of a typical day, an amalgamated caseload of patients presenting for intermediate risk surgery at Hospitals A, C or D.

Box 5.6 Vignette of clinical care for Intermediate risk surgery

Patient factors	Surgery/Anaesthesia	Postoperative medical notes
Patient 1: **24 years old male, ASA 1** Non-DOSA, admitted through emergency department (ED)	**Laparoscopic appendicectomy** GA, Duration of surgery 3 hours	Discharged home after 6 days **Pathology – inflamed necrotic appendix, purulent pelvic fluid.* Nil by mouth for postoperative 3 days for ileus, nasogastric tube (NGT) high aspirates, febrile needing IV antibiotics Surgeon review 2 weeks postop.
Patient 2: **70 years old male, ASA 2-3** **Hypertension, hyperlipidaemia, mild heart block, gastro-oesophageal reflux, mild kidney impairment, on multiple medications** PHQ triage, referral from surgeon, **MDT + PAC**, DOSA	**Left total knee replacement** **CP-AROP** Regional anaesthesia – spinal block and GA Time in theatre 2 hours 15 minutes	Discharged home day after surgery with hospital-in-the-home (HITH) service for one week, for home mobilisation, physiotherapy, and venothromboembolism (VTE) prophylaxis Surgeon review 3 weeks postop.

Patient factors	Surgery/Anaesthesia	Postoperative medical notes
<u>Patient 3:</u> **71 years old female, ASA 3** **Obese, hypertension, stoke (2018)** left sided weakness), **diabetes mellitus, gastric reflux, anaemia** PHQ triage, referral from surgeon, **MDT + PAC**, DOSA	**Right total knee replacement** Regional anaesthesia – spinal block and Sedation Time in theatre 2 hours 30 minutes	Discharged home 6 days after surgery. Postoperative haemoglobin 81g/L, 2 units blood transfusion, with associated fever GP review post discharge 3 days (to review pain and other medications) at 2 weeks (to review wound) Surgeon review 6 weeks postop
<u>Patient 4:</u> **72 years old male, ASA 3** **Type 2 diabetes mellitus, hypertension, on multiple medications** PHQ triage, referral from surgeon, PAC, DOSA	**Removal of right kidney and ureter** for cancer GA Time in theatre 4 hours 35 minutes	Discharged home after 5 days Mechanical and chemical VTE prophylaxis; drain out day 1; patient controlled analgesia (PCA) (Morphine) stopped day 2; urinary catheter (IDUC) removed day 4. Complication – constipation received enema. Surgeon review 2 weeks postop.
<u>Patient 5:</u> **88 years old female, ASA 3-4,** Independent at home **Hypertension, ischaemic heart disease with past coronary artery stents (2015), frailty** PHQ triage, referral from surgeon, PAC, DOSA	**Resection of rectal cancer** GA Time in theatre 4 hours	Discharged home after 9 days in care of daughter Planned high dependency unit stay overnight, then transferred to ward, VTE prophylaxis; PCA (Morphine) stopped day 4; urinary catheter (IDUC) removed day 2. Uncomplicated recovery. Surgeon review 2 weeks postop.
<u>Patient 6:</u> **89 years old male, ASA 4** **Severe chronic obstructive pulmonary disease** (COPD) (oxygen saturation 88-92% on room air)**,** **gastro-oesophageal reflux disease.** Has stair lift at home for COPD PHQ triage, referral from surgeon, PAC, DOSA	**Endovascular Abdominal Aortic Aneurysm repair** Local anaesthetic and sedation Time in theatre 2 hours 45 minutes and	Discharged home after 3 days Planned high dependency unit stay, had antiplatelet therapy GP review required in first week at home 6 weeks postoperative

The heterogeneity of postoperative courses of recovery for patients presenting for intermediate risk surgery can be understood by superimposing the clinical cases from Box 5.6 with the BPM Figure 5.5, postoperative column of diamonds (points of clinical reasoning) from the hospital wards. The diamonds depict variable LOS characteristic of the 'predictable to unpredictable' dimension of intermediate and higher risk surgery, not evident for low risk surgery. That was dependent on a patient's clinical condition, that teams found at the time. The BPM continuum for intermediate and higher risk surgery proceeded to a more complex postoperative direction where multiple avenues potentially faced the team, with subsequent impact on resources (Figure 5.5).

It can be seen in the contrasting cases of Patients 1 and 6 (Box 5.6) the interacting nature of multiple risk factors that influenced perioperative high-risk. Namely the surgical risk factors, the type of surgery and anaesthesia, emergency or elective, and patient comorbid health status risk factors such as age, frailty and chronic medical conditions. Patient 1 was a healthy young man, who presented to ED, had urgent laparoscopic appendicectomy under GA for a perforated appendix, took four-five days to recover and was discharged home on postoperative Day 6. Patient 6 was a man at the extreme of age, 89 years old, had severe lung disease requiring a stair-lift at home; who was offered vascular surgery, an endoluminal aortic aneurysm repair, had PAC and DOSA, had the procedure under local anaesthesia and sedation, and was discharged home on postoperative Day 3. Patient 6 was safe for discharge in half the time in hospital for Patient 1.

Patient 6 highlighted that new non-invasive technologies such as intravascular stents, significantly shortened LOS, by radically altering surgical and anaesthetic risk stratification. The open operation of the past for an expanding abdominal aortic aneurysm of 5.5cm at risk of rupture and death, involved a large abdominal incision, aortic clamping with high physiological stress, this compounded by the patient's lung disease, would have required prolonged ICU level, GA and postoperative care with extended rehabilitation and convalescence. Multiple risk factors and their interacting nature combined with the advances in medical technology and WPO, seen in the case of Patient 6, was summarised, and supported by the following exemplar quote:

> *"Risk is multifactorial a high-risk medical comorbidity patient having complex vascular surgery under local anaesthesia and sedation is low risk"*
>
> Clinician-Manager (2), Hospital A

Patients 2 and 3 had similar low-intermediate risk surgery that was elective total knee replacement. For similar surgical and anaesthesia risk factors, the differences in the patients' comorbid health status risk factors was thought to have influenced their postoperative course. Patient 2 went home the following day and continued recovery as an outpatient whilst Patient 3 stayed in hospital for six days requiring a blood transfusion and other hospital level care. The two patients were around the same age, had the same surgery and anaesthetic.

> *"Medical high-risk ASA 3 is our ERAS Knee replacement, exclusion criteria. Also, patients with no confidence. Aim of my job is to get patients out of hospital in a timely and safe way – we select lower risk patients for ERAS, do not take all patients. So, we do not take ASA 3. We have successfully decreased LOS down to 1.8 days for knees in selected lower risk patients.*

Nurse (11), Hospital A

Patients 4 and 5 had similar high-intermediate risk surgery that was abdominal organ removal for cancer. Despite the similar anatomical features and surgical and anaesthesia risk factors, the nature of colorectal surgery was thought to have influenced their different postoperative course. LOS for Patient 4 was five days and for Patient 5 was nine days. The unpredictability is exemplified in the following quotes.

> *"Colorectal surgery – postop it's about Diet and Drains. ERAS is some for all; some patients fall off, one in five develop an ileus and need a nasogastric tube to prevent aspiration, < 5% have breakdown of the join – anastomotic leak, then patients who develop SSI (surgical site infection) or VTE (venous thromboembolism – blood clot)"*

Surgeon (6), Hospital C

The observation that ERAS colorectal is "*some* for all" means that of the many components of the ERAS bundle of care, 'all' patients should receive ERAS standardised care. However, individual patients will only be able to receive '*some'* of the intended care package, depending on the patient's condition before the surgical team at the time. This clinical understanding was echoed by another surgeon.

> *"Complications - SSIs, dehiscences, leaks, bleeds all occur in first 2-3 weeks, inflammatory markers, keep patients in for longer until confident patient not leaking. If all colorectal surgeons agree on an ERAS standardisation of care – easier for team, reduces LOS, but ERAS should not be about auditing. This hour*

you do this and if not …, it's not like the patient comes off ERAS he is still on ERAS but paused … and will return onto ERAS"

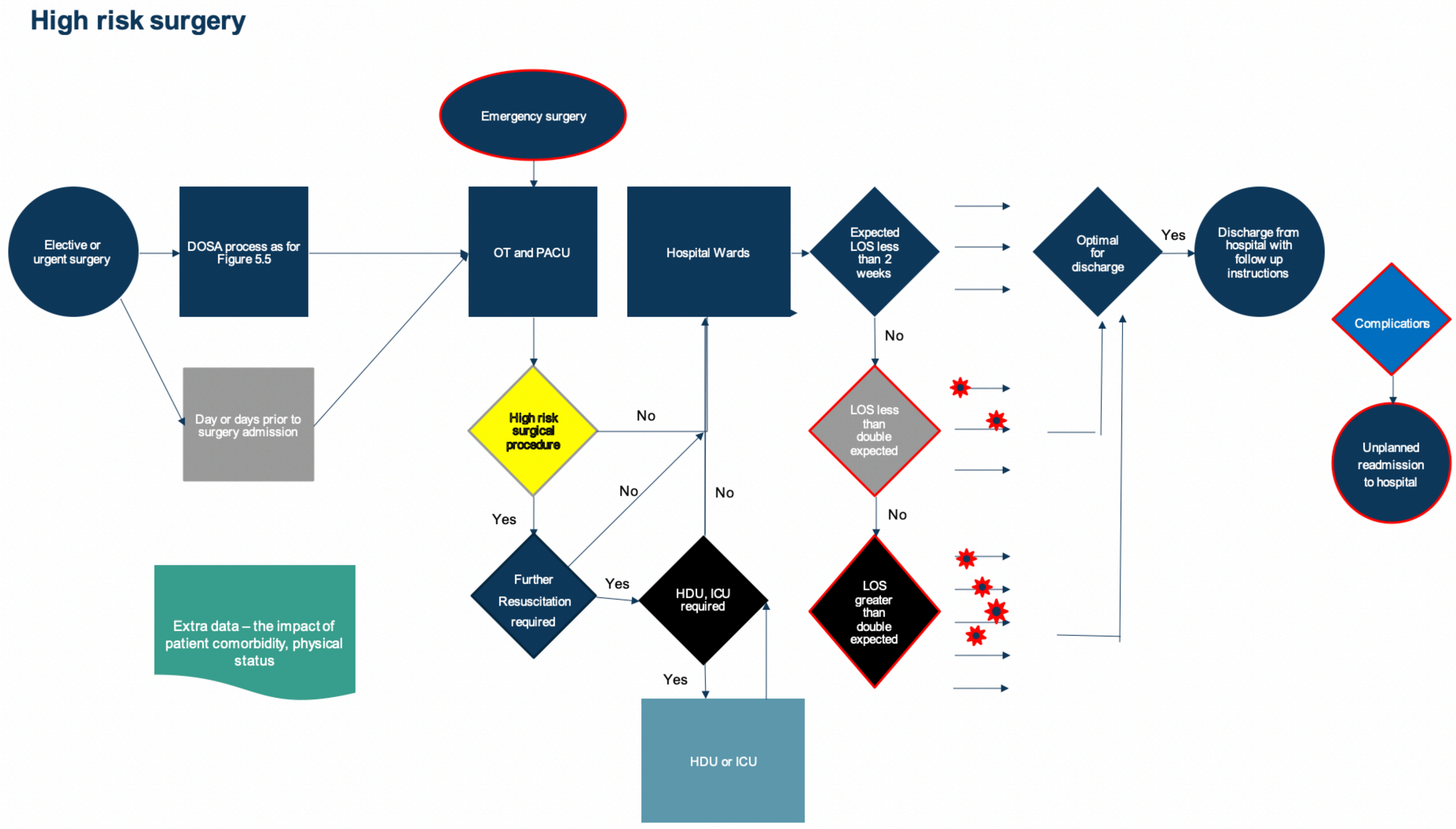
Surgeon (8), Hospital D

For a detailed description on the use of ERAS clinical pathways in the research setting see Appendix 6

5.2.2.4 **High risk surgery**

WPO for high risk surgery was characterised as one where the ability to predict a patient's postoperative care pathway to recovery was challenging, especially when compared to intermediate and low risk surgery. Postoperative WPO could easily become unpredictable, dependent on the patient's clinical response to the constituent high surgical risk factors, that teams found at the time. In practice, clinicians and clinician-managers had to adapt their understanding of the patient's evolving perioperative risk based on the interacting nature of multiple risk factors and the patient's clinical condition. The continuum of care for patients was complex where multiple avenues potentially faced the team, including unplanned events that resulted in 'detours' or 'loops' in the perioperative continuum, with subsequent impact on resources (Figure 5.6). A similar BPM for high risk surgery was observed to be present at Hospitals A, C, D (Figure 5.6) but not Hospital B. There are four distinguishable features on the BPM for high risk surgery. First preoperative WPO for elective high-risk surgery was considered important and necessary for <u>all</u> patients. This is depicted as an amalgamation event rectangle on Figure 5.6 "DOSA process as Figure 5.5" encompassing all the elements drawn for intermediate risk surgery. Second, WPO as critical resuscitation, high dependency or intensive care was often considered and utilised. Third, WPO from the added impact of the urgency of surgery. Fourth, the continuum of care for patients was distinctly complex, where multiple avenues potentially faced the team, including unplanned events that resulted in 'detours' or 'loops' in the perioperative continuum, with subsequent impact on resources. The unplanned events are represented by the 'red stars' in the BPM, signifying that the 'loops' in the perioperative continuum were more likely the longer a patient needed to stay in hospital due to complications.

Figure 5.6 BPM: High risk surgery – work practice and organisation



The characteristics of high risk surgery WPO and the patient population that presented to each hospital is detailed in Table 5.8. High risk surgery included large incisions and entry into at least one of the major cavities for example, cranium, thorax, abdomen or pelvis. There was surgical destruction or removal of major tissues that were centrally or deeply placed organs with cancer or other disease, and with major blood supply; resulting in major fluid shifts and the risk of major blood loss that required the consideration of transfusion. The predicted duration of surgery, as documented by surgeons on the RFA form, was usually four to ten hours, or longer. General anaesthesia was always observed to be provided and going beyond standard care, with the establishment of ICU level monitoring and care (Box 5.8).

Table 5.8 Characteristics of WPO for high risk surgery

WPO high-risk surgeries	**Hospital A**	**Hospital C**	**Hospital D**
Like high-intermediate risk surgery but to greater extent in all procedural aspects, central location and great depth of surgery: involving larger internal structures, near vital blood supply or nerves, on organs with specific functions e.g. liver, kidneys, pancreas and other hormone secreting organs. And longer duration of surgery. <u>For example:</u> <u>High risk (4 hours and longer)</u>: Invasive open intracavity surgery for removal of organ, cancer, other pathology	**Yes**	**Yes**	**Yes,** But to a lesser extent (depth, level of tissue destruction, duration, blood loss)
Examples site of surgery and surgical subspecialty Major trauma surgery - Lumbar spine – orthopaedic or neurosurgery Neurosurgery (NSx) Cardiothoracic surgery (CTSx) Thoracoabdominal incisions e.g. oesophagectomy Intrabdominal – removal of organ e.g. Bowel (General), Kidney (Urology) or transplant e.g. Kidney (Vascular, General or Urology) Pelvis - Bladder (Urology)	**Yes**	**Yes**	**Yes** to lesser extent e.g. no CTSx, NSx.
Usually, examples of patients more likely to have local anaesthesia and sedation, rather than general anaesthesia	**NO** HDU, ICU level GA required	**NO** HDU, ICU level GA required	**NO** HDU, ICU level GA required
ICU HDU - Planned Postoperative	**Yes**	**Yes**	**Yes**
Prolonged postoperative recovery course (LOS > 1-2 weeks)	**Yes**	**Yes**	**Yes**
Elective cases and urgent, emergency afterhours cases	**Yes**	**Yes**	**Yes**
Elderly patients 70 years and older common	**Yes**	**Yes**	**Yes**
Included patients with stable, not acutely unstable and unstable complex chronic multi-system comorbidities	**Yes**	**Yes**	**Yes**
Patients went home in more than 60% of cases	**Yes**	**Yes**	**Yes**
Patients discharged to higher than preoperative level of care for example respite care, or nursing home	**Yes**	**Yes**	**Yes**

An interesting finding presented in the WPO around surgical risk factors tables (Tables 5.6, 5.7, 5.8) was that for all levels of surgery risk, the patients observed having the surgery were similar in terms of diversity of patient comorbid risk factors namely, age, frailty and chronic medical conditions. However, when viewed together the evidence for WPO characterising low, intermediate and high risk surgery and the clinical vignettes of patients that had high risk surgery (Box 5.7), two distinct and interrelated features of WPO for high risk surgery became evident First, a progression of accumulating anatomical and physiological surgical risk factors with, often an urgency of the surgical pathology, more prolonged and higher levels of general anaesthesia and postoperative critical care and complex ward care. Second, there was a longer expected and unplanned LOS, a higher incidence of escalation of care or rescue for clinical deterioration in ward, lower percentages of patients were discharged directly home, more patients were discharged to higher than preoperative level of care for example, to respite care or a nursing home, and patients were also observed to return to hospital for further management of a postoperative complication (Box 5.7).

Box 5.7 is a vignette of clinical care for four patients that had high risk surgery in Hospitals A or C. The complexity of the care these four patients received was seen to be distinctly higher than those patients having intermediate risk surgery (Box 5.6). The amalgamated clinical vignette represents the range of complexity of care observed. The amalgamated clinical vignette does not quantitatively represent the proportion of high-risk surgery patients with postoperative complication; that could not be ascertained by our study (Section 5.2.3 Unclear patient outcome measure).

Six distinctive features of high-risk surgery were observed. First, intraoperative work was observed to be highly technical, intricate and complicated; consisting of many interconnected parts for each of the three professions namely, surgery, anaesthesia and nursing. There was an increased demand for precision. Second, the duration of surgery, from 4.5 hours to 13.5 hours. Third, the depth of surgery, close to major blood vessels, compressing the lungs for example, deep in the abdomen for Patient 4 cutting out half the stomach, Patient 3 half the stomach, Patient 2 and 1 deep in the chest cavity and abdomen cutting out part of the oesophagus.

Box 5.7 Vignette of clinical care for high risk surgery

<table>
<tr><th>Patient factors</th><th>Surgery/ Anaesthesia</th><th>Postoperative Medical notes</th></tr>
<tr><td><u>Patient 1:</u>
70 years old male, ASA 2
Dysphagia, weight loss, 5 cycles of chemotherapy for oesophageal cancer.
Previously well, on antacid only</td><td>Oesophagectomy (open abdomen, open chest)

GA and local blocks

Time in operating theatre
Patient with anaesthetists, nurse
13 hours 34 minutes
Surgeon and surgical time
10 hours 45 minutes

Planned postop. ICU admission 5 days</td><td>Discharge home after 2 weeks.
Review by surgeon in 2 weeks.

In hospital course was standard and with expected ‘complications’:

Five days in ICU; airway ETT extubated Day 1; no inotropes required; daily blood tests monitoring and correction of fluid and electrolytes; postoperative pneumothorax (expected) chest catheters inserted intraop., daily chest xray monitor until resolved.

Postop reconditioning:
<u>postop nutrition</u> commenced on IV TPN feeding whilst nil by mouth, progressing to upgrading of GIT feeding, discharged on low fat diet and PEJ tube feeds because of chyle leak;
<u>multimodal pain relief</u> – PCA (Morphine) plus regional local anaesthetic blocks;
<u>early mobilisation</u> and <u>chest physiotherapy</u>, upgrading to mobilising safely and independently on discharge.
Discharge medications related to surgery only.</td></tr>
<tr><td><u>Patient 2:</u>
70 years old female, ASA 4
Chemotherapy for oesophageal cancer, associated pulmonary emboli (PE), morbidly obese, obstructive sleep apnoea, hypertension, chronic kidney disease, on multiple medications including blood thinner for PE</td><td>Oesophagectomy (open abdomen, open chest) – as above

GA and thoracic epidural

Time in operating theatre
Patient with anaesthetists, nurse
11 hours 20 minutes
Surgeon and surgical time
9 hours 29 minutes

Planned postop.
ICU admission 9 days</td><td>Discharge to local hospital near patient’s home after 32 days in Hospital, under care of her local surgeon.

Complications – small anastomotic leak postop day 5 with resolution on repeat swallow xray study day 18; Bilateral pleural effusions; Paroxysmal atrial fibrillation (pAF).

<u>Hospital care:</u> as above plus multiple different avenues of postoperative care compared with Patient 1 to manage comorbidities and complications. Including MET call for rapid heart rate (paroxysmal AF)

<u>Care post-discharge</u>:
Ongoing dietician review, IV antibiotics, VTE prophylaxis, diuretic therapy for right heart dysfunction, medication for fast heart rhythm.

Discharged on multiple including new medications.</td></tr>
<tr><td><u>Patient 3:</u>
81 years old male, ASA 3</td><td>Subtotal gastrectomy for stomach cancer</td><td>Discharged home after 7 days.</td></tr>
</table>

Patient factors	Surgery/ Anaesthesia	Postoperative Medical notes
Obese, type 2 diabetes mellitus, past abdominal aorta stent, on multiple medications	GA **Time in operating theatre 4 hours 45 minutes** However, complication arose 10 days after discharge, patient presented with nausea and vomiting. **Second procedure by interventional Radiologist** GA **Time in Radiology 2 hours 5 minutes**	Planned postoperative HDU overnight, NGT, VTE prophylaxis; drain out day 5; PCA (Morphine) stopped day 5; IDUC out day 2. Discharged on post-gastrectomy diet for 2-3 weeks, antacids started. Plan review by surgeon at 3 weeks. * However, **Complication** 10 days after discharge, **requiring re-admission to hospital** for 2 weeks stay. Diagnosis – CT scan para-duodenal collection needing drainage and insertion of drain by Radiologist; Sepsis screen to exclude pneumonia, was seen by Infectious Diseases physician and antibiotic regime prescribed, Also Endocrine physician consulted to improve blood glucose control. Single episode of 'fainting' in ward with very low blood pressure 60mmHg systolic requiring MET call, and simple resuscitation with IV fluids. Patient improved and discharged after 2 weeks. Discharged on multiple including new medications. Surgeon review 2 weeks post-discharge
<u>Patient 4:</u> **86 years old male, ASA 4** **Ischaemic cardiomyopathy (heart failure) LVEF 30%, ischaemic heart disease, moderate to severe COPD**	**Resection of right lobe of Liver for cancer** GA Time in operating theatre **4 hours 30 minutes**	In hospital mortality, 7 months after initial surgery **Complications:** **multiloculated collection infection right sub-diaphragm area,** **bilateral pleural effusions** (resolved over time)**;** **Hypoxia,** **Delirium;** **Peptic stress ulcer bleed requiring blood transfusion;** **Recurrent aspiration pneumonia;** **Worsening heart failure** Postoperative course – fluctuating, periods of recovery weaned off oxygen, at best able to mobilise around ward with assistance of physiotherapists Daily review by Geriatrician, including judicious fluid management for heart failure Multiple MET calls, two ICU admissions for 4 days and 3 days in last 2 months of life **Last 1 month of life – Ceilings of care, not for CPR, intubation, MET team review, ICULast 48 hours – Care focus on comfort and dignity (Geriatrician)**

Fourth, the need to re-join or bypass the remaining parts of major organs that have physiological functions such as nutrition in the case of the gastrointestinal tract, or sugar regulation and the production of blood clotting factors in the case of the liver.

Fifth, all four patients required prolonged critical care level medical and nursing care during the intraoperative and immediate postoperative phases to the order of days. The observed elements that comprised the intensive care level of anaesthesia for high-risk surgery are summarised in Box 5.8. The anaesthetic set up in the operating theatres for high risk surgery more resembled the ICU set-up around the patient, than that in the operating theatre for intermediate or low risk surgery. Particularly in the range of intravenous medications, lines, tubes, drains, machines, monitoring, alarms and equipment.

The sixth distinctive feature of high risk surgery patients was that they had prolonged hospitalisations. An exception was Patient 1 who recovered uneventfully going directly home after 2 weeks. For the same operation, Patient 2 stayed 32 days in hospital and was discharged to a high-level hospital nearer home for further rehabilitation and care. Patient 3 was initially discharged after one week, and was readmitted to hospital ten days later, for further treatment for a complication and chronic medical conditions staying for two weeks. Patient 4 had in-hospital mortality after seven months of complex postoperative care in Hospital A or C.

Box 5.8 Intensive care level anaesthesia for high risk surgery

The majority of patients having high risk surgery, regardless of age and patient comorbid health status had a postoperative HDU or ICU bed confirmed before commencing high risk surgery.

General anaesthesia was observed to be always provided, going beyond standard care, with the establishment of ICU level monitoring and care. This included arterial blood pressure as well as non-invasive blood pressure cuffs, arterial lines; central venous pressure and central venous access lines, large bore peripheral intravenous access lines for fast fluid resuscitation, blood scavenging cell saver devices, blood

transfusion devices, point of care investigations for arterial blood gases or patient's ability to form blood clots, temperature regulation devices, indwelling urinary catheter, nasogastric tube and on occasion lines placed for epidural or other regional analgesia.
General anaesthesia was required beyond standard anaesthesia, pain relief and ventilation. The application of ICU level care for physiological support of Heart rate, Blood Pressure, Organ perfusion, Respiration, Oxygenation, Temperature regulation, fluid and blood products Resuscitation, for prolonged periods of around four hour to fourteen hours in the operating theatres followed by HDU, ICU admission for days followed by prolonged ward care for two weeks and often more.

An important distinction between the intraoperative care and the postoperative care of the four patients having high risk surgery, was that the care was highly complicated but not complex intraoperatively. In the operating theatre, the small team of surgeons, anaesthetists and nurses most commonly consisted of six clinicians, usually two per professional team. The team usually did not change mid-surgery, it was considered important that personnel changes were minimised for purposes of sterility and continuity of care. Team interactions were observed to be cooperative, making steady progress together with each profession - surgeons, anaesthetists and nurses playing specific predetermined roles. Next steps were seldom discussed except in the case of the unexpected for example, anatomy or changes in physiological parameters or availability of equipment. The discussions were to inform and ask for more time or support to manage the new problem rather than to ponder what to do next.

In contrast, postoperative care in the wards for high risk clinical vignette was not only complicated but highly complex. In the postoperative wards, the team structure was distinctly different to that in the operating theatre. The surgeon and surgical trainee were the only team members to progress with the patient to the next phase of care, postoperative. The new ward nursing team was augmented by team members including the junior doctors, and allied health physiotherapists, dieticians, social workers, pharmacists and specialist doctors, such as Geriatricians in Hospitals A and C and Pain management specialists and nurse consultants in Hospitals A, C and D. Other medical specialists consulted included Cardiologist, Infectious Diseases for Patient 4, Infectious Diseases Physician, Endocrinologist and Interventional Radiologist for Patient 3, Respiratory Medicine for Patient 2. The medical specialists were usually the consultant on for the day and contributed as once-off team members. Afterhours, the teams caring for acutely unwell high-risk patients were also observed to be once-off team formations, different people to the regular team during the daytime. Team interactions were observed to be collaborative; the best next steps in care were often discussed and negotiated amongst senior doctors, whilst the condition of the patient before them was changing.

The next section presents the evidence for how clinicians and managers responded to complexity of care for acutely unwell patients. These surgical patients most often had high-risk surgery, and were simultaneously exposed to the interrelated, interacting risk factors of anaesthesia, chronic medical conditions, age, frailty, and organisational processes.

5.2.2.5 **Complex adaptive systems in times of crises**

For the purpose of this research, CAS are characterised by an openness in the boundaries of the WPO structures and processes established for surgical services. The CAS WPO were observed to behave to a different set of rules and had a different set of problems. These CAS were observed as responding to unplanned, unpredictable events based on the condition of the surgical patient before them, with new transient dynamic networks of interactions or relationships. The complex practice environment was summarised by one manager as follows:

> *"High clinical risk is – something difficult to mitigate or change … need more than to rely on an individual to fix. High risk has less controlled elements.*
> *More chaotic environments are high risk– lots of people, lots of things happening, so when something goes pear-shaped it is likely to result in a bad outcome. Chaotic environments are less reliable, difficult to say who is doing what to who,*

> *so cannot guarantee the same thing will be replicated reliably to a good standard"*
>
> Manager (8), Hospital A, LHD

The evidence for how clinicians and managers responded to acutely unwell, complex care, highest risk surgical patients, is presented in two parts. First, rescue of clinically deteriorating patients in the wards (Box 5.9). Second, the unique organisational environment at Hospitals B and D (Box 5.10). Both parts describe CAS for the clinically deteriorating surgical patient.

Box 5.9 CAS for the clinically deteriorating (surgical) patient

<u>Characteristics:</u>

1. <u>Openness in the boundaries of CAS WPO</u>

Recognising and responding to the clinically deteriorating patient is Standard 8 (NSQHS). It was LHD policy '#283'; a 'procedural' document with a 'high' risk rating, compliance was mandatory and applied to all LHD facilities. The policy was not specific to surgical services.

2. <u>Behaved to a different set of rules</u>

All LHD facilities were to use a standardised rapid response system, in line with NSW MOH policy. The attending Surgeon was to be informed of the progress of their patient but did not have the authority to not comply with or unilaterally override the procedure set out in the policy. The policy aim was to provide tools and educate staff to identify and reverse early signs of deterioration using staged observations criteria. That is, to get timely senior medical response from the primary care team (within 30 minutes), escalating to specialised emergency care if the patient's medical condition became life-threatening.

3. Designed for unplanned, unpredictable events based on condition of patient:

The observed unplanned events have been represented by the 'red stars' in the BPM for high risk surgery (Figure 5.6) and the CAS that were activated for:
Patient 2 Medical Emergency Team (MET) call for rapid heart rate (paroxysmal Atrial Fibrillation); Patient 3 after readmission through the ED with postoperative surgical site infection, MET call for hypotension requiring fluid resuscitation and, on multiple occasions for Patient 4 MET calls for sepsis, heart failure, aspiration pneumonia, peptic ulcer haemorrhage, and delirium (Box 5.7).

4. New transient dynamic networks of interactions or relationships

If the patient's medical condition became life-threatening and was escalated to specialised emergency care, WPO and complexity of care for the surgical patient increased rapidly. For example, the admitting surgeon collaborated with: for Patient 2 a cardiologist; for Patient 3 the ED physician and team, the radiologist, radiology department, an anaesthetist, the endocrinologist and infectious diseases physicians in addition to the additional nursing, physiotherapy, nutritional care required to manage the Deep surgical site infection; for Patient 4 who had a seven months hospital stay with multiple complications and multiple MET calls, multiple procedures in the operating theatres and radiology, multiple anaesthetists and critical care physicians and department, twice daily reviews by the geriatricians, infectious diseases physicians, cardiologist in addition to the additional nursing, physiotherapy, nutritional care required to manage all the postoperative complications, chronic medical conditions and in-hospital sarcopaenia and deconditioning.

The two smaller Hospitals B and D, had to establish CAS WPO to recognise, resuscitate and transfer out clinically deteriorating patients to larger hospitals with greater capacity to respond appropriately. Transporting acutely unwell patients between Hospitals for higher level diagnostics and care was considered lifesaving and an additional organisational risk factor (Box 5.10)

Box 5.10 CAS clinical deterioration – added complexity for Hospitals B and D

New transient dynamic networks of relationships at Hospital B and D

Hospital B CAS WPO (additional)

"Our ED has a rural model of care, a country hospital in the CBD. No pathology, blood bank, HDU/ICU, PACU is not a critical care area. In the middle of the CBD streets can be closed for major events"

"Delayed presentation through ED -from the street or from within the hospital. ED is the control hub of Hospital B because no HDU/ICU. We have developed our own "critical care pathway". If the patient is unwell, some'-itis' (infection) *or requires Operating Theatres or higher ward care (needing inotropes* – blood pressure support*) go to Hospital A. If patient critically ill and on the slippery slope medically go to Hospital X, geographically closer and less red-tape due to collegiality. Hospital X and Hospital B have the same director, and 3 staff specialists overlap, people you know personally have been receiving our patients at Hospital X. This has saved lives."*

Physician (6), Nurses (23 and 24), Hospital B

Hospital D CAS WPO (additional)

"Less safe after hours, difference is staff is less skilled, and not many medical specialists available on site. Experienced staff are on-call. Smaller hospital so not as attractive to trainees looking for experience at tertiary centres, so less experienced registrars, who can get jobs at Hosp D, and they are on duty afterhours in the smaller hospitals. 70% ICU admissions are unplanned and thus higher risk from ED, MET and OTs urgent or emergency surgery requiring emergency lines, assessment, airway, talking with family, carers, and consideration of transfer to Hospital C"

Physician (10), Anaesthetists (11 and 15), Hospital D

"Site specific high-risk – Hospital D does not have access to all services or diagnostics … so there are transporting risks – negotiating, delays etc"

Manager (5), Hospital D

The evidence for WPO for high-risk surgery has shown that the ability to predict a patient's postoperative care pathway to recovery could be challenging. Postoperative WPO could easily become unpredictable requiring CAS WPO, dependent on the patient's clinical condition that teams found at the time. The continuum of care for patients was complex where multiple avenues potentially faced the primary care and CAS MET teams. These included unplanned events that resulted in 'detours' or 'loops' in the patient's perioperative continuum, with subsequent impact on organisational resources. Data on service trends for CAS WPO at larger Hospitals A and C, including for high-risk surgical patients, indicated threats to long term resourcing sustainability (Box 5.9). Hospitals B and C encountered patients with clinical deterioration, and relied on Hospitals A and C with full capacity CAS WPO, when necessary to accept care (Box 5.10)

The previous section presented evidence that revealed a progression from a predictable, reliable form of WPO for patients having low risk surgery, progressing ultimately towards an unpredictable, CAS WPO for highest risk patients. Highest risk patients had higher risk surgery, often semi-urgently or as an emergency and their recovery was influenced by the interacting nature of the multiple risk factors they faced, namely surgical, anaesthesia, comorbid health status and organisational. The following section addresses the third theme, unclear patient outcome measure.

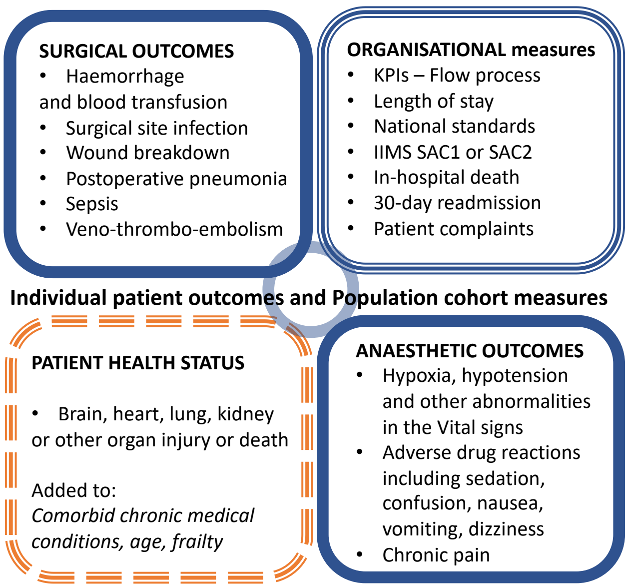
5.2.3 Unclear patient outcome measure

The third main theme for perioperative work practice and organisation around risk was an unclear patient outcome measure. The analysis of UPOM is presented in four parts. First, how participants described what constituted adverse outcomes for individual patients. Second, organisational population cohort measures are identified. Third, participants reported that there was a lack of availability of meaningful patient health outcome information. Fourth, evidence of individual and personalised understandings among participants of high-risk, based on direct observation of their patients coming to terms with perioperative complications or adverse outcomes.

5.2.3.1 Adverse outcomes reported by participants

First, participants connected their UHR with adverse patient outcomes (Section 5.2.1); the following presents participants' accounts of how they understood poor outcomes. Participant accounts of what constituted adverse outcomes for individual patients is summarised in Diagram 5.3. Interestingly, the same classification system for high-risk factors key elements namely, surgical, anaesthetic, patient comorbid health status and organisational (Diagram 5.2) could be applied to the reported 'adverse outcomes' constituents (Diagram 5.3). However, the important distinction was organisational measures were retrospective population cohort measures and did not address the impact on patients as individuals. In contrast to the three clinical key elements namely, surgical, anaesthetic and patient comorbid health status. Patient comorbid health status adverse outcomes were considered to be the cumulation of the surgical pathology, surgical and anaesthetic adverse events, added to a patient's pre-existing chronic medical conditions, frailty or age.

Diagram 5.3 Adverse patient outcomes and organisational population cohort measures, and their reported constituents



5.2.3.2 Organisational population cohort measures

Second, outcomes at the population level were collected and reported by the four hospitals, and addressed through various multidisciplinary committees and subcommittees, through multiple levels of governance from LHD to clinical floor. These population cohort level measures were understood to be retrospective and address organisational safety and quality processes, not the outcomes experienced by their individual patients.

However, the purpose and meaning of these organisational population cohort measures were not shared by clinicians and managers. These population cohort level measures were always listed in interviews with Executive and senior managers. Clinician-managers spoke less comprehensively of this category of 'outcomes' and, they were not commonly named by clinicians (Table 5.9).

Table 5.9 IDS: Examples of organisational population cohort measures reported by participants

Organisational measures	**Participants (Total=129)**
KPIs – cancellations on the day of surgery, surgery start times, prolonged PACU stay > 4-5hours, return to OT	23
Length of stay	24
National standards	
Clinical deterioration – CERS (Clinical Emergency Response system)	22
Hospital infection – prevention and control	19
Medication safety	13
Other Patient Safety Quality data e.g. Falls, Pressure Areas, Blood management	11
IIMS (Incident Information Management System) SAC 1 or 2 (highest Severity Assessment Codes)	23
In-hospital death	20
30-day readmission	20
Patient complaints	16

> *"I know return to OTs and death certificates to CHASM, SCIDUA, Coroners. National standards, directives, CEC – I chair or co-chair or am on CERS, Infection control, Blood management, Medication safety drug committee. There is also*

Falls, Pressure Areas that feed into the PSQC (Patient Safety and Quality Committee) *of the hospital which I chair. IIMS and SAC 1 and 2 are presented there. These are for organisational safety – add value to the day-to-day. It is not outcomes it is something else."*

Manager (5), Hospital D

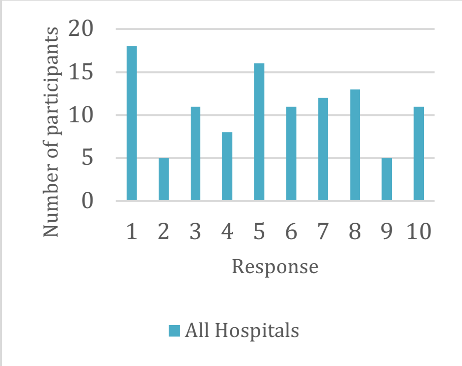
Senior Executive managers acknowledge a gap between the organisational population cohort measures they routinely use and a clear, direct patient outcome measure for individual high-cost high-risk patients having surgery. Instead, a range of surrogate measures, including patient complaints and hand-washing rates, are used to maintain quality and safety.

"High risk - the stuff that makes me nervous, … I have to rely on systems that are robust to provide good care for patients. I have to rely on, assume rather than can test it myself. Outcomes are important for gauging organisational culture. Subjectively, the frequency in which senior clinicians come and see me about issues, problems in relation to what is being done and being done to them (e.g. close 150 beds). At one hospital once per week is a good culture, so may have healthy robust discussions. At another one in 18 months that is a concern. Objectively, patient and carer feedback and complaints. What people are complaining about. Patient recommended score (PRS)– recent good evidence this correlates well with what is happening at the ward level for clinical care, workforce - staff turnover, financial. Lead indicators - Ministry of Health Service Level Agreements (SLA) – Falls, SAC 1 & 2 etc. Handwashing 48% in Operating Theatres is a serious concern "scary"; a surrogate measure of culture, attitude towards quality improvement."

Manager (1), Hospital A and B

Over one-third of participants (37%, 42/113) were unaware of the details of organisational key process measures for example, LOS (Figure 5.7). Similarly, an equivalent number were informed (36%, 41/113). The figures demonstrate the diverse understanding of these items.

Figure 5.7 SDS: Knowledge of key process measures



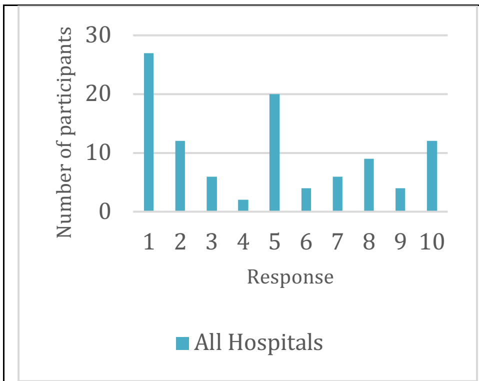
Responding to the question of knowledge of their patients that have had increased length of stay:

- 36% (41/113) agreed or strongly agreed
- 37% (42/113) disagreed or strongly disagreed

5.2.3.3 Lack of availability of meaningful patient health outcomes measures

Third UPOM was derived from individual clinicians and managers all reporting that high-risk signified the increased likelihood that a patient would suffer clinical deterioration, a serious complication or an adverse outcome (Tables 5.1 and 5.2). However, both clinicians and managers repeatedly reported a lack of meaningful outcomes data being available to them in their WPO context. The patient health outcome information that they did receive were often fragmented and unclear. Participants reported minimal to no feedback on performance for patient outcomes beyond immediate care. After a patient left the department or unit where the clinician and clinician-manager worked, a majority (over 73%) reported that they had no knowledge on the patient's progress or outcomes (Figure 5.8). Similarly, nearly two-thirds of participants strongly disagreed or disagreed that they were aware of the outcomes of patients that they had cared for (Figure 5.9).

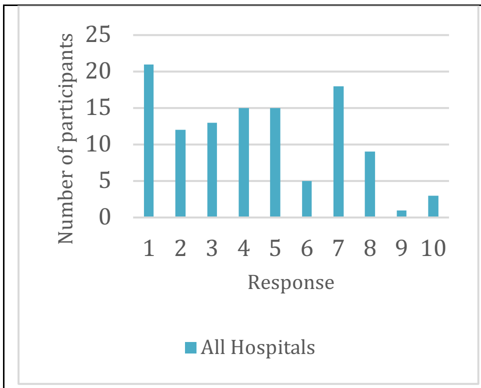
Figure 5.8 SDS: Knowledge of a patient's progress after patient leaves their department



Responding to the question of their knowledge of their patients' progress and outcomes upon leaving their department:

- **73% (82/113) disagreed, were neutral or answered 'not applicable'**
- 14% (16/113) participants strongly agreed

Figure 5.9 SDS: Knowledge of health outcomes for all their patients



Responding to the question:
"In my experience I know the health outcomes of all our patients"

- **63% (71/113) disagreed or strongly disagreed**

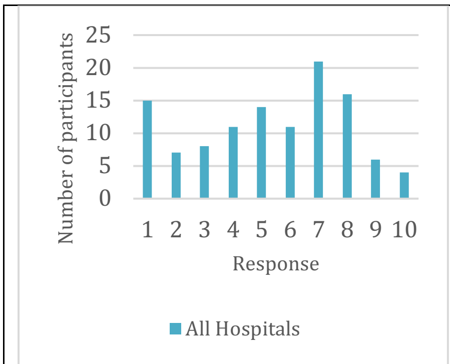
- **4% (4/113) strongly agreed**
- 24% (27/113) agreed

Few participants strongly agreed (4%) that they knew the health outcomes of all their patients (Figure 5.9). These were two surgeons and one senior nurse from Hospital B where patients often repeatedly returned over months or years for follow-up of chronic eye conditions. The other nurse was a clinical nurse consultant from Hospital A who had proactively collected data on all her patients herself.

> *"Outcomes … I can make time…collect my own data (set) … don't have the bandwidth beyond my own (project) data. If I don't hear, just presume everything is okay, I give all patients, family the phone number of my office.*
>
> Nurse (11), Hospital A

Participants were more likely to have knowledge of the high-risk patients they had cared for, for example, older and sicker patients that had surgery (Figure 5.10). However, less than half of participants said they knew these outcomes.

Figure 5.10 SDS: Knowledge of health outcomes for their high-risk patients



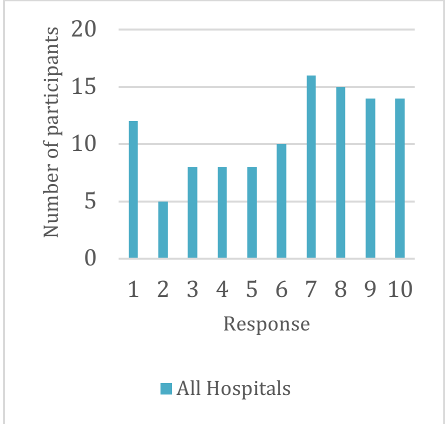
Responding to the question of knowledge of health outcomes for **high risk** – elderly and sick patients having surgery:

- **41% (47/113) agreed or strongly agreed**

- **36% (41/113) disagreed or strongly disagreed**

Just over half of participants (52%, 59/113) indicated that they knew if their high-risk patients had had clinical deterioration and an unplanned admission to critical care (Figure 5.11). Whilst nearly one third of participants (29%, 41/113) indicated that they did not have access to this knowledge.

Figure 5.11 SDS: Knowledge of patient unplanned admission to critical care

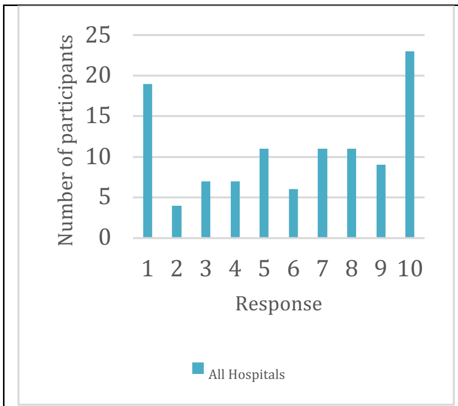


Responding to the question of knowledge of their patients that have had an unplanned admission to HDU and ICU:

- 52% (59/113) agreed or strongly agreed
- 29% (33/113) disagreed or strongly disagreed

Just under one half of participants (48%, 54/113) indicated that they knew if their high-risk patients had clinical deterioration and died in hospital (Figure 5.12). Whilst for one third of participants (33%, 37/113) this knowledge was unavailable to them.

Figure 5.12 SDS: Knowledge of patient death in hospital

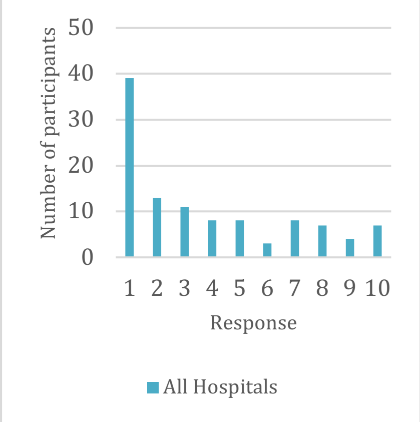


Responding to the question of knowledge of their patients that have died in hospital:

- 48% (54/113) agreed or strongly agreed
- 33% (37/113) disagreed or strongly disagreed

Significantly, nearly three-quarters (73%, 82/113) of participants did not know whether their patients had died within 30 days of leaving hospital after having surgery, despite having contributed significantly to their perioperative care (Figure 5.13). Nearly one-half (46%, 52/113) strongly disagreed, and a further one-quarter (27%, 42/113) disagreed that they had this knowledge, despite all participants having said they based their understanding of high-risk on adverse patient outcomes (Figure 5.13).

Figure 5.13 SDS: Knowledge of patient death within 30 days of leaving hospital



Responding to the question of knowledge of their patients that have died within 30 days of leaving hospital:

- **46% (52/113) participants strongly disagreed**
- 27% (30/113) disagreed, were neutral or answered ‘not applicable’

Participants interviewed across the professions and hospitals confirmed these items (Figure 5.8 – 5.13) and expanded on the lack of availability of health outcomes data for patients they have been responsible for. Participants reported minimal to no feedback on performance for patient outcomes beyond immediate care (Table 5.10).

The evidence presented in Table 5.10 revealed eight constituents for the subtheme of lack of availability of meaningful patient health outcomes. Box 5.11 summarises the key constituents and all the participants that responded similarly. Detailed interview data may be found in Appendix 6 Table 5.10 and Box 5.11. The findings included the following. Patient outcomes available were for immediate care only, either limited to during direct care for the patients before them or, limited to the time the patient spent in the participant’s ward or hospital. Patient outcomes were not received for the main part or, not at all or, in ad hoc meetings for example, coincidental conversations in the hospital corridors. Participants described the need to find or collect patient outcomes data themselves and that this was difficult due to lack of time and resources to collect data. Participants reported a lack of meaningful patient outcomes data, data sets were still poorly developed and not applicable for learning and quality improvement. Participants reported using surrogate outcomes for example, from the clinical literature or morbidity and mortality meetings.

Table 5.10 TDEQ: Lack of availability of patient health outcomes

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Lack of availability of patient health outcomes / Lack of access to meaningful patient health outcome measures	*"Outcomes? –* (shakes head)- *No don't get any. Ad hoc, all word of mouth, verbal or I just came across it. Or 'big data' from journal articles.* Anaesthetist (4), Hospital B and A *"Hospital daily ward round. Follow-up at 2 weeks, usually last review then back to GP* Surgeon (2), Hospital A *"A weak point is if patients do not turn up for the 2 weeks followup – we don't hear about what we don't hear about"* Surgeon (8), Hospital D *"Actually, a distressing part of our job, when bad things happen no-one tells you but you, as the anaesthetist is referenced. You find out incidentally, usually from another anaesthetist"* Anaesthetist (X), Hospital A, D *"I am not interested in the education of staff with outcomes, … the outcomes are good, I follow them up, I do as I like"* Surgeon (X), Hosp A, C or D	*"Wards are silos. Don't really know what is going on in the ward across the road from me. Maybe if there is an RCA going on … maybe find out in a corridor chat not official"* Nurse (22), Hospital B *"Outcomes important, informs practice. Outcomes for our ward – postop in hospital score 10/10, after discharge 2/10. Orthopaedic CNC to collect data but no CNC so no time for data collection, clinical workload. Doctors do some but not daily. Time consuming if done in pieces"* Nurse (31), Hospital C *"Don't follow up on adequately, QOL at 6M, 12M; no outcome data to reflect on. Our care can leave people with a lot of deficits, (we) don't know the impact on patients, family, society … ongoing harm or benefit.* Nurse (32), Hospital C *"Outcomes – nil after leaving ward, 'that's it' even if patient admitted to HDU"* Nurse (21), Hospital B	*"Know, mainly how patients are progressing in front of your eyes day-to-day. To be honest, not much out of ICU. Ad hoc, I would have to ask maybe in Rehab"* Physiotherapist (4), Hosp A *"None, only what we look for ourselves. PSQ – IIMS SAC 1 & 2 trends. Escalation of concern through family"* Speech therapist (1), Hospital D *"Very difficult to get patient outcome info, … Know number of interventions …Know patient outcome for SSIs – decrease SSIs, cases of resistant organisms"* Pharmacist (1), Hospital A *"90% no follow-up, don't know. In hospital – yes.* Physiotherapist (2), Hosp C *"Know from literature that adequate nutrition decreases wound infection LOS, but no objective day-to-day, case-by-case clinical data"* Dietician (2), Hospital C	*"Meaningful clinical outcomes, answer is 'NO' 'still got a way to go' "* Manager (11), Hospital A *"In infancy … using data to drive innovation and performance"* Manager (1), Hospital A and B *"Know outcomes – No, not in a meaningful way. LOS, unplanned readmission, death - yes, at 30 days maybe. LHD think dollars and KPIs"* Manager (4), Hospital C *"Data is so obtuse, difficult to get hold of, you really have to chase what you need"* Clinician-Mx.er (2), Hospital A *"None…More resources needed, on how best to deliver care. Data to engage teams, start the conversation, get the understanding."* Manager (12), Hospital B

Box 5.11 STC: Lack of availability of meaningful patient health outcomes information

Lack of availability of patient health outcomes key constituents of subtheme			Participant			
			Profession	**No.**	**Hospital**	**No.**
1.	Immediate care only	*"Outcomes – immediate whilst patient is with me"* *"Now, mainly how patients are progressing in front of your eyes day-to-day"*	Anaesthetist Nurse Physiotherapist Physician	15 14 1 2	A B C D	9 3 5 10
2.	Within department or hospital only	*"Outside ICU – outcomes are difficult, we are not looking at these outcomes except return to ICU"* *"We are an acute ward don't get to see what happens next"* *"Outcomes for our ward – postop in hospital score 10/10, after discharge 2/10"*	Nurse Physiotherapist Dietician Speechtherapist Physician	37 4 4 1 8	A B C D	13 12 12 12
3.	Do not receive much or at all beyond immediate care	*"Outcomes? - No don't get any.* *"When bad things happen, no-one tells you"* *"Outcomes less than 5%, I know sounds really bad, but no-one tells us"* *"Rarely get feedback"*	Nurse Junior doctor Anaesthetist Physiotherapist Dietician Speechtherapist Physician	35 8 14 4 4 1 8	A B C D	17 17 21 19
4.	Receive 'ad hoc'	*"Ad hoc, all word of mouth, verbal or I just came across it"* *"Maybe find out in a corridor chat not official"*	Anaesthetist Nurse	2 6	A B C	4 1 0 2
5.	Need to find on own	*"None, only what we look for ourselves"* *"It is up to the individual"*	Surgeon Anaesthetist Nurse Speechtherapist Physician Manager	8 15 16 1 6 1	A B C D	14 6 14 13
6.	Lack of resources	*"More outcomes would be ideal, but we are very stretched with time"* *"No budget for administrative support to collect and present outcomes"*	Nurse Anaesthetist Physiotherapist Dietician Speechtherapist Pharmacist Manager	4 15 1 1 1 1 1	A B C D	6 3 7 9
7.	Lack of meaning, capability.	*"In infancy … using data to drive innovation and performance"* *Don't drill down on your results enough, barrier to learning from outcomes"* *"Not a lot, some…"*	Surgeon Physician Manager	3 1 5	A B C D	4 2 3 1
8.	Use of surrogate outcomes	*"M&M – voluntary reporting, otherwise hard to find out"* *Or 'big data' from journal articles"* *"Know from literature that…"*	Surgeon Anaesthetist Nurse Physiotherapist Dietician Speechtherapist Physician Manager	9 14 0 2 2 1 3 1	A B C D	12 7 9 11

5.2.3.4 Participants’ insights from observing high-risk patient outcomes that were prospective, individual, experiential

Fourth, there was evidence of participants’ insights on high-risk based on their personal direct observation of prospective patient outcomes. Outcomes that emerged within their scope of care as some of their patients progressed through an episode of perioperative care. This was reported to be knowledge gained through participants’ direct observation of their patients coming to terms with perioperative complications or adverse outcomes.

These participants described high-risk as patients’ prolonged LOS in hospital living with deep infection of a surgical wound that is difficult to stitch up, limiting independence for example, in physical movement.

> *“Patients more likely to have a poor outcome, increased LOS, infections, problems with wound closure and leave hospital worse than when they come in, not getting their hopes”*
>
> Dietician (4), Hospital A

Participants considered how patients came to terms with their adverse outcomes.

> *“High risk is an outcome from surgery not beneficial to the patient … a complication post-surgery or mortality up to 30 days post-surgery, also quality of life, how a patient feels for example, to lose through intended ENT* (ear, nose, throat) *cancer surgery, an organ and function”*
>
> Nurse (17), Hospital A

Participants mentioned the emotional and social aspects of adverse outcomes.

> *“Patient reported outcomes and experience informs informed consent beyond the medical to seeing the patient as a whole e.g. for oesophagectomy patients they lose a lot of weight, not able to eat foods, not at family BBQs, Christmas*

dinner. Change to diet, eat this but the patient does not understand why, does not like taste, cannot tolerate volume, cannot feed themselves physically. With feeding tube can they continue to live at home independently?"

Dietician (4), Hospital A

Participants noted that outcomes were understood from distinct perspectives, appreciated differently between Executive managers, clinicians and the individual patient. From the patients' perspective, adverse outcomes could significantly alter quality of life, such as the ability to breathe comfortably doing minimal activity, to be pain-free, the ability to think clearly. Functions fundamental to independence.

"Outcomes are important, it depends on who you ask – the Exec or Patient or Clinicians. For the patient, has anything been achieved? What can they do post-surgery? Or is just life a certain way now because of fatigue or shortness of breath? Or post-surgery, anaesthesia, hospitalisation they may be muddled, have persistent pain, may not be the same cognitively again"

Physician (3), Hospital A

Participants reported on patients, not frequently but not uncommonly, deteriorating slowly and progressively over months whilst in hospital (including beyond the research setting) becoming increasingly more susceptible to further complications.

"We are doing too much stuff compared with thinking about quality of life – that is a big thing for us for example, this over 80 years old man, (has been) three months in ICU, can't wean off ventilator (patient cannot breathe for himself independently)*, deconditioning in ICU* (losing muscle mass and physical functioning)*, high risk of mortality in 12 months, cardiac surgery, iatrogenic* (relating to complications caused by medical treatment)*, family want to continue, feel guilty. It should be about achieving progress … There is always one patient like this in every ICU, depressing to see for clinicians …*

Physician (10), Hospital D

Participants observed periods of prolonged hospital stay followed by an anticipated prolonged convalescence, including a care level higher than home and the possibility of the inability to return home.

> *"A complication leads to malnutrition, sarcopaenia* (loss of lean muscle mass)*, immobility, further risk of complications. Quality of life, poor outcomes, inability to return home because cannot cope with stoma* (an artificial opening made into a hollow organ -gut or trachea to the surface of the body) *etc*"
>
> Dietician (1), Physiotherapist (1), Speech therapist (1), Hospital D

Several senior clinicians and clinician-managers raised the idea of 'non-beneficial' surgery in relation to the 'high risk' patient.

> *"Obviously, my brain goes to patient high risk – age and comorbidities and the consequences of going ahead with surgery and then unexpectedly being in ICU. Was the surgery appropriate?"*
>
> Clinician-Manager (13), Hospital A

> *"Patient factors – somebody with a high probability of a poor outcome or less than ideal outcome from their procedure and 'avoid-ability'. 'Avoid-ability' is an important part of that. 'Avoid-ability' is the opposite to intention. Harm can arise from an intended procedure.*
>
> Clinician-Manager (4), Hospital C

> *"The most difficult is the elderly patient (over 80's) having emergency surgery, GA* (General Anaesthesia) – *"why are we doing this?" but not to offer surgery is not an easy job so we support the surgeon and anaesthetist"*
>
> Physician (1), Hospital A

> *"An emerging risk is … the ability to do a whole lot of stuff, interventions offered or imposed onto patients, families and their ability to make good judgments.*

The appropriateness of care agenda – the very high-risk patient and non-beneficial treatments"

Manager (4), Hospital C

"Physicians should do advance care directives, as over 50% of our patients are elderly. From a patient's point of view, it sounds terrible to start the conversation in ED but physicians don't allow their patients to die. Is it 'end of life' or 'save the life'? "

Physician (6), Hospital B

5.3 Wicked complexity in gaps in fully comprehending high-risk

Evidence is provided for a "wicked complexity" arising from the work environment that has a more extensive impact on clinicians and managers, than UHR, WPO or UPOM impacting alone. The evidence for the complexity arising from at the intersections of UHR, WPO, UPOM is presented in three parts. First, for individuals caring for high-risk patients. Second, for interprofessional teams caring for high-risk patients. Third, for the broader organisation. Then at the conclusion of this section, the complexity arising at the intersections of all three UHR, WPO and UPOM will be summarised, defined and discussed as wicked complexity in gaps in fully comprehending high-risk. A wicked complexity that becomes increasingly apparent as WPO around risk progresses from a predictable, reliable linear system and approaches a CAS.

5.3.1 Wicked complexity at the intersections of understandings of high-risk, work practice organisation and unclear patient outcome measure

The following evidence will show that context was a background facilitator of gaps in fully comprehending high-risk for individuals, teams and the organisation.

5.3.1.1 For individuals caring for high-risk patients

A principal research finding is the wicked complexity in the learning gap, between individuals' high-risk definition and UHR, and an UPOM. Clinicians and those in management conceptualised high-risk differently based on their roles, responsibilities and education. All participants, irrespective of profession and seniority, understood and related high-risk in the perioperative period to an increased chance of the patient having an expected on unexpected clinical deterioration, complication or suboptimal health outcome such as vital organ failure. Yet individuals, across the professions and across the four hospitals reported a culture of general lack of availability of meaningful patient outcomes information beyond immediate care. Inadequate patient outcomes information was available to clinicians and managers in their working environment for them to fully comprehend high-risk.

At all four hospitals, clinicians and clinician managers were all observed to be dedicated, time poor, working hard at jobs with high precision demand. It was unpractical for individuals to address UPOM in their day-to-day work.

> *"I wish I could know beyond* (my ward) *but there is no … what is the right word, not time, not focus but I have moved onto something else, something more important I need to concentrate on"*

Anaesthetist (15), Hospital A and D representative of,

Individual clinicians, clinician-managers; Hospital A, B, C or D

The inter-related, interacting nature of the risk factors in their individual 'internal rubric' became most activated as the surgical complexity of care and comorbidities increased. Clinicians working understandings of 'high-risk' became most challenged when the patient's episode of care 'detoured' or 'looped' from the planned. Participants clinical reasoning and decision-making were most taxed when the chronic complex care surgical patient's condition was changing acutely before them in the postoperative period or afterhours.

The high-risk key elements and their multiple constituents were difficult to comprehend, learn and teach, and communicate accurately to other clinician colleagues.

"The ASA score is dated, an inaccurate guide e.g. it does not include …. Need to identify these cofactors. How to communicate risk accurately to colleagues, a big problem, … and to patients, families. How to imagine how you would learn that, how to interpret that."

Clinician-Manager (3) Anaesthetist, Hospital A

High-risk was also challenging to communicate to high-risk patients and their families; an important part of the informed consent and 'shared decision making' process.

"Surgeon sees the risk, patients cannot really grasp the risk, can't really know the journey. The aim should be 'high good' optimal outcome, target intense effort through thorough workup"

Surgeon (1), Hospital A

"For Geriatricians, it is … delirium, acute surgery, some surgical procedures, and the social aspects, the consequences of complications. Technically we are now very good at keeping people alive … In elective surgery doctors need to be clear 'what are your aims?' … There should 'ceilings of care' – doctors do not have to provide care (surgery) if we know we should not be doing them, despite patient's and family expectations."

Physician (14), Hospital D

For individuals, juggling how to improve patient care, UHR, UPOM and WPO was well summarised in the following exemplar quote from a senior clinician.

Maybe I, we could get outcomes from the surgical team … but I guess they are busy. It is not the culture, working at different facilities on different days difficult to follow up on patients in a timely way. Annoyed when I find out third hand when there is a loss opportunity to contribute to care or advice. We are an important part of the team so should be kept in the loop. Third hand - usually another anaesthetist or nurse, or someone not involved with the case at all.

> *Don't need to have a pat on your back for everything. It is a high bar. Also, denial is bliss. Not knowing is less stressful.*
>
> Anaesthetist (5), Hospital A and B

Individuals reported minimal to no feedback on performance for patient outcomes beyond immediate care.

5.3.1.2 For teams caring for high-risk patients

Members in the interprofessional team around a single patient, were consistently observed to increase in number, specialisation and diversity, when the high-risk patient's episode of care 'detoured' or 'looped' from the planned (Figure 5.6). For example, complexity of care for Patients 2, 3 and 4 in the vignette for high-risk surgery (Box 5.7). The combined knowledge of the interprofessional team was most enacted when the inter-related, interacting nature of the patient's multiple risk factors became increasingly complex, and the patient's condition was changing acutely before them. For example, a physician referred the patient to the surgeon who referred on to an anaesthetist who referred to a cardiologist or geriatrician. The high-risk knowledge pooled, was the increasingly deep specialty specific clinical detail on particular risk factors, and how best to manage them. It was understood that clinicians within interprofessional teams conceptualised high-risk differently based on their roles, responsibilities and seniority, and no single discipline had the complete picture.

The interprofessional teams caring for high-risk surgical patients often consisted of 'one-off teams'. 'One-off teams' of individuals came together to solve a problem in the patient's care. Whilst similar professional groupings made up the interprofessional teams, the individual clinicians involved across all the professions at Hospitals A, C and D varied with rostering, particularly afterhours in the wards. The potential combinations of individuals increased when complexity of surgical care progressed to CAS, and MET were called to manage risk and rescue from clinical deterioration. The work environment relied on 'one-off teams' rather than solely on stable team formations.

Box 5.12 is a documents amalgamation for Patient 4 from Box 5.7, displaying some of the multiple different team formations that provided his patient-centred care.

Box 5.12 DA: Stable team and 'one-off' team formations for Patient 4 from Box 5.7

Team formation	Function
Stable team (short term) – Senior surgeon (1), Senior anaesthetist (1), Operating theatre Scrub and Scout nurses	Surgery (1): Resection of right lobe of liver for cancer
Stable team (short term) – Senior surgeon (1), Critical Care Physician (1) and ICU team	Postoperative ICU level care
Stable team (continual)– Senior surgeon (1) and surgical team including junior doctors; ward nursing team and allied health team (physiotherapist, dietician, pharmacist)	Postoperative ward care
'One-off team' – MET (1) (short term) – intensive care registrar and nurse	Rescue from clinical deterioration
New stable team (short term) – Senior surgeon (1), Critical Care Physician (2) and ICU team	Resuscitation and physiological support for sepsis; diagnosis and treatment pf sub-diaphragm multiloculated collection
New stable team (short term) – Radiologist (1), Anaesthetist (2), radiology team	Drainage sub-diaphragm multiloculated collection
Stable team – (continual) Senior surgeon (1) and surgical team including junior doctors; ward nursing team and allied health team (physiotherapist, dietician, pharmacist) plus daily review by Geriatrician (1) (including to manage fluid status and heart failure) and Infectious Diseases physician (1)	Postoperative ward care
'One-off teams' (x3 Afterhours)– MET (2,3,4) (short term) – cardiology registrar and nurse	Rescue from clinical deterioration – infection, sepsis, delirium
'One-off team' – MET (5) (short term) – cardiology registrar and nurse	Rescue from clinical deterioration – aspiration pneumonia (recurrent)
New stable team – (short-term) Senior surgeon (2), Senior anaesthetist (1), Operating theatre Scrub and Scout nurses	Surgery to prevent recurrent aspiration pneumonia
Stable team (short-term) – Senior surgeon (1), Critical Care Physician (3) and HDU/CCT team	Postoperative HDU level care
Stable team – (continual) Senior surgeon (1) and surgical team including junior doctors; ward nursing team and allied health team (physiotherapist, dietician, pharmacist) plus daily review by Geriatrician (1) (including to manage fluid status and heart failure)	Postoperative ward care

The succession of 'short-term' and 'one-off' teams created gaps for clinicians, clinician-managers and managers in fully comprehending high-risk together. Furthermore, teams were observed, and individuals confirmed, that teams received minimal to no feedback on performance for patient outcomes beyond immediate care.

5.3.1.3 For the organisation

Evidence for wicked complexity at the intersections of UHR, WPO, UPOM for the organisation is presented in three parts, all relating to threats to service sustainability.

First, the statistical modelling of the LHD Directorate of Planning, Population Health and Equity - Technical papers for Hospital A or C Redevelopment identified that the high cost complex care surgical patient would require a 30% increase in hospital bed numbers from current by 2027.

> *"A subset of predominantly surgical inpatients are those requiring high cost and complex care…identified as National Weighted Activity Unit (NWAU) of 3 or higher… Of these high cost and complex patients in 2013/14: more than 98% were surgical patients; more than 60% were planned admissions; people aged 70 years and older accounted for nearly 40% of separations and slightly more than 40% of bed days … By 2027, using base case scenario, high cost and complex separations are expected to remain constant, but with an increase to nearly 37,000 bed days, equating to an increase (from nearly 90 beds) to 117 beds (assuming 85% occupancy rate) … In comparison to other inpatient activity these high cost and complex patients are projected to have more than double the average length of stay (10.7 days for high cost and complex patients versus 3.9 for all other acute patients)"*
>
> (LHD 2015b p19)

Second, the statistical modelling of clinical emergency response services charged with managing NSQHS standard 8, in a monthly report to hospital Executive managers and the LHD. The CAS WPO that high-risk surgical patients relied on had increasing demand for its services and were facing resourcing challenges.

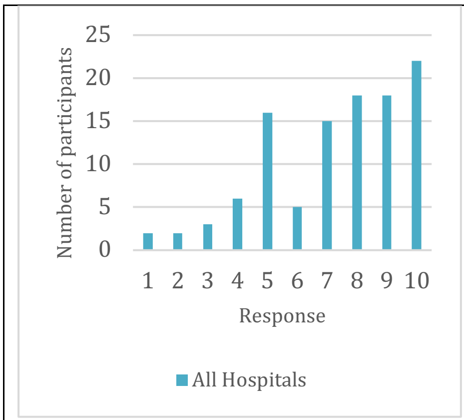
"<u>MET trends Oct 2018</u>:

- *More than 28 MET calls per day (double that of 2 years ago) and increasing*
- *1-2 Cardiac arrest calls per day*
- *Almost 50% Cardiac arrest calls resulted in HDU/ ICU admission*
- *Main reasons for MET activation – respiratory distress/ desaturation, decreased level of consciousness, hypotension, seizures; often associated with sepsis. Also, an increase number of stroke calls.*
- *Top 5 wards attended included 2 surgical wards (that was in the 75% of hospital surgical ward beds that were not HVSSS)*
- *16% of cardiac arrest calls required the MET to attend for over an hour stabilising/ treating the patient. Taking the MET senior doctor and senior nurse away from their home ward (cardiology, ED or ICU) and home Ward duties.*
- *Single MET team per shift, and increasing reports of simultaneous MET calls, in different parts of the hospital, for different patients*

Conclusion – Current model of care will not be sustainable with growing campus"

Third, the majority of clinicians and clinician-managers said that they personally contributed to decision-making on resource use, both their own and that of the organisation, based on their knowledge of each patient's clinical needs or risk (Figure 5.14). This is a wicked complexity for the organisation as the research has found, at the intersections of UHR, WPO for high-risk patients, and UPOM there is a gap in fully comprehending high-risk for individuals, teams and for those in Executive management.

Figure 5.14 SDS:Participant's knowledge of risk informed their choices on resource use



Responding to the question that the participant feels that they make a contribution to decisions made to use resources based on each patient's needs:

- **65% (73/113) agreed or strongly agreed**
- 12% (13/113) disagreed or strongly disagreed

At the intersections of the main themes, at multiple levels of care, across all four hospitals, across all professions and seniority, the evidence has shown that a wicked complexity embedded deep in context, arises and is maintained. A wicked complexity in gaps in fully comprehending high-risk arises as perioperative WPO transitioned from a high volume predictable, reliable linear system and approached an increasingly complex adaptive system.

5.4 Conclusion

In this chapter the research evidence on the WPO around risk has been synthesised into three themes. Namely, clinicians' and managers' understandings of high-risk, perioperative work practice organisation and an unclear patient outcome measure. At their intersections, further complexity arises. As perioperative WPO progressed from a linear to a complex adaptive system, a wicked complexity in gaps in fully comprehending high-risk arises. That is a complexity that was unintended, modern and exacerbated by the behaviours in the practice environment. Hospitals need to continue to meet the public demand for safe quality surgery whilst addressing resource constraints and improving productivity. To this end, addressing the work practice organisation around the high-risk high-cost complex care patient that threatens the sustainability of surgical services is important. The next chapter examines what individuals, teams and the organisation require to implement emerging perioperative models of care for the high-risk patient.

Chapter 6 Workforce learning, communication and collaboration for high-risk surgical patients

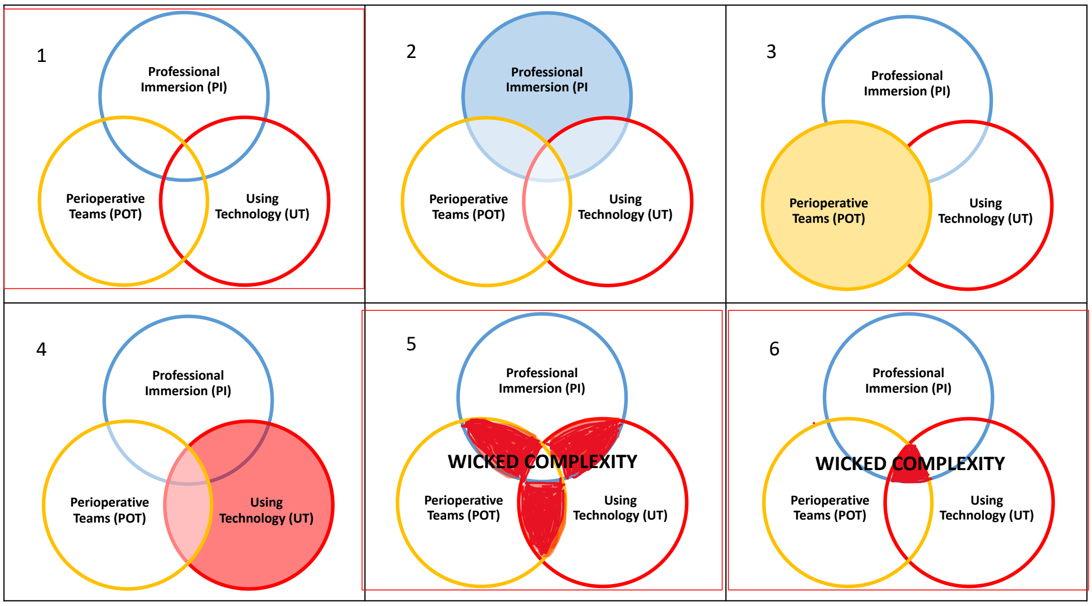
6.1 Introduction

This chapter aims to answer research question 3: *What do individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient?* To answer this question, this chapter investigates the interprofessional setting for workforce learning, communication and collaboration.

The structure of the chapter is based on the three main findings that address high-risk models of care namely, learning through professional immersion (PI), perioperative teams (POT) and using technology (UT). Professional immersion is the process that individual clinicians and managers follow in order to develop their expertise in understanding and managing high-risk patients. The nature of sharing high-risk knowledge and skills in perioperative teams, was primarily through contributing detailed profession specific expertise. Perioperative team orientation for individual clinician and managers was both uni-disciplinary and multidisciplinary, and team roles were stationary or boundary crossing. Access to integrated detailed clinical information was enabled by the new electronic medical record (eMR) used in conjunction with some paper records. The situation at the intersections of PI, POT and UT gave rise to an unintended wicked complexity in gaps in perspective. That is, professional expertise grounded in a wicked complexity arising simultaneously from: developing detailed profession specific knowledge and skills, parallel working in a multidisciplinary team context and, technology both connecting and separating information exchange and understanding.

Diagram 6.1 presents the evidence in a series of six Venn diagrams (VD). The three main themes are PI in *blue*, POT in *yellow*, and UT in *red* circles (VD1). The following sections of this chapter examine each of the themes in turn (VDs 2-4) followed by what occurs at their intersections (VDs 5 and 6). At the intersections of the main themes, a wicked complexity arises, that is, a complexity in gaps in perspective that was unintended. The focus on detailed profession specific knowledge, necessary for high-risk patient care, obscured interprofessional team learning and seeing the patient holistically, and was facilitated by the behaviours and technology of the practice environment.

Diagram 6.1 The structure for presenting the evidence to answer research question 3



6.2 Evidence of professional immersion, perioperative teams, and using technology

This section presents the evidence on the process that clinicians and managers described undertaking to learn about high-risk, and their experiences of being in perioperative teams and using technology in caring for high-risk patients. The detail of individuals' process for developing high-risk knowledge and skills is now presented.

6.2.1 Professional immersion

The first main theme for workforce learning, communication and collaboration was that clinician and managers reported developing their high-risk knowledge and skills in professions. This learning was through four inter-related means namely, personal workplace experience, professional qualifications, professional practice and professional peer learning. Tables 6.1 and 6.2 presents participants' descriptions of their learning processes and reveals the interrelatedness and importance of all four learning modalities.

> *"Self-directed learning focusing on the care of the patient … a continuing evolution of studies from anaesthetic training time to continuing medical*

> *development, conferences and workshops … a normal part of our practice to extend our knowledge"*
>
> Anaesthetist (5), Hospital B

Learning through personal workplace experience was supplemented by other forms of profession-based learning and directed towards improving practice or obtaining qualifications.

> *"AQAM* (within profession morbidity and mortality meetings)*, ANZCA* (College of Anaesthetists) *training program, textbooks and 'hand-me-down' notes, weekly-biweekly tutorials… but they need to be relevant to practice, would it change my practice? … or do I need it for exams? … otherwise what is the utility?"*
>
> Anaesthetist (2), Hospital A

As individuals, practicing their profession in the workplace was considered by all participants to be the most important opportunity for developing their high-risk knowledge (Table 6.1). Some participants further compared the effectiveness of active participation in the workplace to other modalities for learning high-risk (Box 6.1).

Box 6.1 STC: Distinguishing between means of knowledge development

Descriptor	Participant
Active participation in the workplace was considered more important than:	
Remote professional programmes, conferences, courses	Surgeons (2) Hospital A, (6) Hospital C; Anaesthetist (4) Hospital (B); Nurses (37) Hospital C, (26,27) Hospital B; Clinician-Manager (3) Hospital A; Manager (12) Hospital B
Research	Clinician-Manager (3) Hospital A
Textbooks	Physician (2) Hospital A
Training in the simulator	Anaesthetists (4) Hospital B, (6) Hospital C (1) Hospital A; Physician (10) and Nurse (23) Hospital C; Clinician-Manager (5) Hospital D
Watching technical procedures on 'YouTube'	Surgeons (2) Hospital A, (3) Hospital B, (7) Hospital C; Anaesthetists (1), Hospital A, (4) Hospital B
Professional peer learning	Anaesthetists (8) Hospital C, (13) Hospital D; Surgeon (6) Hospital C; Physician (2) Hospital A

High-risk learning endures after participants became fully qualified consultants; that occurred primarily between peers (Box 6.1, Tables 6.1 and 6.2).

Table 6.1 IDS: High-risk knowledge development – Professional Immersion

Theme	Subtheme	Key concepts	Number and % respondents for each concept by Hospital participant. Total (n=129)								Number and % respondents for each concept by roles. Total (n=167)							
			Hospital A (n=37)		Hospital B (n=27)		Hospital C (n=34)		Hospital D (n=31)		Doctor (n=56)		Nurse (n=61)		Allied Health (n=12)		Manager (n=38)	
			No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
High-risk knowledge development – as an individual – Professional Immersion	**Workplace experience**	Personal work experience and exposure was of paramount importance	37	100	27	100	33	97	31	100	56	100	61	100	11	92	38	100
		Time needed participating in the practice context to learn what was standard and normal or not	37	100	27	100	34	100	31	100	56	100	61	100	12	100	38	100
	Professional qualifications	Professional training and qualifications, continuing professional development	31	84	23	85	28	82	26	84	56	100	40	**66**	8	**67**	38	100
	Professional practice	Importance of 'scaffolded' learning, gaining greater independence from exposure to increasingly challenging cases within a profession	25	**68**	18	**67**	23	**67**	16	**52**	37	**66**	37	**61**	7	**58**	27	**71**
		Time needed to gain familiarity with complicated new procedures with increased precision demand	29	78	20	**74**	28	82	21	**68**	43	77	42	**69**	7	**58**	0	**0**
		Learning from juniors' questions; or for new technology 'expert-novice reversal'	8	**22**	3	**11**	8	**23**	6	**19**	17	**30**	8	**13**	0	**0**	0	**0**
	Peer Learning	Within profession discussion of challenging cases	33	89	21	78	31	91	23	**74**	43	77	48	79	12	100	26	**68**

6.2.1.1 Workplace experience

The focus for the individual clinician and clinician-manager was on learning profession specific detailed knowledge whilst seeking to work in a multi-professional team context. Participating in this workplace context was regarded by all to be the most important enabler to developing high-risk knowledge.

Table 6.1 shows that for learning high-risk, almost all participants (99%, 128/129) considered gaining personal workplace experience with new or increasingly challenging cases to be of highest educational value. Across all hospitals and multidisciplinary professions, participants found that these opportunities for 'learning by doing' was the most impactful and all agreed that a period of time spent participating in the practice context to learn expectations, behaviours and norms was critical.

As indicated in Table 6.1 for other forms of learning high-risk, some participants show a lower level of agreement (less than 75%) highlighted in 'Bold'. For example, in relation to professional qualifications: whilst all doctors and managers (100%; 56/56, 38/38 respectively) consider their attainment important for high-risk learning; nurses and allied health professionals show lower levels of agreement (66% and 67% respectively). In the case of professional practice: whilst the majority of clinicians (doctors, nurses, allied health) particularly at the larger tertiary Hospitals A and C (range 58% - 82%) considered the importance of time needed to gain familiarity with complicated new procedures or technology requiring increasing precision demand; no managers considered this to be in an issue for their high-risk learning. In contrast to some doctors (30%) and nurses (13%); no managers or allied health professionals reported learning how to use new technology from juniors or learning whilst teaching novices. In the case of peer learning the level of agreement was high for the majority of participants: clinicians (doctors 77%, nurse 79%, allied health 100%) particularly at Hospitals A and C (89% and 91% respectively), considered within profession discussion of difficult cases important to high-risk learning; managers show slightly lower levels of agreement (68%).

Professional qualifications for learning high-risk was uniformly considered important by the majority of participants across the four hospitals A, B, C, D (84, 85, 82, 84%). Similarly, for over two-thirds of participants, across the hospitals and professions, professional practice and professional peer learning were also considered integral. However, both accumulated personal work experience and increasing exposure to new challenging cases, skills or circumstances were considered key to knowledge development. Such exposure was necessary to learn risk mitigation strategies and how best to recognise and manage adverse events.

> *"Clinical experience and exposure are the most important. They are different. Experience is what you have gained from working e.g. previous experience in ICU, General Medicine. Exposure means you have the experience of similar, but the new exposure or case has an added complexity that you have not met before. For instance, all cardiac arrests and deteriorating patients are not the same - depending on age, comorbidities etc."*
>
> Nurse (50), Hospital D

Two features were considered integral to the subtheme of workplace experience and exposure. First, active participation that is working, and not just observing, in the practice context. Box 6.2 summarises the key descriptors for active participation.

Box 6.2 STC: Descriptors for active participation in the workplace

Descriptor	Participant
"Learning from doing … in different settings"	Manager (1), Hospitals A, B; LHD; Surgeons (3) Hospital B, (7) Hospital C; Anaesthetists (2) Hospital A, (5) Hospital B; Physicians (9) Hospital C, (6) Hospital B; Nurses (44) Hospital D, (30) Hospital C, (23) Hospital B, (5) Hospital A]; Physiotherapists (2) Hospital C, (3) Hospital B; Dieticians (4) Hospital A, (3) Hospital B; Speech Therapist (1), Hospital D]
"learning from caring for patients … and practice"	Anaesthetists (2) Hospital A, (10) Hospital D; Surgeons (3) Hospital B, (6) Hospital C; Junior doctors (5,6) Hospital C
"learning how things work in the everyday"	Nurse (6) Hospital A; Junior doctors (5,6) Hospital C; Anaesthetist (14) Hospital D; Manager 11, Hospital A
"hands on", "trial and error"	Nurse (30) Hospital C; Managers 1, 2, 6, Hospitals A,B,C,D LHD
"learn from mistakes"	Nurses (5) Hospital A, (30) Hospital C, (43) Hospital D; Anaesthetists (2) Hospital A, (11, 13) Hospital D

Second, a certain period of time in the practice setting was needed to learn their role, gain familiarity in the practice setting and develop technical or managerial expertise. For junior doctors to learn their roles and adapt to new surgical or medical specialty terms, it took some time to become familiar with what was not high-risk, for a pattern of high-risk to emerge.

> *"It takes about six to seven weeks into each new rotation to learn what is happening, what to do, recognise patterns of signs. By that stage no patient will have something I haven't seen before…so no new presentations… and the management plans are clear" ….*
>
> Junior doctor (5), Hospital C

Table 6.2 provides exemplar quotes across the professions and hospitals describing the weeks or months required to see patterns in a new practice setting, "*to learn to predict … and prevent disasters"* and the years in professional practice to develop expertise. The experience of workplace learning described by clinicians applied equally to managers in the hospitals.

> *"Experience, trial and error, takes eighteen months to two years to fully understand a service and then be able to plan ahead, be conscious when the starting of something bad may happen"*
>
> Manager (6), Hospital C

Time was needed for clinicians and those in management to understand their context of practice, and also to understand themselves in their context of practice.

> *"First five years managing – observing … I was like a sponge, next 5 years 'trial and error' last few years, know myself, comfortable enacting my philosophy… know the system…organisation…the best way of succeeding"*
>
> Manager (1), Hospital A, B; LHD

Table 6.2 TDEQ: Knowledge development as individuals in professions – Workplace experience

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Personal work experience and exposure in the practice context was of paramount importance	*"Learn from caring for the patient … and practice … "* Anaesthetist (2), Hospital A *"Clinical experience – learn to pre-empt problems"* Surgeon (1), Hospital A *"Learning focusing on the care of the patient … a normal part of our practice … "* Anaesthetist (5), Hospital B *"RACS (College of Surgeons) training, and I have been at Hospital C, since a medical student, so done all the jobs over the years"* Surgeon (7), Hospital C *"Learning from previous role … and tapping into what already exists"* Physician (9), Hospital C *"Learn from the patients I care for"* Anaesthetist (10), Hospital D	*"Postgraduate certificate but mainly practical, on the floor doing everyday … Learning from making mistakes and reflecting"* Nurse (43), Hospital D *"Learn by being here, learn from mistakes, hands-on, trial-and-error because with (major) trauma (and brain injury) every individual patient is different, can't learn from a book".* Nurse (30), Hospital C *"Experiencing a new case, a case new to me"* Nurse (16), Hospital A and C *"Day-to-day managing …"* Nurse (21), Hospital B *"Original studies at nursing school … but acquiring experience is of much greater importance. Learning how things work in the everyday."* Nurse (6), Hospital A	*"Years of experience and exposure to increasingly complex patients … from the various wards to ICU … to help you develop your assessment, to predict disasters before they happen and prevent them."* Dietician (4), Hospital A *"Experience based 80-90%, going through the physiotherapy rotations"* Physiotherapist (3), Hospital B *"50:50 Formal studies and … experiential for learning – rotate through general surgery ward versus orthopaedic ward versus etc"* Physiotherapist (2), Hospital C *"Learning how to prioritise what is best for the patient as an individual, including in case conferences with other Allied Health specialties"* Dietician (1), Hospital D	*"Learning from doing in 3-5 different settings"* Manager (1), Hospital A, B; LHD *"Trial and error, numbers of exposure to different problems "* Manager (2), Hospitals A,B,C,D LHD *"Learning – being in roles and dealing day-to-day with situations, develop and grow and expand your focus."* Manager (11), Hospital A *"Eighty percent from experience, the people that you work with…Twenty percent postgraduate studies…"* Manager (12), Hospital B *"Experience, trial and error"* Manager (6), Hospital C *"Experience through work training and completing fellowship"* Manager (5), Hospital D

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Time needed participating in the practice context to learn what was standard or normal and what was not	*"Takes about six to seven weeks into each new rotation to learn what is happening, what to do, recognise patterns. Even as a senior junior doctor"* Junior doctor (6), Hospital C *"I am in first year, not enough experience …I want to know about … unacceptable outcomes"* Anaesthetist (14), Hospital D	*"Takes about a year to work out the lay of the land"* Nurse (28), Hospital A and C *"Learn? – I have lived in the role … I have been in the system a long time picking up cues from patients and staff, who needs help, recognising patterns, observing and direct clinical"* Nurse (33), Hospital C	*"A big process (over 14 years): I started at the bottom like everyone else, fell into ICU - Initially it was a 'baptism of fire' - now I am a Physio. Consultant, clinically being able to bring it all together".* Physiotherapist (4), Hospital A *"Seven years in Hospital A, informs Hosp B secondment"* Dietician (3), Hospital B	*"Takes 18M - 2 years to fully understand a service and then be able to plan ahead, be conscious when the starting of something bad may happen"* Manager (6), Hospital C *"Backbone is a strong senior nursing group but now they are more junior, so numbers the same but care watered down"* Anonymous, Hospital B

Table 6.3 TDEQ: Knowledge development as individuals – Professional training and qualifications

Subtheme	Doctors	Nurses	Allied Health	Managers
Professional training and qualifications, continuing professional development	*"RACS College of Surgeons … for all surgical registrars… Accredited RACS ENT registrars on Tuesdays get to go to 'snot school' – get theory, study a topic…."* Surgeon (3), Hospitals A and B *"College training and CPD"* Anaesthetist (6), Hospital C *"Formal learning, College, CPD, Masters Medical Education (simulation)…"* Physician (10), Hospital D	*"Undergrad. and postgrad. plus, Hospital and LHD courses study but experience is most important, HD (high distinction) in essays doesn't make you good in scenarios. Need exposure, learn through trial and error"* Nurse (49), Hospital D	*"University (undergraduate) and I am doing a Masters in Physiotherapy"* Physiotherapist (2), Hospital C *"Speech pathology … undergraduate … Australian society of speech therapists"* Speech therapist (1), Hospital D	*"Education – undergraduate clinical profession, Masters Health Service Management, a number of graduate certificates I felt would be useful"* Manager (1), Hospital A, B; LHD Names undergraduate clinical, College qualification, Masters Public Health, Law degree - *"it's like school you think you didn't learn anything, but it is up there somewhere* (points to their head)*"* Manager (2), Hospitals A,B,C,D LHD

6.2.1.2 Professional qualifications

The importance of professional training, acquiring the skills and qualifications of a profession, and continuing professional development was noted by over 80% of participants across the four hospitals (Table 6.1). Doctors (100%) and managers (100%) mentioned professional qualifications and affiliations more often than nurses (66%) and allied health professionals (67%). (Tables 6.1, 6.3).

6.2.1.3 Professional practice

Professional practice was characterised by a within profession scaffolding of learning in the practice setting, whereby the novice or junior learned and gained greater independence through exposure to increasingly challenging cases, whilst supervised by a senior colleague. Across the hospitals and professions, around two-thirds of participants described the importance of this process during their training and in the early years after attaining their qualifications.

Appendix 7 Table 6.4 presents a thematic display of exemplar quotes on the subtheme of professional practice. In Appendix 7 Table 6.4, professional practice is presented based on two hierarchical levels: firstly, from the perspective of the novice or intermediate, learning the profession and, secondly, from the perspective of the expert, responsible for teaching the profession.

The responsibility for teaching and learning high-risk primarily occurred within the educational structures of each profession. The interpersonal relationships established in learning and teaching high-risk within a profession were hierarchical. A common response was received to the question: ‘how do you learn, understand, communicate and manage high-risk perioperative patients?’, that is:

“Senior physiotherapists”

Physiotherapist (4), Hospital A
Physiotherapist (3), Hospital B
Physiotherapist (2), Hospital C
Physiotherapist (1), Hospital D

"*Senior dieticians*"

Dieticians (4), Hospitals A
Dieticians (3), Hospitals A, B

"*Senior pharmacists*"

Pharmacist (3), Hospital C

The hierarchical structure of the surgical, and other professional, teams was one of interdependence in roles and responsibilities for patient care in the operating theatres and hospital wards. The senior or consultant surgeon held highest seniority, then the surgical Fellow, the surgical Registrar, the junior doctor resident medical officer (RMO). Trainees, junior clinicians, clinical educators and managers most commonly described scaffolded learning and teaching in professional practice. As the quotes below demonstrate:

"My teaching responsibility is that they are safe by the end of the term for… Surgical Fellows need to do safe operations. Surgical registrars, rely on them to see the not-standard, to notice deterioration that is their main role on the team, … the RMOs (junior doctors) are still undifferentiated and I am not very demanding of them, they should just enjoy the term"

Surgeon (6), Hospital C

"Registrar oversees the ward junior doctor looks after the ward and updates registrar if patient deteriorating and can initiate simple investigations and pathways. Registrar is there to support and teach. Senior surgeon decides on the important care steps"

Surgeon (3) Hospital A and B

The interpersonal relationships established in learning and teaching high-risk were enduring in the hospital context. They were established early, and determined by, the framework and networks of professional qualifications and continuing professional development.

> *"I am in first year, not enough experience … I don't really learn from the patient but from senior anaesthetists …I want to know about … what are unexpected outcomes* <u>*and*</u> *because I am in first year, what are unacceptable outcomes (for high-risk patients)"*
>
> Anaesthetist (14), Hospital D

Work experience allowed iterative learning to distinguish whether an adverse outcome was just 'unexpected' and not predictable, or predictable and thus 'unacceptable' due to below standard care. Senior colleagues within the profession were the teachers and considered the benchmark.

> *"Learn from individual consultants…. Learn from making small mistakes … after hours … (when I can be) more independent"*
>
> Anaesthetist (2), Hospital A

> *"Buddy system, senior staff teaching less experienced"*
>
> Nurse (16), Hospital A and C

The interpersonal relationships established in learning and teaching high-risk within a profession were hierarchical and had implications for profession and career advancement.

> *"Mentoring from senior nurses NUMs, they groomed me for the role"*
>
> Nurse (17), Hospital A

Interpersonal high-risk clinical learning and teaching was practical and face-to-face; it could not be learned through reification of knowledge.

> *"Managing risk is not recording clinical variance … clinical pathways variance is not knowledge of what to do. The teaching and learning from senior RNs (nurses) is more important e.g. what to do with a deteriorating patient. Some things are just not written down on a clinical pathway."*
>
> Nurse (22), Hospital B

For novices and intermediates learning high-risk, an important experience, often described as inherent to professional practice, was having the opportunity to develop greater work practice independence whilst having a senior within the same profession to call for advice. Across professions and settings, this was commonly reported (Box 6.3).

Box 6.3 STC: Opportunity to practice patient care whilst supported within a profession

Descriptor	Participant
"The opportunity to think for myself"	Anaesthetists (2) Hospital A; Junior doctor (1) Hospital A; Surgeons (3) Hospital B, (7) Hospital C; Nurses (16) Hospital A and C, (17) Hospital A
"I get to examine patients myself"	Junior doctors (1) Hospital A, (5, 6) Hospital C, (7,8) Hospital D; Anaesthetists (2, 3) Hospital A, (9) Hospital C, (14, 15) Hospital D; Surgeons (3) Hospital B, (7) Hospital C
"I get to … figure things out"	Junior doctors (1) Hospital A, Anaesthetists (2, 3) Hospital A, (9) Hospital C; Surgeons (3) Hospital B, (7) Hospital C; Physician (7) Hospital B; Nurses (16) Hospital A, (18) Hospital B; Physiotherapists (2) Hospital C; (3) Hospital B
"learn from making small mistakes"	Anaesthetist (2) Hospital A, Surgeon (7) Hospital C, Nurse (4) Hospital A, Physiotherapist (4), Hospital A; Manager (3) Hospital B
"learn from my and others' mistakes"	Manager (3) Hospital B; Nurses (3, 4, 5) Hospital A
"when I can be more independent"	Anaesthetists (2, 3) Hospital A, Junior doctor (1) Hospital A; Surgeon (7) Hospital C; Nurses (17) Hospital C, (16) Hospitals A, C
"when I get to be acting in-charge"	Nurses (3, 4, 5) Hospital A, (21) Hospital B; Physiotherapist (1) Hospital D

Supervision and scaffolding the learning of the novice, with the appropriate amount of support to extend the learner's knowledge and clinical independence was considered important across the clinical professions and hospitals. Surgeon (6) was described by other research participants for example, Anaesthetist Clinician-Manager (4) and Nurse (39) Hospital C, as a professional who really watched the Surgical Fellows as they operate on patients, offering precise step-by-step technical advice as required.

All clinical professions spoke of the time needed to gain familiarity and expertise with complicated new procedures or technology with increased precision demand: particularly doctors, surgeons and anaesthetists (77%), nurses working in hospital wards and critical care (69%) and Allied Health physiotherapists, dieticians, speech therapist (58%). Whilst challenging the clinical learner was reported as important to high-risk learning, it was equally important to balance the risk of a novice learning in the real-world work context, with maintaining patient safety.

> *"Experience is most important, HD (high distinction) in essays doesn't make you good in scenarios. Need exposure, learn through trial and error. As CNC learn not to be frontline, but one step back, no patient load (unless things are going very badly for the patient), to allow frontline staff their exposure to the deteriorating patient, facilitating learning into their experiences, assimilate learning into their tasks"*
>
> Nurses (49, 50), Hospital D

The high-risk learning process was considered complex. It was the interplay of the technical skill set of the trainee, the interacting nature of the multiple risk factors – as described in Chapter 5, and the capability and capacity of the novice to accurately judge risk.

> *"A risk is the skill set of the trainees, a senior registrar versus junior registrar … but also their insight of risk, their anticipation and appropriate guidance seeking behaviour especially in the operating theatre"*
>
> Surgeon (1), Hospital A

However, managers who were not frontline for patient care reported not having to face this particular challenge directly as they transitioned to more senior managerial roles. This experience was described by Clinician-Manager (13) Hospital A and confirmed across the hospitals and LHD by Manager (7) Hospital B; Manager (9), Nurse (41), Hospital C; Manager-Clinician (1), Hospital A, LHD.

> *"Bedside practical skills such as managing a chest drain or new equipment, gets worse and worse as you develop non-clinical skills expertise, (you) lose practical bedside skills … The ability to delegate and implement policies with good interpersonal skills … it is hard to delegate initially and not to feel guilty. It is how you tell not what you tell, and you follow with an example. You can't work for years without … the team … this is an amazing bunch of staff"*
>
> Clinician-Manager (13), Hospital A

The time needed to gain familiarity with complicated new technical procedures was reported by all clinicians and clinician-managers but not managers. Conversely, executive managers reported needing to develop a different set of interpersonal skills.

> *"Getting to know different perspectives, emotions and dealing with challenging people. I learnt a lot about myself and other people in these squabbles. Reflection is most important after every encounter but especially after difficult cases – could do better, learn for next time. All work is about learning."*
>
> Manager (3), Hospital B

Managers similarly reported their progress up the hierarchy of seniority and responsibility within the boundaries of a profession.

> *"Learning – being in roles and dealing day-to-day with situations, develop and grow and expand your focus. As nurse or NUM focus is your Unit, Programme Nurse Manager focus is a number of services, DON focus is the facility. Your knowledge and vision become bigger. In relieving GM (General Manager) role accountable to LHD, responsible for doctors, nurses, allied health and support staff, decision making at a bigger level, approve at whole of facility level, above DON delegation"*
>
> Manager (11), Hospital A

The interpersonal relationships established in learning and teaching high-risk while professional and hierarchical, were implicitly or explicitly based on common values.

> *"Bosses and mentors (and you know they are different things) that have 'informed my thinking, colleagues that I have stolen shamelessly from and learnt from…and developed 'my philosophy' that is, hierarchical governance structure and devolved governance for innovation … My philosophy is also the CEO's philosophy because I, you choose who you work for - alignment in 'value-set' is important in employment"*
>
> Manager (1), Hospital A, B; LHD

For one participant, having occupied most levels ascending the professional hierarchy over decades, the pinnacle was reached.

> "*Mentors – I have got to an age when I have no mentors, they are looking at me from the walls* (speaking of framed photos or portraits of retired colleagues).
>
> Manager-Clinician (1), Hospital A and LHD Board

Nevertheless, senior clinicians also reported learning whilst they were answering novices' and intermediates' questions on complex high-risk patients or procedures.

> *"Working with a boss, learn from all bosses even 'bad' bosses learn what not to do. Registrars who over or under access the risk or even correctly access patient risk, learn a lot from being with registrars and talking to them"*
>
> Clinician-Manager (), Hospital A

Occasional instances where the junior clinician explicitly teaches the senior clinician were also reported. Learning new technical skills, new technology or procedures from juniors was the case mostly with senior trainees. In the case of specialist doctors, they were called Fellows or Advanced Trainees being in their last year of their professional vocational training.

> *"Learning from our Fellows, they have the most knowledge, they act as conduits (of knowledge and skills) between bosses (they have worked with) from other hospitals".*
>
> Surgeon (2), Hospital A

Advanced Trainees were described as 'conduits' channelling high-risk technical skills and knowledge using the newest technologies, by senior Surgeon (2) Hospital A, other surgeons and anaesthetists. Within their professions, the Advanced Trainees developed and shared high-risk techniques between hospitals through their work rotations, profession's structures and affiliations.

The interpersonal relationships established early in professional work were enduring and occurred within the networks and framework of professions and professional development. Developing and maintaining domain expertise – that is, the specialised comprehensive, up-to-date and innovative knowledge, in a particular area or field - marked the process undertaken by clinicians and managers to understand what was high-risk.

The previous section presented the evidence for a predominantly hierarchical form of teaching and learning that was profession based. The following section presents the evidence for high-risk learning that endured after participants became fully qualified consultants, that occurred between peers.

6.2.1.4 Professional peer learning

Participants across the hospitals and professions described as important, the experience of continual developing high-risk knowledge. This learning was through discussion of challenging cases, new procedures and complex patients with their professional peers. More participants from the larger higher acuity tertiary hospitals - Hospitals A (89%) and C (91%) - reported relying on this strategy than those working at the smaller institutions - Hospital B (78%) and Hospital D (74%). Clinicians, Allied Health staff (100%), nurses (79%) and doctors (77%), mentioned learning from peers more commonly than senior managers (68%) (Table 6.1). However, even executive managers described the importance for learning from professional peers.

> *"… informed my thinking, … colleagues that I have stolen shamelessly from and learnt from"*
>
> Manager (1), Hospital A and B; LHD

Appendix 7 Table 6.5 compiles the detailed evidence for how clinicians and managers across the hospitals described the role of professional peer learning in their high-risk knowledge development as individuals. Professional peer learning was reported as important for quality improvement to see how good outcomes were considered, presented and achieved, from colleagues practicing in the same domain.

"Learning from other surgeons (that are) presenting good outcomes"

Surgeon (6), Hospital C

Peer learning was also important when clinicians were faced with a challenging patient in a context that was new to the participant. Learning from peers was an integral component to learning how best to consider a case or technical procedure.

"Other consultants, or more senior anaesthetists give you tips because they have more experience with a high-risk surgical procedure (and I do my own background reading)"

Anaesthetist (1), Hospital A

Learning high-risk knowledge through reading and reification of high-risk knowledge was important but incomplete without consulting with peers. Learning from peers was integral to the work practice learning of clinician-managers for example, learning how best to manage a high-risk ward or unit.

"Ask other nurses – depends on the topic …other NUMs that have been a surgical NUM for longer or other NUMs on how best to do things"

Nurse (45), Hospital D

Professional peer learning was important to confirm their approach to work was best practice.

"*Clinical practice mainly over years. And CPD, conferences and … validate with other pain specialists is very important"*

Physician (1), Hospital A

Professional peer learning for high-risk patient care was characterised by 'one-off' interpersonal interactions used to think through a single challenging high-risk case, or to validate decision making.

An outlier finding was that of Allied Health professional peer learning at Hospital D. That was distinguished by the character of the professional relationships between senior Dietician, Speech therapist, and Physiotherapist. The clinicians shared an office space away from the clinical wards where they provided patient care. They collaborated continually on the cohort of patients they jointly provided care for. They understood and could describe the nature of each other's professional work and how the other's progress with a patient could impact on their own professional progress with the same patient. For example, safe swallowing (Speech therapy) and the impact on nutrition (Dietetics) and muscle mass for strength and independent movement (Physiotherapy). There was evidence of multiple modes of communication, integrated long-term planning and joint projects.

> *"Very collegial Allied Health department multiple meetings and other communication – corridor, emails, projects"*
>
> Dietician (1), Speech therapist (1), Physiotherapist (1), Hospital D

6.2.2 Perioperative teams

The second main theme for workforce learning, communication and collaboration for high-risk surgical patients was that of perioperative teams. At the four hospitals perioperative teams comprised of multiple team formations for a high-risk patient's episode of care. Perioperative team orientation for individual clinician and managers - that is, their ability to locate themselves in time, space and people – was both uni-disciplinary and multidisciplinary, perioperative team roles were stationary or boundary crossing.

For the purpose of this research the following definitions apply. A multidisciplinary team (MDT) consists of two or more disciplines – branches of learning and instruction. Each of the professions within a MDT made up uni-disciplinary team (UDT). Multidisciplinary cooperation involved sharing professional expertise with mutual assistance in working towards a common goal. Interprofessional collaboration was the action of working with multiple professions, sharing professional and other expertise, to create a new work practice from existing components.

6.2.2.1 Perioperative team orientation

Perioperative teams had four dominant orientations (Box 6.4). Box 6.4 summarises the team formations, and their intra- professional and inter-professional characteristics. The unit-based team was the foundational team formation. Two types of 'one-off' team formations, rather than a long-term team formation, added to this foundational team. One through co-opting other professions to add specialty knowledge to a complex surgical episode of care for a high-risk patient. The other, short-term rescue teams providing immediate care for the deteriorating patient. The fourth team formation related to organisational business teams.

Business process map for high-risk surgery (Figure 5.6) was the work practice context for the first three team orientations; the ward or unit-based teams have a clinical orientation rather than the organisational or business orientation of the fourth. Ongoing long-term team orientation were evident in the first, foundational unit-team and the fourth, organisational or business team. Ad hoc or short-term team formations characterised the second and third, "one-off" consulting and rescue clinical teams.

Box 6.4 Dominant formations of perioperative teams

Form	Intra- and inter-professional characteristics
1. Unit-based teams	The locations where people worked exclusively in stand-alone structures where the high-risk patient was receiving care, were observed to be one foundational team formation. Individuals were part of both uni-disciplinary (UDT) and multidisciplinary teams (MDT). Each of the professions in a unit made up a UDT. MDT differed across units due to the range of professions in that location

<table>
<tr><th>Form</th><th colspan="2">Intra- and inter-professional characteristics</th></tr>
<tr><td rowspan="6"></td><td>Department - Unit</td><td>Team members</td></tr>
<tr><td>Preadmission clinics</td><td>Nurses, clerical staff, anaesthetists, junior doctors, subspecialty surgical nurses</td></tr>
<tr><td>Operating theatre suite and procedural units</td><td>Senior and junior surgeons, senior and junior anaesthetists, theatre suite nurses</td></tr>
<tr><td>High volume short stay units</td><td>Nurses and junior doctors</td></tr>
<tr><td>Hospital wards</td><td>Nurses, junior surgeons, junior doctors, Allied Health – Physiotherapists, Acute pain team (doctor and nurse), senior surgeon, geriatrician</td></tr>
<tr><td>Critical care units</td><td>Senior and junior Intensive care doctors, Critical care specialty nurses, Allied Health – Physiotherapists, Speech therapist, Dietician, Pharmacist</td></tr>
<tr><td rowspan="2">2. Co-opting other professions to the unit-based team – ‘one-off’ consulting teams</td><td colspan="2">‘One-off’ teams formed by co-opting other professions to the ward-based team to contribute to a high-risk patient’s care through a request for consultation. Uni-disciplinary professional teams that provided additional expertise and resources.</td></tr>
<tr><td colspan="2">Co-opted for consultation as requested by the senior surgeon or other clinicians, for example:

“Imminent high-risk pharmacy patients referred by JRMOs or nurses – for polypharmacy, on high-risk drugs, a patient’s challenged understanding etc…”
Pharmacist (3), Hospital C

“For Infectious Diseases physicians on the roster we don’t know about patients until there is a complication for example, wound infection, pneumonia, sepsis, osteomyelitis, cellulitis, multi-resistant organisms, collections, infected hardware and requiring prolonged antibiotics. Not involved in the PAC and prevention”
Physician (13), Hospital A

“For Geriatricians, it is … delirium, acute surgery, some surgical procedures, and the social aspects, the consequences of complications. Technically we are now very good at keeping people alive”
Physician (14), Hospital D</td></tr>
<tr><td>3. Multiple short-term ‘one-off’ rescue teams</td><td colspan="2">Multiple ‘one-off’ teams formed through being called in an emergency to manage a deteriorating patient, often afterhours or on weekends. This team formation has been described in Chapter 5 Sections 5.2.2.5 and 5.3.1.2.</td></tr>
</table>

Form	Intra- and inter-professional characteristics
	This team model was characterised by lack of time and resources for collaboration, brought together solely for a short-lived episode of crisis care. Team members were ward nurses and junior doctors plus the MET drawing the cardiology/ ED/ anaesthetic registrar and CNC away from their work in their own home units.
4. Organisational teams	Managerial business teams Both UDT and MDT (Table 6.4)

Perioperative organisational teams and the attendance at their meetings: business, patient safety and quality (PSQ) and morbidity and mortality (M&M), are presented in Table 6.4.

Table 6.4 Composition of MDT meetings across the LHD and hospitals

Key: Yes denotes regular attendees by profession at MDT meetings; (-) not a regular attendee; (+/-) regular attendee at some surgical specialty meetings e.g. orthopaedic

Level and Meeting	Profession	Hospital			
		A	B	C	D
LHD Surgical, Anaesthesia and Perioperative Stream meeting	Surgeon	Yes	-	-	-
	Anaesthetist	-	-	-	-
	Physician	-	-	-	-
	Nurse	Yes	Yes	Yes	Yes
	Allied Health	-	-	-	-
	Executive Manager	-	-	-	-
Hospital PSQ and Business meeting	Surgeon	Yes	Yes	Yes	Yes
	Anaesthetist	Yes	Yes	Yes	Yes
	Physician	Yes	Yes	Yes	Yes
	Nurse	Yes	Yes	Yes	Yes
	Allied Health	Yes	Yes	Yes	Yes
	Executive Manager	Yes	Yes	Yes	Yes
Surgical department Business and PSQ meeting	Surgeon	Yes	Yes	Yes	Yes
	Anaesthetist	Yes	-	Yes	-
	Physician	-	-	-	-
	Nurse	Yes	-	Yes	-
	Allied Health	-	-	-	-
	Executive Manager	Yes	-	Yes	-
Surgeons and Anaesthetists M&M	Surgeon	-	-	Yes	-
	Anaesthetist	-	-	Yes	-
	Physician	-	-	-	-
	Nurse	-	-	-	-
	Allied Health	-	-	-	-
	Executive Manager	-	-	-	-
Surgeons M&M	Surgeon	Yes	Yes	Yes	Yes
	Anaesthetist	-	-	-	-
	Physician	- (+)	-	-	-
	Nurse	-(+)	-	-(+)	-
	Allied Health	-	-	-	-
	Executive Manager	-	-	-	-

Anaesthetists M&M	Surgeon	-	-	-	-
	Anaesthetist	Yes	Yes	Yes	Yes
	Physician	-	-	-	-
	Nurse	-	-	-	-
	Allied Health	-	-	-	-
	Executive Manager	-	-	-	-
Critical care unit CCU MDT meetings	Surgeon	-	-	-	-
	Anaesthetist	-	-	-	-
	Physician (CCU)	Yes	Yes	Yes	Yes
	Nurse	Yes	Yes	Yes	Yes
	Allied Health	Yes	Yes	Yes	Yes
	Executive Manager	-	-	-	-

In clinical teams and organisational business meeting teams, the primary perioperative team structure was that of multiple different professions coming together to form the MDT. In the MDT, individual clinicians and managers predominantly described themselves and their work, and were observed to behave, as principally profession based. The perioperative MDT were UDT aggregating to care for individual high-risk patients. Each of the professions in the perioperative MDT made up a UDT with reference to their work, interchangeability in undertaking or delegating roles, sharing the same roster and payroll.

The gaps in complete MDT attendance by profession was notable on the clinical units (Box 6.4) and at the organisational business meetings (Table 6.4). In the clinical units or wards executive managers were the profession notably absent; the exceptions being for example, an 'one-off' organisational problem such as conflict resolution to be addressed in the Unit, and the regular walk arounds to all wards for annual Christmas hampers and thank you for staff at Hospital A (Box 6.4). At the organisational business meetings of the LHD, the Surgical Anaesthesia and Perioperative Stream meeting had highest hierarchical seniority in the organisational chart (Table 6.4). The absence of surgeon representation beyond those from Hospital A and the absence of the heads of departments of anaesthetics were notable. The anaesthetic department heads met at a separate LHD anaesthetists meeting and shared the same manager as the higher hierarchical LHD Stream meeting. The LHD Stream meeting was well represented across the four hospitals for senior nurses that had key roles in ESWT management and that was the important recurring agenda item for the organisational business meeting.

Senior nurses across the four hospitals also met regularly to develop the LHD Clinical Pathways, these meetings were chaired by the LHD Stream manager.

At all four hospitals, the executive level PSQ and Business meetings (Table 6.4) were well represented by all professions. A suite of meetings fed into the PSQ and Business meetings and they were usually conducted in the Executive Unit. The meeting agenda items for the hospital PSQ and Business meetings were related to the management of organisational population cohort measures (Section 5.2.3.2, Table 5.9). A member of the executive, namely a patient safety officer attended the hospital surgical department PSQ and business meetings at Hospitals A, C and D (Table 6.4). However, the executive managers and allied health professionals were absent at M&M and PSQ separate and combined meetings of surgeons and/or anaesthetists. In the majority of cases across the hospitals and surgical specialties, senior nurses and physicians attended these meetings by invitation if the agenda item or case was relevant. Some specialty meetings had regular attendance for one or two nurses and physicians for example, for orthopaedic surgery and ENT surgery at Hospital A (Table 6.4).

The reasons given for the lack of full representation of all the professions at the MDT meetings (Table 6.4) were: not invited (Allied Health professionals and nurses in Hospitals A,B,C, D for surgery and/or anaesthetic M&M PSA meetings); invited but do not attend (Clinician-Manager 6 LHD, Nurse 36 Hospital C speaking of anaesthetists and surgeons for Hospitals B,C, D for LHD Stream meeting); unable to attend hospital business meetings (Managers 5 and 9, Clinician-managers 4 and 5 speaking of VMO surgeons operating in other hospitals); and meeting not relevant to clinician (Anaesthetist Clinician-Managers Hospitals A, B, C, D for LHD Stream meeting).

The descriptions of intra-professional relationships previously presented in Section 6.2.1 were hierarchical, enduring and integral for workforce learning and managing the high-risk patient. An exemplar quote on single disciplinary learning and UDT working relationships.

> *"In the private hospital they contact me directly because I am the only one. At the public hospital I rely on the (surgical) JRMOs, registrar, fellow. The safety is in the team, there are more defence mechanisms".*

Surgeon (2), Hospital A

In contrast, the descriptions of interprofessional relationships and learning in the wards were less detailed and few (less than a dozen). The exception was the inter-professional relationships among allied health professionals: dietician, speech therapist, physiotherapist and their senior manager, at Hospital D. The allied health inter-professional relationships were non-hierarchical, enduring through joint collaborations over years and, deliberate learning caring for the same cohort of patients. An outlier quote on single disciplinary alongside interprofessional learning and relationships was from a senior nurse clinician-manager.

> *"Nursing mentors, colleagues to 'bounce off.' Also, younger senior surgeons that I have grown up with, now friends, approachable, history of learning together developed relationship"*

Nurse (3), Hospital A

6.2.2.2 Team roles – stationary roles and boundary crossers

The perioperative team comprised team roles that were stationary specialist roles or boundary crossing roles (Box 6.4). Stationary roles focused solely on providing detailed specialty specific knowledge and skills in a discrete location or for a discrete time period. For example, nurses working exclusively in a surgical specialty ward and, anaesthetists work during the surgery and immediate recovery from anaesthesia in the operating theatres suite. Boundary crossing roles either crossed structural boundaries for example, hospital units and/or phases of care or professional boundaries. Professional boundary crossers facilitated interprofessional collaboration and for the purpose of this research are termed knowledge brokers. Interprofessional collaboration was the action of working with multiple professions to create a new work practice from existing components. Knowledge brokers were individual clinicians who had to an extent, a shared understanding of the capabilities and capacities or other individuals in the MDT and teamwork needed for change. They were 'go-to' people, seen as grassroots leaders, that could cross boundaries and enable trust. They used this knowledge and social capital to address a clear purpose, that is, a quality improvement goal. They were senior clinicians who communicated across phases of care and between professional groups and between levels of care. In the purposive sampling for this research, multiple staff pointed out 'knowledge brokers' and their projects for example, "*have you talked to X yet*", and "*You should talk to X*". The research came across four examples of knowledge brokers. Box 6.5 provides the evidence for perioperative team roles, classification, work title and functional examples.

Box 6.5 Perioperative team roles

Classification	Work title	Functional examples
1.Stationary specialist	Specialist clinicians, clinician managers, executive managers (Multiple and at all hospitals unless specified)	Procedural anaesthetists providing anaesthetic care in the operating theatre suite and DSU NUM and nurses working single surgical ward or unit Allied health team working in single surgical ward or unit Acute pain management team (MDT) member focused on post-operative pain management Physician (UDT) providing specialty specific expertise Geriatrician (UDT) providing specialty specific expertise with MDT in surgical ward for shared decision making (surgeon, anaesthetist) and discharge planning meetings (NUM, junior doctors, Allied Health) Managers (MDT) member working in Executive Unit
2.Boundary crosser – Phases of care	CNCs Hospital A, B, C and D	Care coordinators or case managers that helped navigate patients between different specialists and supported patients across phases of an episode of perioperative care
	Senior surgeon	Providing surgical care decision making across phases of care or units for an episode of surgical care
3.Boundary crosser – Professionals *"Knowledge brokers"*	(I) CNC Orthopaedics Hospital A (see Appendix 7)	Knowledge brokerage <u>Goal achieved</u>: Reduced LOS, improved quality of care <u>Changes</u>: New CP ERAS for hip and knee replacements for carefully selected patients. Day-to-day goals on CP.

Classification	Work title	Functional examples
3.Boundary crosser – Professionals *"Knowledge brokers"* (cont.)	(I) CNC Orthopaedics Hospital A (cont.)	Variance recording, audit and feedback on performance. Sharing of team outcomes. <u>Multiple levels</u>: state-wide policy work with ACI and LHD; hospital units; Phase 2 state research grant application <u>MDT, IPC</u>: CNC, Allied Health (Physiotherapist, Occupational therapist), senior surgeons, anaesthetists <u>Multiple phases</u>: Pre-op. patient education, prehabilitation, carbohydrate drink. Intra-op. change to regional anaesthetic technique, multimodal anaesthesia and early Postop. PACU physiotherapy, mobilisation and early discharge home on Postop Day 1-2 for further rehabilitation at home, with up to one week of 'hospital in the home' principally, physiotherapy <u>Knowledge broker expertise extended to</u>: Patients were selected based on their medical comorbidity, personality and motivation, a cohort of patients could have accelerated recovery and early discharge home for rehabilitation (Patient 2, Box 5.6); alternatively, due to comorbidities or deterioration this was not possible (Patient 3, Box 5.6). *"Medical high-risk ASA 3, our ERAS exclusion criteria, also patients with no confidence or alternatively arrogant and downplay need for some time to recover. Aim of job is to get patients out of hospital in a timely and safe way – select lower risk for ERAS, do not take all patients. So do not take ASA 3. Decrease LOS down to 1.6 days hips, 1.8 days knees* (from 5 days*) in selected lower risk patients"* Nurse (11), Hospital A *"Need to motivate patients … get an early sense patient will be a problem for discharge home, ERAS failure to fitness, feeling I get, got a sense of not being able to go home or not wanting to go home. The words they use, anxiety level, "No way I will be going home at 3 days" My job, to EDUCATE more, aided by ERAS physiotherapy.* Nurse (11), Hospital A

Classification	Work title	Functional examples
3.Boundary crosser – Professionals *“Knowledge brokers”* (cont.)	(II) CNC Acute surgery Hospital A	Knowledge brokerage Goal achieved: To get acutely unwell surgical patients to the operating theatres or to appropriate care in a timely manner Multiple levels: National NEAT, state-wide policy lead ‘Acute surgery program’ with MOH, ACI; across all hospital departments – ED wards surgical and medical, Critical care units. MDT, IPC: Core MDT – CNC senior surgeons, registrar and junior doctor; extensive networking with senior ED and other ward nurses, multiple feedback loops. Multiple phases: Pre-intra-postop. Knowledge brokerage for in-hours and afterhours surgical emergencies. Knowledge broker expertise extended to: *“Go and see for myself – High-risk – looks unwell at foot of bed, or reading history for ‘red flags’ in history or in current presentation or mental health – because not presented to us… I want patient seen properly … Main role is coordinating teams, especially if my team (Acute Surgery Registrar and RMO) are in OTs – patient flow – time is critical for the patient”* Nurse (9), Hospital A *“Even I can call consultants, 11 very supportive surgeons, and they all get on, share workload and handover on Monday mornings. Clean up reallocate on Mondays* Nurse (9), Hospital A *“I don’t have a home ward go everywhere but ward_X nominally. I consider every bed in this hospital a virtual potential acute surgery care bed. MET calls. All these problems from ED and wards. Also, usually handover to another hospital e.g. regional”* Nurse (9), Hospital A
	(III) CNC (Lead) Hospital C	Knowledge brokerage: Goal achieved: Reduced LOS, improved quality of care Changes: New CPs ERAS for bowel surgery (x4) Day-to-day goals on CP. Standardised, coordinated bundles of care. Variance

<table>
<tr><th>Classification</th><th>Work title</th><th>Functional examples</th></tr>
<tr><td rowspan="2">3.Boundary crosser – Professionals “Knowledge brokers” (cont.)</td><td>(III)
CNC (Lead)
Hospital C
(cont.)</td><td>recording, audit and feedback on performance. Sharing of team outcomes.
<u>Multiple levels</u>: state-wide policy work with ACI and LHD; hospital units; Phases 2, 3 state research grants
<u>MDT, IPC</u>: CNCs (x3 clinical and academic), anaesthetists (2), senior surgeon, geriatrician, Allied Health dietician
<u>Multiple phases</u>: Pre-op including prehabilitation and post-op.
<u>Knowledge broker expertise extended to</u>:

“I don’t have a lot to do with patients these days, trying to fully implement ERAS Colorectal (x4), planning took 1 year, first patient March 2017. Soon add vascular, urology, (U) GIT… At the beginning, it’s always about ‘bringing the team together’ …A lot of corridor conversations… an authority figure required (named) … also broad consultation … include GP – community representative …”
Nurse (36), Hospital C

“I read a lot of peer reviewed literature. Use the clinical librarian, networked into libraries (interstate)EBP – Literature reviews, have team knowledge, completed PhD in 2006, learnt stats at the university, in management, involved with IHI – new rules for radical redesign in healthcare…I have a lot of connections, people, networked, international societies and Boards for QI.”
Nurse (36), Hospital C</td></tr>
<tr><td>(IV)
Geriatrician,
Hospital D</td><td>Knowledge brokerage:
<u>Goal achieved</u>: Day-medical-unit to optimise high-risk complex geriatric patients, avoiding ED admission and educate local GPs.
<u>Multiple levels</u>: National and state-wide research grant.
<u>MDT, IPC</u>: Lead geriatrician, hospital Executive managers, general physicians (x4), NUM and ward nurses, Allied Health – dieticians, physiotherapists, occupational therapists, speech therapists; GPs paid to attend Day-medical-unit through research grant.</td></tr>
</table>

Classification	Work title	Functional examples
3.Boundary crosser – Professionals *"Knowledge brokers"* (cont.)	(IV) Geriatrician, Hospital D (cont.)	Multiple phases: Not specific to surgical patients. Knowledge broker expertise extended to: *"Forming new team relationships and new model of care, new ward for frail geriatric patients to avoid ED and post-acute care services to prevent readmission to hospital"* Clinician-Manager (7), Hospital D, LHD Board

6.2.3 Using technology

The third main theme for workforce learning, communication and collaboration for high-risk surgical patients was using technology and examines the introduction of the new electronic medical record system and reification of knowledge more broadly.

The research LHD began a staged implementation program of eMR across all the four hospital in 2016. Almost all (95%; 122/129) participants reported finding using the new eMR enhanced their work practice. The participants that used the eMR least were the executive managers and some senior surgeons. Executive managers said they relied more on emails, telephone and face-to-face meetings in their work practice but would look items up in the eMR if they needed to complete clinical reports (Manager (2), Hospitals A,B,C,D, LHD; Manager (5), Hospital D). Some senior surgeons reported or were observed to be neutral regarding the benefits of the eMR, as they usually accessed patient information via the eMR or paper record via the junior doctors attached to their team (Surgeon (2), Hospital A; Surgeon (7), Nurses (22), (23), Physician (8) Hospital C; Junior doctors (7), (8) Hospital D). The following section outlines the reported strengths and challenges in using the new eMR.

6.2.3.1 Access through and navigating the electronic medical record

Box 6.6 summarises the descriptors used by participants as the advantages of the eMR over the paper record system. The eMR allowed remote, real-time access to high-risk patient's clinical notes and progress across structural boundaries. For example, from the operating theatres where senior surgeons and anaesthetists spent most of their time, to the surgical wards; and, also, from home into the intensive care ward. The real-time access provided access to detailed information for remote supervision of juniors and patients under the care of the senior doctors. Multiple clinicians could access the same patient's file simultaneously from different parts of the hospital. This had not been possible with the previous one per patient paper medical record that was kept with the patient at all time. Clinicians and managers could access and navigate through vast and diverse patient related information systematically categorised as opposed to bounded loose sheets in the previous paper record system. By whom and how the eMR information is comprehensiveness used and accessed is detailed in Box 6.6. The eMR includes current and historical old notes, multidisciplinary specialists' reviews, tracking of past and present trends in clinical information and test results. Safety alerts and simple data queries enhanced learning.

Box 6.6 STC: Rich access to patient information through the eMR

<table>
<tr><td>Descriptor</td><td colspan="4">Participants</td></tr>
<tr><td>"remote real-time access to clinical information of high-risk patients in the hospital wards, from the operating theatres"</td><td>Senior surgeon
Junior doctor
Anaesthetist
Nurse</td><td>6
2
17
7</td><td>Hospital
A
B
C
D</td><td>11
5
8
8</td></tr>
<tr><td>"can access patients' vital signs from home when I am on call supervising the RMOs, check on how a patient is doing"</td><td colspan="4">Physician (10), Hospital D</td></tr>
<tr><td>"get nearly 'everything' in one place, more easily"</td><td rowspan="10">Senior surgeon
Junior doctor
Anaesthetist
Nurse
Allied Health
Physician
Manager</td><td rowspan="10">7
9
17
52
12
14
2</td><td rowspan="10">Hospital
A
B
C
D</td><td rowspan="10">31
24
30
28</td></tr>
<tr><td>"can see the patient's history (of presenting history) and continuation notes"</td></tr>
<tr><td>"can 'see' what happened on the surgical ward round, what the plan is"</td></tr>
<tr><td>"can see the operation report"</td></tr>
<tr><td>"can see MET calls, clinical deterioration since I last saw the patient"</td></tr>
<tr><td>"can access 'old notes', past hospital admissions"</td></tr>
<tr><td>"can see how the medications have changed"</td></tr>
<tr><td>"can check results of investigations"</td></tr>
<tr><td>"to document the management plan"</td></tr>
<tr><td>"to document care provided"</td></tr>
<tr><td>"can read reviews by other specialists"</td><td>Surgeon
Junior doctor
Anaesthetist
Physician</td><td>6
9
15
12</td><td>Hospital
A
B
C
D</td><td>11
10
10
11</td></tr>
</table>

<table>
<tr><th>Descriptor</th><th>Participants</th></tr>
<tr><td>“can see how the weight has changed”</td><td>Dietician (4) Hospital A; Dietician (2) Hospital C</td></tr>
<tr><td>“to order tests”</td><td rowspan="2"><table><tr><th></th><th></th><th>Hospital</th><th></th></tr><tr><td>Surgeon</td><td>3</td><td>A</td><td>9</td></tr><tr><td>Junior doctor</td><td>9</td><td>B</td><td>10</td></tr><tr><td>Anaesthetist</td><td>15</td><td>C</td><td>9</td></tr><tr><td>Physician</td><td>12</td><td>D</td><td>11</td></tr></table></td></tr>
<tr><td>“to chart meds”</td></tr>
<tr><td>“there are safety alerts for prescribing and administering medications”</td><td>Pharmacist (2), Hospital B; Pharmacist (1), Hospital C</td></tr>
<tr><td>“you can set up simple data queries on the eMR for our patients and use the data at department meetings”</td><td>Surgeon (3), Hospital B and A</td></tr>
</table>

The eMR was also reported and observed to be used as an important channel of communication, for making information available *“to document the management plan”,* when the multidisciplinary team members were unable to meet face-to-face. Ensuring that the multidisciplinary care needed could be maintained if the nurse, doctor, or therapist was absent from ward or busy, and on their return *“can ‘see’ what happened on the surgical ward round, what the plan is”.*

> *“Rarely get a chance to talk to nurse or other professional, you usually write in the notes, prefer to talk but no time”*
>
> Junior doctor (1), Physician (1), (5) Hospital A; Surgeon (4) Hospital B; Anaesthetist (9) Hospital (C)

Using the eMR had three main challenges. First, the access to detailed information, documentation and practice from using the eMR, enabled a focus on the patient from the perspective of the eMR. The patient could be conceptualised from analysing and synthesising information found in the eMR, rather than from an as thorough direct, in-person examination of the patient before the clinicians.

> *“High-risk is all intensivists, senior and juniors looking at the screen and not the patient. I do the round with 3 COWS (computer-on-wheels).”*
>
> Physician (10), Hospital D

Second, desktop computers are stationery and computers-on-wheels (COWS) are bulky, often the size of small shopping trolleys. The technology was observed to cause a physical distance between the clinical team and the surgical high-risk patient, already attached to several other pieces of bulky equipment such as the ventilator and infusion pumps.

Third, new technology required time and effort to learn and apply whilst clinicians were working. Some senior clinicians elected not to learn new technology such as the eMR, as reported by Surgeon (7), Physician (8) Hospital C; Junior doctors (7,8) Hospital D; Physician (7) Hospital B; Surgeon (2) Hospital A. The 'novice-to-expert reversal' for new technology, delegating to juniors, was particularly mentioned around the introduction of the eMR.

> *"The junior doctors, registrars and Fellows are very familiar with the eMR; the Professor handwrites his operation report and one of the registrars then types it verbatim into the eMR"*
>
> Surgeon (7), Hospital C

> *"Junior doctors are very tech savvy. The junior doctors are like clerks they admit and discharge the patients from the ICU, and they are very fast at typing and navigating the eMR. I say 'I will not be able to function without a junior doctor, but I can do without the (specialty) registrar"*
>
> Physician (8), Hospital C

6.2.3.2 Reification of knowledge – merging and splitting of organisational artefacts and coordination of care

Reification of knowledge in high-risk work practice and organisation provided evidence on workforce communication and coordination. Box 6.7 summarises the merging and splitting of organisational artefacts and coordination of care using clinical pathways across the four hospitals and LHD. The eMR itself was an innovative and powerful tool for merging key organisational artefacts for information access, work and communication. There was common access for within each hospital and on another level to a certain degree, common access to information across the LHD. Specifically, for each patient, the front page of their eMR provided a synopsis of important administrative and clinical information with tabular access to other functions and more detailed categorised information. This included the patient's 'continuation notes' an up to date window, organised by time of entry of documented care provided by the clinicians of the perioperative teams irrespective of profession, seniority or location.

Box 6.7 Reification of knowledge, workforce communication and coordination

Characteristics of reification of knowledge	Hospital			
	A	B	C	D
Merging of organisational artefacts				
- patient front page on eMR, collated important administrative information and latest clinical information	Yes	Yes	Yes	Yes
- 'continuation notes' on eMR, entries organised by time of entry	Yes	Yes	Yes	Yes
Splitting of organisational artefacts				
-hybrid eMR and paper records	Yes	Yes	Yes	Yes
-multiple eMR platforms with separate access between departments, specialties	Yes	No	Yes	Yes
-data entry and documentation by profession	Yes	Yes	Yes	Yes
-data organised by document type and profession	Yes	Yes	Yes	Yes
Coordination of care				
-clinical pathways for specific surgical procedures (Appendix 7 Boxes 6.7, 6.8, 6.9)	Yes	Yes	Yes	Yes

The splitting of organisational artefacts was evident in three ways. First, a hybrid that is, paper record plus eMR clinical record set-up, co-existed in all four hospitals. For example, of the commonly used forms, the anaesthetic chart and the fluid therapy charts remained in paper form. Second, several participants reported the presence of multiple eMR platforms in Hospitals A, C and D that limited staff access and fragmented information sharing. For example, a separate eMR system for the critical care, ICU/ HDU and for oncology services. The splitting of eMR systems led to information 'blackouts' and also added work for the junior doctors and nurses that had to transcribe information from one eMR system to another when a patient moved between eMR systems.

> *"After a patient is cleared for the wards de-ICU-ing patients for safe transfer out to the wards, so that they are ward ready is more time and work intensive than admitting a patient to ICU. Few outside staff know that … and that is a risk. A*

lot of extra work now, time consuming, transferring information from ERIC (ICU eMR) to eMR when discharging patients from ICU to the wards, for nurses as well as JRMOs. More 'paperwork' (documentation)."

Clinician-Manager (13), Hospital A

The third manner in which splitting of organisational artefacts was evident in using the eMR was that documentation entry and presentation was based on profession. The 'continuation notes' in the superseded paper medical records was compiled by time of entry. Each author would identify their name, role and time of entry.

"We voice our assessment through the eMR documentation, but doctors don't always read it, so we write the same thing again."

Physiotherapist (X), Hospital A, C or D

A suite of clinical pathways (CPs) also called ERAS pathways were located in all four hospitals. A detailed summary of CPs for low risk, intermediate risk and high-risk surgery, with analysis is presented in Appendix 7 Boxes 6.7, 6.8, and 6.9 respectively. Unlike the patient's eMR front page that provided an aggregation and synopsis of important administrative and clinical information, the CPs were developed by the LHD surgical stream and designed to improve care through standardisation and coordination of care processes.

"…the LHD pathways … there are key pockets of people at each hospital, … written by nurse consultants at each hospital in the main with a monthly meeting with the LHD nurse manager … and being implemented with varying degrees of success"

Clinician-Manager (6), LHD

CPs were implemented in the four hospitals to different degrees and effect. Standardisation from the LHD was in the form of the LHD endorsed light blue striped A4 paper booklets of four and more pages depending on the type of surgery. The booklets made documentation more uniform, with tick boxes for anticipated sequential bundled care processes and progress. The origin of the CPs and their implementation had been predominantly nurse-led in writing and implementation, with surgeon and anaesthetist support, at the LHD and hospitals. An established standard of care and time for recovery was established in their reification of knowledge and practice. The different elements of the CP bundle of care for specific surgery type were organised on the CP so as to make them work together effectively, minimising delays in progress for example, due to limited communication with the senior surgeon.

On analysis, there was little reported benefit or disruption to usual practice with the introduction of CPs for low risk surgery at Hospitals B, A, C and D. The CPs for HVSSS were not complicated, did not contain many steps or bundles and the booklets usually contained less than two pages to complete (See Appendix 7 Box 6.7 for details). For intermediate risk surgery, there was significant gains in efficiency and reducing length of stay for CPs for hip and knee replacements at Hospital A, and for four CPs for bowel surgery at Hospital C. At Hospitals A and C, there was multidisciplinary support for the CPs from senior surgeons, senior nurses, Allied Health – physiotherapists, occupational therapists, senior doctors - anaesthetist and geriatrician, and senior managers. On the CPs variance document, with tracking, audit and staff feedback regarding variance, was observed and reported to occur. CPs ERAS was recognised as an example of transformational leadership in Hospital A and Hospital C, both initiatives receiving LHD and state-wide accolades (See Appendix 7 Box 6.8 for details).

Several challenges to full-scale CP implementation were reported and observed. The LHD was observed to be very committed to drafting and promulgating an increasing number of increasingly complex CPs. Sign off was by the LHD surgery senior surgeon. A committee of senior nurses mainly from Hospitals A and C met regularly with the LHD surgery stream senior nurse to draft new CPs [Nurse 9,11,12, 36; Clinician Manager 6]. Surgeons and other relevant clinical staff were consulted, followed by distribution for LHD-wide consultation. However, some CPs were found on hospital ward shelves, dating back to 2013, unused and re-released for LHD-wide review, for example (LHDXXX141).

Certain patients and their progress did not fit into the booklet layout. In particular, nurses reported patients on the CP for laparoscopic appendectomy in Hospitals A, C and D. For example, for Patient 1 (Box 5.6) had a perforated appendix and took five days to recover and was discharged home on postoperative Day 6. The CP ALOS of 2.17 days was exceeded. The number of pages and checklist of care on the CP did not accommodate this common variance. To accommodate this variation, clinical documentation then continued on the eMR. A similar situation arose for CPs for other gastrointestinal surgery where the patients' recovery was less predictable and reliable.

> *"General surgery is more complex compared with orthopaedics, (latter) is more repetitive, easier to catch on more quickly for staff. Ours is a very routine ward, mainly orthopaedic, compared with the (adjacent) full general surgery ward"*
>
> Clinician Manager (9) - Nurse

Elective orthopaedic surgery CPs were considered more predictable of most patients' recovery compared with bowel surgery. For that reason, a senior surgeon described a more nuanced local approach to CP ERAS across the LHD.

> *"Next steps, ERAS colorectal. At the moment I am still doing my own fast-track. Enablers are hospital support, a supportive culture - I am taking a team to Hospital X (external to LHD)– two surgeons, an anaesthetist* (Anaesthetist 10, Hospital D*), Preadmissions nurse* (Nurse 48, Hospital D), *a CNC 'who will need to wear this as an extra hat' and a dietician. If all colorectal surgeons agree on a Hospital D ERAS standardisation of care – easier for team, reduces LOS, but ERAS should not be about auditing. This hour you do this and if not …, it's not like the patient 'comes off ERAS' they are still on ERAS but 'paused' … and will return onto ERAS. I found LHD (Hospital C ERAS) very complicated, 4 pages of a lot of detail, designed for auditing purposes. Prefer our team to derive our own ERAS and put down on paper a simple ERAS pathway that allows for clinical decision making by surgeons."*
>
> Surgeon (8), Hospital D

Duplication of work for documentation onto the CP, the eMR and other paper forms led to occasions of implementation failure. Variance to care was thus not auditable, or not audited and no feedback was provided to staff other than that by the clinical nurse consultants of Hospital A (Nurse 11) and Hospital C (Nurse 34). Where audit and feedback were provided, it was limited to two and four CPs, respectively.

Despite the stated ambition of the CPs, when in use, CPs were used almost exclusively by nurses. Across all four hospitals, when asked 'Patients' and 'Medical officers' were not aware of the CPs in practice and did not use the forms. Allied health, for example, physiotherapists and dieticians were aware of the forms and occasionally documented into CPs but the primary documentation for Allied Health was the eMR.

6.3 Wicked complexity in gaps in perspective

Evidence is provided for a wicked complexity arising from the interprofessional setting that had a more extensive impact on workforce learning, communication and collaboration for managing high-risk than PI, POT and UT impacting alone. The evidence for the complexity arising from the intersections of PI, POT, UT is presented in three parts. First, for individuals caring for high-risk patients. Second, for teams caring for high-risk patients. Third, for the broader organisation. At the conclusion of this section, the complexity arising at the intersections of PI, POT and UT will be summarised, defined and discussed as wicked complexity in gaps in perspective.

6.3.1 Wicked complexity at the intersections of professional immersion, perioperative teams and using technology

The following evidence will show that in examining workforce learning to collaboratively provide care for the high-risk patient, the behaviours and technology of the practice context were facilitators of gaps in perspective.

6.3.1.1 For individuals caring for high-risk patients

First, for individuals wicked complexity arises in the narrow but necessary focus upon learning and applying profession specific knowledge (Section 6.2.1), whilst seeking to work in a multi-professional team context to improve perioperative care. The detailed technical information made available by the eMR, for clinicians and managers enabled a gap to emerge - to lose sight of the high-risk patient as the person before them.

> *"High risk is when doctors review deteriorating patients through the eMR rather than at the bedside. It is challenging to teach doctors they are looking at a machine and not the patient. I had to call a code once in ICU to get the doctors to come to the bedside"*
>
> Nurse (50), Hospital C

The doctors were all busy, working with the focus on further clinical information gathering, analysis and decision-making for the high-risk patient in critical care.

> *"High-risk is all intensivists, senior and juniors looking at the screen and not the patient. I do the round with 3 COWS (computer-on-wheels):*
>
> - *one just for me to see important information – trends in vital signs, xrays, CXR, scans, blood tests, entries by other teams etc. I need to think and flick through the screens as I go*
> - *one JRMO needs to type into the eMR the results of the round – the physical findings and medical management plan*
> - *another JRMO is charting the medications, changing the medications, ordering tests*
>
> Physician (10), Hospital D

The ambition and focus on the technical learning and proficiency of a profession for quality improvement could be very specific, for example for the specialty of Anaesthetics.

> *"Ideally, I would like data on the individual practitioner compared with peers in a similar space e.g. vascular complications, postoperative nausea and vomiting,*

> *patient is cold postop, cardiac surgery patient extubated sooner or later - currently this is not identified by individual practitioner giving the anaesthetic. I would love to know how I am going compared to colleagues so I can learn. From the organisation, I want an easy way to access sensible reports, outcome reports per practitioner e.g. if their patients are always aspirating, having laryngospasm; to improve care, not punitive."*
>
> Clinician -Manager (2), Hospital A

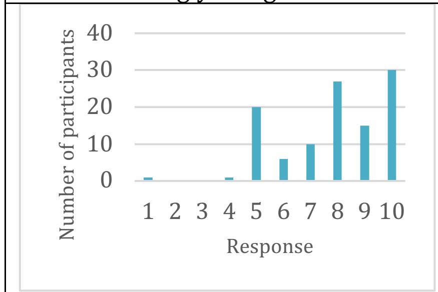
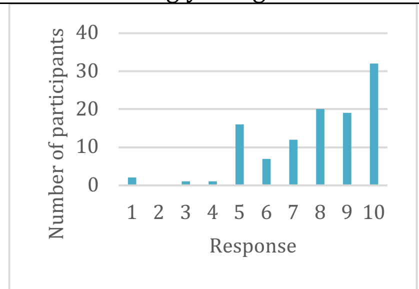
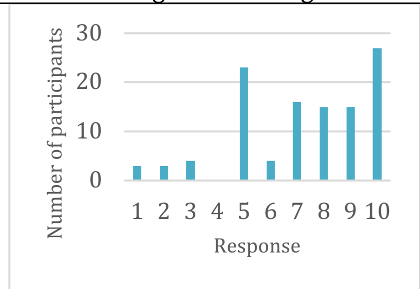
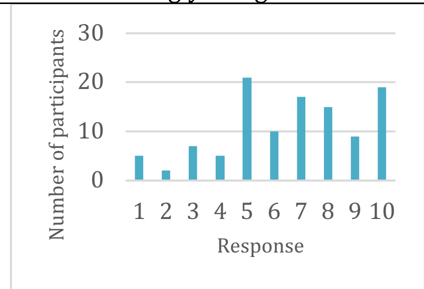
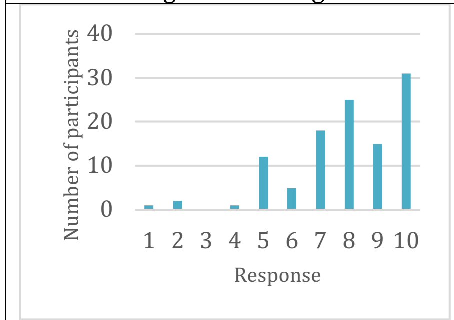
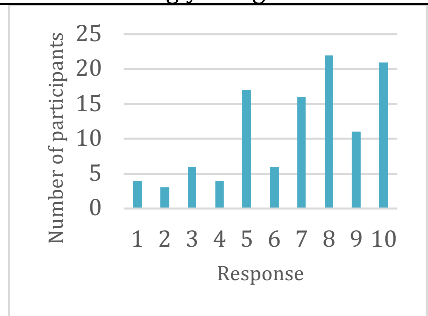
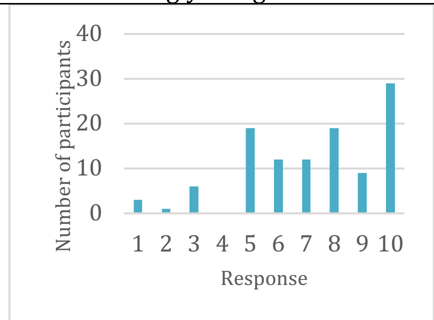
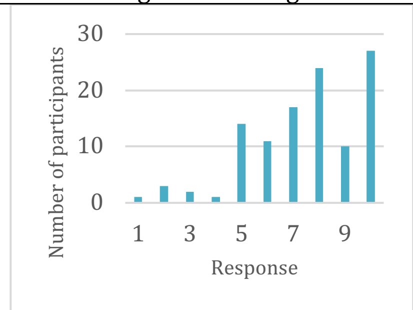
The 'law of diminishing returns' was given as a reason for the precise focus on addressing patient outcomes that were specific to the professional practice of a single clinical specialty, for a single phase of care.

> *"Time. Lack of time and 'law of diminishing returns' Intraop. - most of our problems, got worst out of the way, PACU, anything anaesthesia has done, first 24 hours, death under anaesthesia."*
>
> Clinician -Manager (2), Hospital A

6.3.1.2 For teams caring for high-risk patients

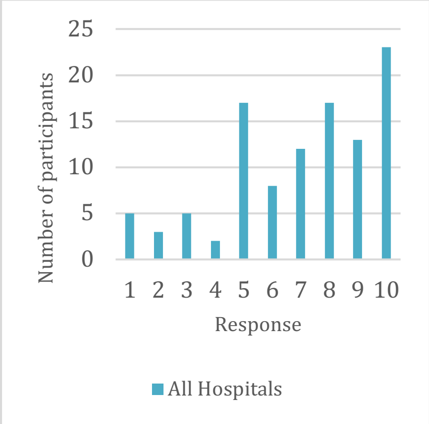
Second, for teams, wicked complexity in the gap between individual participants' motivation to improve patient care through interprofessional team collaboration and the current reality. Participants were invested in multidisciplinary teamwork. The attitude and belief of the majority of clinicians and clinician-managers was that in the future there was the need for broader team collaboration for the care of the high-risk patient (Figure 6.1). To improve care, by implementing emerging perioperative models of care for high-risk patients, participants indicated that they would like to collaborate more with other departments in the hospital (79%), with people in their own departments (73%), with patients (73%) and their carers (64%), GPs (62%) and primary care professionals (61%) and the LHD (60%).

Figure 6.1 SDS Compilation: Motivation to improve perioperative patient care through broader team collaboration

Responding to the question that, to improve perioperative care for patients, participant would like to work more with:			
People in own department • 73% (82/113) strongly agreed or agreed • 2% (2/113) disagreed or strongly disagreed	**Patients** • 73% (83/113) strongly agreed or agreed • 4% (4/113) disagreed or strongly disagreed	**Carers** • 64% (73/113) strongly agreed or agreed • 9% (10/113) strongly disagreed or disagreed	**Community carers** • 53% (60/113) agreed or strongly agreed • 17% (19/113) disagreed or strongly disagreed
			
Other departments in the hospital • 79% (89/113) strongly agreed or agreed • 4% (4/113) strongly disagreed or disagreed	**General Practitioners (GP)** • 62% (70/113) agreed or strongly agreed • 15% (17/113) disagreed or strongly disagreed	**Primary care health professionals** • 61% (69/113) strongly agreed or agreed • 9% (10/113) disagreed or strongly disagreed	**Our LHD** • 60% (68/113) strongly agreed or agreed • 6% (7/113) strongly disagreed or disagreed
			

Considering the existing POT orientation, a majority of participants (58%) said that the purpose of the MDT was to collect, analyse and integrate baseline with emerging information during the high-risk patient's evolving perioperative episode of care (Figure 6.2).

Figure 6.2 SDS: MDT needed to analyse and integrate information for the high-risk patient

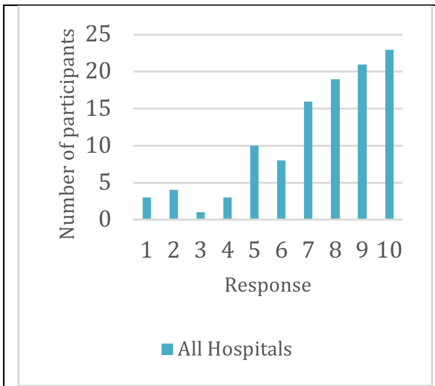


Responding to the question that one function of the multidisciplinary team was to collect, analyse and integrate information for the patient's surgical journey:

- 32% (36/113) strongly agreed
- 26% agreed (29/113)
- 13% strongly disagreed or disagreed (15/113)

The majority of clinicians and clinician-managers (70%) believed that their contribution to the MDT was important and valued by others in the team (Figure 6.3).

Figure 6.3 SDS: MDT value in diverse professional contribution



Responding to the question that, my contribution to the multidisciplinary team is valued:

- 39% (44/113) strongly agreed
- 31% agreed (35/113)
- 10% strongly disagreed or disagreed (11/113)

However, when surveyed on the question: "*When I make decisions based on a patient's medical condition and risk, I work closely with*" it was found that actual diverse professional MDT collaboration was limited (Figure 6.4). Collaboration was limited in the number of participants that reported working closely with team members from other professions, and it was limited to within hospital care. MDT collaboration with nurses (50%), surgeons (47%) and anaesthetists (48%) was standard for only around half the participants. For optimisation or to address an adverse event, only around one-third of participants reported that collaboration with medical specialists, with the patient's physician (27%) or new physician referrals (31%), was standard to their practice. For perioperative patient care few participants reported working closely with the patient's General Practitioner (18%), and one-third strongly disagreed or disagreed that collaboration with primary care was standard MDT practice.

Conventional ideas of teamwork and collaboration may not be applicable in the acute hospital surgical setting. It is not equivalent to the sports field that is relatively stable in structure. For example, reports from multidisciplinary staff observing novices on team rotations, in this case junior doctors, emphasised the importance of maintaining professional siloes and hierarchies for maintaining patient safety.

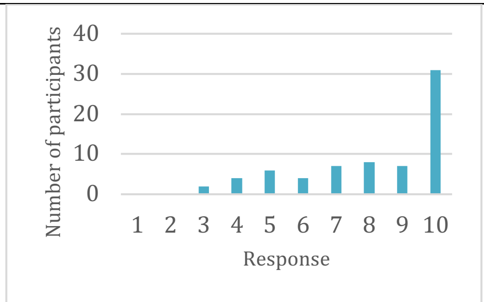
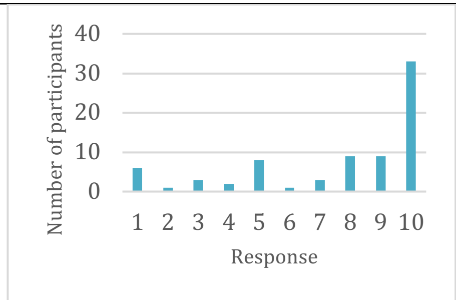
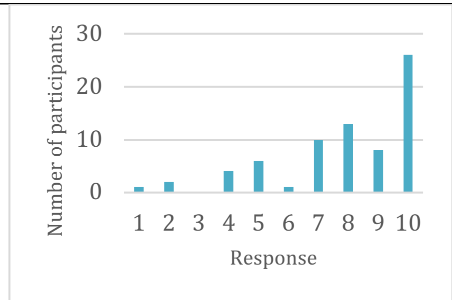
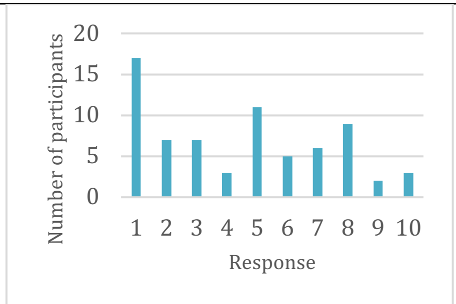
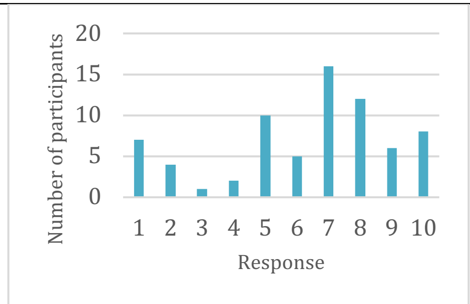
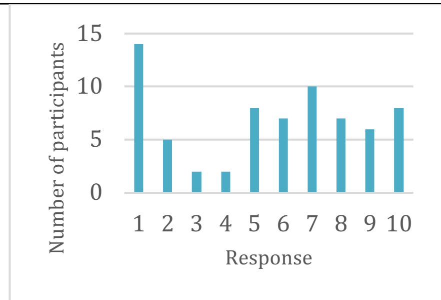
> *"New team is a risk in a complex surgery ward – new year, change of team – February 'everyone' - changes at once (of the doctors) – the Fellows, Registrars, Residents, Interns…- makes it hard for interns to be familiar with complex medicine regimes - for cancer"*
>
> Nurse (33), Hospital C

> *"Not specific to this hospital but high risk can be dealing with a whole lot of people who are inexperienced with high risk drugs and you can't find an alternate or senior clinician"*
>
> Pharmacist (2), Hospital C

However, a co-existing perspective was that of Allied Health staff in all four hospitals. Allied Health teams reported the lack of access to senior surgeons, and greater communication was needed to obtain important information about individual patients that impacted on their ability to undertake their work. For example, a social worker's comment at a ward discharge planning meeting.

> *"You are finally having a conversation with a senior doctor and you get to …what is actually wrong with the patients …"*
>
> Social worker (1), Hospital A

Figure 6.4 SDS Compilation: MDT actual diverse professional collaboration

<table>
<tr><td colspan="3">Responding to the question that, “When I make decisions based on a patient’s medical condition and risk, I work closely with:”</td></tr>
<tr>
<td>Surgeons
34% (38/113) strongly agreed
13% (15/113) agreed
5% (6/113) disagreed</td>
<td>Anaesthetists
37% (42/113) strongly agreed
11% (12/113) agreed
11% (12/113) disagreed</td>
<td>Nurses
30% (34/113) strongly agreed
20% (23/113) agreed
6% (7/113) disagreed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The patient’s GP
21% (24/113) strongly disagreed
9% (10/113) disagreed
18% (20/113) agreed</td>
<td>The patient’s Physicians
25% (28/113) agreed
12% (14/113) strongly agreed
12% (14/113) disagreed</td>
<td>New Physician referrals
27% (31/113) agreed or strongly agreed
4% (4/113) disagreed
17% (19/113) strongly disagreed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</table>

Lack of direct access to the senior surgeon, who was the key decision maker for approving ward care was reported and observed to be a significant gap in MDT teamwork.

> "*Ward MDT meetings, discharge planning meetings attended by junior RMO or intern, nutrition plans discussed, then plans unravel because the intern, RMO needs to ask the registrar and the registrar needs to consult the senior surgeon and then the NEXT time you ask about the plan you may get "Oh I didn't ask" or "I don't work for that team anymore*"
>
> Dietician (1), Hospital D

The gaps in communication embedded in context, between MDT members was a missed opportunity to share the most current profession specific detailed knowledge to improve patient care.

> "*'traditional surgeons' are not very evidence based where Allied Health is now very, very evidence based, … wasted opportunities for quality improvement*"
>
> Allied Health staff – Dieticians and Physiotherapists, Hospitals A, C, D

Barriers to interprofessional team learning led to gaps in understanding from different clinical perspectives. Particularly from the viewpoint of the high-risk surgical patient and the impact of surgery on a person's quality of life.

> *"Communication and other failures – surgery handover of care -focus on 'medical' but not how it effects a patient's daily life. Surgeons fix the problem but not the whole patient or discuss the whole surgical experience. Geriatricians are better than surgeons … but Allied Health come across this everywhere e.g. change to diet, eat this but patient does not understand why, does not like the taste, cannot tolerate the volume, cannot feed themselves physically …"*
>
> *"Not communicated to patient or nurses, just write e.g. after surgery to jaw 'pureed diet for 6 weeks ready for discharge' and the patient asks "why can't I*

have a steak? I don't like pureed or soft-diet". It has never been selected as a choice by them before. Doctors don't really communicate or understand the surgery effects and complications of surgery."

Dietician (X), Hospital A, C or D

Commonly there was limited two-way face-to-face communication between senior clinicians from different professions. At times the limitation extended to written communication.

"I feel like the 'middle man' between the patient and doctors, who wants the ideal and write: 'Plan – mobilise, walk' and we have to implement, and think what can we safely provide, e.g. this patient cannot stand safely, let alone walk. We voice our assessment through the eMR documentation, but doctors don't always read it, so we write the same thing again."

Physiotherapist (X), Hospital A, C or D

This practice gave rise to individual case and ongoing teamwork knowledge gaps in understanding. Continually there can be detail missing and limitations that the condition of a high-risk patient has for the knowledge and skills of other professions.

We are trained to see pathology – cardiovascular blood pressure, respiratory, chest xray, haemaglobin, anaemia – that will change our interventions, when certain things are contraindicated. Physical function flags for – supine to up - are aids required compared to baseline preoperative -? Is a monkey bar required to sit up, then OOB (out of bed) to chair, to toilet. Also ask Occupational Therapist is assistance required with shower equipment, are there stairs at home? Is the patient physically, functionally safe for discharge?

Physiotherapist (2), Hospital C

This gave rise between different professions of gaps in knowledge of what the other professions could offer in terms of patient care.

"Often (65% of the time) it is the senior nurses 'helping' the junior doctors know when to refer to Allied Health – dietetics, speech therapy etc whereas a single referral to Allied Health means that further appropriate referrals within the department will reliably be made for specific patients via formal and informal meetings or email, through familiarity with each others' clinical work contribution."

Allied Health staff (X), Hospital A, C or D

Attendance at MDT meetings was another marker of professional integration or gaps in practice and understanding. For example, daily facility-wide, ward 'safety-huddles' chaired by the Nurse Unit Manager, some professions attended and others not as they viewed it relevant for their work priorities. There could be inconsistent or consistent junior medical staff attendance depending on the ward and Hospital.

"Attending daily meetings that contain content that is not relevant to your work"

Speech therapist (1), Dietician (1), Physiotherapist (1), Hospital D

"Safety huddle – every ward, daily, should be NUM, RNs, JRMO and Allied Health – items discussed e.g. patients falls risk, troublesome behaviours, PACE patients that have been deteriorating, bed management, patient flows – No medical staff attend"

Nurses (2) (15), Hospital A; (18) (21) Hospital B; Nurses (33) (40) Hospital C;
Speech therapist (1), Dietician (1), Physiotherapist (1), Hospital D

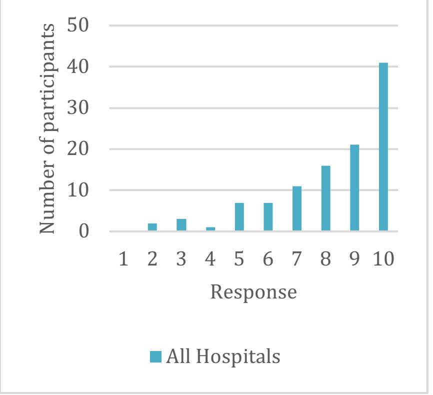
6.3.1.3 For the organisation

Third, wicked complexity arises for the broader organisation in the tension between maintaining mandatory long-term investment in KPIs and other data metrics for Service Agreements and Accreditation, whilst encouraging and supporting innovation and quality improvement for the high-risk surgical patient. For executive managers, the drivers for knowledge sharing and working together with clinicians and clinician-managers on emerging models of perioperative care was service sustainability (Chapter 5 Section 5.3.1.3) and quality improvement.

> *"Ideal" (for Perioperative Medicine) … data metrics and an underpinning Quality Improvement culture … would like an inquisitive culture … excited about what others are doing overseas, or go to a conference overseas and see others doing 'x, y, z' and would like to try the same at Hospital A or B. This is how we can do better. I want these conversations and would rather have the problem of saying to clinicians I have no resources and try to help raise resources. Would like to be challenged by clinicians, would like the feeling that I am holding them back. Would like to support, encourage, reward and drive further quality improvement. At the moment (almost) no-one is coming up here (the Executive Unit) with the ideas".*
>
> Manager (1), Hospital A and B; LHD

The attitude of a majority of clinicians and managers (78%) was that to improve perioperative patient care, they needed to know what happened to their patients beyond the immediate care provided in a timely manner (Figure 6.5)

Figure 6.5 SDS: Knowing individual patient's outcome important for quality improvement



Responding to the question that: to improve patient care we need to know in a timely fashion what happens to our patients:

- **55% (62/113) strongly agreed**
- 23% (27/113) agreed
- 7% (8/113) disagreed or strongly disagreed

Access to a meaningful clear patient outcome measure that reflected the individual patient's progress and outcome would enable the generation of ideas for quality improvement and efficiencies.

"Real time outcome on real patients with their name and background risk score. Will give us better outcome data and better use of resources"

Physician (7), Hospital C

For quality improvement both access to a clear patient outcome measure, rather than organisational population cohort measures, learning from harm or surveillance in conjunction with opportunities for regular interprofessional learning will be required. However, currently there are gaps in the membership and attendance of perioperative teams (Table 6.4). At all levels there are barriers and divisions - information, surveillance, professional, hospital, department and unit siloes. Other than in the critical care units of Hospitals A, C and D discussing patient that had surgery and care in their units, perioperative MDT did not routinely meet to discuss patient cases or long-term patient health outcomes, team outcomes or projects. In meetings to learn from complications or adverse events experienced by individual patients, there was a gap in perspective in the most common forum namely, Morbidity and Mortality (M&M) quality assurance meetings. In most hospitals and departments, attendance was primarily uni-disciplinary and focused on profession specific detailed knowledge sharing.

"M&M – wouldn't even know, would like to if relevant, good to get learnings from individual patient stories where we can get education. For example, aspiration pneumonia cases we want to improve quality of care and life"

Allied Health staff, Nurses (X), Hospital A, B, C or D

"M&M meetings wouldn't know when, where, who; not invited, do not attend"

Nurses, Allied Health staff (X), Hospital A, B, C or D

There was a notion, in the future to close the gap and move towards an 'ideal' form of interprofessional learning and practice, as expressed by an executive manager.

"M&M primarily 'the doctor's domain', 'in-house' rather than MDT. M & M with IT development and accountability. Nurses not on the same playing field.

Aim for research with the MDT and outcomes. Ideal is moving outcomes to the MDT, because the team, not individuals, gives a good clinical outcome. 'Nurse sensitive outcomes' are pressure injuries, UTIs, maybe part of the contribution."

Manager (11), Hospital A

At the intersection of the main themes, at multiple levels of care, across all four hospitals, across all professions and seniority, the evidence has shown that a wicked complexity embedded deep in context, arises and is maintained. A wicked complexity in gaps in perspective that was unintended and facilitated by the behaviours and technology of the practice environment. Organisational service agreements and the needed focus on profession specific detailed knowledge dominated and obscured interprofessional team learning and seeing the high-risk patient before professionals, individually and as teams.

6.4 Conclusion

With the increasing number and complexity of both our medically high-risk patients, and the systems and processes they navigate, analysing how clinicians, managers, perioperative teams and the organisation come to understand and address high-risk is important. This chapter presented the evidence for workforce learning, communication and collaboration considering what was required to implement appropriate perioperative models of care for the high-risk patient. The evidence has been synthesised into three main findings: first, how individual clinicians and managers acquired their understandings of high-risk through professional immersion; second, how teams shared their high-risk knowledge and skills; and third, how the organisation facilitated high-risk knowledge sharing using technology. At their intersections, there was further complexity. For the individual and the team, the focus was upon developing profession specific knowledge and skills that were necessary for high-risk patient care, whilst seeking to work in a multidisciplinary team context. This gave rise to a wicked complexity in gaps in perspective. The next chapter is the discussion chapter, it draws together the findings of the three results chapters 4-6 with the research literature.

Chapter 7 Discussion

7.1 Introduction

The aim of this thesis was to improve our knowledge of perioperative context, particularly how in practice – clinicians and managers understand risk and how this influenced their work and use of resources when caring for patients having surgery and anaesthesia. This chapter draws together the empirical findings from previous chapters, integrating them with the details from the introduction of the problem, literature review and methods. The nine interconnected themes in the findings Chapters 4, 5 and 6 are integrated with the literature review to derive answers to the overarching research aim. The discussion centres on the challenge of simultaneously addressing high volume surgical demand and the needs of the high-risk, high cost surgical patients.

The research arcs were the policy arc (Chapter 4), the risk and practice arc (Chapter 5) and the interprofessional arc (Chapter 6). The nine themes were compression of time and space (CTS), fragmentation of care (FC), clinical complexity (CC), understandings of high-risk (UHR), work practice organisation (WPO), unclear patient outcome measure (UPOM), professional immersion (PI), perioperative teams (POT) and using technology (UT).

The end result was the development of a new concept called "wicked complexity in perioperative context" (WC_{PC}). This concept (Diagram 7.1) links the potential impact on the high-risk surgical patient exacerbated by system stress and failure. Diagram 7.2 outlines this system stress with the analysis and synthesis of the empirical evidence across the three research arcs and nine themes of the results chapters. On examining the nine themes in the policy, the risk and practice and the interprofessional arcs, WC_{PC} gave a structure for integrating and understanding perioperative risk from a new perspective.

The perioperative system is a linear transitioning to a complex adaptive system based on surgical risk. This was the most rendered solution clinicians, managers and the organisation, could develop by continually fine-tuning elements of care to address current challenges. This thesis argues that the perioperative system has evolved to incorporate WC_{PC}. By targeting WC_{PC} health service researchers and policy makers are able to chart a parallel evolving course, an innovation-disruption approach, to equip clinicians and managers to deal with the impact of context and face future challenges associated with increased demand, sustainably and new challenges such as COVID-19 for example.

Diagram 7.1 Wicked complexity in perioperative context

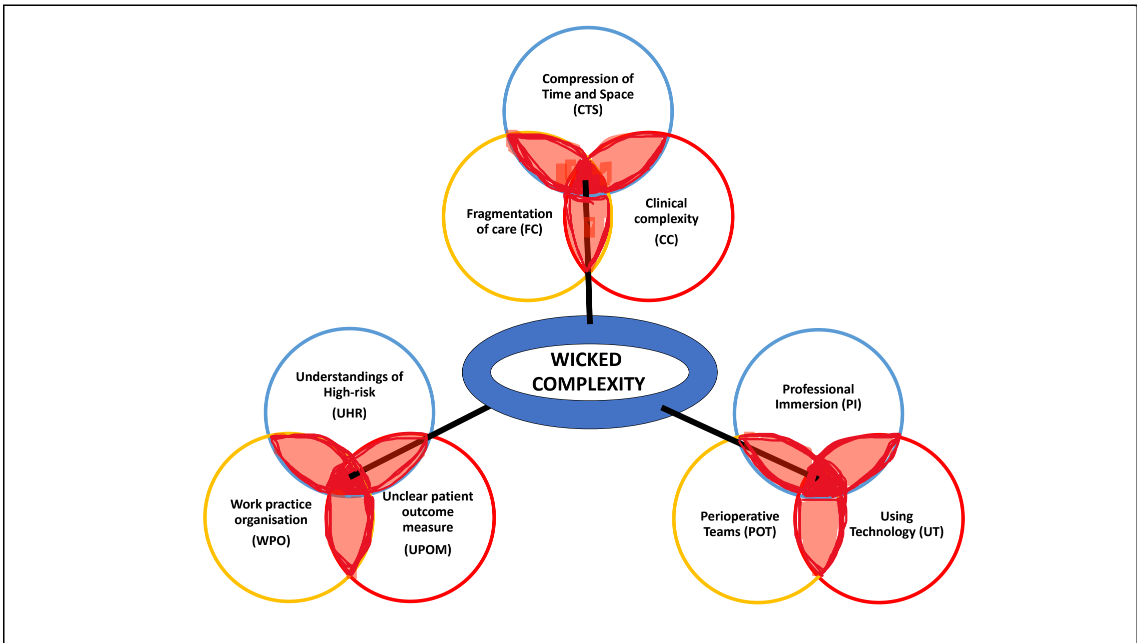


Diagram 7.2 Analysing and synthesising wicked complexity in perioperative context

Results chapter	**4**	**5**	**6**
Research arc examined	**Policy**	**Risk and Practice**	**Interprofessional**
Themes	CTS FC CC	UHR WPO UPOM	PI POT UT
Result			
Wicked complexity in perioperative context =	**Competing priorities and demands +**	**Gaps in fully comprehending high-risk +**	**Gaps in perspective**
WC_{PC} =	WC_{CPD} +	WC_{GFCHR} +	WC_{GP}

This chapter is structured in three parts. First, an examination of existing best practice in the research setting, namely sections 7.2-7.4, how clinicians and managers coped with and addressed current challenges by adjusting the elements of perioperative care under their control. Second, section 7.5 describes how existing work practice organisation may best evolve to address WC_{PC} embedded deep in context, arising and maintained by the behaviours of the practice environment. At the conclusion of both parts, a consideration of how clinicians and managers would cope with continuing current practice or alternatively, adopt a combined strategy, an innovative disruption approach. Third, section 7.6 draws up the ideas presented here to identify and integrate the unique contributions of the research.

7.2 Wicked complexity in competing priorities and demands (WC_{CPD})

As indicated throughout this thesis, this study furthers our understanding of the context of care for the high-risk, high-cost complex care surgical patient cohort by considering the impact of policy. The research explores for the first time, this problem across different organisational levels of policy enactment, the multiple professions and seniority of the people involved in the process. On examining the policy arc, empirical evidence at the intersections of the themes, CTS, FC and CC, gave rise to competing priorities and demands that prove increasingly complex and interwoven. That is, a WC_{CPD} that could be extrapolated to impact most significantly upon the high-risk patient having surgery and anaesthesia. Competing priorities arose from the necessity for Executive and senior managers to achieve multiple different long-term national and state targets, standards and service agreements from the same pool of limited resources (Boxes 4.14, 4.15, 4.23). Competing demands arose from the necessity for frontline clinicians and clinician managers to respond in day-to-day work practice, to the policy responses made at higher levels of the organisation. Specifically, for frontline clinicians in the immediate or short-term, the need to simultaneously provide care for patients across multiple discreet locations (Section 4.3.2) with pressure not to delay care processes (Section 4.3.1). There are five key findings that define WC_{CPD} to be reviewed (Table 7.1).

Table 7.1 WC_{CPD} - Key research findings

Number	Finding
Competing priorities from multiple long-term strategies employed by the organisation and senior managers	
CPD1	*Competing policies for hospital beds – NEAT/4HR versus NEST targets*
CPD2	*Competing priorities for HVSSS and efficiency versus complex care surgery*
Competing demands from immediate and short-term strategies employed in day-to-day work practice by clinicians and clinician managers	
CPD3	*Focus on the 'here and now' and 'not delaying care processes downstream'*
CPD4	*Focus on high-technology areas, complicated care and complications*
CPD5	*Choosing to contribute profession specific expertise based on professional rosters*

7.2.1 Competing priorities

Key finding CPD1: Competing policies for hospital beds – NEAT/4HR versus NEST targets

A key finding was the human resource impact that two long-term competing policies for limited hospital beds capacity had on day-to-day work practice and culture. Namely, the NEAT/4HR policy that addresses access to hospital beds for patients presenting through the Emergency department and the NEST policy that addresses access to hospital beds for patients presenting for elective surgery. The research findings from the clinical frontline (Boxes 4.14, 4.15, 4.23) supports recent reports of funding shortfalls for hospitals (AMA 2019, SMH 2019). Particularly the observations at Hospitals A, C and D of managers and clinicians expending human resources across all levels of care, trying daily to address or cope with the wicked problem of 'no beds' (Box 4.23). Advocacy and media reports of threats to access and sustainability were substantiated by government reports from the AIHW (Chapter 1 p9, AIHW ESWT 2017-2018 p.iv). The increase in ESWT, across the last two decades has increased, year on year (Chapter 1 Figure 1.1, AMA 2019 p8, Chapter 1 p9, AIHW ESWT 2017-2018 p.iv). The Australian Medical

Association (AMA) in their Public Hospital Report Card 2019 concluded that "*this was the worst performance against this measure since 2001-2002*" (AMA 2019 p8).

Local evidence provided by the statistical modelling of the LHD for Hospital A Redevelopment indicated that the strain on hospital beds, access and sustainability came in significant part from the high-risk, high-cost, complex care surgical patient population cohort (LHD 2015b p19). The modelling is consistent with national reports from the AIHW (AIHW AH 2018, AIHW EWST 2017-2018, AIHW EDC 2017-2018) and international peer reviewed publications from the U.K. (NCEPOD 2010)**,** Europe (Pinto 2019), and the U.S.A (Hall 2017). This numerical understanding linking challenges to service sustainability with the complex care surgical patient is confirmed (Chapter 4 Box 4.20, Chapter 5 Boxes 5.6, 5.7) and extended by the empirical results of this study into the perioperative context of care. The results have provided evidence that the high-risk surgical patient was the most at-risk of being at the confluence of competing policies as these patients most needed access to hospital beds, they were the most likely not to be suitable for DOSA or HVSSS, and they often needed access to all the multiple fragments of perioperative care, including critical care resources (Chapter 4 Box 4.21; Chapter 5 Boxes 5.6, 5.7; Figure 5.6, Table 5.8). The research confirms that the following departures from linear processes impacts most on the high-risk patient: delays to surgery and prolonged fasting times contributing to in-hospital malnutrition (Rycroft-Malone 2012); cancellations on the day of surgery due to lack of postoperative critical care beds (Seim 2009); and, admission to outlier rather than preferred surgical ward or to cause other patients needing hospital beds to be admitted to outlier beds; or pressure to earlier discharge from critical care or hospital ward bed (Chapter 4 Section 4.3.1.5 and Chapter 5 Section 5.2.1.1) . The research evidence provides a contextual explanation for consistent findings that, despite increase in costs to patients and government, adverse events in hospital and postoperative morbidity and mortality in the community have increased over the past ten years in Australia (Ellis 2021, AIHW AH 2018) and globally (Grocott 2019, Pinto 2019, Nepogodiev 2019, Hall 2017, Merkow 2015).

Key finding CPD2: Competing priorities for HVSSS and efficiency versus complex care surgery

This research supports previous empirical findings on the success of past national and state perioperative policy for addressing surgical demand and sustainability. Redesigning systems, structures and processes to increase efficiency and reduce length of stay for a high volume of patients having surgery and anaesthesia was key to this end (MacLellan 2012, Lee 2011, Lowthian 2011, Ben-Tovim 2008, MacLellan 2008, PC 2005, NSW_ACI_PSP2004, Caplan 2002, Caplan 1998, Kerridge 1995). Evidence of the structures and processes for the PSP and HVSSS were found to be well established at the four hospitals (Box 4.1, Figure 4.1 and Box 4.2). The policy success of the PSP and HVSSS is consistent with two Australian before-and-after studies on the implementation of process-orientated care delivery across all phases of the hospital perioperative processes (pre-intra-post-operative), for the majority of patients presenting for surgery, using a linear Deming model for quality improvement (Lowthian 2011, Ben-Tovim 2008). Patients were regarded as abstract homogenous units in industrial processes amenable to efficiency gains (Lowthian 2011, Ben-Tovim 2008). Lowthian (2011) using linear logistics and Ben-Tovim (2008) using linear 'Lean thinking' methods developed in the manufacturing industry, achieved significant efficiency gains in length of stay and staff time by eliminating non-value-added steps and, adding process pull factors to push factors for bed management.

The policy success of the PSP and HVSSS was distinctively evident in Hospital B. Unlike the other hospitals in the research setting, Hospital B did not have the pressure of, nor the consequences of managing competing policies for hospital beds. The strategic focus of Hospital B was on low to low-intermediate risk quaternary level surgeries, that is HVSSS linear systems for efficiency. Hospital B did not have a critical care unit, high-risk patients that required more complex surgery or were more acutely physiologically compromised were transported to Hospital A or another nearby teaching hospital (Chapter 5 Section 5.2.2.2).

However, the policy success of the PSP and HVSSS appear at odds today with the AMA Public Hospital Report Card 2019 (AMA 2019 p8). The empirical findings of this research reconcile and support both claims that strategies for dealing with high volume demand: are necessary and effective (Chapter 4 Box 4.1, Figure 4.1, Box 4.2) (MacLellan 2012, Lowthian 2011, Ben-Tovim 2008) and, confirm that the high-risk, high-cost, complex care surgical patient population cohort (Chapter Box 4.20, Chapter 5 Boxes 5.6, 5.7) and the perioperative context they inhabit (Chapter 5 Figure 5.6), are the modern challenge (Ellis 2021, Nepogodiev 2019, Grocott 2019, Pinto 2019, AIHW AH 2018, Hall 2017, LHD 2015b p19, Merkow 2015, NCEPOD 2010).

The limitation of the single hospital linear logistics studies of the past was that they did not fully consider patient risk and case complexity, other than elective or emergency surgery (MacLellan 2012, Lowthian 2011, Ben-Tovim 2008). This research and that of Vos (2010) using mixed methods, contradict the simplicity of linear logistics studies and question their ability to fully address current challenges to perioperative service sustainability - such as that found at Hospitals A, C and D. This research confirms that healthcare delivery for high-risk patients in hospitals is complex and not linear (Ghaferi & Dimick 2016, Vos 2010). This was due to the number of different illnesses, treatments and preferences of patients and their medical professionals, and oftentimes patients may have more than one problem requiring different kinds of services, sometimes simultaneously (Chapter 5 Table 5.5, Figures 5.3, 5.4, 5.5, 5.6) (Ghaferi & Dimick 2016, Vos 2010). In addition, in institutional context, hospitals tried to perfect individual care processes, in fragments, causing breakdowns in the coordination of care (Chapter 4 Section 4.3.2) (Ghaferi & Dimick 2016, Vos 2010).

Summary: Competing priorities from multiple long-term strategies employed by the organisation and senior managers

Together key findings CPD1 and CPD2 comprise to form the conclusion: the policy context establishes unresolved competing priorities from multiple long-term strategies employed by the organisation and senior managers, that are focused on access and efficiency targets based principally on linear industrial process models that are outdated. This is part of the wicked complexity from competing priorities that gives rise to and exacerbates competing demands for frontline clinicians and clinician-managers.

7.2.2 Competing demands

There is a lack of literature exploring the combined issue of patient high-risk and the context of work practice. The study results are consistent with previous individual findings across the whole spectrum of risk, low, intermediate and high (Ellis 2021, Pinto 2019, AIHW AH 2018, Hall 2017, Ghaferi & Dimick 2016, MacLellan 2012, Lee 2011, Lowthian 2011, NCEPOD 2010, Vos 2010, Ben-Tovim 2008, MacLellan 2008, PC 2005, NSW ACI PSP 2004, Caplan 2002, Caplan 1998, Kerridge 1995) and furthermore significantly add to the literature by qualifying the impact of perioperative policy addressing HVSSS and efficiency with its unintended consequences that contributed to WC_{CPD}. In doing so, the thesis confirms the findings from the organisational safety literature, in healthcare and other high-hazard industries, that budgetary pressures to make systems leaner can increase the complexity of the short-term interactions and the longer-term inter-relationships within it (Nemeth & Hollnagel 2016, Nemeth 2008).

The following three research findings – CPD3, 4, and 5 - are unique, individually and together, revealing the multifaceted competing demands faced by frontline perioperative clinicians and managers. The following evidence supports and provides an explanation for challenges in managing the high-risk complex care patient namely, clinical handover problems in a surgical episode of care (Moller 2013, Segall 2012, Nagpal 2010), serious adverse events from failure in escalation of care (Johnston 2015, Johnston 2014, Rotella 2014, Greenberg 2007) and failure to rescue (Fry 2020, Ward 2019, Ghaferi & Dimick 2016, Ghaferi 2009).

Key finding CPD3: Focus on the 'here and now' and 'not delaying care processes downstream'

The historical evidence for compression of time and space shows that over the decades of progressive DOSA, DOS, HVSSS policy, the reduction in both the number of hours patients physically now spend in the hospitals and the physical decrease in the numbers of beds and wards across the hospitals (Chapter 4 Boxes 4.3, 4.4, 4.5, 4.7). Participant quotes across the professions, seniority and hospitals (Chapter 4 Section 4.3.1), made apparent that a policy driven concertina-like compression of process time had resulted in previously sequential tasks becoming overlapping or parallel tasks for all clinicians (Chapter 4 Box 4.7). For example, senior surgeons and anaesthetists were, providing intraoperative care; simultaneously thinking about their other patients in the pre-operative and postoperative wards; projecting forward as how to meet upcoming demands for the day; and, considering how to maintain patient flow (Chapter 4 Section 4.3.1.2). Patient safety and the pressure not to delay processes to the operating theatres that can affect the rest of the day, presented as dual competing demands for junior doctors, nurses, anaesthetists and surgeons (Chapter 4 Boxes 4.3, 4.5). First thing in the morning surgical ward rounds were reported to be as fast as "*20 patients in 60 minutes*" (Chapter 4 Section 4.3.1.2).

This finding on the pressure not to delay care processes to the operating theatres is significant when considered with literature reviews and studies on hospital ward rounds and postoperative handovers. CTS for perioperative clinicians resulted in fragmentation of multidisciplinary team attendance on ward rounds (Section 4.3.2.3). This evidence provides an explanation for Walton (2020) findings that professions were inconsistent in their identification of ward rounds, doctors were most consistent within specialty disciplines, whilst some nurses were unable to identify any rounding processes. CTS can have an opportunity cost as hospital ward rounds present opportunities for: doctors, nurses, allied health clinicians and patients to interact and plan patient care; and, clinician education and multidisciplinary team collaboration (Walton 2020, Walton 2016).

This finding on the need to consider multiple tasks simultaneously with pressure not to delay care processes, is also consistent with three systematic literature reviews on perioperative handovers. Handovers were found to be characterised as complex work practices challenged by interruptions, time pressure and lack of a supporting framework (Moller 2013, Segall 2012, Nagpal 2010). In light of the patient safety literature this is a unique research contribution. The research evidence makes the connection between economic pressures to make perioperative systems leaner by removing resources, such as time and space, that may have latent value (Nemeth & Hollnagel 2016, Nemeth 2008). Resources that may appear to be superfluous in normal operations may have latent value in multidisciplinary ward rounds and clinical handover for the high-risk complex care patient (Nemeth & Hollnagel 2016, Nemeth 2008).

Key finding CPD4: Focus on high-technology areas, complicated care and complications

A unique research finding was a culture, where perception of a lack of time was dominant across all clinical professions - surgeons, anaesthetists, nurses, physiotherapists, dieticians and pharmacists, resulted in care becoming increasingly fragmented across multiple phases of care. This was manifest in a common decision to hand over care and assume that safety and quality of care was at an acceptable standard unless otherwise notified, that is, *'no news is good news'* (Chapter 4 Section 4.4.1.2). When there was the constant need to focus on the next patient on the process line the default resource option was to focus on high-technology areas, complicated technical care and complications *'call me if needed'*.

The inability to physically be in two places at the same time meant that clinicians had to choose how to use their resources for example, unlike in '*times gone by*' there was '*no time*' to follow-up patients or teach (Chapter 4 Section 4.3.2). Surgeons, anaesthetists, nurses, physiotherapists, dieticians, pharmacists and junior doctors all reported that they had to continually prioritise their time and focus to the immediate or to the higher risk and not delay processes downstream (Chapter 4 Section 4.3.1). Senior surgeons and anaesthetists stated they were expected to prioritise and have traditionally chosen to focus their time and expertise in the operating theatres over the wards, in working hours and afterhours (Chapter 4 Section 4.3.1.2; Chapter 6 Section 6.2.2.2). This was similar to other senior doctors such as intensive care and emergency department physicians. Interestingly, this finding on the attitude and behaviour of senior doctors and clinicians prioritising their time and expertise to acute care areas requiring intensive psychomotor technical precision, is duplicated in healthcare teamwork research (Rosen 2018). The research on perioperative teamwork is based on tightly collocated acute care settings such as the operating theatres (Lingard 2004a) and critical care unit (Dietz 2018, Lingard 2004b, Pronovost 2004) rather than the more geographically distributed multidisciplinary teams of the hospital wards (Walton 2020, Rosen 2018, Walton 2016, Rotella 2014, Weller 2014, Ravikumar 2010, Eliott 2008).

Nurses and Allied Health staff were for the most part members of stationary teams and ward or unit based or allocated (Chapter 6 Section 6.2.2.1). Nurses, Allied Health physiotherapists and junior doctors were observed to spend the most time with high-risk patients in the hospital wards (Chapter 4 Section 4.3.1). This is a significant finding as previous studies have found that for the high-risk patient, other than avoiding complications, inpatient surgical mortality may be reduced by timely recognition and management of postoperative complications (Fry 2020, Ward 2019, Ghaferi & Dimick 2016, Ghaferi 2009). This unique research on policy and context, that describes a culture where the experience and perception of a lack of time was dominant across all clinical professions, also provides an explanation for several studies that have reported failures in escalation of care due to status asymmetry, ambiguity about responsibilities, junior doctors reluctant to disturb senior surgeons (Rosen 2018, Johnston 2015, Rotella 2014, Greenberg 2007).

Focusing on complications often meant professionals choosing to take action to avoid their development by continuing to provide care and miss ward rounds designed to aid care plans and teamwork. The inability to physically be in two places at the same time meant that clinicians had to choose how to use their resources for example, nurses providing a series of complicated technical care for the high-risk patient after major surgery, often observed in Hospitals A, C and D, could not attend daily ward rounds with the senior surgeon, the surgical team, or the pain management team (Chapter 4 Section 4.3.1.3). This decision to stay with one patient to complete intensive psychomotor technical care, rather than attending whilst distracted, surgeon or specialist handover for patients, is supported by broad recommendations from systematic literature reviews on clinical handover (Moller 2013, Segall 2012, Nagpal 2010). This finding supports a systematic literature review that found that information transfer failures are common in the hospital setting in the fields of surgery and anaesthesia and are distributed across the continuum of care -pre, intra, postoperative (Nagpal 2010). This finding of clinicians needing to prioritise their time to complicated technical 'taskwork' over 'teamwork' further questions the predominant lean strategies focusing on access and efficiency and their appropriateness in the context of the high-risk complex care patient (Rosen 2018, Nemeth 2008). This research extends the knowledge on teamwork in high-risk healthcare settings and argues that resources such as time for teamwork learning, that may appear to be superfluous in normal operations may have significant latent value for high-risk patient safety (Rosen 2018, Nemeth 2008).

Key finding CPD5: Choosing to contribute profession specific expertise based on professional rosters

For high-risk patients, complex care provision was fragmented between and within professions. The high-risk patient often had one senior surgeon but multiple individuals in each of the professional groupings of nurses, anaesthetists, physicians and junior doctors, rostered throughout their episode of care (Chapter 4 Boxes 4.20, 4.21). This finding is consistent with reviews on patient safety describing geographically distributed multidisciplinary teams within teams across a perioperative episode of care (Rosen 2018, Weller 2014). The work practice organisation of clinicians within the same profession had two distinct characteristics. First, clinicians within the same profession were observed to be co-opted to provide care within the same domain of specialty specific expertise, with little cross-over between professions. Second, within professions care was provided based on single profession rosters that over a prolonged episode of care incorporated many different individuals and added multiple handovers to clinical complexity. This was particularly the case for anaesthetists and physicians contributing short term care for the high-risk patient. Hospital rosters, with the majority of senior specialist doctors working in multiple hospitals, contributed to a culture focused on the '*here and now*', '*call me if needed'* and high acuity complicated care, over integrated teamwork and continuity of care (Rosen 2018, Weller 2014, Heath & Staudenmayer 2000). This finding is consistent with the teamwork and communication challenges of other industries where there is a strong tendency for division of labour based on specialty expertise (Rosen 2018, Weller 2014, Heath & Staudenmayer 2000).

Summary: Competing priorities and competing demands from multiple long-term strategies employed by the organisation and senior managers

The five key findings that together define competing priorities and demands in surgical services, were unexpected and are a unique new contribution to the literature. In an organisational context that prioritised efficiency, clinicians and managers were stressed for time and tried to improve individual care processes, in fragments, as needed. This exposed culture could potentially result in the significant breakdowns in the coordination of care for high-risk complex care patients found in related studies (Fry 2020, Ward 2019, Rosen 2018, Ghaferi & Dimick 2016, Johnston 2015, Johnston 2014, Rotella 2014, Weller 2014, Moller 2013, Seagall 2012, Nagpal 2010, Vos 2010, Ghaferi 2009, Greenberg 2007, Hillman 2005, Heath & Staudenmayer 2000).

7.3 **Wicked complexity in gaps in fully comprehending high-risk (WC_{GFCHR})**

This study furthers our understanding of the context of care for the high-risk, high-cost complex care surgical patient cohort by considering work practice organisation around risk. The research was a unique empirical study to explore this issue across multiple professions and seniority for how high-risk was conceptualised and operationalised. On examining the risk and practice arc, empirical evidence at the intersections of the themes, understandings of high-risk, work practice organisation and unclear patient outcome measure, gave rise to gaps in fully comprehending high-risk. The complexity identified – a WC_{GFCHR} - could be extrapolated to impact most significantly on the high-risk patient having surgery and anaesthesia. Table 7.2 presents the key findings that define WC_{GFCHR}. Gaps in fully comprehending high-risk became increasingly apparent as perioperative WPO transitioned from a high volume predictable, reliable linear system and approached an increasingly complex adaptive system.

For clinicians and managers caring for the high-risk complex care patient, five key findings contribute to gaps in fully comprehending high-risk. Considered together there are significant implications to patient safety, quality of care, informed consent and service sustainability.

Table 7.2 WC$_{GFCHR}$ - Key research findings

Number	Finding
Gaps in fully comprehending high-risk from work practice organisation transitioning from a linear to an increasingly complex adaptive system	
GFCHR1	*The perioperative system was a business process model (BPM) series showing a progression from a linear to a CAS, as risk increased*
GFCHR2	*As perioperative BPMs became more complex with 'detours' and 'loop backs' gaps in fully understanding high-risk became exposed*
GFCHR3	*Each individual has an internal risk rubric with significant gaps or blind spots*
GFCHR4	*A fragmented picture of high-risk in surgical services with communication challenges*
GFCHR5	*Skew in measures, information and outcome focuses – individual patient, population cohort and organisational safety population cohort measures*

Key finding GFCHR1: The perioperative system was a business process model series showing a progression from a linear to a CAS, as risk increased

The perioperative system at Hospitals A, B, C and D were observed to be, an assemblage of work practice components across a perioperative continuum of pre-, intra-, and post-operative phases of care that together formed a complex and unitary whole. For patients undergoing an episode of surgical care, the whole perioperative system could be captured in a series of business process models showing a progress from a linear to a CAS, as risk increased (Chapter 5 Figures 5.4, 5.5, 5.6). This finding is consistent with previous study findings on linear reliable predictable systems for low-risk surgery (NICE 2016, ACC/AHA 2014, LaFortune 2012, MacLellan 2012, Lee 2011, Lowthian 2011, Ben-Tovim 2008, MacLellan 2008, Khuri 2005, Alexander 2000, Caplan 2002, Caplan 1998, Kerridge 1995). Additionally, this finding is consistent with previous study findings on systems for intermediate and high-risk surgery (Grocott 2019, Stone 2018, Ljungqvist 2017, Liu 2017, Nelson 2016, NICE 2016, ACC/AHA 2014, Khuri 2005) and complex adaptive systems (Fry 2020, Ward 2019, Johnston 2018, Ghaferi & Dimick 2016, Iberti

2016, Johnston 2015, Johnston 2014, Rotella 2014, Cull 2013, Ravikumar 2010, Ghaferi 2009, Eliott 2008, Greenberg 2007, Hillman 2005, Huddleston 2004, Story 2004).

Importantly, the research evidence extends the existing body of knowledge by defining the whole perioperative system as a series of three business process models showing a transition from a linear to a CAS, as risk increased. This finding is uniquely established on evidence not presented in previous studies in five ways. First, by specifying and listing the types of surgeries for low, intermediate and high-risk surgeries. (Chapter 5 Table 5.6, 5.7, Table 5.8). Second, by describing their distinct characteristics (Chapter 5 Table 5.6, 5.7, Table 5.8). Third, by providing examples of patients in clinical vignettes that had low, intermediate and high-risk surgeries (Chapter 5 Boxes 5.5, 5.6, 5.7). Fourth, by presenting patients having the same surgery but were different in their presentation for example age, frailty, comorbid medical conditions, elective or emergency (Chapter 5 Boxes 5.5, 5.6, 5.7). Fifth, the findings acquired using mixed methods were presented as a whole, together with the BPMs (Chapter 5 Tables 5.6, 5.7, 5.8; Boxes 5.5, 5.6, 5.7; Figures 5.4, 5.5, 5.6) and detailed descriptions of specific work practice components of the perioperative assemblage (Chapter 5 Boxes 5.8, 5.9, 5.10) interspersed with interview quotes from senior surgeon, nurse, clinician manager and manager providing their insights, across levels of risk.

Important evidence from the local context was presented demonstrating looming threats to surgical services sustainability from the high-risk complex care surgical patient namely, LHD statistical modelling and increasing demand and utilisation of critical care MET services (Chapter 5 Section 5.3.1.3). The research findings support a body of literature that argue the importance of investing in understanding, mitigating and managing adverse outcomes for the high-risk perioperative patient because of the significant costs to the individual and to society (Cline 2020, Fry 2020, Stephens 2020, Grocott 2019, Pinto 2019, Nepogodiev 2019, Shinall 2019, Ward 2019, Grocott 2017, Ghaferi & Dimick 2016, Sheetz 2016, Grocott & Mythen 2015, Minto & Biccard 2014, Lawson 2013, Vonlanthen 2011, Ravikumar 2010).

Key finding GFCHR2: As perioperative BPMs became more complex with 'detours' and 'loop backs', gaps in fully understanding high-risk became exposed

As perioperative WPO progressed from a linear system to a CAS gaps – individually, professionally and organisationally, in fully understanding high-risk became increasingly apparent (Chapter 5 Figure 5.6). A vast body of empirical evidence attest to the challenge of timely recognition and rescue of high-risk complex care patients once a postoperative complication is evident (Fry 2020, Grocott 2019, Ward 2019, Johnston 2018, McDonald 2018, Ghaferi & Dimick 2016, Iberti 2016, Kabrhel 2016, Sheetz 2016, Cull 2013, Symons 2013, Guillamondegui 2012, Ravikumar 2010, Bellomo 2004, Huddleston 2004, Story 2004). The results in this study confirmed that WPO needed to be capable of reorganising and reacting to changes in a patient's medical condition for their resource deployment.

This research exclusively shows that each individual patient having surgery is on one version of the BPMs and on any given day clinicians face multiple BPMs trajectories, in parallel. This important finding adds to the literature by presenting the work practice context around risk as a detailed whole, in the manner experienced by clinicians and managers. This finding is evidence for the reconceptualisation of the perioperative system: from a simplistic two-dimensional perioperative system based on process and timeline, to a multidimensional series of BPM based on low, intermediate and high-risk. The perioperative system exists in context as the simultaneous multiple parallel individual patient trajectories faced by clinicians and managers. This is a major new addition to the empirical knowledge base on perioperative systems.

Members in the interprofessional team around a single patient, were consistently observed to increase in number, specialisation and diversity, when the high-risk patient's episode of care 'detoured' or 'looped' from the planned (Chapter 5 Figure 5.6 and Boxes 5.7, 5.9, 5.10, 5.12). The study results confirmed that the interprofessional teams caring for high-risk surgical patients consisted of 'one-off teams' of different individuals rather than relying solely on stable team formations (Chapter 5 Box 5.12) (Johnston 2018, Rosen 2018, McDonald 2018, Iberti 2016, Kabrhel 2016, Weller 2014, Cull 2013, Symons 2013, Guillamondegui 2012, Ravikumar 2010, Bellomo 2004, Huddleston 2004, Story 2004). The study results extends existing knowledge on perioperative systems by showing that for high-risk complex care patients that suffered a complication, the succession of 'short-term' and 'one-off' teams created gaps for clinicians, clinician-managers and managers in fully comprehending high-risk together (Chapter 5 Box 5.12, Chapter 7 Section 7.2.2). This finding is consistent with studies from other settings on 'knotworking' in complex acute care environments (Hurlock-Chorostecki 2015, Reeves & Lewin 2004). These teams were observed, and individuals confirmed, that as teams or as individuals, they received minimal to no feedback on patient outcomes beyond immediate care (Chapter 5 Table 5.10, Boxes 5.9, 5.11).

Key finding GFCHR3: Each individual has an internal risk rubric with significant gaps or blind spots

All research participants said they had their own *'internal rubric'* or *'working understanding'* of multiple risk factors that they used to understand which patients were at 'high-risk' and inform their work practice. Consistent with previous study findings the risk factor key elements were (1) type of surgery and urgency, emergency, (2) anaesthesia related factors, (3) patient's chronic medical condition and age or frailty, and (4) organisational risk factors (Chapter 5 Table 5.2, Diagram 5.2) (Fry 2020, Stephens 2020, Pinto 2019, Shinall 2019, Minto & Biccard 2014, Allman 2015, Schilling 2010, Khuri 2005).

Furthermore, these results add to the knowledge base by revealing the clinical reasoning processes that clinicians undertake (Higgs 2008). In relation to the multiple risk factor key elements and constituents, and their interacting and dynamic nature, was the finding that nearly all participants routinely reasoned with four or more high-risk factor key elements when considering perioperative high-risk (Chapter 5 Table 5.3). Participants clinical reasoning and decision-making were most taxed with multiple increasing interrelated and interacting variables when the high-risk complex care surgical patient's condition was changing acutely before them in the postoperative period or afterhours (Chapter 5 Boxes 5.7, 5.12). The majority of clinicians adaptively applied their knowledge of risk to inform choices on resource use (Chapter 5 Section 5.3.1.3). This knowledge, together with the evidence presented demonstrating a lack of availability of team feedback and an unclear patient outcome measure for high-risk perioperative patients (Chapter 5 Sections 5.2.3.2, 5.2.3.3, 5.2.3.4), is an organisational concern that requires further investigation. In addition, this research found that junior clinicians, junior doctors in particular, reported and were observed by other professionals to need, the time to learn what was standard and what was high-risk, and risk mitigation strategies (Chapter 6 Section 6.2.1.3, Table 6.2). In the complex practice environment that encapsulates the high-risk patient, this is time that is increasingly not available.

A distinctive research finding was the gap in participants' common definition of high-risk (Chapter 5 Table 5.1). All participants, irrespective of profession and seniority, understood and related high-risk in the perioperative period to an increased chance of the patient having an expected or unexpected clinical deterioration, complication or suboptimal health outcome such as vital organ failure (Chapter 5 Tables 5.1, 5.2). This was consistent with a vast body of interprofessional literature (Fry 2020, Stephens 2020, Grocott 2019, Pinto 2019, Shinall 2019, Kahan 2017, Talmor & Kelly 2017, Wijeysundera 2016, Minto & Biccard 2014, Allman 2015, NCEPOD 2011, Ghaferi 2010, Schilling 2010, Story 2010, Ghaferi 2009, Schifftner 2007, Khuri 2005). Yet individuals, across the professions, and across the four hospitals, reported a culture of general lack of availability of meaningful patient outcomes information beyond immediate care leaving a serious and large blind spot in knowledge (Chapter 5 Table 5.10, Box 5.11, Figures 5.8-5.13). This was a new important finding. Patient outcomes information was inadequate or unavailable to clinicians and managers in their working environment for them to fully comprehend and improve their knowledge of high-risk. This situation leaves the high-risk complex care patient particularly exposed to poorer outcomes, the individual and team providing care unable to learn from work, and the organisation unable to accurately report meaningful care data to assess quality and efficiency (Cantu 2020, Zurynski 2020, Sutcliffe 2011).

Key finding GFCHR4: A fragmented picture of high-risk in surgical services with communication challenges

A new finding was that clinicians and managers conceptualised high-risk differently based on their roles, responsibilities and education. Whilst organisational system factors associated with major postoperative complications and mortality have been an area of interest to researchers, the primary method of interrogation has been retrospective analysis of large administrative databases (Fry 2020, Ward 2019, Kahan 2017, ISOS_2016, Ghaferi 2010, Schifftner 2007). This research directly adds to the literature by showing that specialty specific detail on what constituted high-risk in terms of work roles and responsibilities, was most divergent between clinicians, clinician-managers and those working exclusively in executive or senior management (Chapter 5 Boxes 5.2 and 5.3). The most important aspect of this divergence in high-risk understanding between those in senior management and clinicians, was the impact on day-to-day practice, when these divergent understandings were enacted as risk mitigation strategies (Chapter 5 Section 5.2.1.2).

For clinicians, the combined knowledge of the multidisciplinary team was most enacted when the inter-related, interacting nature of the patient's multiple risk factors became increasingly complex, and the patient's condition was changing acutely before them (Chapter 5 Figure 5.6; Boxes 5.7, 5.9, 5.12; Chapter 6 Sections 6.2.1.3, 6.2.1.4). The high-risk knowledge pooled, was the increasingly specialty specific clinical detail on particular risk factors, and how best to manage them (Chapter 6 Sections 6.2.1.3, 6.2.1.4). It was understood that clinicians within multidisciplinary teams conceptualised and operationalised high-risk knowledge differently based on their roles, responsibilities and seniority, and no single discipline had the complete picture (Chapter 5 Boxes 5.7, 5.9, 5.12; Chapter 6 Sections 6.2.1.3, 6.2.1.4, 6.3.1.2). This unique finding describing profession specific detailed knowledge, reasoning and enactment, for high-risk patients having surgery, adds to the literature on the importance of, challenges involved and limited scope for interprofessional collaboration, professional practice and health outcomes (Lanham 2021, Rosen 2018, Reeves 2017, Leykum 2014, Weller 2014, Heath

& Staudenmayer 2000) and shared decision making (Pinto 2019, deMik 2018, Grocott 2017, Ankuda 2014).

For the high-risk complex care patient, particularly one that had a postoperative adverse event (Chapter 5 Figure 5.6), a research finding was: the dynamic nature of the high-risk key elements and their multiple constituents, was difficult to comprehend, learn and teach, and communicate accurately to other clinician colleagues, within and across professions (Chapter 5 Section 5.3.1.1). This is an important study finding as there is an absence of literature exploring this issue of perioperative risk, uncertainty and interprofessional relationships (Lanham 2021, Reeves 2017, Leykum 2014).

For the high-risk complex care patient, particularly one that had a postoperative adverse event (Chapter 5 Figure 5.6), a research finding was that perioperative high-risk was dynamic and difficult for clinicians to accurately predict, and hence challenging to communicate to patients and their families (Chapter 5 Section 5.3.1.1). This is an important finding as SDM is an integral part of the informed consent process (Pinto 2019, Grocott 2017, deMik 2018, Ankuda 2014). This finding offers insight into understanding patient and family experience of high-risk surgery and a tragic outcome of impairment or death, when they are not fully aware or fully prepared for such a potential outcome. This is a significant finding for SDM research for surgical patients as it suggests that beyond socio-economic, language and education level barriers (Ankuda 2014) and exploring new interventions to improve SDM during surgical consultations (deMik 2018), communicating risk and uncertainty requires further investigation (Lanham 2020, Reeves 2017, Leykum 2014).

Key finding GFCHR5: Skew in measures, information and outcome focuses –individual patient, population cohort and organisational safety population cohort measures

A unique finding was participants' insights were acquired through their personal observations of the high-risk perioperative patients they had cared for, as each prospectively encountered and experienced adverse outcomes (Chapter 5 Section 5.2.3.4). Participants spoke of individual patient's challenging outcomes, including surgical wounds that were infected or difficult to stitch up limiting physical movement, patients adjusting to losing function of a vital organ and not being able to eat, clear wastes without dialysis or a bag, being muddled, or chronically tired and short of breath, elderly, frail, wasting away in critical care, prolonged mechanical ventilation and repeated tests and surgeries, and unable to achieve functional progress, rehabilitation, or unable to return home. In the context of the high-risk perioperative patient, this finding was unexpected in its specific detail, its insight on quality of life and adverse outcomes from a patient-centred perspective. This information is an uncommon contribution to the literature that requires further investigation (Wang & Gottumukkala 2020, Myles 2017, Myles 2016). The finding highlights the learning process for clinicians is immediate, direct and longitudinal; finding strategies to understand and communicate the experience and insight, for the individuals involved, peers and interprofessional colleagues is key to improving care and outcomes for high-risk patients (Wang & Gottumukkala 2020, Myles 2016).

Juxtaposed to individual learning, the dominant form of quality improvement in the four hospitals and LHD was through organisational resource commitment and compliance with the national accreditation standards (NSQHS_2021) and external evaluation (Chapter 4 Table 4.1; Chapter 5 Table 5.9, Section 5.2.3.2). The research findings confirmed that the national standards enabled interprofessional staff focus on common goals, ideas, language, posters, and the targeting of resources to retrospective population cohort measures (Hinchcliff 2020, Greenfield 2015). The research findings confirmed that there was consistency across the hospitals, wards and units, and across the organisation and at different levels, the scheme sped up implementation, shortened the knowledge to action cycle for the outcomes continually targeted (Hinchcliff 2020, Greenfield 2015).

A significant finding was that the long history of commitment to ACSQHC standards and accreditation since 2013 was similar to other successful organisational investments in retrospective population cohort measures and benchmarking such as the NSQIP database for surgical patients (Chiwera 2018, Gorgun 2018, Oliver 2018, Barakat 2016, Lower 2013, Cima 2012, Guillamondegui 2012, Ghaferi 2010, Ghaferi 2009, Schifftner

2007). In contrast, was the finding that national, state and organisational investment in prospective patient health outcomes information for the high-risk high-cost complex care surgical patient, was in its infancy. This was also found to be the case in other studies (Zurynski 2020, Wang & Gottumukkala 2020, Myles 2017, Myles 2016).

Individual patient outcomes and feedback on performance beyond immediate care, were both not routinely available from the organisation, for the clinicians, clinician managers and teams providing care for high-risk perioperative patients (Chapter 5 Sections 5.2.3.2, 5.2.3.3; Table 5.10, Box 5.11). This finding was in contrast to the commitment to long term service agreements and investment in continual measurement, audit, feedback and quality improvement for the national standards outcome targets and the incident management (IIMS) process. These findings are consistent with the existing state MOH funding arrangement that is volume-based service contracting (Koff & Lyons, 2020), rather than the ambition to transition towards a multidisciplinary approach focused on evidence of improved patient-centred outcomes (Koff & Lyons 2020, Porter & Lee 2013).

Summary: Gaps in fully comprehending high-risk from work practice organisation transitioning from a linear to an increasingly complex adaptive system

The five key findings that together define gaps in fully comprehending high-risk are a unique new contribution to the literature and the local context. Clinicians and managers in Hospitals A, C and to a lesser degree and number in Hospital D, were exposed to the full series of BPMs for low, intermediate and high-risk surgery. The focus at Hospital B was on low to intermediate BPMs and there were no threats to sustainability, nor the beds shortages faced by the other hospitals. Junior clinicians, junior doctors in particular, for escalation of care, needed the time to develop their 'internal rubric' and learn what was standard and what was high-risk, and risk mitigation strategies. There was no difference in hospitals, professions and seniority for gap in definition of high-risk, using similar terms but having different meanings for high-risk. At Hospitals A, C, D there were challenges in communicating high-risk to colleagues, patients and family, and the reliance on population cohort measures for quality improvement and surrogate outcome measures for decision making on resource use.

7.4 **Wicked complexity in gaps in perspective (WC_{GP})**

This study furthers our understanding of the perioperative context of care by analysing workforce – individual, team and organisational - learning, communication and collaboration for high-risk surgical patients. The research is a unique empirical study to explore this issue across different organisational levels, the multiple professions and seniority. On examining the interprofessional arc, empirical evidence at the intersections of the themes, professional immersion, perioperative teams and using technology, gave rise to the complexity identified as a $WC_{GP.}$ For the purpose of this research, perspective is defined as the ability to regard all the relevant components of perioperative healthcare delivery in a meaningful relationship. Gaps in perspective arose from the need to focus on detailed profession specific knowledge that obscured the interprofessional learning and collaboration needed for fully seeing the high-risk patient before them. There are three key findings that define WC_{GP} to be reviewed (Table 7.3).

Table 7.3 WC_{GP} - Key research findings

Number	Finding
Gaps in perspective from the need to focus on detailed profession specific knowledge	
GP1	*Focus on developing detailed profession specific knowledge whilst seeking to work in an interprofessional team context*
GP2	*Motivation to improve high-risk patient care through interprofessional team collaboration whilst working with the current 'team' reality*
GP3	*Maintaining mandatory Service Agreements whilst seeking to encourage and support innovation and quality improvement for high-risk surgical patient care*

Key finding GP1: Focus on developing detailed profession specific knowledge whilst seeking to work in an interprofessional team context

Clinicians and managers emphasised the importance of professional immersion when describing their learning of ‘high-risk’ and risk mitigation strategies (Chapter 6 Section 6.2.1). Across the professions, professional immersion was said to be particularly important as individuals progressed from novice to expert. Clinicians more than executive managers considered career-long professional immersion as essential to safe work practice.

This finding is consistent with key finding CPD5, where clinicians caring for the complex care high-risk surgical patient in interprofessional teams, primarily contributed profession specific expertise when working in a multidisciplinary team context. This finding is consistent with the evidence from the systematic literature review, where new models of perioperative care were initially based on individuals contributing their profession specific expertise; and, then expanding these roles through crossing boundaries for interprofessional collaboration on the research intervention. This point applies to all professions – doctors, nurses, allied health and managers: doctors (Barakat 2016, Barbaren-Garcia 2018, Bellomo 2004, Bhatt 2017, Berggren 2019, Chiwera 2018, Cima 2012, Cull 2013, De Vries 2010, Gorgun 2018, Guillamondegui 2012, Hall 2017, Huddleston 2004, Iberti 2016, Johnston 2018, Kabrhel 2016, Liu 2017, Lower 2013, McDonald 2018, Minella 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Ravikumar 2010, Stephens 2020, Symons 2013, Vester-Andersen 2015); nurses (Berggren 2019, Chen 2017, Chiwera 2018, Cima 2012, De Vries 2010, Eliott 2008, Gorgun 2018, Guillamondegui 2012, Hall 2017, Liu 2017, Lower 2013, McDonald 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Ravikumar 2010, Story 2004, Symons 2013, Vester-Andersen 2015); allied health clinicians (Barakat 2016, Barbaren-Garcia 2018, Boden 2017, Cima 2012, Hall 2017, Jensen 2014, Liu 2017, Minella 2018, Partridge 2017, Peden 2019, Ravikumar 2010, Silva 2013, Symons 2013, Wick 2012); and, management professionals (Barakat 2016, Chiwera 2018, Cima 2012, De Vries 2010, Duclos 2016, Gorgun 2018, Guillamondegui 2012, Iberti 2016, Liu 2017, Lower 2013, McDonald 2018, Nelson 2016, Peden 2019, Ravikumar 2010, Wick 2012).

In day-to-day practice, focus on the detailed technical information for example that available in the eMR led some clinicians, mainly doctors, to lose sight of the high-risk patient as the person physically before them and, also the other members of the multidisciplinary team (Chapter 6 Section 6.3.1.1). This finding is consistent with key findings CPD3, CPD4 and CPD5, where as a result of DOSA, DOS, HVSSS policy, clinicians are time poor, pressured not to delay processes downstream and choose to focus on high technology areas, complicated care and complications. The unique triangulated research findings of professional immersion whilst seeking to work in interprofessional setting is important for three reasons. First, the research confirms past study findings of time poverty and lack of hospital beds impacting on multidisciplinary communication and interprofessional learning and collaboration (Stephens 2020, Milne 2015, Weller 2011) including local and international papers from the systematic literature review (Bellomo 2005, McDonald 2018, Peden 2019, Story 2004, Symons 2013, Vester-Andersen 2015). Second, the research contradicts the past view that failure in multidisciplinary team communication is deeply embedded in individual's professional identities in organisational hierarchies and siloes (Gittell 2013). Rather, third, the research supports and extends the knowledge on the reasons for reported 'clinical tribalism' (Braithwaite 2016). The research confirms that it is inaccurate to attribute uni-professional siloes solely to sociological or psychological differences between individuals in the professions (Dietz 2018, Petit-dit-Dariel & Cristofalo 2018, Rosen 2018, Braithwaite 2016, Walton 2016, Weller 2014, Weller 2011, Reeves & Lewin 2004). This finding is new and distinct because in the perioperative context, it relates failures in interprofessional communication and collaboration directly: to the unintended consequences of national and state perioperative policies; clinical complexity in complex adaptive systems; and, gaps in perspective.

Key finding GP2: Motivation to improve high-risk patient care through interprofessional team collaboration whilst working with the current 'team' reality

As presented above, seeking to work in an interprofessional team context to collaborate and improve perioperative care for the high-risk patient, was consistent with the systematic literature review papers, where the nascent models of perioperative care were primarily interprofessional team based. However, two unique quantitative findings from the research context may suggest a lack of organisational investment in leadership for developing interprofessional teamwork in the research setting. First, the finding that whilst the majority of clinicians and managers valued, and were motivated to seek interprofessional teamwork, there was a significant difference between what was considered 'ideal' (Chapter 6 Figure 6.1), and their 'actual' experience of interprofessional collaboration, which was limited (Chapter 6 Figure 6.4). Second, the incomplete interdisciplinary composition and attendance at perioperative organisational team meetings at higher hierarchical levels of the LHD and the four hospitals (Chapter 6 Table 6.4).

The finding of misaligned perspectives for interprofessional teamwork in the local context is a unique and relevant finding for developing safe quality improvement initiatives for the high-risk patient. Capturing the motivation for interprofessional teamwork expressed by frontline clinician and clinician-managers is important. This can be achieved through coordinated multi-level leadership for developing interprofessional teamwork, as evidenced in the systematic literature review papers, where this type of investment was integral to implementing new models of perioperative care. For example, multi-hospital enhanced peri-operative care pathway for high-risk patients having emergency abdominal surgery (Stephens 2020, Peden 2019, Oliver 2018), prehabilitation-optimisation programs (Barakat 2016), reducing surgical site infections (Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012), state-level multi-hospital collaboration addressing surgical process and outcomes measures (Guillamondegue 2012), private regional integrated health care system (Liu 2017) or statewide implementing ERAS pathways (Nelson 2016), multi-hospital risk mitigation co-management model (Ravikumar 2010), multi-hospital intermediate post-operative care (Vester-Anderson 2015). The challenges to aligning leadership for interprofessional collaboration arising from the local context and culture are not unique to the research setting and can be systematically identified and addressed (Stephens 2020, Dietz 2018, Petit-dit-Dariel & Cristofalo 2018, Rosen 2018, Braithwaite 2016, Walton 2016, Milne 2015, Weller 2014, Weller 2011, Reeves & Lewin 2004).

Multiple papers of emerging models of care for the high-risk patient from the systematic literature indicate that systematically developing interprofessional collaboration between doctors, nurses and allied health is critical (Barakat 2016, Barbaren-Garcia 2018, Berggren 2019, Bhatt 2017, Boden 2017, Chen 2017, Eliott 2008, Iberti 2016, Jensen 2014, Kabata 2015, Liu 2017, McDonald 2018, Minnella 2018, Nelson 2016, Partridge 2017, Peden 2019, Prestmo 2015, Silva 2013). These papers stress the importance of the contributions of allied health professionals including physiotherapists, dieticians and speech pathologists: in prehabilitation – improving muscle strength, mobility and nutrition prior to surgery: and, in rehabilitation when high-risk patients are recovering from surgery and prevention of post-operative complications is critical. However, the research finding that allied health professionals had limited access to senior surgeons and often communicated with the doctors via indirect eMR communication, rather than face-to-face (Section 6.3.1.2), confirms results of previous studies (Walton 2020, Walton 2016, Milne 2015). The findings extend knowledge on care for the high-risk patient, as these gaps in multidisciplinary communication across medical and allied health professionals, describe high-risk patient's experiences and progress with recovery: eating, diet, ability to sit, stand, mobilise, self-care, towards independence.

Key finding GP3: Maintaining mandatory Service Agreements whilst seeking to encourage and support innovation and quality improvement for high-risk surgical patient care

There is an absence of literature exploring the finding that for executive managers there was a tension between maintaining long-standing KPIs and other data metrics for Service Agreements and Accreditation, whilst seeking to support and develop innovative quality improvement models of care from frontline clinicians (Chapter 6 Section 6.3.1.3). The majority of clinicians and clinician-managers (78%) indicated that to improve perioperative patient care they needed to know in a timely manner, what had happened to their patients beyond immediate care (Chapter 6 Figure 6.5). However, across the four hospitals and medical professions, morbidity and mortality quality assurance meetings were still primarily *"the doctors' domain"* most often specialty uni-disciplinary in attendance. Outside the intensive care units, nurses were seldom and allied health never invited to learn from meetings discussing individual patient health outcomes. This finding supports the evidence of interprofessional teams of doctors, nurses, allied health professionals and managers learning together from discussing individual patient health outcomes is limited (Petit-dit-Dariel & Cristofalo 2018, Rosen 2018, Weller 2014).

Summary: Gaps in perspective from the need to focus on detailed profession specific knowledge

The three key findings that together define gaps in perspective, are of practical value as important key stakeholder information for quality improvement in the local context. The findings add new knowledge to the interprofessional teamwork and implementation science literature. Gaps in perspective arose from the need for clinicians to focus on developing and keeping up to date on detailed profession specific knowledge. The time and energy required to obtain and the expectation to provide profession specific expertise to the multidisciplinary team obscured the interprofessional learning and collaboration needed for fully understanding the complex needs of the high-risk patient cohort. This multilevel gaps in perspective threatens future policy efforts to address the high-risk patient and surgical services sustainability.

This concludes the first part of the discussion chapter that examines existing best practice in the research setting. Sections 7.2-7.4 described how clinicians and managers coped with and addressed current challenges by rendering the elements of perioperative care under their control. Table 7.4 consolidates the 13 key findings from Tables 7.1, 7.2 and 7.3.

Table 7.4 $WC_{PC} = WC_{CPD} + WC_{GFCHR} + WC_{GP}$: Key research findings consolidated

Number	Finding
Competing priorities from multiple long-term strategies employed by the organisation and senior managers	
CPD1	*Competing policies for hospital beds – NEAT/4HR versus NEST targets*
CPD2	*Competing priorities for HVSSS and efficiency versus complex care surgery*
Competing demands from immediate and short-term strategies employed in day-to-day work practice by clinicians and clinician managers	
CPD3	*Focus on the 'here and now' and 'not delaying care processes downstream'*
CPD4	*Focus on high-technology areas, complicated care and complications*
CPD5	*Choosing to contribute profession specific expertise based on professional rosters*
Gaps in fully comprehending high-risk from work practice organisation transitioning from a linear to an increasingly complex adaptive system	
GFCHR1	*The perioperative system was a business process model (BPM) series showing a progression from a linear to a CAS, as risk increased*
GFCHR2	*As perioperative BPMs became more complex with 'detours' and 'loop backs' gaps in fully understanding high-risk became exposed*
GFCHR3	*Each individual has an internal risk rubric with significant gaps or blind spots*
GFCHR4	*A fragmented picture of high-risk in surgical services with communication challenges*
GFCHR5	*Skew in measures, information and outcome focuses – individual patient, population cohort and organisational safety population cohort measures*
Gaps in perspective from the need to focus on detailed profession specific knowledge	
GP1	*Focus on developing detailed profession specific knowledge whilst seeking to work in an interprofessional team context*
GP2	*Motivation to improve high-risk patient care through interprofessional team collaboration whilst working with the current 'team' reality*
GP3	*Maintaining mandatory Service Agreements whilst seeking to encourage and support innovation and quality improvement for high-risk surgical patient care*

Continually adjusting elements of perioperative care to address current challenges is supported on principle by the overwhelming majority of research participants (Chapter 6 Figure 6.1) and the current initiatives of government; and local and international medical colleges and societies (NSW_ACI_SST_2021; ANZCA POM 2021, Cline 2020, CPOC 2020, Pinto 2019, Grocott 2019, Grocott 2017). However, the consequences of continuing this strategy alone, without addressing WC_{PC} include the potential practical inability of the majority of clinicians and clinician managers to be involved with new initiatives as they continue to struggle with competing priorities and demands in day-to day practice, the organisational gaps in fully comprehending high-risk and the cultural gaps in perspective.

The following section is an exposition of how existing work practice organisation may best evolve to incorporate new evidence-based models of care for the high-risk complex care surgical patient whilst disrupting the WC_{PC} embedded deep in context, arising and maintained by the behaviours of the practice environment. This leads to the need to consider adopting, a combined strategy for future perioperative policy implementation that is, an innovation -disruption approach.

7.5 Answering the research questions and overarching aim with consideration to future perioperative policy and practice

The outcomes of the systematic literature review studies suggest that the finding of WC_{PC} will have a moderating role on future perioperative policy and practice. Despite being evidence of the highest hierarchical research quality (Petticrew 2013a, Petticrew 2013b, Rychetnik 2002) the following authors independently concluded that local context had an impact on the implementation and outcomes of their interventions. Almost half of the systematic literature review studies (15/39) were unable to prove their intervention resulted in reduction in serious adverse events examined. These perioperative interventions included: a multi-hospital enhanced peri-operative care pathway for high-risk patients having emergency abdominal surgery (Stephens 2020, Peden 2019, Oliver 2018); the introduction of a high dependency unit (Bellomo 2005), or intermediate care unit (Vester-Anderson 2015) for high risk surgical patients; critical care nurse outreach (Story 2004); pre- and post- operative physical exercises and enhanced mobilisation (Jensen 2014); exercise and nutrition prehabilitation (Minella 2018); improving senior surgeon supervision and escalation of care procedures (Johnston 2018); geriatric interdisciplinary home rehabilitation (Berggren 2019); team-based training (Duclos 2016); and, surprisingly for SSI other than rate reduction associated outcomes such as LOS, unplanned return to theatre of critical care, or 30-day readmission were beyond the scope of reporting (Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012). Examples of the postulated impact of contextual factors included: elements of care fast-track pathway already well implemented separately by others and introduction of less invasive surgery technique (Jensen 2014); no guaranteed beds for the research intervention of intermediate care beds (Vester-Anderson 2015); unexplored staff attitudes for reluctance to call MET (Story 2004); staff experiencing lack of time (Stephens 2020, Peden 2019, Oliver 2018) and, resources for organisational safety population cohort measure restricted to SSI rate and specific micro-organisms (Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012).

The emergent set of practices comprising perioperative policy currently proposed by local and international medical colleges, societies and the NSW MOH (NSW_ACI_SST_2021, ANZCA POM 2021, Cline 2020, CPOC 2020, Pinto 2019, Grocott 2019, PT_2018) integrate the individual elements found in the papers of the systematic literature review (Appendix 3 Table 2.2). Around high-income countries the ambition is to integrate and coordinate the pre-, intra-, and post-operative elements of surgical care under one organisational umbrella (NSW_ACI_SST_2021, ANZCA POM 2021, Cline 2020, CPOC 2020, Pinto 2019, Grocott 2019, PT_2018) and concentrate resources on high-risk patients (ANZCA POM 2021, CPOC 2020, Pinto 2019, Grocott 2019, PT_2018). The elements of care incorporate shared decision making with patients and family regarding proceeding with surgery, preoperative control and optimisation of modifiable risk factors and multimorbidity, prehabilitation, education, standardisation of care pathways for all perioperative phases and interdisciplinary collaborative staffing models (Cline 2020, Pinto 2019, Grocott 2019, PT_2018). The aim is to promote risk-adapted postoperative care, identify patients at high-risk of developing major adverse events using clinical scores and biomarkers, with frequent risk assessment throughout the perioperative period because predictive models are imperfect (Pinto 2019, Grocott 2019). High-risk patients are to be allocated to specific care pathways with perioperative organ protection, close surveillance and specific early interventions (Pinto 2019, Grocott 2019).

The current integrated proposals to address the high-risk complex care patient and surgical services sustainability are more complex interdisciplinary interventions than those study interventions they aggregate from the systematic literature review. Implementation of change is expected to be *"notoriously slow and incomplete"* (Grocott 2019, p97). Systematic data collection on processes and outcomes, audit and feedback, and benchmarking need to be fundamental to ongoing resourcing (Pinto 2019, Grocott 2019, PT_2018). National and local stakeholders need to agree on specific outcomes, as indicators of quality, that are prospectively collected in all high-risk patients (Pinto 2019). These quality indicators include postoperative mortality and major adverse events, unplanned return to the operating theatre, unplanned ICU admission or readmission, and failure to rescue (Pinto 2019, Grocott 2019, PT_2018).

A summary of the emergent set of practices in perioperative policy proposals, derived from the literature, is presented in Table 7.5. The set of practices integrated in policy proposals constitute the 'innovation' part of the 'innovation-disruption' approach (Table 7.5). An innovation-disruption approach is being considered as the result of the 13 research findings that together define the new concept of wicked complexity in perioperative context (Table 7.4).

Table 7.5 Integrated set of practices in perioperative policy proposals

Practice	
1	To integrate and coordinate the pre-, intra-and post-operative elements of surgical care under one organisational umbrella
2	To concentrate resources on high-risk patients
3	Shared decision making with patients and family regarding proceeding with surgery
4	Preoperative control and optimisation of modifiable risk factors and multimorbidity, population health

Practice	
5	Prehabilitation, education
6	Standardisation of care pathways for all perioperative phases
7	Aim to promote risk-adapted postoperative care, identify patients at high-risk of developing major adverse events using clinical scores and biomarkers, with frequent risk assessment throughout the perioperative period because predictive models are imperfect
8	High-risk patients are to be allocated to specific care pathways with perioperative organ protection, close surveillance and specific early interventions
9	Interdisciplinary collaborative staffing models
10	Systematic data collection on processes and outcomes, audit and feedback, and benchmarking should be fundamental to ongoing resourcing
11	National and locally agreed specific outcome measures, as indicators of quality, that are prospectively collected in all high-risk patients

The emergent set of practices, as integrated perioperative policy, aim to address service sustainability by improving care for the high-risk patient (Table 7.5). The following sections present recommendations on how existing work practice organisation may best evolve to disrupt the WC_{PC} that can interfere with future perioperative policy and practice developments. This section integrates the 13 key research findings from sections 7.2-7.4 (Table 7.4) that together define in detail the perioperative context that gave rise to the wicked complexity facing individuals, teams and the organisation, when addressing service sustainability and the high-risk patient having surgery. For clinicians and managers there is the need to tame the wicked complexity they face in simultaneously addressing competing priorities and demands, organisational gaps in fully comprehending high-risk and cultural gaps in perspective.

7.5.1 **WC_{CPD}: 'whole system' integrated care approaches for future policies**

The findings from examining research question 1: *What has been the impact of health policy on the organisation and practice of perioperative care?* - reveal the change strategies needed to simultaneously redesign the perioperative healthcare system for the high-risk complex care surgical patient and tame $WC_{CPD.}$

To equip clinicians and managers to deal with the wicked complexity that arises at the policy arc, it is necessary and time to reactivate a policy strategy that was successful, albeit for the short-term period it was applied, a workforce generation ago when surgical services were first re-engineered in Australia (Alexander 2000). The 'whole system' multi-level top-down, bottom-up approach to re-engineering perioperative systems was then actively supported, politically and financially, by national and state MOH (Chapter 2 Section 2.2.4.1, Box 2.1) (Alexander 2000, Maclellan 2012, Maclellan 2008).

'Whole system' integrated care approaches can ensure collective responsibility: through governance structures and other levers of influence from the MOH to LHDs, their hospitals and primary care (Hughes 2020, Waddock 2015, Maclellan 2012, Buse 2011, Maclellan 2008, Greenhalgh 2004); and, enable care coordination across all perioperative phases (Table 7.5) (Cline 2020, CPOC 2020, Hughes 2020, Pinto 2019, Grocott 2019, PT_2018). 'Whole system' multi-level integrated perioperative care approaches are needed in today's iteration of the policy cycle, presented in Chapter 2 Box 2.1, as much as when introduced previously in 1995. Reliable linear systems have been established for lower risk patients (Chapter 5 Section 5.2.2; Figures 5.2 and 5.4). The perioperative healthcare service re-engineering needed now is to target expertise and resources to high-risk complex care patients in complex adaptive systems (Chapter 5 Sections 5.2.2.4 and 5.2.2.5; Figure 5.6).

There is further evidence of the effectiveness of integrated, politically and financially supported 'top-down bottom-up' policy initiatives. Those found in the research setting include the human resources and other infrastructure, such as a common language, set of tools and organisational safety population cohort measures associated with the National Standards (Section 5.2.3.2). From the systematic literature review, models of care with comprehensive multilevel multidisciplinary integrated interventions include: national surgical site infection (SSI) reduction programs (USA, UK, Norway) (Chiwera 2018, Cima 2012, Gorgun 2018, Lower 2013, Wick 2012); statewide ERAS implementation program (Canada) (Nelson 2016); and, a highly integrated private healthcare system ERAS implementation program (USA) (Liu 2017).

Strategies to integrate care, the quality improvement opportunities they provide and, how and why they can minimise WC_{CPD} are summarised in Table 7.6. Integrated care is described as an emergent set of practices, intrinsically shaped by contextual factors, and not a single intervention to achieve predetermined outcomes (Hughes 2020). Recognising the mediating role of context, policy makers, frontline clinicians and managers are advised to critically evaluate integrated care programs during the implementation of new models of care, to identify and manage conflicts between a program's aims and the context in which it is introduced (Hughes 2020). The collaborative health services research and clinical perspective examining the concept of perioperative 'high-risk' that uniquely enabled defining WC_{PC} may also militate WC_{PC} by simultaneously addressing the clinical complexity, context and culture of today (Waddock 2015)

Table 7.6 Strategies to integrate care and their potential impact on WC_{CPD}

Strategy	Integration and impact on WC_{CPD}
'Whole-system' multilevel strategy	Collective accountability for value-based healthcare rather than volume-based service contracting. Addresses high-risk patient-centred care and outcomes valued by patients. Providers are paid as teams. Impact on WC_{PC}: FC, UPOM, PI, POM, UT; CPD5, GFCHR2,3,4,5, GP1,2,3
Top-down, bottom-up approach	Reactivates a policy strategy that was successful a workforce generation ago when surgical services were first re-engineered. Opportunity to systematically address the unintended consequences of past policies. Timely opportunity to review competing polices for access to hospital beds NEAT/ 4HR versus NEST Impact on WC_{PC}: CTS, FC, UHR, WPO, UPOM, PI, POT, UT; CPD1,2,3,5, GFCHR2,3,4,5, GP1,2,3
Coordinate all phases of perioperative care	Coordinates pre-intra-post-operative care and concentrates resources on high-risk patients. Standardisation of care pathways for all phases. Aims to promote risk adapted postoperative care with surveillance and frequent risk assessment of high-risk patients. High-risk patients are to be allocated to higher levels of preventative physiological care. Interdisciplinary staffing models, agreed prospective patient health outcome measures, audit, feedback and benchmarking required for resourcing. Impact on WC_{PC}: FC, UHR, WPO, UPOM, PI, POT, UT; GFCHR2,3,4,5; GP1,2,3

7.5.2 WC_{GFCHR}: considering 'uncertainty' and the interdependence required for high-risk patient care realisation

The findings from examining research question 2: *How is perioperative work practice organised around low, intermediate and high-risk patients?* – reveal the change strategies needed to redesign the perioperative health system and tame WC_{GFCHR}.

To equip clinicians and managers to deal with the wicked complexity that arises at the risk and practice arc, it is critical to approach a common and complete understanding of 'high-risk' that considers context and culture (Chapter 5 Section 5.3). It is also necessary to consider 'uncertainty' in work practice organisation (Leykum 2014, Seely 2013). System-level 'uncertainty', both disease-related uncertainty and task-related uncertainty, is a defining characteristic of complex systems (Leykum 2014) and the practice environment (Leykum 2015, Seely 2013). The research findings confirm gaps in fully comprehending high-risk from work practice organisation transitioning from a linear to an increasingly complex adaptive system (Section 7.3).

In the implementation science and complexity science literature, the degree of 'uncertainty' inherent in systems is thought to influence the improvement strategies that are more likely to be successful (Leykum 2014, Seely 2013). Process-based approaches to quality improvement are suited to linear, reliable, low to intermediate risk systems (Chapter 5 Sections 5.2, 5.4 Figure 5.4, Box 5.5). Relationship-based approaches are more suited to improving high-risk patient care in complex adaptive systems (Chapter 5 Section 5.2.2.4; Figure 5.6; Box 5.7) (Leykum 2014). Investment in relationship-based approaches including facilitating interprofessional team collaboration and sociocultural learning from direct patient care and individual patient outcomes measures - can address WC_{GFCHR} and, may result in a complete and common definition of 'high-risk' that considers context and culture (Leykum 2014).

From the systematic literature review, models of care with relationship-based approaches to quality improvement in complex adaptive systems addressing uncertainty included: rotating senior surgeon onto surgical ward to lead ward rounds, discharge patients and perform non-elective surgery (Cull 2013); senior surgeon ward rounds, availability of senior resident and contact cards to support junior doctors for escalation of care for deteriorating patients (Johnston 2018); formation of multidisciplinary high-risk pulmonary embolus team of medical specialists to discuss emergency clinical care (Kabrhel 2016); two levels of high-risk collaboration between intensivists and hospitalists rounding and Unit care (Ravikumar 2010); and, critical care nurse outreach for three or more days post-discharge to hospital wards (Eliott 2008, Story 2004).

Strategies to address uncertainty around high-risk, improve care, the team relationship building opportunities they provide and, how and why they can minimise WC_{GFCHR} are summarised in Table 7.7.

Table 7.7 Strategies to address the uncertainty around high-risk, improve care and their potential impact on WC_{GFCHR}

Strategy	Approach and impact on WC_{GFCHR}
Process-based approaches	Process-based approaches to quality improvement for linear, reliable systems Disease-related uncertainty is minimal, the evolution of the patient's health status is steady in pattern. Task-related uncertainty may be complicated but is standard and routine. Impact on WC_{GFCHR}: WPO
Relationship-based approaches	Relationship-based approaches to quality improvement for complex adaptive systems. Disease-related uncertainty is maximal, the evolution of the patient's health status is irregular in pattern with more extreme physiological perturbations. Task-related uncertainty is unplanned, non-standard, complex, negotiated, and may also be complicated demanding precision. Impact on WC_{GFCHR}: FC, UHR, WPO, UPOM, PI, POT, UT; CP3,4,5; GPCHR2,3,4,5; GP1,2,3

7.5.3 WC_{GP}: organisational change and education for interprofessional collaboration

The findings from examining research question 3: *What do individuals, teams and* *organisations require to implement appropriate models of perioperative care for the high-risk patient?* – reveal the change strategies needed to redesign the perioperative health system and tame the WC_{GP}.

To equip clinicians and managers to deal with the wicked complexity that arises at the interprofessional team arc, optimism and endurance will be required to establish organisational change and education for interprofessional education. Although interprofessional teamwork has been shown to improve patient safety, the empirical education evidence find that it is not yet routine in most hospital settings (Petit-dit-Dariel & Cristofalo 2018, Weller 2014). The findings of this research confirm the findings of the two narrative reviews and local empirical studies and, extends the knowledge on the barriers to interprofessional teamwork and communication in the local context: for example, compression of time and space; geographically distributed teams; multiple team formations with loosely bound 'one-off teams' in high-risk patients care and emergencies; lack of opportunity and knowledge of the value of interprofessional teamwork from clinical and organisational leaders (Sections 4.3.1, 4.3.2, 4.4.1.1, 6.2, 6.3) (Petit-dit-Dariel & Cristofalo 2018, Walton 2016, Milne 2015, Weller 2014, Weller 2011).

This finding was in stark contrast to the research interventions and interprofessional teams of the systematic literature review papers on perioperative models of care. In terms of change processes and innovation, a notable and common finding across the 39 papers was staff crossing multiple boundaries: level of care (macro-meso-micro); phases of perioperative care (pre-intra-post); across geographical hospital boundaries, interprofessional and intra-professional boundary spanning roles (Table 2.16). This finding from the systematic literature review confirms the value of interprofessional learning, communication, collaboration and teamwork for patient safety and implementing evidence-based models of care (Petit-dit-Dariel & Cristofalo 2018, Rosen 2018, Weller 2014). Strategies to improve interprofessional teamwork in hospitals that have been proposed (Petit-dit-Dariel & Cristofalo 2018, Weller 2014) and, how and why they can minimise WC_{GP} are summarised in Table 7.8.

Table 7.8 Strategies to develop interprofessional teamwork and their potential impact on WC_{GP}

Improvement strategy	**Impact on WC_{GP}**
Organisational change strategies	Executive and heads of professional departments need to see the value of and provide the essential leadership, acting as champions and role models for, interprofessional teamwork Foster and define inclusive democratic interprofessional teams as part of the 'whole system' strategy to integrate care. Teams should be inclusive of all disciplines providing patient care, form a cohesive whole with common goals, each member should feel valued and safe to voice opinions. Impact on WC_{GP}: FC, UHR, WPO, UPOM, PI, POT, UT; CPD2,3,4,5, GFCHR2,3,4,5, GP1,2,3
Educational approaches	Professionally educate and facilitate interprofessional teamwork and collaboration around information-sharing and problem-solving using high-risk patient outcomes measures Impact on WC_{GP}: FC, UHR, WPO, UPOM, PI, POT, UT; CPD3,4,5, GFCHR2,3,4,5, GP1,2,3

7.5.4 Addressing wicked complexity in perioperative context (WC_{PC}): $WC_{PC} = WC_{CPD} + WC_{GFCHR} + WC_{GP}$

Drawing the answers to the three research questions together provides the answer to the overarching research aim: *to improve our knowledge of perioperative context, particularly how in practice – clinicians and managers understand risk and how this influenced their work and use of resources when caring for patients having surgery and anaesthesia.*

The research has shown that the impact of context on the perioperative workforce and their patients can be clearly analysed and articulated. The three research arcs were the policy, the risk and practice, and the interprofessional. The nine themes were compression of time and space (CTS), fragmentation of care (FC), clinical complexity (CC), understandings of high-risk (UHR), work practice organisation (WPO), unclear patient outcome measure (UPOM), professional immersion (PI), perioperative teams (POT) and using technology (UT). Service sustainability in the perioperative system evolved to encompass a wicked complexity, WC_{PC}, represented schematically in Diagram 7.1 and expressed as an equation in Diagram 7.2. WC_{PC} was the outcome and solution clinicians, managers and the organisation derived by continually adjusting elements of care to address current challenges. By addressing WC_{PC} systematically using the research evidence enables the charting of an evolving course to equip clinicians and managers to: deal with the impact of context, face economic challenges to service sustainability and address the needs of the high-risk complex care perioperative patient.

Diagram 7.1 Wicked complexity in perioperative context

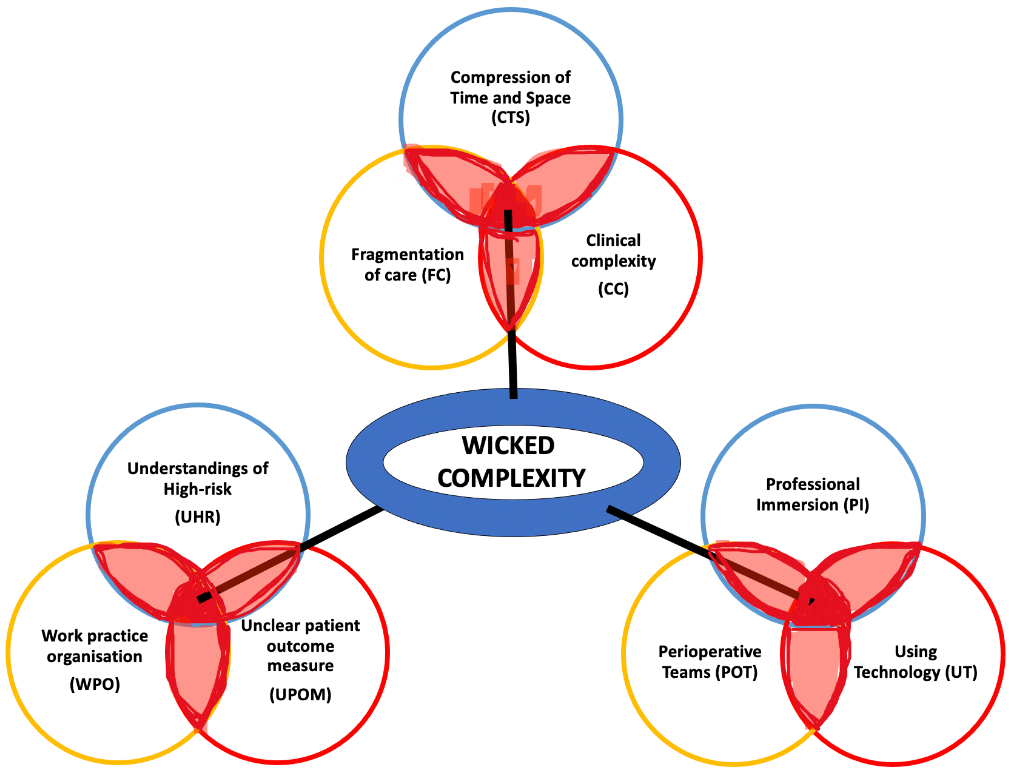


Diagram 7.2 Analysing and synthesising wicked complexity in perioperative context

Results chapter	**4**	**5**	**6**
Research arc examined	**Policy**	**Risk and Practice**	**Interprofessional**
Themes	CTS FC CC	UHR WPO UPOM	PI POT UT
Result			
Wicked complexity in perioperative context =	**+ Competing priorities and demands**	**+ Gaps in fully comprehending high-risk**	**+ Gaps in perspective**
$\mathbf{WC_{PC}}$ **=**	$\mathbf{WC_{CPD}}$	**+** $\mathbf{WC_{GFCHR}}$	**+** $\mathbf{WC_{GP}}$

7.6 The unique contributions of the research

The research makes eight unique contributions to the literature, policy and practice. These contributions incorporate empirical, theoretical and practical dimensions.

The first unique contribution is a theoretical re-conceptualisation of the perioperative system. The thesis findings provide an important new lens to view the work done in hospital surgical services and adds to the literature by presenting the work practice context around high-risk, as that experienced by the workforce. The whole perioperative system is defined as a series of business process models showing a progress from a linear to a complex adaptive system, as risk increased (Chapter 5, Figures 5.4, 5.5, 5.6) and exclusively shows: that each individual patient having surgery is on one version of the business process models; and that on any given day clinicians face multiple business process model trajectories, in parallel. As perioperative business process models became more complex with 'detours' and 'loop backs' (Chapter 5, Figure 5.6), gaps in fully understanding high-risk became exposed, unintended consequences of policy became more intertwined, and gaps in perspective and interprofessional teamwork were more pronounced (Chapter 7, Table 7.4). For clinicians and clinician-managers the perioperative system has evolved from a simplistic two-dimensional concept based on process and timeline. Today, clinicians and managers experience, and work with, the perioperative system as a multidimensional concept, encapsulating multiple parallel patient trajectories, or multiple simultaneous business process models based on risk.

The second unique contribution is developing theory, in a new model and equation, for understanding the context of perioperative policy and practice for high-risk high-cost complex care patients having surgery (Chapter 7, Diagrams 7.1 and 7.2).

The third, fourth and fifth important contributions are theoretical in empirically revealing the 13 key findings at the intersections of the nine themes (Chapter 7, Tables 7.1, 7.2, 7.3 respectively), that together define wicked complexity in perioperative context (WC_{PC}) (Chapter 7, Table 7.4, Diagrams 7.1 and 7.2).

The sixth contribution is empirically and systematically revealing possible best next steps for advancing perioperative policy and systems to meet the needs of the high-risk, high-cost complex care surgical patient whilst simultaneously addressing high-volume surgical demand and surgical services sustainability. An extensive stakeholder analysis of the workforce responsible for innovation and the care of the high-risk patient has been undertaken in the context of care over an appropriate period of time. Multi-level engagement across multiple professions (doctors, nurses, allied health professionals including physiotherapists, dieticians, speech therapist and pharmacists, and managers) and seniority. An empirical analysis made rigorous by using mixed methods methodology. Possible future directions, including consideration of an innovation-disruption approach, are informed: by the research findings; local and international emerging models of perioperative care; and, knowledge from peer reviewed literature on health services research, complexity science implementation science and interprofessional team education.

The seventh important contribution of the research is that it presented and grounds the study in a comprehensive Literature Review that uniquely combined a scoping review of the grey literature with a systematic literature review of highest hierarchical evidence for emerging models of perioperative care. In this chapter, the research findings were then grounded back in this diverse literature to provide answers to inform practice, future policy implementation and empirical research.

The eighth contribution is the innovative presentation of the research data collected by multiple methods, and juxtaposing the evidence acquired using mixed methods methodology (Chapter 3, Section 3.7.3, Table 3.9).

7.7 Conclusion

The dual challenges of addressing high volume surgical demand and the needs of high-risk complex care surgical patients are increasing in unison. This chapter described how clinicians and managers coped with current challenges by adjusting the elements of perioperative care under their control. This chapter synthesised the evidence for wicked complexity in perioperative context (WC_{PC}) as the sum of wicked complexity: in competing priorities and demands, gaps in fully comprehending high-risk and gaps in perspective, $WC_{PC} = WC_{CPD} + WC_{GFCHR} + WC_{GP}$. Competing priorities and competing demands arise from multiple long-term strategies employed by the organisation and senior managers. Gaps in fully comprehending high-risk emerges from work practice organisation transitioning from a linear to an increasingly complex adaptive system. Gaps in perspective were revealed from individual's need to focus on detailed profession specific knowledge. Understanding how the organisation, teams and individuals can reduce wicked complexity in perioperative context WC_{PC}, to effectively implement evidence-based models of care, is necessary and timely. The strategies that align to the research findings are 'whole system' multi-level integrated care approaches to future policy, managing 'high-risk' uncertainty and developing interprofessional teamwork and collaboration for high-risk patient care. The next chapter is the eighth and final for the dissertation. It presents a synopsis of the chapters, the implications of the research findings and, identifies study limitations and directions for future research.

Chapter 8 Conclusion

8.1 Introduction

This thesis has provided empirical evidence to articulate a new concept called wicked complexity in perioperative context. Wicked complexity in perioperative context (WC_{PC}) is a new form of complexity, a counterproductive situation that is unintended, difficult to overcome, embedded deep in context, dynamic and caused by the very people tasked with planning and delivering safe value-based surgical services. WC_{PC} needs to be considered when addressing today's challenges of the competing requirements for high-volume surgical demand, the needs of the high-risk patient and surgical services sustainability.

Evidence-based health policy is the practice of applying valid research data to specific clinical, funding and governance questions engendered during patient care (Buse 2011). When implementing an 'innovation' to address the needs of the high-risk high-cost surgical patient, such as the proposed integrated models of perioperative care described in Chapters 2 and 7 (Table 7.5), WC_{PC} is a factor that needs to be continually considered. While there is no simple or single solution, the research has made it clear that WC_{PC} is embedded deep in context, arising and maintained by the behaviours of the work practice environment. WC_{PC} can hinder implementation success and be costly. WC_{PC} may be systematically 'disrupted' and tamed. A systematic and evolving 'innovation-disruption' approach may be required to equip clinicians and managers to cope with the WC_{PC} whilst attempting to implement coordinated and appropriate models of care. This approach is supported by empirical research in non-surgical settings (Long 2018, Leykum 2014, Seely 2013) and opinion leaders in complexity and implementation science (Braithwaite 2018, Greenhalgh & Papoutsi 2018, Khan 2018, Long 2018, Cristancho 2016). An 'innovation-disruption' approach could address the 13 key research findings comprising competing priorities and demands, gaps in fully comprehending high-risk and gaps in perspective (Chapter 7, Table 7.4).

This is the eighth and final chapter for the dissertation. The chapter is structured in seven sections. Section 8.2 presents a synopsis of the first seven thesis chapters. This is followed by succinct answers to the three research questions in the context of the overarching research aim (8.3). The synopsis of Chapter 7 Discussion will be included in the answers to the research questions and again presented with the 23 implications of the thesis findings (8.4). The fifth section (8.5) then merges the 23 implications with the eight unique contributions of the research described in Chapter 7, to show that the new contribution to knowledge has both empirical and practical dimensions, informing the perioperative literature, policy and work practice. The sixth section (8.6) identifies three study limitations and four directions for future research. The final section (8.7) concludes the thesis, drawing together the main ideas and integrates the new contribution to knowledge in the discipline, including the problem of high-volume surgical demand, surgical services sustainability and the needs of the high-risk high-cost patient.

8.2 Summary of thesis chapters

The thesis was structured in three parts. The first part comprised chapters 1, 2 and 3, the introduction, literature review and methods. The second part, chapters 4, 5 and 6 presented the empirical findings. The third part, chapters 7 and 8, comprised the discussion and conclusion chapters.

Chapter 1 began with a broad discussion of the concerns facing the sustainability of surgical services, arising from the competing stipulation for high-volume surgical demand and the pressing requirement to identify and collectively manage the small, but growing cohort of high-risk, high-cost complex care patients. Acknowledging that the challenge arises from an increasing number, and complexity of both, medically high-risk patients, and the systems and processes they navigate, the focus of the thesis was on the impact of context, and how health care organisations and their workforce continue to respond to these challenges. Chapter 1 provided an overview of the thesis, the case for the research and its significance, how the case was established, the three research questions in the context of the overarching research aim and, how the research setting, and methods used to examine the problem were fit-for-purpose to address the questions posed.

Chapter 2 Literature review utilised two complementary methods – scoping review (Brown 2012, Brien 2010, Levac 2010) and systematic literature review (Petticrew 2013a, Petticrew 2013b, Rychetnik 2002). This novel approach for interrogating the literature was necessary to thoroughly establish the rationale for, and challenges associated with, the research. The scoping review, included grey literature to capture key stakeholder voices, provided a background trajectory over three decades of perioperative policy for the local research setting. It positioned the thesis to address the current major challenge to the sustainability of healthcare systems for surgery - the high-risk, high-cost, complex care patient. Local and international evidence point to the increasing number and complexity of both, our medically high-risk patients, and the systems and processes they must be navigated through, by dispersed multidisciplinary clinical teams. The results of the scoping review gave rise to research questions 1 and 2.

1.What has been the impact of health policy on the organisation and practice of perioperative care?

2.How is perioperative work practice organised around low, intermediate and high-risk patients?

The systematic literature review critically examined how high perioperative risk is conceived and researched, and what teams and organisations are doing to mitigate the risk of an adverse patient outcome. To address the situation today, novel solutions need to go beyond simple linear models for coordinating care in hospitals. The high-risk patient does not fit the homogenous process mould of lower risk patients. Historical antecedents and local context moderate desired change processes in ways unexpected or unidentifiable with current research approaches. The results of the systematic literature review gave rise to research question 3.

3.What do individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient?

The three research questions were examined in the context of the overarching aim of the thesis: *to improve our knowledge of perioperative context, particularly how in practice – clinicians and managers understand risk and how this influenced their work and use of resources when caring for patients having surgery and anaesthesia.*

Chapter 3 presented the methodological approach undertaken to address the thesis aim and research questions. The research questions, setting and participants were investigated using a mixed methods approach of parallel convergent design (Cresswell & Plano Clark 2011). The methodological strengths and limitations of the peer-reviewed empirical papers in the literature review were pragmatically considered. The strengths and weaknesses of each method used, their sequencing, relationship, and integration were analysed and the contribution of each, explained. As this evaluative research into perioperative systems has not been conducted previously, tools were purpose designed giving due consideration to establishing validity. Data collection, analysis and presentation processes were explained, including a rationale for thematic analysis and descriptive statistical analysis.

The research setting was four university adult general hospitals (113, 360, 440, 547 bed capacity) in a health district in NSW, Australia. Institutional ethics approved a mixed methods study – site observation (187 hours), secondary documents (223 documents: paper and electronic), survey (113 completed) and interviews (143 conducted). Purposive sampling targeted 129 participants in 167 roles, including multidisciplinary clinicians (nurses, doctors and allied health) in senior and junior roles, and managers.
The study was conducted part-time whilst the researcher worked as a senior clinician. Data collection (September 2017 – June 2019) and analysis was conducted using a parallel convergent design through triangulation with descriptive statistics and thematic analysis. The rigour of the research was addressed using the four dimensions framework of trustworthiness and the associated strategies for validity (Forero 2018, Lincoln & Guba 1986, Guba & Lincoln 1982). The chapter concluded with regard to the methodological limitations and ethical considerations of the study.

In chapter 4 the research explores for the first time, the impact of health policy across different organisational levels of policy enactment, the multiple professions and seniority of the people involved in the process. The research evidence on the impact of competing policies was synthesised into three themes. Namely, compression of time and space (Chapter 4, Section 4.3.1), fragmentation of care (Chapter 4, Section 4.3.2), and clinical complexity (Chapter 4, Section 4.3.3). At their intersections, further complexity arises, there is an unwarranted wicked complexity in competing priorities and demands that prove increasingly complex and interwoven (Chapter 4, Section 4.4). That is, a wicked complexity in competing priorities and demands that could be extrapolated to impact most significantly upon the high-risk patient having surgery and anaesthesia. Competing priorities arose from the necessity for Executive and senior managers to achieve multiple different long-term national and state targets, standards and service agreements from the same pool of limited resources (Chapter 4, Section 4.3.1.5, Boxes 4.14, 4.15, 4.23; Chapter 5, Section 5.2.1.2, Box 5.2; Chapter 7, Section 7.2, Table 7.1). Competing demands arose from the necessity for frontline clinicians and clinician managers to respond in day-to-day work practice, to the policy responses made at higher levels of the organisation (Chapter 4, Sections 4.3.1, 4.3.2, Box 4.23; Chapter 5, Section 5.2.1.2, Box 5.3; Chapter 7, Section 7.2, Table 7.1). Specifically, for frontline clinicians in the immediate or short-term, the need to simultaneously provide care for patients across multiple discreet locations (Chapter 4, Section 4.3.2) with pressure not to delay care processes (Chapter 4, Section 4.3.1).

In chapter 5 the research evidence on perioperative work practice organisation around risk was synthesised into three themes. Namely, clinicians' and managers' understandings of high-risk (Chapter 5, Section 5.2.1), perioperative work practice organisation around risk (Chapter 5, Section 5.2.2) and an unclear patient outcome measure (Chapter 5, Section 5.2.3). At their intersections, further complexity arises that is a complexity that was unintended, modern and exacerbated by high-risk knowledge blind spots and the behaviours in the practice environment. As perioperative work practice organisation transitioned from a linear, to a complex adaptive system for the high-risk high-cost complex care patient, a wicked complexity in gaps in fully comprehending high-risk arises (Chapter 5, Section 5.3). That is, a wicked complexity in gaps in fully comprehending high-risk that could be extrapolated to impact most significantly upon the high-risk patient having surgery and anaesthesia (Chapter 5, Sections 5.2.2.4 and 5.2.2.5, Figure 5.6, Table 5.8, Boxes 5.7, 5.8, 5.9, 5.10; Chapter 7, Section 7.3 Table 7.2).

Chapter 6 presented the evidence for workforce learning, communication and collaboration considering what was required to implement appropriate perioperative models of care for the high-risk patient. The evidence was synthesised into three main themes: first, how individual clinicians and managers acquired their understandings of high-risk through professional immersion (Chapter 6, Section 6.2.1); second, how teams shared or were unable to share and develop, their high-risk knowledge and skills (Chapter 6, Section 6.2.2); and third, how the organisation facilitated and failed to facilitate high-risk knowledge sharing using technology or other measures (Chapter 6, Sections 6.2.3 and 6.2.2, Figures 6.1, 6.2, 6.3, 6.4). At the intersections of the three themes of professional immersion, perioperative teams and using technology, there was further complexity. At their intersections, a wicked complexity in gaps in perspective arises (Chapter 6, Section 6.3; Chapter 7, Section 7.4, Table 7.3). That is a complexity that was unintended, modern and exacerbated by the profession-based learning behaviours in the practice environment that were considered to be fundamental to maintaining patient safety. For the individual and the team, the focus was upon developing the detailed profession specific knowledge and skills that were necessary for high-risk patient care (Chapter 6, Sections 6.2.1, 6.2.1.3, 6.3.1.1, Box 6.3), whilst seeking to work in a multidisciplinary team context (Chapter 6, Sections 6.3.1.2, 6.3.1.3, Box 6.2, Table 6.2, Figures 6.1, 6.2, 6.3, 6.4). For the organisation, it was the challenge of facilitating culture change for multidisciplinary team learning, around a clear patient outcome measure for example, in-hospital patient mortality or longer-term morbidity, rather than reliance on retrospective population cohort measures (Chapter 6, Section 6.3.1.3, Table 6.4; Chapter 7, Section 7.4, Table 7.3). That is, a wicked complexity in gaps in perspective that could be extrapolated to impact most significantly upon the high-risk patient having surgery and anaesthesia (Chapter 6, Section 6.3.1.3).

Chapter 7, the discussion chapter introduced an 'innovation-disruption' approach to best equip clinicians and managers to implement appropriate models of perioperative care for high-risk patients. First, the chapter synthesised the evidence for wicked complexity in perioperative context (WC_{PC}) as the sum of wicked complexity: in competing priorities and demands, gaps in fully comprehending high-risk and gaps in perspective, $WC_{PC} = WC_{CPD} + WC_{GFCHR} + WC_{GP}$. (Chapter 7, Sections 7.2, 7.3, 7.4, Diagrams 7.1 and 7.2, Table 7.4). Second, the chapter provided a summary of the emergent set of practices in perioperative policy proposals, derived from the literature (Chapter 7, Table 7.5). The set of practices integrated in policy proposals constitute the 'innovation' part of an 'innovation-disruption' approach. Third, the chapter provided an exposition on how the organisation, teams and individuals can reduce wicked complexity in perioperative context WC_{PC}, to effectively implement evidence-based models of care (Chapter 7, Section 7.5). The exposition constituted the 'disruption' part of an 'innovation-disruption' approach. The strategies that align to the 13 research findings (Chapter 7, Table 7.4) are 'whole system' multi-level integrated care approaches to future policy (Chapter 7, Table 7.6), managing 'high-risk' uncertainty (Chapter 7, Table 7.7) and developing interprofessional teamwork and collaboration for high-risk patient care (Chapter 7, Table 7.8). Lastly, the chapter draws up the ideas presented to identify and integrate the unique contributions of the research.

8.3 Concise answers to the research questions and overarching research aim

This section now presents succinct answers to the three research questions followed by a concise answer to the overarching research aim.

Research question 1

1. *What has been the impact of health policy on the organisation and practice of perioperative care?*

In answering the first research question on the impact of policy on the organisation and practice of perioperative care, there are five key findings that defined wicked complexity in competing priorities and demands (Chapter 7, Table 7.1). The impact for the organisation and senior managers that had flow-down effects to clinicians and clinician-managers were firstly, competing policies for hospital beds and secondly, competing priorities for high volume short stay surgery versus complex care surgery. In addition, the impact on clinicians and clinician managers were the immediate and short-term strategies they use to cope in their day-to-day practice namely: the need to focus on the 'here and now' and 'not delay care processes downstream'; the focus on high-technology areas, complicated care and complications; and, tending to contribute profession specific expertise based on professional rosters.

Research question 2

2. *How is perioperative work practice organised around low, intermediate and high-risk patients?*

In answering the second research question on how perioperative work practice is organised around low, intermediate and high-risk patients, there are five key findings that defined wicked complexity in gaps in fully comprehending high-risk (Chapter 7, Table 7.2). First, the perioperative system was a business process model series showing a progression from a linear to a complex adaptive system, as risk increased (Chapter 5, Figures 5.4, 5.5, 5.6). Second, as perioperative business process models became more complex with 'detours' and 'loop backs', gaps in fully understanding high-risk became exposed (Chapter 5, Figure 5.6). Third, each individual clinician, clinician-manager, executive manager of multiple professions and seniority had their own internal risk rubric with significant gaps or blind spots. Fourth, there was a fragmented picture of high-risk in surgical services with communication challenges. Fifth, there was a skew in measures, information and outcome focuses – individual patient, population cohort and organisational safety population cohort measures, that did not address gaps in fully comprehending high-risk and the needs of the high-risk high-cost complex care surgical patient.

Research question 3

3. *What do individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient?*

In answering the third research question on what individuals, teams and organisations require to implement appropriate models of perioperative care for the high-risk patient, there are three key findings that defined wicked complexity in gaps in perspective (Chapter 7, Table 7.3). First, for individuals, providing patient safety directed the focus on developing detailed profession specific knowledge (Chapter 6, Section 6.2.1, Section 6.3.1.1) whilst seeking to work in an interprofessional team context. Second, for teams, the motivation to improve high-risk patient care through interprofessional collaboration (Chapter 6, Figure 6.1), whilst working with the current 'team' reality (Chapter 6, Figure 6.4, Table 6.4). Third, for the organisation and executive managers the requirement to maintain mandatory Service Agreements whilst seeking to encourage and support innovation and quality improvement for high-risk surgical patient care (Chapter 6, Section 6.3.1.3).

Overarching aim: to improve our knowledge of perioperative context, particularly how in practice – clinicians and managers understand risk and how this influenced their work and use of resources when caring for patients having surgery and anaesthesia.

The answer to the overarching research aim is layered and interrelated. For individual clinicians and managers there are gaps in fully comprehending high-risk. No-one had the complete picture, yet all were directing their resources to their own working understanding of high-risk. Clinicians and managers were coping with competing priorities and demands arising from policy with the need to prioritise the 'here and now'. Moreover, the need to continually develop, focus and contribute detailed profession specific knowledge in a complex adaptive system context, generated cultural gaps in perspective that impeded the interprofessional learning, communication and collaboration needed to understand high-risk. In answering the overarching aim, the research demonstrates that the perioperative system undergoes continual evolution to a best achievable solution for a period of time and space, which now incorporates a counterproductive situation that could incur an 'opportunity cost' when implementing future policy to address current challenges. An opportunity cost is the foregone benefits from other alternative actions, when one action is selected and resourced over the others.

The thesis findings provide a new lens to view work, and the unintended consequences of work behaviours, in providing surgical services. An awareness of the reality of current systems allows key stakeholders: to see the whole context; to start with the 'Big Picture' and, then establish how best to get all the parts to talk to each other and work together effectively. This insight was achieved through the development of a new concept called 'wicked complexity in perioperative context' (Chapter 7, Sections 7.2-7.4, Diagrams 7.1 and 7.2) that forms the basis for suggested change through an evolving innovation-disruption approach (Chapter 7, Section 7.5). The implications of the research findings will be discussed in the following section.

8.4 Implications of thesis findings

To equip clinicians and managers to cope with the wicked complexity in perioperative context while implementing new models of care there are 23 implications derived from this research. The implications address three interrelated domains (Table 8.1). First, the need for an agreed and common understanding of high-risk when caring for the high-risk complex care patient. Second, the scale of the problem and the approach to the innovation and care planning. Third, enabling the workforce learning, communication and collaboration needed to approach an agreed, common understanding of high-risk to address the needs of the high-risk complex care patient.

Table 8.1 Implications of thesis findings

Domain		**Implications**	
A	THE NEED FOR A COMMON AGREED DEFINITION OF PERIOPERATIVE HIGH-RISK	1	That is evidence based on data from patient outcomes
		2	As there are gaps in fully comprehending high-risk, it is also important to involve patients more in decisions around high-risk surgery
		3	High-risk patients have a higher incidence of postoperative complications, short-term and longer-term harm post-hospital e.g. discharged to a higher care facility, rather than home
		4	Currently there is poor health literacy among both, health care staff and patients, with regard to a genuine understanding of risk and benefits of high-risk surgery

Domain		Implications	
A	THE NEED FOR A COMMON AGREED DEFINITION OF PERIOPERATIVE HIGH-RISK (cont.)	5	For genuine informed consent and shared decision making, both clinicians and high-risk patients need to be made aware of the current outcome data with its inherent uncertainty in order to make informed decisions
		6	This is particularly important in a work environment containing wicked complexity in perioperative context and complex adaptive systems
		7	Currently, there is a fragmented picture of high-risk in surgical services with communication challenges
		8	A more honest and data-based discourse from a health care and community perspective may help narrow this gap
B	THE SCALE OF PROBLEM AND APPROACH TO INNOVATION AND CARE PLANNING	9	A more holistic approach needs to be taken to involve all key stakeholders – patients, doctors, nurses, allied health professionals, health service researchers, interprofessional team educators, policy makers and health bureaucrats
		10	In order to facilitate change requires greater awareness of the bigger picture; the scale of the solution must address the scale of the problem
		11	In order to facilitate change requires the transparent use of patient outcome data to drive that change
		12	Leadership is required in order to establish new models of care
		13	Currently, the identification of leadership is not clear; the challenge of where and how the leadership for coordinated and appropriate action will occur is significant
		14	For policy and practice, an integrated ‘whole-system’ multilevel investment, in ‘top-down’ and ‘bottom-up’ approaches, is required
		15	As a consequence of implementing ‘whole system’ multilevel integrated perioperative models of care executive managers at the local health district and hospitals can incur financial risk as a result of the new systems
		16	Dedicated ongoing funding is needed to harness the support: of interdisciplinary expert opinion leaders, multidisciplinary peer opinion leaders and interprofessional champions amongst clinicians and managers, working in long-term collaborative teams, willing to drive the innovation and create solutions to problems that arise

Domain		Implications	
B	THE SCALE OF PROBLEM AND APPROACH TO INNOVATION AND CARE PLANNING (cont.)	17	Other new organisational roles that may be needed include: the organisational buffer who creates a loose monitoring system to ensure that innovators use organisational resources efficiently; and, the knowledge brokers, boundary spanners and network facilitators that enable cross-functional collaboration
C	ENABLING THE WORKFORCE LEARNING, COMMUNICATION AND COLLABORATION NEEDED TO APPROACH A COMMON AGREED DEFINITION OF PERIOPERATIVE HIGH-RISK	18	Collaborative interprofessional teams are not yet routine in most hospital settings
		19	The complexity science approach needed to address the challenge of the high-risk surgical patient requires a move away from the predetermined outcomes and process fidelity of linear systems to one that embraces learning, evolution and emergence
		20	Interprofessional education for sensemaking and fostering a shared understanding of an individual patient's clinical trajectory may improve outcomes such length-of-stay, unnecessary length-of-stay and complication rates
		21	Interprofessional education for sensemaking may lead to a shared understanding of whether, in fact, the surgery should be undertaken
		22	Clinicians and clinician managers may be educated for interprofessional team education for the high-risk surgical patient. To achieve this, organisations will need to address wicked complexity in competing priorities and competing demands by artificially constructing the time and space in local perioperative environments for clinicians of all professions – doctors, nurses, allied health, in senior and junior roles, as well as managers, to actively participate in interprofessional teams
		23	Long-term interprofessional teams will be needed for dealing with uncertainty, developing a common agreed definition of high-risk and a shared understanding of an individual patient's clinical trajectory. There may be the need for two new team roles to work alongside clinicians and managers in context namely, interprofessional team educators and, health service researchers to help understand the impact context

Firstly, there are eight implications of the research arising from the study findings on uncertainty in understanding and addressing 'high-risk'. For the high-risk patient and the use of public resources, there is an urgent need to come to a commonly agreed definition and understanding of high-risk, that is evidence-based on data from patient outcomes (Chapter 5 Section 5.3; Chapter 7 Section 7.5.3) (Santhirapala 2020, Waddock 2015, Leykum 2014, Seely 2013). As there are gaps in fully comprehending high-risk, it is also important to involve patients more in decisions around high-risk surgery. There is increasing information that high-risk patients have a higher incidence of postoperative complications that can result in not only short-term adverse outcomes but also for the longer-term harm post hospital, such as being more likely to be discharged to a higher care facility, rather than to their home (Bell 2019, Merkow 2015, Ghaferi 2009). Currently there is poor health literacy among both, health care staff and patients, with regard to a genuine understanding of risk and benefits of high-risk surgery. For genuine informed consent and shared decision making, both clinicians and high-risk patients need to be made aware of the current outcome data with its inherent uncertainty in order to make informed decisions.

This is particularly important in a work environment containing wicked complexity in perioperative context and complex adaptive systems (Santhirapala 2020, Greenhalgh and Papoutsi 2018, Braithwaite 2017, Cristancho 2016, Waddock 2015, Leykum 2014, Seely 2013). Currently, there is a fragmented picture of high-risk in surgical services with communication challenges (Chapter 7 Section 7.3). A more honest and data-based discourse from a health care and community perspective may help narrow this gap (Santhirapala 2020, Seely 2013, Gittell 2012).

Secondly, there are nine implications of the research arising from the study findings on the scale of the problem that may form the basis of an approach to the innovation and care planning. A primary implication of the research findings is to take a more holistic approach and involve all key stakeholders – patients, doctors, nurses, allied health professionals, health service researchers, educators, policy makers and health bureaucrats. In order to facilitate change requires greater awareness of the bigger picture and the transparent use of patient outcome data to drive that change. This also requires leadership in order to establish new models of care. Currently, the identification of leadership is not clear.

The challenge of where and how the leadership for coordinated and appropriate action will occur is significant. The scale of the solution must address the scale of the problem. The thesis has highlighted problems: associated with increasing high-volume surgical demand, high-risk high-cost complex care patients: and, threats to surgical services sustainability despite three decades of perioperative policy. Past and current policy enactment has been invested in attempting to address access to surgical care (Chapter 4) relying on linear systems (Chapter 2 Section 2.2.4; Chapter 5 Sections 5.2.2.1, 5.2.2.2, 5.2.2.3) rather than more comprehensively developing the learning and work practice organisation needed for high-risk patients in complex adaptive systems (Chapter 5 Sections 5.2.1, 5.2.2.4, 5.2.3, 5.3; Chapter 7 Sections 7.5.3 and 7.4). Moreover, top-down policy has many limitations in addressing real change at the patient level (Braithwaite 2017). New perioperative policy proposals are aimed at providing an integrated set of practices or models of care to provide safer care and better value for high-risk patients in complex adaptive systems (Chapter 7 Table 7.5) (ANZCA POM 2021, CPOC 2020, Pinto 2019, Grocott 2019, PT_2018). This thesis has detailed where current policies have not achieved this.

For policy and practice, an integrated 'whole-system' multilevel investment, in 'top-down' and 'bottom-up' approaches (Chapter 7 Section 7.5.2, Table 7.6), is required. This strategy was adopted in the short term when attempts were first made to re-engineer linear systems in surgical services in 1995 (Chapter 2 Box 2.1) (Greenhalgh 2004, Alexander 2000). As a consequence of implementing 'whole system' multilevel integrated perioperative models of care, executive managers at the local health district and hospitals can incur financial risk as a result of the new systems (Greenhalgh 2004). They will need to provide dedicated ongoing funding to and harness the support: of interdisciplinary expert opinion leaders who can exert influence through their authority and status; multidisciplinary peer opinion leaders through their representativeness and credibility; and, foster interprofessional champions amongst clinicians and managers, working in long-term collaborative teams, willing to drive the innovation and create solutions to problems that arise (Pomare 2020, Greenhalgh 2004). Other new organisational roles that may be needed include: the organisational buffer who creates a loose monitoring system to ensure that innovators use organisational resources efficiently; and, the knowledge brokers, boundary spanners and network facilitators that enable cross-functional collaboration (Reeves 2018, Gittell 2012, Greenhalgh 2004).

Thirdly, there are six implications of the research arising from the study findings on gaps in perspective arising from professional immersion, using technology and collaborative interprofessional teams that are not yet routine in most hospital settings (Chapter 7 Section 7.4, Table 7.3) (Petit dit Dariel & Cristofalo 2018). The complexity science approach needed to address the challenge of the high-risk surgical patient requires a move away from the predetermined outcomes and process fidelity of linear systems to one that embraces learning, evolution and emergence (Braithwaite 2018, Long 2018, Waddock 2015). Interprofessional education for sensemaking and fostering a shared understanding of an individual patient's clinical trajectory may improve outcomes such as length-of-stay, unnecessary length-of-stay and complication rates (Khan 2018, Leykum 2015).

Interprofessional education for sensemaking may lead to a shared understanding of whether, in fact, the surgery should be undertaken (Pinto 2019, Boss 2016, Dhesi & Swart 2016). Clinicians and clinician managers may be educated for interprofessional team learning, communication and collaboration for the high-risk surgical patient (Chapter 6). To achieve this, organisations will need to address wicked complexity in competing priorities and competing demands (Chapter 4) by artificially constructing the time and space in local perioperative environments for clinicians of all professions – doctors, nurses, allied health, in senior and junior roles, as well as managers, to actively participate in interprofessional teams (Petit dit Dariel & Cristofalo 2018, Greenhalgh 2004). Long-term interprofessional teams will be needed for dealing with uncertainty, developing a common agreed definition of high-risk and a shared understanding of an individual patient's clinical trajectory (Khan 2018, Leykum 2015, Waddock 2015, Seely 2013).

Gaps in perspective (Chapter 6 Section 6.3) where the motivation the majority of clinicians and managers had, to improve high-risk patient care through 'ideal' interprofessional team collaboration (Chapter 6 Figure 6.1) was in contrast to the current ‘team’ reality (Chapter 6 Figure 6.4 and Table 6.4) will need to be addressed through leadership and role models at higher organisational levels (Walton 2020, Petit dit Dariel & Cristofalo 2018, Greenhalgh 2004). However, whilst interprofessional collaborative practice is considered important in the implementation of patient safety initiatives (Lutfiyya 2019, Petit dit Dariel & Cristofalo 2018, Rosen 2018, Weller 2014), there is little research evidence of the relationship between teamwork and patient health-related outcomes (Lutfiyya 2019, Weller 2014).

There may be the need for two new team roles to work alongside clinicians and managers in context namely, educators and health service researchers. Educators for developing interprofessional team collaboration expertise (Weller 2014). Health service researchers to provide an evaluation framework where change is simultaneously analysed and fed back as a basis for continuous adjustment and improvement (Eljiz 2020, Braithwaite 2018). Both educators (Weller 2014) and researchers (Eljiz 2020, Braithwaite 2018) can be embedded in the boundaries of profession specific knowledge and bridge the gaps. This approach may result in addressing gaps in fully comprehending high-risk (Chapter 5); gaps in perspective (Chapter 6) as well as gaps in departmental or professional siloes and organisational levels (Chapter 4). However, both clinical interprofessional team educators (Petit dit Dariel & Cristofalo 2018, Rosen 2018, Weller 2014) and health service researcher roles (Greenhalgh & Papoutsi 2018) while considered important adjuncts in the implementation of patient safety initiatives are also described as being in their infancy.

Wicked complexity in perioperative context is dynamic. It has been shown to vary over decades; it can be tamed and constrained through appropriately directed policies for their time. Analysis of stakeholders’ influences is critical to this end (Huckel Schneider 2016, Buse 2011, Head 2008). A comprehensive stakeholder analysis prior to future policy implementation is the basis for this research.

8.5 New contribution to knowledge in the discipline

The new contribution to knowledge in the perioperative literature, that informs theory, policy and practice, is comprised of two parts. First, the eight unique contributions of the research that have been discussed in Chapter 7, Section 7.6. Second, the twenty-three implications of the thesis findings that were presented in Table 8.1 and Section 8.4 of this chapter. Together, the new contribution to knowledge in the discipline is summarised in Table 8.2.

Table 8.2 The new contribution to knowledge in the discipline

Number	New contribution
1	A re-conceptualisation of the modern perioperative system as one that is not two-dimensional and linear but rather, presents the work practice context around the high-risk patient as experienced by clinicians and managers
2	Developing a new model (Chapter 7, Diagram 7.1) and equation (Chapter 7, Diagram 7.2) (WC_{PC}= WC_{CPD} +WC_{GFCHR} + WC_{GP}) for understanding the context of perioperative policy and practice for high-risk, high-cost complex care patients having surgery through thirteen key findings that define WC_{PC}: Wicked complexity in perioperative context (Chapter 7, Table 7.4)
3	The five findings at the intersections of the three themes of compression of time and space, fragmentation of care and clinical complexity that define WC_{CPD}: Wicked complexity in competing priorities and demands (Chapter 7, Section 7.2)
4	The five findings at the intersections of the three themes of understandings of high-risk, work practice organisation and unclear patient outcome measure that define WC_{GFCHR}: Wicked complexity in gaps in fully comprehending high-risk (Chapter 7, Section 7.3)
5	The three findings at the intersections of the three themes of professional immersion, perioperative teams and using technology that define WC_{GP}: Wicked complexity in gaps in perspective (Chapter 7, Section 7.4)
6	Empirically and systematically revealing possible best next steps for advancing perioperative policy and practice to meet the needs of the high-risk high-cost complex care patient whilst simultaneously addressing high-volume surgical demand and surgical services sustainability (Chapter 7, Section 7.5)

Number	New contribution
7	A comprehensive Literature Review that uniquely combined a scoping review of historical contextual grey literature with a systematic literature review of highest hierarchical evidence for emerging models of perioperative care
8	An innovative presentation of the research data collected by multiple methods, and juxtaposing the evidence acquired using mixed methods methodology
9	The 23 implications of the thesis findings, to equip clinicians and managers to cope with the wicked complexity in perioperative context while implementing new models of perioperative care as described in Section 8.4 (Table 8.1)

8.6 Study limitations and directions for future research

There were three limitations to the study, which are corollaries of the strengths of the research. First, a single context - four university adult general hospitals within one metropolitan LHD of the NSW public health system in Australia - was examined. However, this allowed the policy arc to be examined, while undertaking an in-depth examination of the existing model of care, the managerial-clinical relationships and, patient issues and flow of patients between services. The findings may require interpretation and adjustment for smaller, regional or rural settings and some international health jurisdictions. Second, a sole researcher conducted the multimethod study with a large and complex data set. The study was completed part-time whilst working full-time, hence the extended time period, which was also impacted by family responsibilities and COVID-19 work demands and restrictions. However, the researcher was familiar with the setting, context and issues of care being explored. The researcher is a clinician with 30 years-experience in anaesthesia, perioperative medicine, services and policy. Third, the extended period over which research undertaken and completed – allowed exploration and detailed analysis of the issues, and implementation of the strategies to advance the rigour of the research. Research rigour was confirmed using the four dimensions of trustworthiness applying triangulation and other strategies (Chapter 3 Section 3.8). The researcher has postgraduate qualifications in health policy, including qualitative and mixed methods research units of study.

Four directions to future research are proposed. Future research could seek to confirm that by using mixed methods, unintended consequences of work practice behaviours in local context can be revealed and addressed. Simultaneously, the impact of the unintended consequences of perioperative policy on high-risk high-cost patient care may be described qualitatively, and through economic analysis, quantitatively. In addition, future studies should search for other factors that may influence the efficient implementation of the perioperative policy currently advocated. This could include studies evaluating the impact of interprofessional collaborative practice or the addition of new proposed members to the perioperative care team for the high-risk complex care patient. Namely: educators with expertise in developing interprofessional team learning and collaboration; health policy and health service researchers that provide the perspectives that enabled the articulation of wicked complexity in perioperative context.

8.7 Concluding remarks

This thesis adds unique empirical knowledge to surgical services sustainability, through investigating the impact of health policy, work practice organisation, teamwork, culture and context on the high-risk complex care patient. A wicked complexity in perioperative context arising and maintained by the behaviours of the practice environment was revealed. The research has provided a basis for understanding the perioperative work environment, the people working in it, their incomplete understandings of high-risk and the choices they make with the resources, frameworks and perspectives available to them. The research demonstrates that the perioperative system undergoes continual evolution and adapts to a best achievable solution for a period of time and space. However, the result now incorporates a counterproductive situation that incurs an 'opportunity cost' and undermines aspirations for value-based healthcare. The research has established a new foundation for understanding perioperative policy as a potential basis for, system improvement and future research into the high-risk high-cost complex care patient having surgery.

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Appendices

Appendix 1 NSW Health Pre-procedure preparation Toolkit (2007)

Guideline

NSW HEALTH

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Pre-Procedure Preparation Toolkit

Document Number	GL2007_018
Publication date	02-Nov-2007
Functional Sub group	Clinical/ Patient Services - Surgical
Summary	Optimal Pre-Procedure Preparation (PPP) is the first vital step for ensuring a successful surgical or procedural patient journey. PPP requires input from a multidisciplinary team: surgeon/proceduralist, anaesthetist, nurse, clerical staff, allied health, the patient's General Practitioner (GP) and the patients themselves. This toolkit has been developed to assist health facilities in optimising their processes for pre-admission assessment and preparation for patients undergoing procedures or surgery.
Author Branch	Health System Performance
Branch contact	Judy Willis 9391 9557
Applies to	Area Health Services/Chief Executive Governed Statutory Health Corporation, Divisions of General Practice, NSW Dept of Health, Public Hospitals
Audience	Pre Admission Clinic Staff - Anaesthetists, Surgeons, Nursing, Allied Health, General Practitioners
Distributed to	Public Health System, NSW Ambulance Service, NSW Department of Health
Review date	02-Nov-2012
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Director-General

The Pre-Procedure Preparation Toolkit

2007

NSW HEALTH

This Toolkit (PPPT) has been prepared to ensure that the best possible care is provided to patients presenting for surgery or a procedure. It offers a service framework to optimise pre-procedure processes for patient assessment and preparation.
The PPPT is designed to be used by all members of the multidisciplinary team involved. It applies to all NSW public health institutions – including tertiary, metropolitan, regional and rural facilities.

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Contents

Executive Summary

By providing optimal Pre-Procedure Preparation (PPP), the first vital step to ensure a successful surgical or procedural journey commences for the patient. Successful PPP requires input from a multidisciplinary team including, amongst others:

- the surgeon or proceduralist
- the anaesthetist
- nurses
- administrative and clerical staff
- allied health professionals
- the patient's General Practitioner (GP)
- the patient and carer.

Effective Pre-Procedure Preparation depends on the following key principles:

1) The PPP process prepares the patient and carer for the whole surgical or procedural journey.
2) All patients require pre-admission review using a triage process.
3) The PPP process optimises the patient's condition for their planned surgery or procedure.
4) The multidisciplinary team collects, analyses and integrates information for the patient's surgical or procedural journey.
5) Effective corporate and clinical governance underpins the PPP process.

The PPP process outlined in this Toolkit aims to ensure that:

- The patient's condition is optimised for anaesthesia, surgery, procedure and recovery
- The patient and carer are appropriately informed throughout the process
- Processes are efficient and duplication minimised
- The planned surgery/procedure is correct
- The patient journey is safe and adverse events avoided
- The patient is returned from hospital to a safe environment within the expected time frame
- The patient is returned to the care of an informed GP and Community Services.

Each NSW health facility is required to have an effective service framework in place for PPP. The PPP process should be integrated within the broader framework of a Perioperative Service and supported and led by a clinical champion.

Key roles

The **Anaesthetic clinical leader** is responsible for

- the coordination of perioperative medical care
- the medical optimisation of the patient pre-admission
- the establishment of guidelines and protocols for the Patient Health Questionnaire (PHQ), fasting, medications and patient information.

The **Nursing clinical leader** coordinates the PPP process and the involvement of each of the members of the multidisciplinary team. They also oversee the admission on the day of surgery and the discharge planning process.

The **PPP team members** review the overall process, monitor key performance indicators (KPI) and initiate modifications to the process when required.

Essential tools and templates

The following tools assist PPP team members to perform their functions efficiently:

- Recommendation for Admission form*
- Patient Health Questionnaire (Appendix 1, 2)
- Discharge Planning Questionnaire (Appendix 3)
- Pre-Admission Medical-Anaesthetic Assessment form (Appendix 4)
- GP Assessment Tool (Appendix 5)
- telephone screening tools*
- pre operative telephone instructions*
- patient information booklets*
- data collection tools to monitor outcomes*

**to be customised and developed at the local Area Health Service Level.*

Introduction

Background

The Surgical Services Task Force commissioned a Working Party to make recommendations to improve or to establish consistent, safe and efficient systems of care for patients presenting for surgery or a procedure. This Toolkit is the outcome and is designed to enhance the care of those patients.

The patient's surgical or procedural journey begins with the patient at home and ends when the patient is safely returned to their home or place of residence. One of the main functions of a Perioperative Service is to ensure that the patient is optimally prepared for their surgical or procedural 'journey' and that it occurs in a safe, efficient and patient-friendly manner. Comprehensive pre-procedure preparation is an essential part of the perioperative process.

The PPP is the framework of systems, processes, tools and multidisciplinary streams that is essential in ensuring a successful surgical or procedural journey. The PPP process framework is described in this toolkit.

What does Pre-Procedure Preparation cover?

PPP is primarily concerned with:

- Optimising the patient's
  - medical condition, in preparation for anaesthesia, surgery or procedure, and recovery
  - nursing preparation
  - sub-specialty and allied health preparation
  - discharge planning
- Ensuring that, where possible, the expectations of the patient, the carer, the referring surgeon or proceduralist and the anaesthetist are all met
- Ensuring the efficient coordination and integration of resources (Diagram 1).

(See glossary for list of acronyms and abbreviations used in this Toolkit)

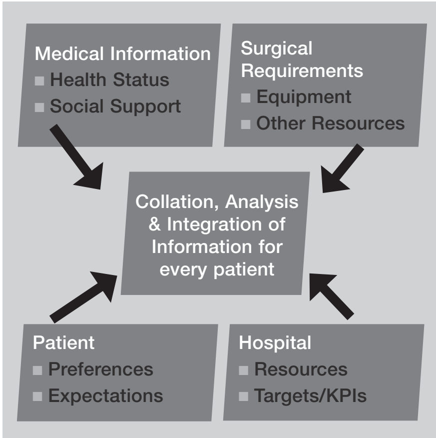

Diagram 1: What does Pre-Procedure Preparation deliver?

Preparing this Toolkit

This Toolkit has been prepared by frontline clinicians and staff experienced in PPP. Anaesthetists, surgeons, proceduralists, general practitioners, nurses and para clinical clerks have all made important contributions.

A common understanding of the fundamental elements of PPP has been derived from discussions of the local and general challenges faced by facilities across a broad spectrum of size, service, location and resources.

As a result, the generic service framework presented here emphasises multidisciplinary collaboration and communication tools for:

- optimal care of patients
- efficient use of triage processes
- appropriate delegation of tasks.

The Toolkit has taken into account best-practice guidelines as described in Australian and International literature; and relevant issues and themes notified in the NSW IIMS (Incident Information Management System) for the period July 2005 to December 2006 (Severity Assessment Code - SAC 1 Clinical Incidents).

2. Key Principles

Effective PPP processes depend on the following key principles:

1	**The PPP process prepares the patient and carer for the whole surgical or procedural journey.**
2	**All patients require pre-admission review using a triage system.**
3	**The PPP process optimises the patient's condition for their planned surgery or procedure.**
4	**The multidisciplinary team collects, analyses and integrates information for the surgical or procedural journey.**
5	**Effective coporate and clinical governance underpins the PPP process.**

3. Step by Step Guide to PPP

This section looks in detail at each of the key principles of PPP and explores the underlying processes.

Principle 1:
The PPP process prepares the patient and carer for the whole surgical or procedural journey.

The patient's surgical or procedural journey begins with the patient at home and ends when the patient is safely returned to their home or place of residence.

The Perioperative Service is responsible for as many phases of this journey as possible, from PPP to discharge home. Having one service ensures that processes are well integrated and protocols are developed in a cohesive manner.

The PPP process optimises the surgical or procedural journey for every patient by collating, analysing and integrating information from multiple sources. The aim is to make each individual patient's experience safe, appropriate, effective, efficient and positive.

The Perioperative Service Framework

The Perioperative Service Framework (Diagram 3) has the following key elements:

- **Surgeon/Proceduralist** refers the patient into the service
- **Perioperative Service leadership** identifies, engages and integrates the multiple components of a high quality surgical or procedural process through the skills of a multidisciplinary team
- **Multidisciplinary team** assist in optimising the patient's condition for their surgery/procedure.
- **The Components of the Patient Journey** – the framework ensures the integration of each component of care
- **Process Review** – a system of continuous feedback of patient data from each component of PPP that informs and allows improvement of the patient journey.

The PPP process is the vital first part of the perioperative patient journey (Diagram 2).

PATIENT	PRE-PROCEDURE PREPARATION	ADMISSION	SURGERY	POST SURGERY	DISCHARGE
Patient referred to surgeon/ proceduralist who refers the patient for admission to hospital. Surgeon / proceduralist completes RFA and consent form and distributes PHQ, DPQ to patient	Patient Health Questionnaire (PHQ) and Discharge Planning Questionnaire (DPQ) are reviewed by the clinical screener and triaged for Pre-Procedure Preparation (PPP). PPP process undertaken ensures the patient is optimally prepared for their surgery/ procedure and that hospital resources are efficiently coordinated.	Patient presents to hospital for admission on the day of their surgery/procedure. Pre-procedure/ surgery preparation is completed. Patient is reviewed by their procedural anaesthetist.	Patient readied for surgery/ procedure +/- anaesthesia and transported to appropriate area. Surgery/ procedure is performed. Patient transferred to Recovery area.	Post surgery/ procedure protocol care given. Post surgery/ procedure instructions recorded in patient's record. Patient returned to EDO unit/ ward for post surgery/ procedure protocol driven postoperative care.	When clinical protocol for discharge is satisfied, patient is given information on post surgery/ procedure care and pain management. Emergency contact details provided. Patient provided with follow up appointment and further information as required.

Diagram 2: PPP as part of the perioperative patient journey

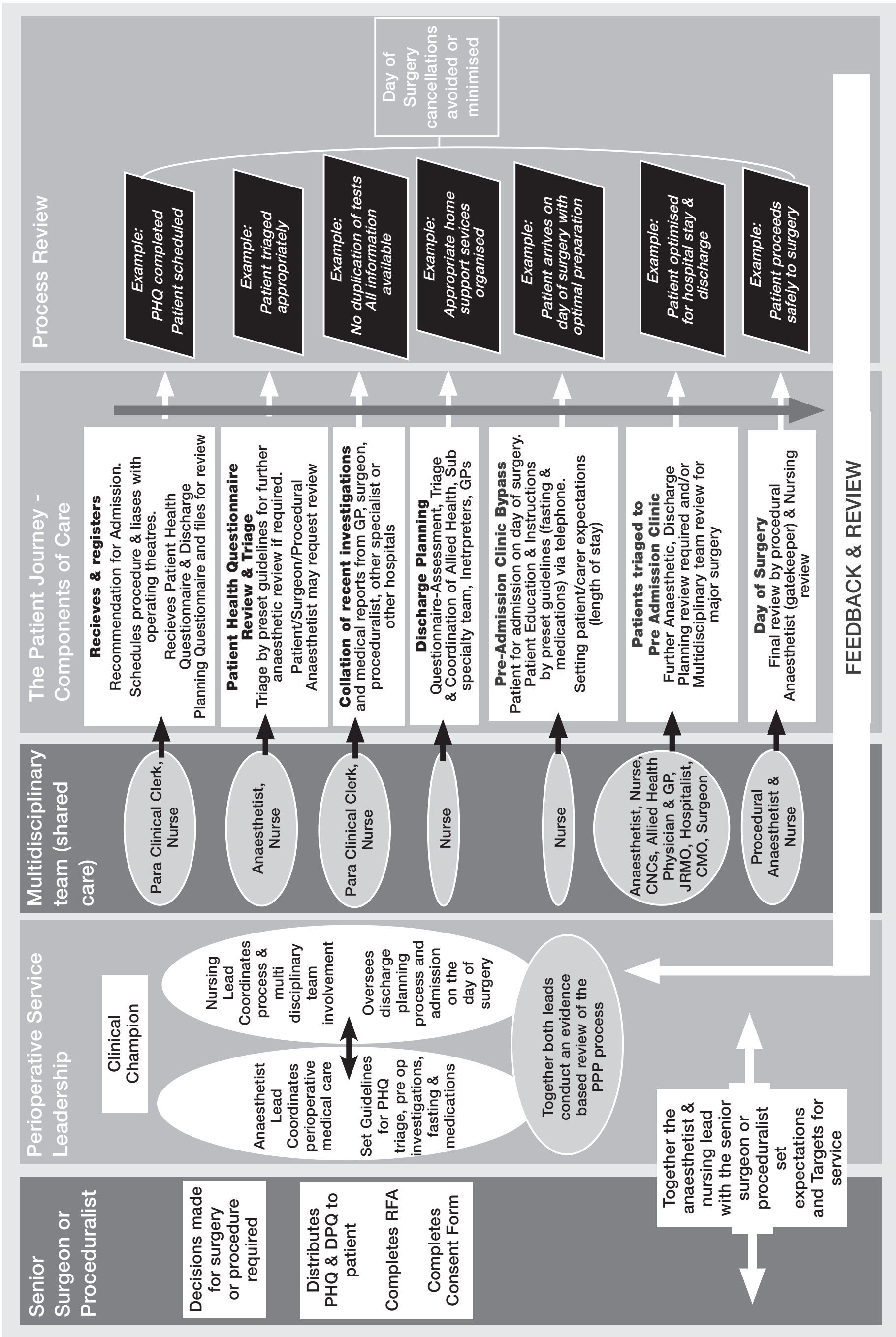

Diagram 3: The Service Framework for PPP

Principle 2: All patients require pre-admission review using a triage process.

All patients require a pre-admission review, however not all patients need to attend the pre-admission clinic (PAC).

Triage of patients to ascertain whether the patient needs to attend a PAC can be safely achieved using pre-admission screening tools such as the PHQ and RFA.

PPP maximises the efficient coordination and integration of resources.

The PPP of patients using a triage process is efficient and safe and streamlines the patient's experience. This has been the practice of well-developed Perioperative Services in many health facilities across NSW for the last 5-10 years. Internationally this practice is also well accepted.

All patients require pre-admission preparation but not all patients need to attend a PAC. Within each service the anaesthetist clinical lead should develop triage criteria that:

- Consider the local service and the resources available for PPP
- Are developed in consultation with other anaesthetists, surgeons and other relevant departments
- Are informed by best practice guidelines and continuous local feedback (e.g. cancellations on the day of surgery).

PPP triage process

This triage process identifies those patients who require further assessment and preparation and will direct them to a pre-admission clinic (PAC).

The process results in only a proportion of patients needing telephone review and then fewer patients needing to attend either a general or multidisciplinary PAC. The actual proportion however will be strongly influenced by the patient population and the nature of the surgery performed by the facility.

1. Distribution of questionnaires to patient

The surgeon or proceduralist distributes the following forms to the patient or carer:

- Patient Health Questionnaire (PHQ)
- Discharge Planning Questionnaire (DPQ).

2. Receipt and register of the RFA form

The RFA is received by the health facility and completion of the PHQ (Appendices 1 or 2) and DPQ (Appendix 3) is checked and forwarded to the screener for review.

The RFA should indicate the nature and complexity of the surgery.

The following examples indicate more invasive surgery:

- open intra-cavity surgery into the abdomen, thorax or cranium
- central orthopaedic surgery e.g. spine, hips
- arterial vascular surgery
- operating theatre time greater than two hours
- day of surgery admission (DOSA) staying more than one night post procedure.

The RFA will indicate a clinical priority category, which acts as a guide for the timing of the PPP process. The RFA may or may not indicate the scheduled date for surgery or procedure. The ideal minimum timeframe for patient screening prior to treatment is 2-4 weeks. If less time is available the clinical screener should prioritise PAC resources to ensure patients are screened in a timely manner.

3. PHQ

The PHQ is integral to the pre-admission triage screening process. It provides the necessary information for the screener to make a decision regarding the level of further pre-admission preparation required.

The PHQ should elicit all the essential elements of the patient's medical history, including:

- basic demographic details (including age, weight and height)
- previous and current medical conditions
- previous surgery or hospital admissions
- current medications
- allergies
- past experience with anaesthesia

- family history
- general fitness
- social habits (e.g. smoking and alcohol)
- relevant discharge planning information.

The information on the PHQ may be further clarified with the patient by telephone. The patient's GP may also be contacted for information and the results of recent investigations.

4. PHQ review and triage

The screening and assessment of the PHQ for triage (Diagram 4) should be undertaken by an appropriately trained health professional who may be a nurse, anaesthetist, GP or surgeon.

All returned PHQs should have an initial review by a screener within 2 working days of receipt of the PHQ. When an incomplete PHQ is received, appropriate action should be taken to ensure that it is completed. For example, depending on when the surgery is scheduled, the patient should be contacted by mail, fax or telephone to complete and return the PHQ to the screener.

The clinical screener reviews the completed PHQ and the clinical information on the RFA to decide on the appropriate level of further review for each individual patient, based on established local guidelines. The outcome of this review determines whether the patient bypasses or attends the pre-admission clinic.

5. Outcomes following triage

The clinical screener will triage patients and classify them into one of the following three processes:

- limited to written and telephone education and instructions
- comprehensive telephone interview required
- attendance at a pre-admission clinic required. This may be either a:
  - general pre-admission clinic (conducted by an anaesthetist and a nurse), or
  - multidisciplinary pre-admission clinic.

The sections below consider each of the three triage classifications.

Limited to written and telephone education and instructions only

- Applies to a healthy patient requiring only minor surgery or procedure (e.g. day-only) with either:
  - no systemic disease, or
  - mild to moderate systemic disease without functional limitation in selected cases
- The patient and carer have written education and instructions to prepare them for the procedure. These will offer the opportunity for further telephone instructions
- On the day prior to surgery the patient (and carer) receives telephone education with a nurse, including instructions for fasting and medications required
- On the day of surgery the patient will have a final assessment for fitness for surgery or procedure with their procedural anaesthetist.

Comprehensive telephone interview required

- Applies to patients with either:
  - mild to moderate systemic disease without functional limitation.
  - low complexity surgery (e.g. day-only or single night stay), or
  - social support problems including language.
- Telephone interview for more information may be required with a nurse and/or GP
- When the clinical screener is satisfied that no further review is required the patient and carer are provided with written and telephone education and instructions.

Pre-admission clinic attendance required General pre-admission clinic (anaesthetist and nurse):

Further assessment and preparation required for medical and anaesthesia optimisation. Applies to patients with any of the following:

- presenting problem requiring moderately invasive surgery
- co-existing medical problems which are not optimally managed

- multiple risk factors for perioperative morbidity
- multiple co-existing medical problems
- past history or family history of problems with anaesthesia
- difficulty obtaining any of the above information due to social or language difficulties
- where patient, carer, surgeon, proceduralist, procedural anaesthetists, GP, other specialist requests PAC.

When the anaesthetist and nurse are satisfied that no further assessment and preparation are required, the patient and carer are provided with written and telephone education and instructions.

Multidisciplinary pre-admission clinic:

Further assessment and preparation required for patients having moderately invasive major surgery.

When the multidisciplinary team is satisfied that no further assessment and preparation is required, the patient and carer are provided with written and phone education and instructions.

PPP is concerned with the coordination and integration of resources.

Pre-Procedure Preparation promotes systems that:

- Triage or direct resources to identified needs
- Ensure no duplication of processes (e.g. coordination and collaboration of a multidisciplinary team to delegate tasks and share care)
- Ensure no unnecessary ordering or repetition of investigations (e.g. coordinate with GP)
- Offer 'one stop' service provision for patients.

What is the ideal pre-admission clinic?

- The PAC should be the 'one stop' service for those patients assessed as requiring pre-admission clinic attendance.
- The PAC should be organised to ensure that patients attend the clinic once prior to their procedure for all the necessary anaesthetist and nurse appointments, tests, investigations, sub specialty and allied health consultations. Sometimes other medical consultations may need to occur outside the PAC.
- The PAC needs to balance the availability of services with the needs of the patient and provide where possible flexible clinic hours (e.g. evening or early morning). The timing of appointments prior to surgery or procedure should allow enough time for any tests, investigations or consultations and their subsequent results to be collected and analysed.
- Individual patient appointments should be staggered to minimise any inconvenience to patients.
- The patient should attend PAC with enough time to arrange appropriate investigations and optimise their condition. This may be 2-4 weeks prior to their presentation.
- The PAC service should incorporate a simple investigations service - blood collection for tests, ECG and spirometry - as part of the 'one stop service'.
- The PAC takes account of the special needs of children.

Special considerations for PPP in children

- Children are a heterogenous group and age, weight, size and developmental stage are important considerations in the paediatric population.
- Separate PHQ Paediatric (Appendix 2) and DPQ should be developed for use with children. PHQ Paediatric (Appendix 2) for documentation that may be locally adapted from the template provided.
- Special needs include children with diagnosed or associated behavioural problems.
- Fasting times should be minimised to that prescribed in locally adapted guidelines.
- The role of parents, guardians and carers is important and should be supported with appropriate education e.g. for parents present at induction of anaesthesia and for post discharge care.
- Proactive measures encouraging phone communication 1-2 days prior to surgery may allay parents' and carers' anxiety and minimise cancellations on the day of surgery (e.g. for children with respiratory symptoms).

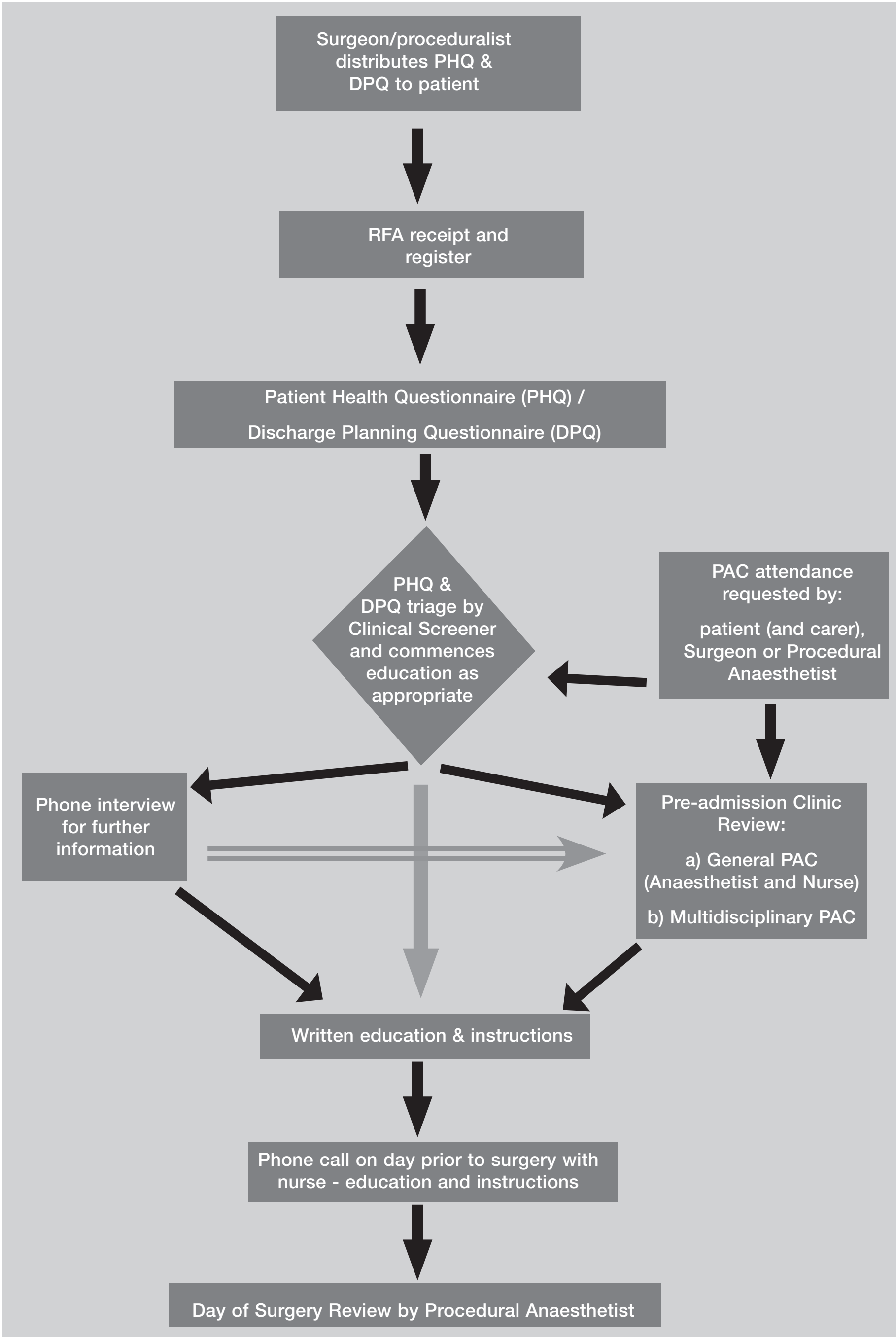

Diagram 4: PPP Triage Process

Principle 3: The PPP process optimises the patient's condition for their planned surgery or procedure.

PPP is primarily concerned with:

- optimising the patient's preparation with regard to their
  - medical condition for anaesthesia, surgery/ procedure and recovery
  - nursing care
  - sub-specialty and allied health care
  - discharge planning, tailored to the individual
- ensuring that, where possible, the expectations of the patient, carer, the referring surgeon or proceduralist and the anaesthetist are all met.

Optimising the patient's preparation

Optimum medical condition for anaesthesia, surgery, procedure and recovery

For the same surgery or procedure, different patients may have different:

- intercurrent illnesses
- medications
- perioperative risk.

A range of health care professionals may note medical comorbidities, including:

- the patient's GP
- the surgeon or proceduralist
- PPP nurse
- anaesthetist.

The following sections look in detail at the roles of different health specialists during PPP in optimising the patient's condition for their planned surgery or procedure.

The PPP Anaesthetist in the PAC:

- Provides the general medical assessment.
- Analyses the information provided and seeks further information as indicated.
- Identifies comorbidities and coordinates optimisation of the patient's medical condition.
- Makes referral to other specialists (e.g.cardiology, respiratory medicine, renal medicine) as required; this is done in consultation with the GP, procedural anaesthetist and surgeon.
- Assesses the medical and anaesthetic risk and identifies the options for anaesthesia.
- Presents this information to the patient and carer in a manner which supports informed decision-making.
- Communicates with the procedural anaesthetist directly as appropriate.
- Formulates an individualised perioperative care plan for the patient.
- Documents the consultation in the patient's medical record. Refer to Pre-Admission Medical-Anaesthetic Assessment Form (Appendix 4): for documentation that may be locally adapted from the template provided. Note: This form or similar should be placed at the front of the patient's continuation notes in the medical record. This is to reduce duplication of medical information.

The General Practitioner:

- Advises other health care professionals of any relevant tests or investigations that have been recently performed in relation to the patient's impending procedure. Early communication with the GP may avoid unnecessary duplication of investigations or tests.
- Plays a crucial role for rural patients particularly for patients with multiple comorbities presenting for major surgery and is an integral role in initial assessment and facilitating optimisation.
- Assists patients with completion of the PHQ.
- Liaises with the anaesthetist and perioperative team to carry out pre-operative testing and investigations. A health summary and/or assessment form facilitates communication. Refer to GP Assessment Tool (Appendix 5): for documentation that may be locally adapted from the template provided.
- Follows up and communicates results to the perioperative team.
- Advises and refers patients to services that may be required post operatively.

The Multidisciplinary team:

- Ensures that each patient has the appropriate pre-procedure tests and investigations.
- May implement standing orders as a useful means to ensure that all appropriate pre-procedure tests are undertaken. Standing orders can be developed for patients in:
  - specific procedure/surgery groups (e.g. total hip replacement)
  - specific co-morbidity groups (e.g. diabetes mellitus).

A **pre-operative investigation matrix** is a useful means to developing local standing orders. This should be consistent with current best practice e.g. the National Institute for Clinical Excellence UK (2003) - The use of routine pre-operative tests for elective surgery. An example of such a matrix may be found for local adaptation in the Oxford handbook of anaesthesia (2006).

The PPP nurse:

- Plans and administers discharge management by assessing the Discharge Planning Questionnaire. Refer to Appendix 3: Discharge Planning Questionnaire for documentation that may be locally adapted from the template provided.
- Different sources of information must be checked to ensure that appropriate referrals are made to sub specialty and Allied Health personnel. These sources include:
  - PHQ
  - DPQ
  - GP
  - PPP nurse
  - PPP anaesthetist.

Refer to Referral Guidelines for Allied Health Personnel (Appendix 7).

- Coordinates pre-operative testing and investigations and collation of results.
- Liaises with appropriate stakeholders regarding patients with special needs e.g. homeless patients, primary caregivers.
- Liaises with appropriate stakeholders regarding special equipment required for particular patients e.g. morbidly obese patients.
- Coordinates PAC and the appropriate members of the multidisciplinary team e.g.: subspecialty CNC, stoma therapist, diabetes and allied health personnel if the patient needs to be referred to them
- Collects baseline physiological data including weight, height, and vital signs - heart rate, blood pressure, oxygen saturation, respiratory rate and temperature
- Prepares patients for day of surgery admission (including arrival time, fasting, medications and contact person)
- Clarifies patient and carers' expectations
- Provides patients with relevant information and education relating to their hospital stay and procedure. Refer to Patient Information Checklist (Appendix 6): for documentation that may be locally adapted from the template provided
- Organises subsequent post-discharge referral to allied health, sub specialty surgical and other services.

Discharge planning:

All patients, adults (Appendix 3) and children require individual planning. The discharge planning tool is often supplemented by a telephone call from the PPP Nurse.

Adult patients screened for further telephone follow-up include individuals who:

- are over 75 years old
- live alone
- are the primary carer of a spouse or family member
- are not independent in all activities of daily living
- use community services e.g. 'meals on wheels'
- are disabled in sight or limb and having surgery or procedure on unaffected side.

Ensuring that, where possible, the expectations of the patient, carer, the referring surgeon/proceduralist and procedural anaesthetist are met.

Patient expectations:

- The patient and carer are to be provided with full information about their procedure, surgery, anaesthesia and recovery, to enhance informed consent.
- Information about the patient is to be appropriately communicated to other health professionals.
- The patient and carer are to gain a sound understanding of:

  - admission details
  - fasting time
  - how to manage medications
  - expected length of hospital stay
  - anticipated time off work
  - anticipated progress of post discharge recovery
  - post discharge care
  - pain management etc.
- The patient and carer are to be provided with the contact details of hospital staff, in case they need to telephone for further advice or information.
- The patient is to be provided with information on their rights and responsibilities.

Procedural anaesthetist and surgeon/ proceduralist expectations

- The patient's medical condition has been optimised.
- The patient has followed PPP instructions.
- The patient and carer are fully informed and consent for treatment has been documented.
- The patient's medical history and results of appropriate investigations are available.

Principle 4: The multidisciplinary team collects, analyses and integrates information for the patient's surgical or procedural journey.

Developing a Perioperative Service with a core multidisciplinary team of anaesthetists, nurses and para-clinical clerks is the standard for NSW hospitals over the last decade.

This team liaises with and facilitates the work of key stakeholders also responsible for the surgical or procedural patient journey.

The multidisciplinary team

Some roles may overlap depending on resources available and on the size, type and location of the health facility. Each role is important for ensuring optimal PPP (Diagram 5).

Roles of the frontline multidisciplinary team

The frontline multidisciplinary team plays a vital role in the optimisation of patients for their procedure or surgery. The Director of the Perioperative Service and a Nursing Leader lead the multidisciplinary team. These team leaders are responsible for the framework for the Perioperative Service.

A number of tasks may be delegated across the three core professional groups - clerk, nurse and anaesthetist - according to the best use of local resources and depending on the size, type of service and location of a health facility.

Roles of the multidisciplinary team

Members of the multidisciplinary team are consulted as required for patients having major surgery and/or with significant comorbid disease requiring perioperative care. The roles of the multidisciplinary team augment that of the frontline team.

Paperwork, documentation and the multidisciplinary team

At all stages the patient information needs to be checked for consistency e.g. the RFA, the consent form, the correct site for surgery, medications. Local guidelines should be developed and implemented to manage anomalies in patient documentation.

All members of the multidisciplinary team are responsible for checking patient information.

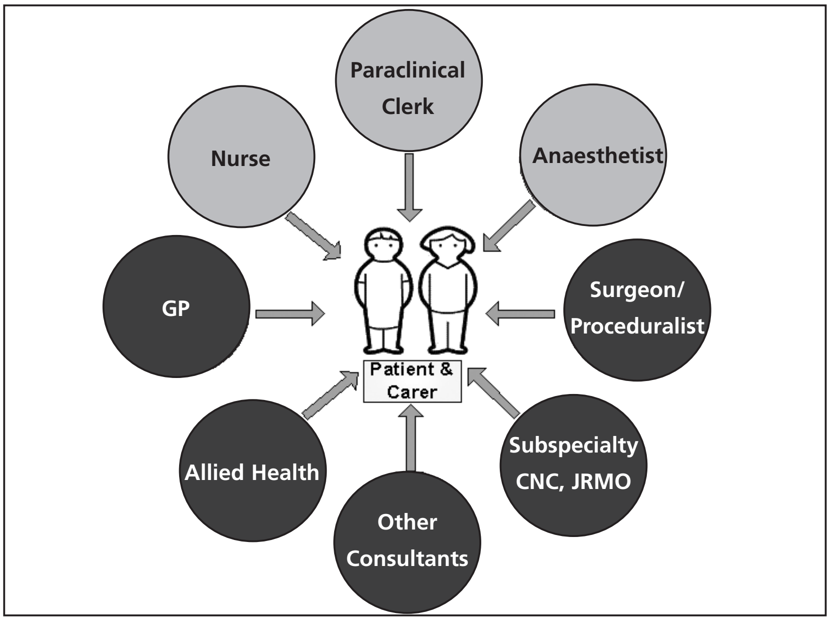

Diagram 5: The Multidisciplinary Team

Frontline PPP team member	Role
Clerk/Para Clinical Clerk	■ The Para Clinical Clerk is a member of the Perioperative Service/PAC and works closely with and reports to the anaesthetic and nursing clinical leaders or delegates. ■ Collates PHQ, DPQ and other paperwork required. ■ Checks patient details and ensures PHQ is complete. ■ Requests patient medical records. ■ Updates Patient Administration & scheduling systems. ■ Arranges and coordinates patient appointments. ■ Collates investigations and test results for review. ■ Medicare processing. ■ Assists in collecting data for KPIs.
Nurse	■ Screens PHQ, RFA for PAC or PAC bypass. ■ Coordinates the Pre-Procedure Preparation process. ■ Collates investigations and flags abnormal results to the anaesthetist. ■ Organises or performs blood tests, ECG and spirometry in 'one stop' PAC. ■ Provides patient with pre operative education information and instructions necessary for their hospitalisation. ■ Organises discharge planning for all patients including identifying patients who may require community-based services (e.g. Community Acute/Post Acute Care). ■ Provides information on patient's rights and responsibilities.
Anaesthetist	■ Screens PHQ, RFA for PAC or PAC bypass. ■ Medical assessment of triaged PAC patients. ■ Orders relevant investigations and consultant referrals to ensure optimal patient condition for surgery or procedure. ■ Follows up abnormal results. ■ Liaises with procedural anaesthetist. ■ Liaises with surgeon. ■ Refers to and organises post-operative High Dependency Unit (HDU), Intensive Care Unit (ICU) as appropriate. ■ The anaesthetist may be assisted by an anaesthetic registrar in the PAC.

Multidisciplinary Team Member	Role
Allied Health staff	■ Includes interpreters, physiotherapists, pharmacists, occupational therapists, speech pathologists, dieticians, podiatrists and social workers, who are consulted according to procedure specific and social circumstances. (Appendix 7)
Sub specialty Clinical Nurse Consultant	■ Provides sub specialty surgical or medical nursing advice, information, education individualised to the patient.
GP	■ Provides advice to the perioperative team as the patient's primary physician. ■ May be involved in pre operative assessment of the patient. ■ Provides pathology and radiology results to the team. ■ Advises and refers patients to services that may be required post-operatively.
Sub specialty Surgical Junior Resident and Career Medical Officers	■ Arranges medical admission for patients presenting for major surgery. ■ Manages the patient's medications during the perioperative period in consultation with relevant specialists.
Hospitalist	■ This is a newly created position within NSW Health, under the Career Medical Officer Award. Hospitalists are medical practitioners whose primary focus is to enhance care for patients in a cross specialty model throughout the patient's healthcare experience. ■ Reports to the anaesthetic clinical leader. ■ Provides medical/surgical admission for patients presenting for major surgery and for patients with significant comorbidities.
Other consultants	■ Provide specialist consultation services to assess specific condition (e.g. cardiac, respiratory, endocrine). ■ Provide advice and treatment in relation to optimising the patient for surgery.
Surgeon or proceduralist	■ Completes RFA and distributes PHQ, DPQ to patient. ■ Provides baseline clinical history and information on the procedure/surgery required. ■ Obtains written informed consent from the patient for the surgery or procedure.

Principle 5: Effective corporate and clinical governance underpins the PPP process.

Corporate and Clinical Governance requires coordination and is critical at three levels:

- the Area Health Service
- the Hospital/Facility
- the Perioperative Service.

Governance	Activities/Responsibilities
Area Health Service	■ Executive sponsorship for the establishment of Perioperative Services. ■ Processes and tools developed for use in PPP meet the clinical and administrative needs of the patient during their Perioperative journey in a seamless manner. ■ Directly engages frontline clinical leaders in this task.
Hospital/Facility	■ Frontline clinician as the Director of the Perioperative Service. ■ Essential to the role of Director of the Perioperative Service and has the capacity to engage local Surgeons and Anaesthetists in ensuring the patient is optimally prepared for their surgery. ■ Supports the establishment of a Perioperative Service of anaesthetists, nurses, and para clinical clerks for PPP. ■ Engages the Director of the Perioperative Service in meeting KPIs for access, wait list, EDO, DOSA and cancellations on the day of surgery targets.
Perioperative Service	■ Director of Perioperative Services, together with hospital/facility management, to establish the leadership team of a senior anaesthetist and a senior nurse for the Perioperative Service to: - Develop the service framework for Pre-Procedure Preparation including standardised systems and processes. - Develop the multidisciplinary perioperative team. - Liaise with and facilitate the work of key stakeholders also responsible for the surgical or procedural patient journey. - Take responsibility for reviewing and managing key performance indicators and other clinical or operational process outcomes.

4. Key Performance Indicators

The table below outlines KPIs for Pre-Procedure Preparation at both state and local levels.

State KPIs	Benchmark
Booked patient cancellations on the day of surgery (any reason)	< 2.0%
% of patients cancelled due to a medical condition (subset)	<1.0%

Suggested local KPIs	Benchmark
% of patients through a PPP process	100%
% of patients who attended PPP assessment through: - telephone interview - General pre-admission clinic (anaesthetist and nurse) - Multidisciplinary pre-admission clinic (PAC)	Depends on local service
Average time spent by patient in PAC - General PAC (anaesthetist and nurse) - Multidisciplinary PAC	 2 hours 4 hours

Other	
Number of patients who 'did not attend' on the day of surgery	< 0.5%

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Appendices

Appendix 1: Patient Health Questionnaire - Adult

Patient to complete. If help is required see your family or local Doctor or Telephone

Insert Telephone No.
.(........)..

Please answer the questions by ticking the appropriate box. Give any necessary details in the space provided.

Medical Record Number..
Surname.............................. Other names..................................
Date of birth........................ Classification................ Sex...........
Admission date..
Senior Medical Officer............................ Hospital/Ward............

(affix label)

Office Use Only

Planned procedure:...

Do you have any health problems other than your planned surgery? ❑ No ❑ Yes

If Yes - What are they? (If you need extra space add a seperate sheet of paper) ....

....

Have you been in hospital for any health problems including previous surgery? ❑ No ❑ Yes

If Yes - What are they? When were they? (Please list)

Operation Hospital Year

....

....

Have you seen any other specialist doctor in the last 5 years? (If yes, please list) ❑ No ❑ Yes

Reason for seeing Dr? Doctor's name Dr Phone number Last visit

....

....

Do you use any regular medications? (e.g. pills, puffers, herbal & non prescribed medications) ❑ No ❑ Yes

If Yes - Please list them below (If you need extra space add a separate sheet of paper.)

Name of medication	When taken?	How often?

Do you have any allergies? (especially to medicines or sticking plaster, iodine, food or latex) ❑ No ❑ Yes

If yes - What are they? What reaction do you have? ....

Have you or any family member had a problem with an anaesthetic? (e.g. a bad reaction) ❑ No ❑ Yes

If Yes - What happened? ....

Can you normally walk without stopping?

- More than 2 flights of stairs ❑ No ❑ Yes
- 2 flights of stairs ❑ No ❑ Yes
- 1 flight of stairs ❑ No ❑ Yes
- Half a flight of stairs ❑ No ❑ Yes
- Around the house ❑ No ❑ Yes

Office Use Only

PHQ TRIAGE INSTRUCTIONS

Patient Health Questionnaire

Patient Health Questionnaire

How tall are you? .... **How much do you weigh?**.................................

Do you have difficulty opening your mouth wide or limited neck movement? ❑ No ❑ Yes

Have you had any recent anaesthetics? (Including at the dentist) ❑ No ❑ Yes

If Yes - When was the last one?..

Do you have any questions, worries or concerns about the anaesthetic that you would like to talk to us about? ❑ No ❑ Yes If Yes - What are they? ....

Do you have or have you ever had	NO	YES
High blood pressure	❑	❑ If Yes - When ....
Chest pain or 'angina'	❑	❑ If Yes - How Often ....
Heart attack	❑	❑ If Yes - When ....
Any other heart condition e.g. heart valve, pacemaker	❑	❑ If Yes - What Type ....
Lung problems needing hospital	❑	❑ If Yes - What Type................................
Troublesome shortness of breath	❑	❑ If Yes - When do you get it..................
Chronic bronchitis	❑	❑ If Yes - When ....
Asthma	❑	❑ If Yes - When ....
Should you be using a puffer (e.g. Ventolin)?	❑	❑ If Yes - How Often ....
Other lung or breathing problems (e.g. sleep apnoea)	❑	❑ If Yes - What Type ....
Reflux of acid or food - heartburn/hiatus hernia	❑	❑ If Yes - How Often ....
Diabetes	❑	❑ If Yes - Do you use Insulin .... ❑ No ❑ If Yes
	Or - Do you take diabetic tablet .... ❑ No ❑ If Yes	
Epilepsy or fits	❑	❑ If Yes - How Often ....
Stroke	❑	❑ If Yes - When ....
Blackouts or fainting	❑	❑ If Yes - When ....
Blood clots or a bleeding disorder	❑	❑ If Yes - What Type.................................
Anaemia	❑	❑ If Yes - When ....
Previous blood transfusion	❑	❑ If Yes - When ....
Kidney condition	❑	❑ If Yes - What type ....
Hepatitis or liver condition	❑	❑ If Yes - What type ....
Has your doctor prescribed for you Prednisone, cortisone or other steroids	❑	❑ (If Yes - When ....
Is there a condition that runs in the family e.g. thalassemia, muscle dystrophy?	❑	❑ (If Yes - What condition.........................
Do you have any other health issues not mentioned above e.g. hormone therapy, poor teeth, rheumatoid arthritis?	❑	❑ (If Yes - What ....
Any infectious disease ('golden staph', HIV, TB)	❑	❑ If Yes - What..
Are you pregnant?	❑	❑ Yes
Do you smoke?	❑	❑ If Yes - How Much ....
Do you drink alcohol?	❑	❑ If Yes - How much per Week ....
Have you completed this questionnaire for yourself	❑	❑ If No - What is your relationship to the patient.....................................

Signature of person completing the form: ....Date: ....

Appendix 2: Patient Health Questionnaire - Paediatric

Parent / Carer to complete. If help is required see your family or local Doctor or Telephone
Insert Telephone No.
.(........)...

Please answer the questions by ticking the appropriate box.

Give any necessary details in the space provided.

(affix label)

Medical Record Number...
Surname............................. Other names..................................
Date of birth........................ Classification............... Sex...........
Admission date ....
Senior Medical Officer........................... Hospital/Ward............

Office Use Only
Age:
Weight:
Height:
Planned Procedure: ....

Who will accompany the child to hospital?

Name:..

Phone: ....

Relationship to child:...

Was your child born prematurely? ❑ No ❑ If Yes - How many weeks early? ....

Does your child have any health problems other than the planned procedure/surgery? ❑ No ❑ Yes
If Yes - What are they? ....

Has your child been in hospital for any health problems including previous surgery/ ❑ No ❑ Yes

If Yes - What, when & where? ....

Does your child have any diagnosed disabilities or special needs?...................................... ❑ No ❑ Yes
If Yes - What type? ....

Has your child seen any other specialist doctor? (if yes, please list) ❑ No ❑ Yes

Reason for seeing Dr | Doctor's name | Dr Phone number | Last visit

....

....

Does your child use any regular medications?
(e.g. pills, injections, puffers ,herbal & non prescribed medications) ❑ No ❑ Yes
If Yes - Please list them below (If you need extra space add a separate sheet of paper)

Name of medication	How much?	How often?

Does your child have any allergies? (Especially to medicines, sticking plaster, iodine, food or latex) ❑ No ❑ Yes

Has your child had previous anaesthetics? ❑ No ❑ Yes

Yes If yes - What for and when? ....

Paediatric Patient Health Questionnaire

Paediatric Patient Health Questionnaire

Are you aware of any problems your child has with general anaesthetics? ❑ No ❑ Yes

If yes - please detail ....

In your child's family are you aware of any problems with general anaesthetics? ❑ No ❑ Yes

If yes - please detail ....

Do you or your child have any questions about the anaesthetic? ❑ No ❑ Yes

Does your child have at present or have they ever had:

	NO	YES
A recognised medical condition or syndrome?	❑	❑ If Yes - name of condition and specialist doctor? . ...
Heart problems	❑	❑ If Yes Detail, name and phone number of heart specialist.. ....
Asthma	❑	❑ If Yes - How Often ....
Should your child be using a puffer (e.g. Ventolin)?	❑	❑ If Yes - How often ....
Other lung or breathing problems (e.g. snoring, stops breathing during sleep-sleep apnoea)	❑	❑ If Yes - What type ....
Reflux of acid or food - heartburn/hiatus hernia	❑	❑ If Yes - How often ....
Diabetes	❑	❑ If Yes - What type and treatment ....
Previous exposure to cortisone, similar steroids	❑	❑ If Yes - When and what type......................
Epilepsy or fits	❑	❑ If Yes - How often ....
Bleeding or bruising problems	❑	❑ If Yes - What type.....................................
Bleeding or bruising problems in a family member	❑	❑ If Yes - What type.....................................
Anaemia or previous blood transfusion	❑	❑ If Yes - When..
Kidney condition	❑	❑ If Yes - What type ....
Hepatitis or liver condition	❑	❑ If Yes - What type.....................................
Is your child's immunisation up to date?	❑	❑ If Yes - What type ....

Has your child had exposure to measles, chicken pox or any other infectious disease in the last 3 weeks?

❑ ❑

If Yes - What type ....

Is there a condition that runs in the family e.g. thalassemia, muscle dystrophy?

❑ ❑

If Yes - What condition. ....

Appendix 3: Discharge Planning Questionnaire

Template form for Adult patients

(affix label)

Medical Record Number...
Surname.............................. Other names..................................
Date of birth........................ Classification................ Sex...........
Admission date...
Senior Medical Officer............................ Hospital/Ward.............

Dear Patient,

You are presently on the waiting list for surgery at the..Hospital. To assist with planning for your hospitalisation and safe return home, would you please complete these questions by ticking the boxes.

1. Age..
2. Do you speak English at home? ❑ Yes ❑ No
   If not, which language to you speak? ....
   Do you need an interpreter? ❑ Yes ❑ No
3. What is your understanding of how long you will be in hospital?
   ❑ Day only ❑ Overnight ❑ 1 - 2 days
   ❑ 2 - 5 days ❑ Unsure ❑ Greater than 1 week
4. Have you made arrangements for someone to take you home from hospital? (A responsible adult must accompany Day Only patients home, and must stay with them at least for the first night after surgery). ❑ Yes ❑ No
5. Do you live / Where do you live
   ❑ alone ❑ house/unit
   ❑ with family ❑ boarding house
   ❑ with carer ❑ hostel
   ❑ nursing home ❑ other...
6. Do you care for another person on a regular basis? ❑ Yes ❑ No
7. Have alternative arrangements been made to look after this person? ❑ Yes ❑ No
8. Do you normally need assistance to walk? ❑ Yes ❑ No
9. Do you use a walking aid such as a stick or frame? ❑ Yes ❑ No
10. What type?..
11. Do you have difficulties walking up or down stairs? ❑ Yes ❑ No
12. Do you have difficulties with your sight/hearing? ❑ Yes ❑ No
    Please describe ... .
    ....

Office Only

<70 = 0, 70 to 80 = 5
>80 = 10

Interpreter needed = 10

Lives alone = 7
Boarding House = 2
Hostel = 2

Primary Carer = 8

Walking Aid = 6

Impaired = 5

Discharge Planning Questionnaire

Discharge Planning Questionnaire

13. On discharge do you anticipate any problem with:

			Office Only
Bathing/Showering	❑ Yes	❑ No	1
Dressing	❑ Yes	❑ No	1
Toileting	❑ Yes	❑ No	1
Cooking	❑ Yes	❑ No	1
Cleaning	❑ Yes	❑ No	1
Shopping	❑ Yes	❑ No	1
Business matters	❑ Yes	❑ No	1
Other..............................	❑ Yes	❑ No	1

14. On discharge, do you anticipate that help will be required at home? ❑ Yes ❑ No

Please describe ....
....
....

15. What arrangements have been made for someone to care for you when you get home?
....
....

16. Do you currently use any of the following services?

❑ Community Nurse ❑ Personal Care Assistance
❑ Meals On Wheels ❑ Home Help
❑ Day care/Therapy Unit ❑ Other

1 point each

Please ask for assistance, as staff are available to assist you with any concerns.

Thank you for completing this form.

The information you have provided will help in planning your discharge from hospital

HOSPITAL USE ONLY

Expected length of stay .... Total needs score .... Intervention required ❑ Yes ❑ No

Telephone intervention ❑ Yes ❑ No.............Action. ....

Screened by ....(RN) Signature.. Date ...../...../.....

Referrals to be made to: ❑ Social Work ❑ CNC Discharge Liaison ❑ Physiotherapy
❑ Stomal Therapy ❑ Occupational Therapy ❑ CA/PAC
❑ D & A ❑ Interpreter ....
❑ Other ....

Requires Pre-Admission Clinic ❑ Yes ❑ No

Appointment made by (administrative staff).................. Signature .... Date ...../...../.....

Appointment date ....

Appendix 4: Pre-Admission Medical-Anaesthetic Assessment

Date: | By: | Anaesthetist Fellow Registrar 1 2 3 4 | Unit No.

Surgeon / Team: | Date Planned: | Surname

Planned Procedure: | Other Names

DOB / Sex

General: ASA 1 2 3 4 5

Age: Sex: Weight: kg Height: cm BMI: kg/m²

Allergies Nil ☐

History of present illness:

Cigs........./d ....Pack/yrs Etoh.........g/d

Medications: Nil ☐

Intercurrent illnesses:

☐ Nil

Anti-Platelet/Aspirin Nil ☐

Relevant Anaesthetic History:

☐ Nil

Alternate Meds: Nil ☐

Perioperative Management Plan:

Admission process explained: ☐

Take usual medications on DOS ☐ except:

☐ Perioperative Options Discussed: PCA: ☐

☐ Perioperative Risks Explained:

Admission Status ☐ Day Only ☐ Day of Surgery Admission (>1night)

☐ Extended Day Only ☐ Full Admission

Signature:

Pre-Admission Medical Assessment form

Pre-Admission Medical Assessment form

PRE-ADMISSION EXAMINATION & EVALUATION

CARDIOVASCULAR

BP:...... HR:...... reg irreg

JVP: ......

Carotids: ......

HS: ......

Ankle oedema: ......

Pulses: ......

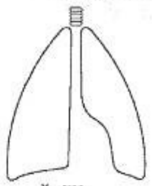
Exercise tolerance: ...... Limited by: ......

ECG: ......

Thallium / Stress Test / Echo / Angiogram: ......

RESPIRATORY

SpO_2: ......%



X = crep
O = wheeze

Breathlessness: Nil Moderate Exertion Mild Exertion At Rest

Examination: ......

CXR / CT: ......

Spirometry, Lung Function Tests: ......

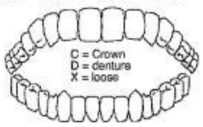
ABG's on ...... $\%O_2$: pH ...... pO_2 ...... pCO_2 ...... Bicarb ...... BE ...... Sat ...... %

More: ......

AIRWAY & TEETH

Mallampati / Gatt Score

Class 1 Class 2 Class 3 Class4



Dentures Nil Upper: Full Partial Lower: Full Partial

Teeth: ......

Jaw opening: ...... Atlanto-Axial Extension: ......

Neck Flexion: ......

More: ......

NEUROLOGICAL

	R	L
Power		
UL	/ 5	/ 5
LL	/ 5	/ 5
Pupils		

Hearing: ......

Vision: ......

More: ......

OTHER

......

BLOOD RESULTS

BIOCHEM: Na ...... K ...... CL ...... $TotCO_2$ ...... BSL ...... Creat ...... Ca ...... LFT's ......

HAEM: Hb ...... WCC ...... Plats ...... INR ...... APTT ...... Groups&Screen ......

OTHER: ......

Appendix 5: GP Assessment Tool

Fax to: ....

GENERAL PRACTITIONERS SUPPLEMENTARY HISTORY

GP to complete. If there are any queries, phone Waitlist/Admissions Department on...........................

PLEASE ANSWER THE FOLLOWING QUESTIONS BY TICKING THE APPROPRIATE RESPONSE.
WHERE APPROPRIATE, PROVIDE ADDITIONAL DETAILS.

Patient name: .... Date of birth: ....

1. Are the patient's answers to the Health Questionnaire complete and accurate? ❑ Yes ❑ No

Please complete the patient questionnaire or annotate corrections. If appropriate, please send / fax a copy of your Health Summary to Perioperative Services.

2. Are there other specialists sharing the care of your patient? (other than the one performing the procedure) ❑Yes ❑No

Speciality ....Speciality:..
Name:...Name:...
Practice location ....Practice location:...
Phone number:..Phone number:...

3. Please tick below any recent (<12 months) reports or results that you have of the following:

❑ Haematology ❑ ECG ❑ Other ....
❑ Serum Chemistry ❑ Echocardiography ❑ Chest X-Ray ....
❑ Physician's *If Yes, please send any relevant reports or results to Perioperative Services.*

4. Please give details of any current medications not listed by the patient:

Medications	**Dose**	**Frequency**

5. What is the control or stability of major chronic medical problems (e.g. hypertension, diabetes)?

Chronic Problem	Duration (years)	Control / Stability	
		❑ Well controlled	❑ Poorly Controlled
		❑ Well controlled	❑ Poorly Controlled
		❑ Well controlled	❑ Poorly Controlled
		❑ Well controlled	❑ Poorly Controlled

6. How would you describe your patients mobility and general functional ability? (Please circle)

Fully independent Generally independent Generally dependent Fully dependent

7. Is there anything (other then those chronic problems) that may impact on the patient's perioperative care?
impact on the patient's perioperative care? ❑ Yes ❑ No

If Yes, please list the other problems and current assessment: ....
....

GP Signature:..GP Name:...

Phone: .... Date:...

GP practice stamp:

Appendix 6: Patient Information Checklist

The following information may be included when the Perioperative Service team is producing written education and instructions for patients and their carers.

Information for patients should include:	Completed
Details of the operation to be performed.	
Expected benefits of the surgery and risks involved.	
Approximate length of stay in hospital.	
Overview of usual recovery for the patient's procedure including: ■ When the patient will usually eat and drink. ■ Mobilise. ■ Return home.	
Degree of pain anticipated and how the pain is relieved, e.g. details of techniques e.g. patient controlled analgesia.	
Approximate time off work needed.	
When it will be safe to resume normal activities e.g. driving?	
The perioperative screener's contact details for the patient to ring if: ■ They cannot attend. ■ There has been a significant change to their medical condition. ■ Their medication has changed. ■ They need advice.	
What to bring on the day of admission?	
Car parking/hospital map and or other transport arrangements.	
Hospital visiting times for relatives.	
Fasting times and other pre operative preparation can be discussed.	

Appendix 7: Referral Guidelines for Allied Health Personnel

The table below provides referral guidelines for allied health personnel involved in Pre-Procedure Preparation.

Allied Heath Personnel	Referral guidelines
Dietician	■ Patients for PEG insertion to organise feeding systems. ■ Cachectic patients for perioperative nutritional support.
Drug & alcohol	■ Life style advice e.g. smoking cessation, reducing alcohol intake. ■ Acute management of withdrawal with perioperative cessation of recreational drugs.
Interpreter service	■ Patient request. ■ The patient's principal language used at home is not English. ■ Also refer to interpreter service guidelines.
Occupational therapy	■ Patient may need assistance with activities of daily living post operatively e.g. operating on 'good' eye or limb.
Pharmacy	■ For patients staying two or more nights in hospital, a pharmacist may obtain a full medication history (including complementary medicines). ■ In consultation with medical staff may assist in providing information to patients on particular medications (e.g. insulin) prior to surgery. ■ Arrange specific medications to be available (if not normally available) for the patient's admission.
Physiotherapy	■ Patient is having a major procedure that requires specific education e.g. use of crutches, deep breathing and coughing exercises, circulation exercises, mobility assistance. ■ Specifically, cardio and/or thoracic surgery; upper abdominal surgery, joint replacement surgery; and significant medical comorbities e.g. CAL.
Podiatry	■ Specific to lower limb amputation process & assessment of viable limb and mobilisation.
Social work	■ Patient lives alone. ■ Patient is a primary carer for a family member. ■ Patient needs advice regarding transport, accommodation, financial support, and access to community services.
Speech pathology	■ Patients undergoing major head and neck surgery where speech and swallowing may be a problem post procedure.

Glossary: List of Acronyms and Abbreviations

CAL	Chronic Airways Limitation
CMO	Chief Medical Officer
CNC	Clinical Nurse Consultant
DOSA	Day of Surgery Admission
DPQ	Discharge Planning Questionnaire
ECG	Electro Cardiogram
EDO	Extended Day Only
GP	General Practitioner
HDU	High Dependency Unit
ICU	Intensive Care Unit
IIMS	Incident Information Management System
JRMO	Junior Resident Medical Officer
KPI	Key Performance Indicator
NSW	New South Wales
NUM	Nursing Unit Managers
PAC	Pre-Admission Clinic
PCA	Patient Controlled Analgesia
PEG	Percutaneous Endoscopic Gastrostomy
PHQ	Patient Health Questionnaire
PPP	Pre-Procedure Preparation
RFA	Recommendation for Admission
RN	Registered Nurse
SAC	Severity Assessment Code

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Working Party membership

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The Chairperson would like to thank for their contribution to the Toolkit:

- The Children's Hospitals, Westmead,
- Sydney Children's Hospital, Randwick
- John Hunter Children's Hospital, Newcastle
- Ms Lesley Innes, Allied Health, NSW Health
- Dr Roger Traill, Royal Prince Alfred Hospital
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Appendix 2 NSW Health Agency for Clinical Innovation Perioperative Toolkit (2018)

Guideline

The Perioperative Toolkit

Summary	The Perioperative Toolkit is designed to aid in the continuous quality improvement of perioperative structures, processes and outcomes for patients having a surgery/procedure and anaesthesia. The Perioperative Toolkit applies evidence and clinical reasoning to risk stratification and directing resources to clinical need. The nine elements of perioperative care described in this Toolkit build upon the five in its predecessor – the Pre Procedure Preparation Toolkit (PPPT) (2007).
Document type	Guideline
Document number	GL2018_004
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Author branch	Agency for Clinical Innovation
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File number	H18/395
Status	Active
Functional group	Clinical/Patient Services - Anaesthetics, Critical Care, Nursing and Midwifery, Surgical Corporate Administration - Information and Data, Records
Applies to	Affiliated Health Organisations, Board Governed Statutory Health Corporations, Local Health Districts, Ministry of Health, Private Hospitals and day Procedure Centres, Public Health System Support Division, Public Hospitals, Specialty Network Governed Statutory Health Corporations
Distributed to	Divisions of General Practice, Ministry of Health, Private Hospitals and Day Procedure Centres, Public Health System, Tertiary Education Institutes
Audience	Clinical, Allied health, Operating theatres, Pre-procedure clinics, Administration nursing, Medical

Secretary, NSW Health

This Policy Directive may be varied, withdrawn or replaced at any time. Compliance with this directive is mandatory for NSW Health and is a condition of subsidy for public health organisations.

NSW GOVERNMENT Health
GUIDELINE SUMMARY

THE PERIOPERATIVE TOOLKIT

The Perioperative Toolkit is designed to aid in the continuous quality improvement of perioperative structures, processes and outcomes for patients having a surgery/procedure and anaesthesia. The Perioperative Toolkit applies evidence and clinical reasoning to risk stratification and directing resources to clinical need.

Shared decision making with patients, families and carers and integration with primary care are integral aspects of perioperative care.

The nine elements of perioperative care described in this Toolkit build upon the five in its predecessor – the Pre Procedure Preparation Toolkit (PPPT) (2007).

KEY PRINCIPLES

The perioperative team comprises of the patient, their family and carers, general practitioners, surgeons, proceduralists, anaesthetists, nurses, administrative and clerical staff, allied health professionals, primary healthcare providers, Aboriginal health, multicultural and diversity health workers.

The Perioperative Toolkit (2016) builds on the state-wide systems of the PPPT (2007). Significant inroads have been made in addressing elective surgery waiting times by reducing length of hospital stay in healthier patients having less major surgery.

The four new elements are directed towards measuring outcomes for quality improvement, pre-operative pre-habilitation and strengthening intra- and post-operative care for the high-risk complex patient with chronic multisystem disease having moderate to major surgery.

Recommendations for prioritising perioperative care

Standard care	Best practice (to be developed further over the next five years)
Elements 1,2,3,4,9	**Elements 5,6,7,8**

Effective perioperative care is reliant on the following key elements.

1. The perioperative process prepares the patient, family and carer for the whole surgical/procedural journey.
2. All patients require pre admission review using a triage process.
3. Pre procedure preparation (PPP) optimises and supports management of the patient's perioperative risks associated with their planned surgery/procedure and anaesthesia.
4. The multidisciplinary team collects, analyses, integrates and communicates information to optimise patient centred care.
5. Each patient's individual journey should follow a planned standardised perioperative pathway.

6. Measurement for quality improvement, benchmarking and reporting should be embedded in the perioperative process.
7. Integration with primary care optimises the patient's perioperative wellbeing.
8. Partnering with patients, families and carers optimises shared decision making for the whole perioperative journey.
9. Effective clinical and corporate governance underpins the perioperative process.

A range of tools are available on the Perioperative Toolkit page on the ACI website. These tools can be used and adapted to meet local needs.

USE OF THE GUIDELINE

To address the economic challenges of safe access to elective surgery each NSW Health facility should have an integrated service in place for perioperative care and invest in strengthening the model of care.

The perioperative service should be supported and led by a clinical champion. Ideally the medical clinical leader or Director, Perioperative Service is an anaesthetist. An anaesthetist's continuing professional development and experience with surgeons and proceduralists at the most critical time of treatment, informs this role.

The medical clinical leader, collaborating closely with the nurse clinical leader, is responsible for:

- facilitating the other's leadership role
- the coordination of integrated perioperative multidisciplinary care
- the identification, communication and management of perioperative patient risk
- the establishment of local guidelines
- measurement, benchmarking and reporting of outcomes.

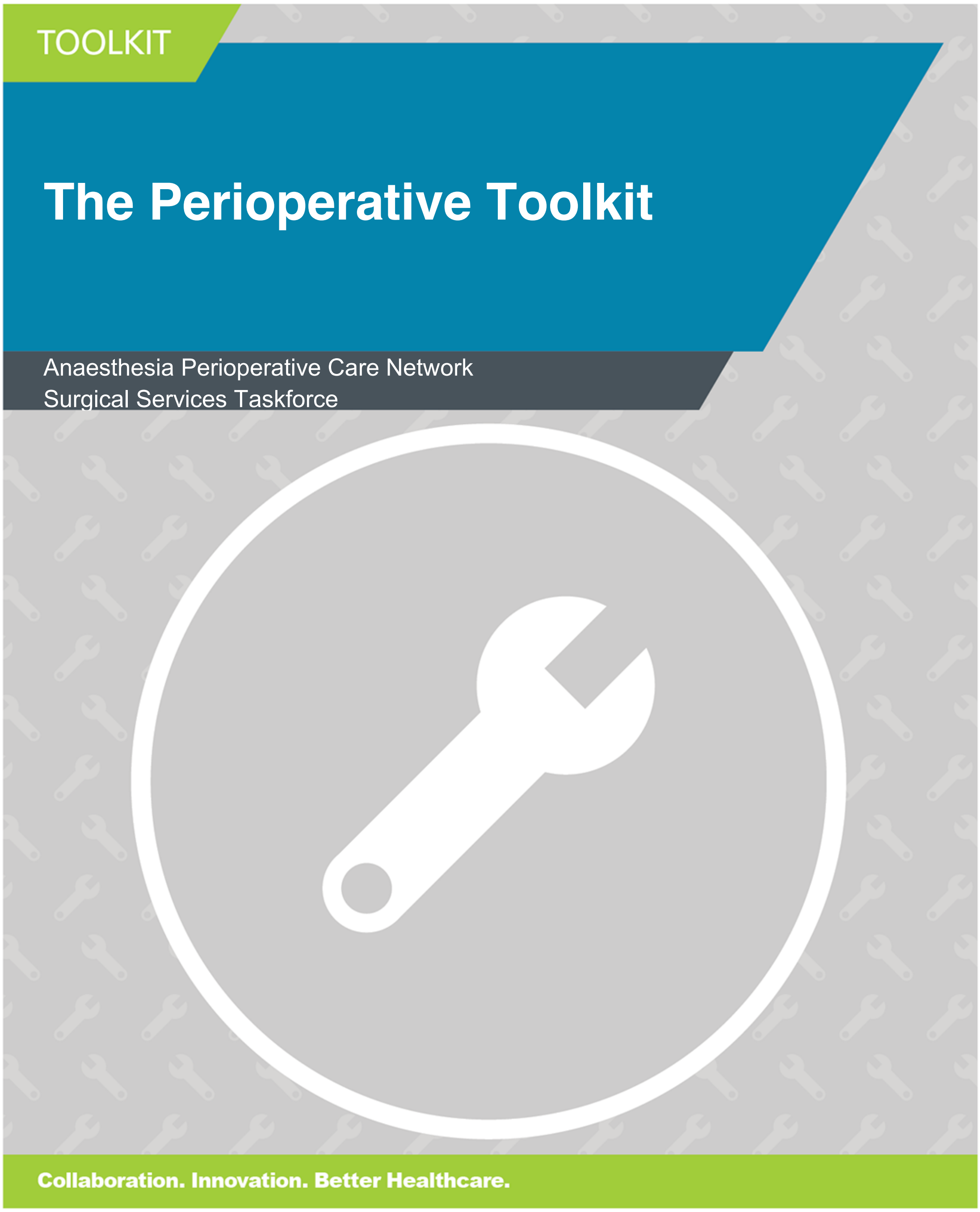
REVISION HISTORY

Version	Approved by	Amendment notes
November 2007 (GL2007_018)	Deputy Secretary, System Purchasing and Performance	First edition.
February 2018 (GL2018_004)	Deputy Secretary, System Purchasing and Performance	Addition of 4 elements of care that exemplify best practice for the perioperative patient.

ATTACHMENTS

1. The Perioperative Toolkit

ACI NSW Agency for Clinical Innovation


TOOLKIT

The Perioperative Toolkit

Anaesthesia Perioperative Care Network
Surgical Services Taskforce

Collaboration. Innovation. Better Healthcare.

The Agency for Clinical Innovation (ACI) works with clinicians, consumers and managers to design and promote better healthcare for NSW. It does this by:

- *service redesign and evaluation* – applying redesign methodology to assist healthcare providers and consumers to review and improve the quality, effectiveness and efficiency of services
- *specialist advice on healthcare innovation* – advising on the development, evaluation and adoption of healthcare innovations from optimal use through to disinvestment
- *initiatives including guidelines and models of care* – developing a range of evidence-based healthcare improvement initiatives to benefit the NSW health system
- *implementation support* – working with ACI Networks, consumers and healthcare providers to assist delivery of healthcare innovations into practice across metropolitan and rural NSW
- *knowledge sharing* – partnering with healthcare providers to support collaboration, learning capability and knowledge sharing on healthcare innovation and improvement
- *continuous capability building* – working with healthcare providers to build capability in redesign, project management and change management through the Centre for Healthcare Redesign.

ACI Clinical Networks, Taskforces and Institutes provide a unique forum for people to collaborate across clinical specialties and regional and service boundaries to develop successful healthcare innovations.

A priority for the ACI is identifying unwarranted variation in clinical practice and working in partnership with healthcare providers to develop mechanisms to improve clinical practice and patient care.

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Date Amended: FINAL – 13 December 2016

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The Perioperative Toolkit was first developed in 2007 as the Pre Procedure Preparation Toolkit by a working party commissioned by the Surgical Services Taskforce. The Agency for Clinical Innovation (ACI) would like to acknowledge the contribution of the 2015/16 working group – comprised of members of the Anaesthesia Perioperative Care Network, the Surgical Services Taskforce and the NSW Ministry of Health – in revising this Toolkit:

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The Chairperson and the ACI would also like to acknowledge:

- Ms Nicola Timmiss – NUM Perioperative Unit, Prince of Wales Hospital

Glossary

ACC	American College of Cardiologists
ACCHS	Aboriginal Community Controlled Health Service
ACI	NSW Agency for Clinical Innovation
AHA	American Health Association
AMS	Aboriginal Medical Service
ASA PS	American Society Anesthesiologists Physical Status Classification
BGL	Blood Glucose Level
BMI	Body Mass Index
CEC	Clinical Excellence Commission
CMP	Calcium, Magnesium and Phosphate
CPAP	Continuous positive airway pressure
CNC	Clinical Nurse Consultant
COU	Close Observation Unit
CP	Clinical Pathway
CXR	Chest X-ray
DOS	Day Only Surgery
DOSA	Day of Surgery Admission
ECG	Electrocardiogram
EDO	Extended Day Only
ENT	Ear, Nose and Throat
ER	Enhanced Recovery
EUC	Electrolytes, Urea and Creatinine
FBC	Full Blood Count
GP	General Practitioner
HDU	High Dependency Unit
HVSSS	High Volume Short Stay Surgery
ICU	Intensive Care Unit
LHD	Local Health District
MACE	Major adverse cardiac event
NSQIP	National Surgical Quality Improvement Program
NSW	New South Wales
OT	Operating Theatres
PAC	Pre Admission Clinic
PDSA	Plan Do Study Act
PHQ	Patient Health Questionnaire
PPP	Pre Procedure Preparation
PPPT	Pre Procedure Preparation Toolkit
RFA	Recommendation for Admission
RN	Registered Nurse
RRT	Rapid Response Team
SPP	Standardised Perioperative Pathway
TCPQ	Transfer of Care from hospital Planning Questionnaire

ASA Physical Status Classification

- ASA 1 – A normal healthy patient
- ASA 2 – A patient with mild systemic disease
- ASA 3 – A patient with severe systemic disease
- ASA 4 – A patient with severe systemic disease that is a constant threat to life
- ASA 5 – A moribund patient who is not expected to survive without the operation

Executive summary

The Perioperative Toolkit is designed to aid in the continuous quality improvement of perioperative structures, processes and outcomes for patients having a surgery/procedure and anaesthesia. This is achieved by facilitating effective knowledge sharing between key members of the multidisciplinary perioperative team for patient centred care. The perioperative team comprises – the patient, their family and carers, general practitioners, surgeons, proceduralists, anaesthetists, nurses, administrative and clerical staff, allied health professionals, primary healthcare providers, Aboriginal health, multicultural and diversity health workers. The Perioperative Toolkit applies evidence and clinical reasoning to risk stratification and directing resources to clinical need. The patient's underlying medical health status and social circumstances are taken into consideration alongside the impact of the intended surgery/procedure and anaesthesia. Shared decision making with patients, families and carers and integration with primary care are integral aspects of perioperative care.

Elements of perioperative care

The nine elements of perioperative care described in this Toolkit build upon the five in its predecessor – the Pre Procedure Preparation Toolkit (PPPT) (2007). The method used by the expert Working Group was the Delphi technique[1] working with nascent international and local evidence, in particular peer reviewed empirical papers and models of care[2,3,4].

Effective perioperative care is reliant on the following key elements.

1. The perioperative process prepares the patient, family and carer for the whole surgical/procedural journey.
2. All patients require pre admission review using a triage process.
3. Pre procedure preparation (PPP) optimises and supports management of the patient's perioperative risks associated with their planned surgery/procedure and anaesthesia.
4. The multidisciplinary team collects, analyses, integrates and communicates information to optimise patient centred care.
5. Each patient's individual journey should follow a planned standardised perioperative pathway.
6. Measurement for quality improvement, benchmarking and reporting should be embedded in the perioperative process.
7. Integration with primary care optimises the patient's perioperative wellbeing.
8. Partnering with patients, families and carers optimises shared decision making for the whole perioperative journey.
9. Effective clinical and corporate governance underpins the perioperative process.

Recommendations for prioritising perioperative care	
Standard care	Best practice (to be developed further over the next five years)
Elements 1,2,3,4,9	Elements 5,6,7,8

The Perioperative Toolkit (2016) builds on the state-wide systems of the PPPT (2007). Significant inroads have been made in addressing elective surgery waiting times by reducing length of hospital stay in healthier patients having less major surgery. The four new elements are directed towards measuring outcomes for quality improvement, pre operative prehabilitation and strengthening intra- and post-operative care for the high-risk complex patient with chronic multisystem disease having moderate to major surgery.

Tools

The following tools aid the perioperative team members to perform their roles.

- Recommendation for Admission Form (RFA)
- Patient Health Questionnaire (PHQ) – Adult – Appendix 1
- Patient Health Questionnaire (PHQ) – Paediatric – Appendix 2
- Transfer of Care from Hospital Planning Questionnaire (TCPQ) – Appendix 3
- Conditions/considerations for assessing a patient's perioperative risk – Appendix 4
- Additional Information to be obtained from the Primary healthcare provider – Appendix 5
- Pre Admission Medical Anaesthetic Assessment Form – Appendix 6
- Perioperative patient information booklet (PPIB) – Appendix 7
- Patient information checklist – Appendix 8
- Standardised Perioperative Pathway (SPP) – Appendix 9
- Enhanced Recovery or Clinical Pathways for specific surgical procedures

A range of tools, including the above Appendices, are available on the Perioperative Toolkit page on the ACI website. These tools can be used and adapted to meet local needs.

Key roles and governance

To address the economic challenges of safe access to elective surgery each NSW Health facility should have an integrated service in place for perioperative care and invest in strengthening the model of care. The perioperative service should be supported and led by a clinical champion. Ideally the medical clinical leader or Director, Perioperative Service is an anaesthetist. An anaesthetist's continuing professional development and experience with surgeons and proceduralists at the most critical time of treatment, informs this role.

The medical clinical leader, collaborating closely with the nurse clinical leader, is responsible for:

- facilitating the other's leadership role
- the coordination of integrated perioperative multidisciplinary care
- the identification, communication and management of perioperative patient risk
- the establishment of local guidelines
- measurement, benchmarking and reporting of outcomes.

Contents

Introduction

In 2007, the Surgical Services Taskforce commissioned a Working Group to develop the Pre Procedure Preparation Toolkit (GL2007_018). Updating the previous guideline in 2015-2016, the NSW Agency for Clinical Innovation (ACI) Anaesthesia Perioperative Care Network in collaboration with the Surgical Services Taskforce and the Ministry of Health present the Perioperative Toolkit (the Toolkit). The evidence based Toolkit is designed to aid in further developing perioperative structures, processes and outcomes for patients having a surgery/procedure and anaesthesia. This is achieved by facilitating knowledge sharing between key members of the multidisciplinary perioperative team for patient centred care. The Toolkit applies evidence and clinical reasoning to risk stratification and directing resources to clinical need. The patient's underlying medical health status and social circumstances are taken into consideration alongside the impact of the intended surgery/procedure and anaesthesia. Shared decision making with patients, families and carers and integration with primary care are integral aspects of perioperative care.

This Toolkit was prepared and has been reviewed by frontline clinicians and staff experienced in perioperative care, including anaesthetists, surgeons, nurses, allied health professionals, consumers, managers and primary healthcare providers. The Toolkit has taken into account best practice guidelines described in Australian and international literature[2,3,5].

Scope of application for this Toolkit

The patient's surgical/procedural journey begins with the patient at home and ends when the patient is safely returned to their place of residence. One of the main functions of a Perioperative Service is to ensure that the patient is optimally prepared for their complete surgical/procedural journey and that this occurs in a safe, efficient and patient-centred manner. The principles outlined in the Toolkit are applicable for both adult and paediatric patients.

It is important that perioperative care is delivered in culturally safe and competent ways. To overcome the evolving barriers to lifelong care that Aboriginal people may experience, Perioperative Services need to work in partnership with Aboriginal health care providers to tailor care to achieve optimal perioperative health outcomes. In particular, this should include a demonstrated commitment to building trust with Aboriginal people to ensure assessment, planning, referral and follow up processes are tailored to the individual. This approach should also take account of the holistic approach to health that is shared by most Aboriginal people and communities and identify key services and staff who can support these processes to achieve optimal health outcomes for Aboriginal people undergoing surgery/procedure.

While the Toolkit is predominantly focussed on the elective patient undergoing surgery/procedure, many of the elements outlined in the document also apply for patients undergoing an emergency surgery/procedure. Emergency surgery is a major component of the surgical services workload in many NSW hospitals. The Emergency Surgery Guidelines provide the principles to be applied to emergency surgery in NSW public hospitals[6].

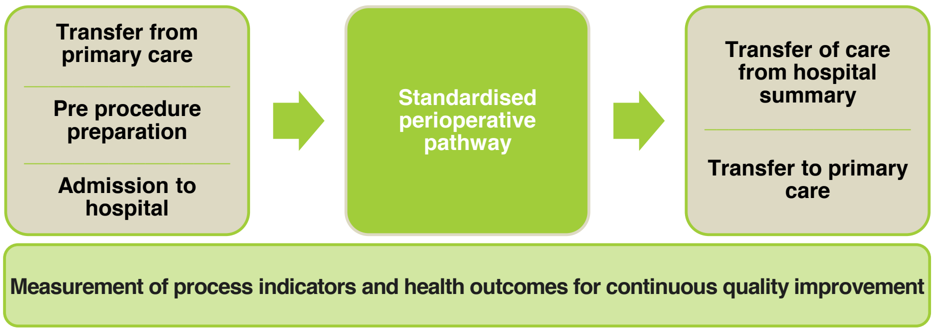
The perioperative process is the framework of systems, tools and multidisciplinary teams that is essential in ensuring a successful surgical/procedural journey. It is applicable for all NSW public health institutions – including tertiary, metropolitan, regional and rural facilities. Each NSW health facility undertaking surgery/procedures must have an effective integrated service framework in place to support the perioperative process.

Step by step guide to perioperative care

Element 1: The perioperative process prepares the patient, family and carer for the whole surgical/procedural journey

The patient's surgical/procedural journey begins at home and ends when the patient is safely returned to their home or place of residence. The Perioperative Service is responsible for as many phases of this journey as possible, from pre procedure preparation (PPP) to transfer of care from hospital. Having one service ensures that processes are well integrated and protocols are developed in a cohesive manner.

Diagram 1: The perioperative process



The perioperative process optimises the surgical/procedural journey for every patient by collating, analysing, integrating and communicating information from multiple sources. The aim is to make each individual patient's experience safe, appropriate, effective, efficient and positive.

The risk stratification process that underpins this Toolkit considers the patient's underlying medical health status and social circumstances alongside the impact of the intended surgery/procedure. Patients may then be effectively and efficiently allocated to: pre admission clinics (PAC), day of surgery admission (DOSA), day only surgery (DOS), extended day only surgery (EDO) or several days stay in the hospital ward, high dependency unit (HDU) – increasingly known in NSW as Close Observation Units (COU) – the intensive care unit (ICU) and sub-acute services such as rehabilitation. High Volume Short Stay Surgical (HVSSS) wards are dedicated areas that look after surgical DOS and EDO admissions as well as hospital stays up to 72 hours. Some of these – for example EDO[7] and HVSSS[8]– have specific NSW Health guidelines. Planning for transfer of care from hospital back to primary care similarly triages community resources to patient need.

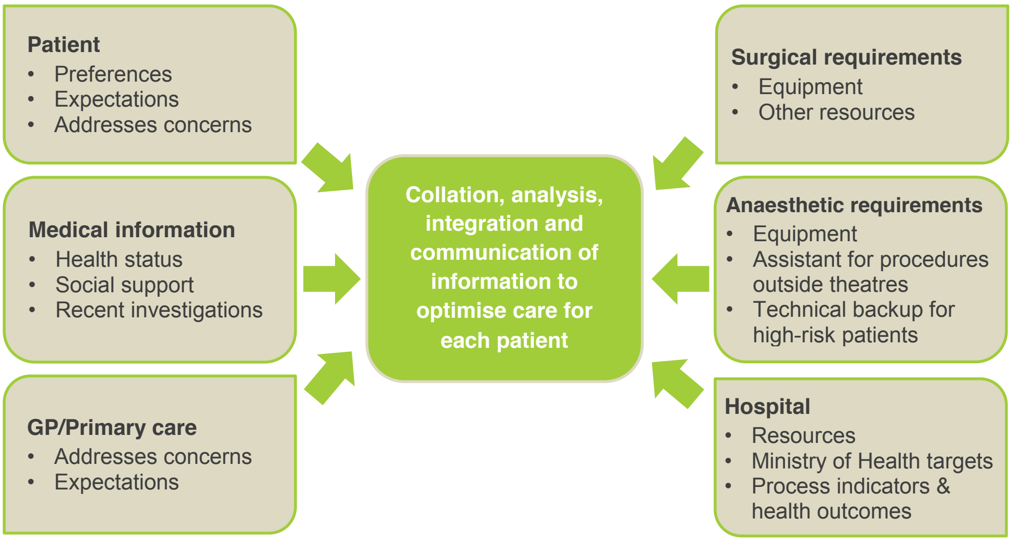
1.1 Health and social summary for the surgery/procedure

The patient's health and social status, along with the details of the surgery/procedure/anaesthesia and plan of care at finalisation of PPP should be documented and dated in a consistent format and readily available to all health professionals caring for the patient.

The detail of the health summary and surgical/procedural information will be influenced by the complexity of both the patient's health and social status and the risks of the planned surgery/procedure. Where possible, the summary should increasingly be part of the hospital's electronic record system. These records lay the foundation for the care that will be delivered by staff before, during and after the surgery/procedure and anaesthesia and should be further updated with the patient's perioperative progress and recovery.

Diagram 2: What does perioperative care deliver?

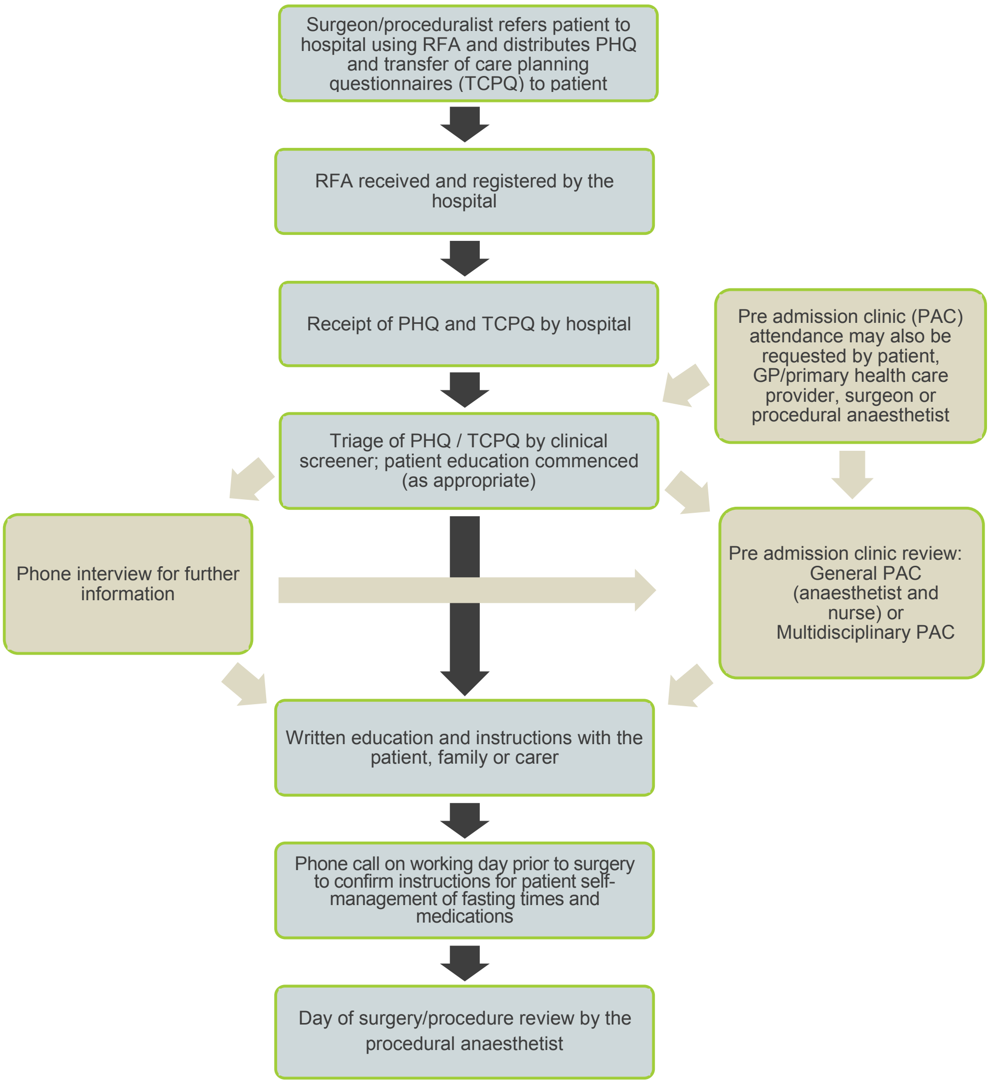
Perioperative care delivers knowledge sharing to support patient centred care.



Element 2: All patients require pre admission review using a triage process

All patients require pre admission review using a Patient Health Questionnaire (PHQ) and Transfer of Care from hospital Planning Questionnaire (TCPQ) triage process but not all patients need investigations or to attend a PAC. Using a triage process has been the practice of Perioperative Services in many hospitals across NSW for the last 15-20 years. Internationally the practice is also well established. The triage questionnaires have been updated for increased sensitivity to frailty, cognitive decline, delirium, behavioural issues and other more prevalent conditions such as obstructive sleep apnoea and chronic pain.

Diagram 3: The triage process



A triage process:

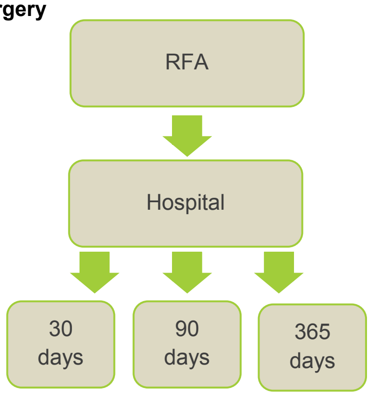
- avoids duplication and unnecessary investigations
- matches resources to the impact or complexity of the surgery/procedure and the patient's medical needs
- assists in perioperative planning and determining whether additional investigations or processes are needed based on the patient's level of medical and surgical risk.

Triage criteria and processes must also include any non-medical needs of the patient, including professional interpreter services, Aboriginal hospital liaison services, multicultural or diversity health services, patients with a disability and patients who are carers for others.

2.1 Recommendation for admission

The surgeon/proceduralist refers the patient to the hospital's Perioperative Service by completing the Recommendation for Admission (RFA) and consent form and distributes the PHQ and TCPQ to the patient and carer. The RFA must include the minimum information outlined in the NSW Health Waiting Time and Elective Surgery Policy[9].

Diagram 4: Time to surgery



2.2 PHQ review and triage

Screening for triage should be undertaken by an appropriately trained health professional, e.g. a nurse, anaesthetist, general practitioner (GP) or surgeon, ideally within two working days of receiving the PHQ. The RFA will indicate clinical priority category, nature and complexity of the surgery/procedure and may include the scheduled or anticipated date for the surgery/procedure and length of stay. The triage process should be completed at least two to four weeks prior to surgery. In some circumstances – for example patients with complex chronic multisystem disease and over 70 years old having more than minor DOS – PHQ and TCPQ review may be necessary several months prior to the surgery/procedure for collaborative prehabilitation in primary care. See Element 7.

A PHQ is the foundational tool for pre admission triage. Examples of these tools: PHQ – Adult (Appendix 1) and PHQ – Paediatric (Appendix 2) are available in the appendices or on the Perioperative Toolkit page on the ACI website and can be adapted to meet local needs. The information provides the necessary detail for the screener to make a decision regarding the level of further assessment required. See also Conditions/considerations for assessing a patient's perioperative risk – Appendix 4

In addition to the PHQ, there are a range of other tools or sources for gathering information about the patient's medical condition. These may include existing records from a previous hospital visit, primary healthcare providers, surgeons or specialist physicians. See Additional Information to be obtained from the primary healthcare provider – Appendix 5.

When an incomplete PHQ is received, action should be taken to complete it by a clerk or if the medical history is complex, a nurse. This may, time permitting, be by mail, or telephone, and where appropriate, may involve the primary healthcare provider.

2.2.1 Transfer of Care from hospital Planning Questionnaire (TCPQ) triage

Screening for transfer of care from hospital for all patients is simultaneous with PHQ triage using the TCPQ (Appendix 3). The information provided on this questionnaire provides prompts for the screener to undertake further action depending on the information provided. This may include assessing the patient's level of frailty and level of community support, or prompt review for assistance from a member of the multidisciplinary team. This may include professional interpreters, pharmacists, physiotherapists, occupational therapists, speech pathologists, dietitians, podiatrists and social workers. The TCPQ may often be supplemented by a telephone call from a PPP/ PAC nurse.

The NSW Health Care Coordination: Planning from Admission to Transfer of Care in NSW Public Hospitals Policy Directive[10] (PD2011_015) and Reference Manual[11] outlines requirements for NSW public hospitals.

To allow clinical decision making for patient safety and quality of care, there must at all times be readily accessible and updated documentation on each patient's aggregated health and social status.

Based on established local guidelines, the clinical screener reviews each completed questionnaire and the RFA to decide on the appropriate level of further review. Generally, the clinical screener may classify patients into one of the pathways and/or processes outlined in 2.3 (and see Model of care 1). Model of care 1 is long standing at one NSW teaching hospital and may be adapted as a template.

2.3 Pathways following PHQ triage

2.3.1 Limited to written education and telephone education and instructions

This can apply to minor surgery/procedure (e.g. DOS or EDO) for healthy patients with no systemic disease, or patients with well controlled simple chronic disease that does not require specific perioperative testing or management e.g. mild asthma.

The patient and carer should be provided with written education and instructions in plain language that is easy to understand. Instructions must be available in written form for culturally and linguistically diverse patients. The local multicultural or diversity health unit can assist with the development of translated written instructions. Where necessary, further instructions via telephone and the use of a professional interpreter should be used.

On the working day prior to surgery/procedure the patient (and/or carer) should receive telephone education with the nurse, including fasting, admission times and management of medications.

Box 1: Phone call with the patient and/or carer on the working day prior

Information discussed on the working day prior to the surgery/procedure should include:

- current health status
- smoking
- medication management
- CPAP machine
- results/x-ray
- fasting instructions for food and drink
- arrival time
- responsible adult available to accompany them at discharge.

On the day of surgery/procedure the patient will have a final assessment for fitness for surgery/procedure with their procedural anaesthetist[12].

2.3.2 Comprehensive telephone interview required

This can apply to patients described above, but also for patients where additional communication is required due to doubt regarding their functional capacity or social needs e.g. language, communication or other difficulties. A telephone interview to source more information from the patient, family, carer and/or primary healthcare provider may be required. A list of additional information that may be obtained from the primary healthcare provider and/or specialists is available at Appendix 5.

When the clinical screener is satisfied that no further review is required the patient and carer are provided with written and telephone education and instructions and review with their procedural anaesthetist as in 2.3.1.

2.3.3 PAC attendance required in person or via Telehealth

2.3.3.1 A **general PAC** is usually conducted by a team of an anaesthetist, nurse, medical officer (surgery team) and clerk and is necessary where further face-to-face assessment and preparation is required for:

- medical and anaesthetic optimisation of the patient's procedural/surgical journey, and/or
- nursing and allied health optimisation of the patient's transfer of care from hospital.

A general PAC can apply to patients with any of the following:

- presenting problem requiring moderately invasive surgery
- co-existing medical problems
- a pre-existing pain condition

- risk factors for perioperative morbidity
- risk factors for frailty and cognitive decline
- past history or family history of problems with anaesthesia
- difficulty obtaining any of the above information due to social or language difficulties
- difficulty obtaining any of the above information from the primary healthcare provider
- difficulty determining fitness for transfer of care from hospital on TCPQ
- where the patient, carer or a member of the health care team (e.g. surgeon, procedural anaesthetist, primary healthcare provider) requests a PAC review.

2.3.3.2 A **multidisciplinary PAC** is required for sicker patients or patients having more complex surgery (see Model of care 1). As appropriate, the general PAC team should liaise with other clinical and health disciplines including:

- subspecialty surgeons and nurses
- other medical specialists e.g. cardiologists, respiratory physicians, endocrinologists, renal physicians, geriatricians and rehabilitation physicians.
- Allied health professionals including pharmacists, physiotherapists, occupational therapists, social workers.
- GP and primary healthcare provider
- professional interpreter services, multicultural or diversity health units or Aboriginal Controlled Community Health Services (ACCHS) or Aboriginal Medical Services (AMS).

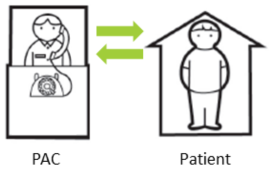
When the PAC team determines that no further assessment is required, the patient and carer are provided with written and telephone education and instructions and review with their procedural anaesthetist as outlined in section 2.3.1.

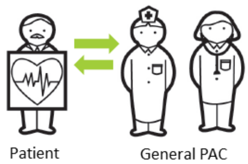
2.3.4 PAC and Telehealth

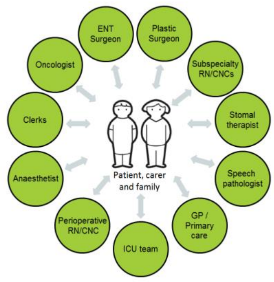
For patients living in rural, remote or isolated regions of NSW, it may be possible to arrange and conduct a PAC visit via Telehealth. The need and arrangements for Telehealth should be locally determined – guidelines on setting up and using this service are available on Telehealth page on the ACI website.

Model of care 1: an example of a triage process at one NSW teaching hospital

Pathway One ASA I-II patients having minimally invasive surgery/procedure	• Patient health questionnaire review • Phone interview if required • No investigations or PAC visit required • Written information and instructions provided to patient/carer • Phone call on working day prior
Pathway Two ASA II-IV having moderately invasive surgery/procedure	• As for Pathway One, plus general pre admission clinic visit required • Includes anaesthetist, surgeon and RN
Pathway Three Patients having moderate and highly invasive surgery >2 hours and intended length of stay >48-72 hours. E.g. head and neck cancer patients, 4-8 hours surgery with planned ICU stay	• As for Pathway Two, plus multidisciplinary pre admission clinic visit required • Includes anaesthetist, perioperative CNC, oncologist, ENT surgeon, plastic surgeon, CNCs for ENT, plastics, stomal care, speech therapist, social worker, ICU tour, physiotherapist







2.4 Paediatric patients

Many NSW public hospitals, both rural and metropolitan, provide paediatric services. While more complex, specialised work is referred to a tertiary paediatric centre, it is necessary for Local Health Districts (LHD) to support commonly occurring paediatric procedures. This is outlined in more detail in the NSW Health Guide to Role Delineation of Clinical Services[13] and the Surgery for Children in Metropolitan Sydney: Strategic Framework[14]. A list of further reading on NSW Health requirements for paediatric surgery is also available in the Reference list. Whilst the three tertiary paediatric hospitals will have specialised guidelines for children, the principles and tools outlined in this toolkit will also support high quality perioperative care for children.

Box 2: Special considerations for pre procedure preparation for children
• Children are a heterogenous group and age, weight, size, developmental stage and possible special needs e.g. diagnosed/associated behavioural problems are important considerations for patients, families and carers. • Use a Paediatric PHQ – Appendix 2 – for assessment. • Fasting times should be minimised to that prescribed in locally adapted guidelines. • The key role of parents, guardians and carers should be supported with appropriate education. • Phone communication one to two working days prior to the procedure/surgery may allay parents' and carers' anxiety and minimise cancellations on the day of surgery.

- timelines for the triage process
- who is responsible for reviewing and actioning results of investigations
- the standardised information to be given to patients and/or carers
- who is responsible for communicating the information to patients and/or carers.

All local staff, including visiting staff such as GP anaesthetists, should be made aware of these guidelines as part of their induction to the PAC and pre procedure processes.

Within each service:

2.5.1 Triage criteria

Triage criteria should be developed based on:

- the impact or complexity of the surgery/procedure
- each patient's medical and non-medical needs
- the local service and resources available for the Perioperative Service
- consultation with anaesthetists, surgeons and other relevant departments
- best practice guidelines and continuous local feedback based on agreed process indicators and health outcomes.

2.5.2 Guidelines for investigations and tests

Choosing Wisely has developed a range of resources to assist healthcare professionals and consumers in discussing and determining appropriate perioperative testing – detailed information and resources are available on the Choosing Wisely website[15]. Choosing Wisely Australia is following the work of this initiative in the United States and Canada – more information is available on the Choosing Wisely Australia website[16].

Each facility should develop preoperative testing guidelines for elective surgical patients. There is no evidence that young, healthy patients undergoing minor surgery should have routine preoperative testing[17]. The American Society of Anesthesiologists similarly recommends against baseline testing for low risk patients having a low risk procedure[18]. This applies to simple blood investigations including full blood count (FBC), electrolytes, urea and creatinine (EUC), calcium, magnesium, phosphate (CMP), coagulation studies, blood group and screen, ECG, chest x-ray (CXR). The American Heart Association (AHA) and American College of Cardiologists (ACC) advise against preoperative cardiac testing in patients with a low calculated risk of perioperative major adverse cardiac event (MACE)[19].

The National Institute for Clinical Excellence UK acknowledges that there is a paucity of high quality studies to allow definitive recommendations in the area of preoperative testing and that guidance should be used to develop and monitor local preoperative testing guidelines[17].

Preoperative tests provide a benefit where they:

- yield additional information that cannot be obtained from a patient history and physical examination
- help to assess the risk to the patient and inform discussions about the risks and benefits of surgery

- allow the patient's clinical management to be altered, if necessary, in order to reduce possible harm or increase the benefit of surgery
- help to predict postoperative complications
- establish a baseline measurement for later reference where potentially abnormal postoperative test results cannot be adequately interpreted in isolation.

2.5.3 Fasting guidelines

Fasting guidelines should be established. If there is no local protocol, general preoperative fasting advice is available on the ACI website.

2.5.4 Perioperative management of patient's medications

Guidelines for the perioperative management of patient's medications should be established, in particular for:

- patients on anti-platelet, anti-coagulant medications
- patients with Diabetes Mellitus on insulin and oral medications
- patients with a pre-existing pain condition.

2.5.5 Enhanced Recovery or Clinical Pathways

Enhanced recovery (ER) or clinical pathways (CP) should be established (See Element 5 or the Enhanced Recovery page on the ACI website).

Element 3: Pre procedure preparation optimises and supports management of the patient's perioperative risks associated with their planned surgery/procedure and anaesthesia

Pre procedure preparation is concerned with:

- identifying the perioperative risks relevant for each patient
- supporting the communication and management of risks to maximal quality of recovery
- optimising each patient's preparation with regard to their:
    - medical condition for anaesthesia, surgery/procedure and recovery
    - nursing care, subspecialty and allied health care
    - transfer of care from hospital to their primary healthcare providers and other services as necessary
- ensuring that, where possible, the expectations of the patient, family, carer, the surgeon/proceduralist, procedural anaesthetist and primary healthcare provider are all met.

3.1 Further aspects of triage and examples of risk assessment tools

Further aspects of triage and examples of risk assessment tools, based on best practice, are explored in this section.

The AHA and ACC recommends dividing procedures into low-risk and other (medium or high-risk). Low-risk procedures are those with minimal fluid shift and without significant stress or impact. A low-risk procedure is one in which the combined surgical and patient characteristics predict a risk of MACE of death or myocardial infarction of <1%[19]. Low- risk examples include cataract surgery, endoscopy and day procedures.

An indicative list of surgery (minor to complex major) for both adults and children is also available in the Appendices of the NSW Health Guide to the Role Delineation of Clinical Services[13].

Functional status is a reliable predictor of perioperative and long-term adverse cardiac events. If functional status is not possible to assess for moderate to major stress surgery and if quantifying cardiac ischaemic threshold with pharmacologic stress testing will affect decision making, it may be reasonable to proceed to further cardiac testing[19] or cardiopulmonary exercise testing (CPX).

Precise calculation of perioperative risk may have implications for informed consent, or for perioperative planning, particularly with regard to postoperative destination (high dependency/close observation or intensive care unit placement)[19]. This assessment can ultimately impact on whether a facility has the capacity to undertake the procedure. Procedures with a risk of MACE of 1% or more are considered elevated risk. Where appropriate, patients should have an explicit mortality risk assessment documented. Particularly for high-risk patients, this should be discussed with the patient and carer, communicated to the surgical/procedural team and form part of the informed consent and shared decision making process[20]. A number of tools that can be used to assess perioperative mortality risk – examples include NSQIP Surgical Risk Calculator[21], P-POSSUM[22] and the Surgical Outcome Risk Tool[23].

However, not all perioperative adverse outcomes are cardiac. Specific areas of medical risk include patients with complex multisystem chronic disease. Appendix 4 lists a range of conditions or risk areas that should be considered as part of the patient's perioperative risk assessment.

3.2 The role of different health care professionals

3.2.1 The anaesthetist in the PPP/PAC

- Provides the general medical assessment identifying complex chronic multisystem disease and their diagnostic and management status.
- Orders relevant testing for the planned surgery/procedure (where this has not been done).
- Discusses and decides on more invasive perioperative testing with the patient and family/carer.
- Reviews test results and consultations from patients seen previously in PACs. Makes the appropriate management changes as a result of this testing. Informs the surgeon/proceduralist of unexpected finding e.g. a lesion on a CXR or a cardiologist recommending a delay in surgery for further investigations or management.
- Assesses the medical and anaesthetic risk and identifies the options for risk optimisation and for anaesthesia and the patient's perioperative care plan.
- Identifies postoperative pain management plan and flags any follow up/cessation plan for those who are opioid tolerant.
- Makes changes to the patient's management as required to optimise their medical condition or preparation for anaesthesia and surgery/procedure e.g. iron infusion, ceasing anti-inflammatory agents.
- Communicates information clearly to the patient and carer in a manner that supports shared decision making.
- Discusses with the patient the likely anaesthetic plan and any common alternatives to this. Answers any questions related to the patient's concerns about anaesthesia.
- Provides advice to the patient regarding their general health e.g. smoking cessation, reducing alcohol intake, weight reduction, nutrition, exercise, managing poor blood glucose control.
- Explains the processes related to the patient's admission and for DO ensures that the patient understands and can comply with the requirements of post-anaesthesia care e.g. has a responsible adult to take them home and stay on the first postoperative night[24].
- Seeks further information and where necessary makes referral to other specialists e.g. cardiologist, respiratory physician, endocrinologist, renal physician, haematologist, geriatrician, rehabilitation specialist in consultation with the GP, surgeon and procedural anaesthetist. Subsequently, where appropriate, this may also require referral back to the surgeon with advice on the patient's perioperative risk. Choosing Wisely has developed a range of resources to assist healthcare professionals and consumers in discussing and determining appropriate perioperative testing and treatment options[15].
- Communicates through written consultation, in the electronic medical record or directly with the procedural anaesthetist, surgeon and surgical team as appropriate.
- Documents the consultation in the patient's medical record. An example – Pre Admission Medical Anaesthetic Assessment Form is at Appendix 6 or on the Perioperative Toolkit page on the ACI website.

3.2.2 The primary healthcare provider e.g. GP, ACCHS, AMS or nurse practitioner

- Provides a patient health summary.
- Communicates with the PAC regarding the patient's health status and provides the results of relevant recent investigations and assessments (in particular cardiology assessments and investigations). A list of additional information that may be supplied by the primary healthcare provider is at Appendix 5 or available on the Perioperative Toolkit page on the ACI website.
- Where appropriate, assists patients with completing their PHQ.
- Plays a crucial role in supporting initial assessment and communicating with patients, especially those in rural areas or those requiring extra assistance.
- Plays a crucial collaborative role in optimising high-risk patients with complex chronic disease and prehabilitation for moderate to major stress surgery/procedure.
- Plays a crucial collaborative role in shared decision making and informed consent for high-risk medical – anaesthetic patients having high-risk surgery.
- Advises and refers patients to services that may be required postoperatively.
- In patients whose surgery may involve significant blood loss, assesses the iron status of the patient and where required and possible, administers intravenous iron injections.
- Follows up any new or worsening test results or new clinical findings in the PAC that will not be managed as part of the patient's surgery/procedure e.g. significantly elevated blood glucose level (BGL) or morbid obesity not requiring acute management or an asymptomatic ejection systolic murmur or early cognitive decline. (See also Element 7 Integration with primary care)

3.2.3 The PAC nurse or clinical nurse consultant (CNC)

- Reviews sources of information – e.g. PHQ, TCPQ, advice from the anaesthetist or GP – to ensure that referrals are made to subspecialty nurses and allied health clinicians.
- Coordinates PAC and attendance of the appropriate members of the multidisciplinary team.
- Collects baseline physiological data – e.g. weight, height, vital signs, finger prick BGL – and coordinates recent preoperative investigations/results, including necessary risk assessments.
- Liaises with appropriate stakeholders regarding patients with particular needs e.g. homeless patients, primary caregivers, people with disabilities, people from Aboriginal and Culturally and Linguistically Diverse backgrounds.
- Communicates information and preoperative instructions to patients and carers, including hospital information such as parking, arrival time, fasting requirements, management of medications, contact person, length of stay and general transfer of care information. Examples of a Perioperative Patient Information Booklet (Appendix 7) and Patient Information Checklist (Appendix 8) are on the Perioperative Toolkit page on the ACI website.
- Facilitates planning for and case manages the transfer of care from hospital by as needed referral to allied health, subspecialty surgical and other services such as the ACCHS /AMS.
- Communicates information to surgical/procedural and anaesthetic teams as required.

3.3 The expectations of patients, procedural anaesthetist, surgeon and proceduralist

3.3.1 Patient expectations

- Patients, their families and carers are an integral part of the health care team and are essential to ensuring a safe surgical/procedural journey.
- The patient and carer should be provided with information in a manner and format in which they understand on how their surgery/procedure is allocated and scheduled.
- The patient and carer must be provided with full information about their surgery/procedure, anaesthesia and recovery and their transfer of care from hospital to facilitate shared decision making and informed consent. NSW Health requirements for consent are outlined in the Consent to Medical Treatment – Patient Information Policy Directive[25] (PD2004_406), supplemented by the Clinical Procedure Safety Policy Directive[26] (PD2014_036).
- The patient, family and carer should understand:
    - admission details
    - fasting time
    - how to manage medications
    - how to manage equipment e.g. continuous positive airway pressure (CPAP) machine, personal subcutaneous insulin pump
    - expected length of hospital stay
    - transfer of care from hospital
    - anticipated time off work
    - anticipated progress of recovery at home and/or in primary care
    - pain management
    - contact details of hospital staff, in case further advice or other care is required
    - their rights and responsibilities.
- Where appropriate, the patient's concerns and expectations should be communicated to other members of the perioperative health care team.

3.3.2 Procedural anaesthetist, surgeon and proceduralist expectations

- The patient's medical condition has been optimised and perioperative risks management supported and communicated.
- The patient's medical history and results of investigations/consultations have been reviewed and there are no testing abnormalities or consultations results that require further acute management.
- The patient and carer are fully informed and consent for treatment has been documented.
- The patient understands and has followed PPP instructions.
- There is an appropriate postoperative pain management plan and/or advice regarding weaning and ceasing.
- There is an appropriate quality of recovery management plan agreed with the multidisciplinary team including the patient, family, carer and primary healthcare providers.

Element 4: The multidisciplinary team collects, analyses, integrates and communicates information to optimise patient centred care

The Perioperative Service is comprised of a frontline multidisciplinary team of anaesthetists, nurses, surgical team medical officers, allied health clinicians and clerks who are responsible for liaising and facilitating the work of key stakeholders responsible for the patient's surgical/procedural journey. The Director, Perioperative Service or medical clinical lead and nurse clinical lead steer the frontline multidisciplinary team. These leaders are responsible for developing the service framework, its process indicators and health outcome measures for continuous quality improvement.

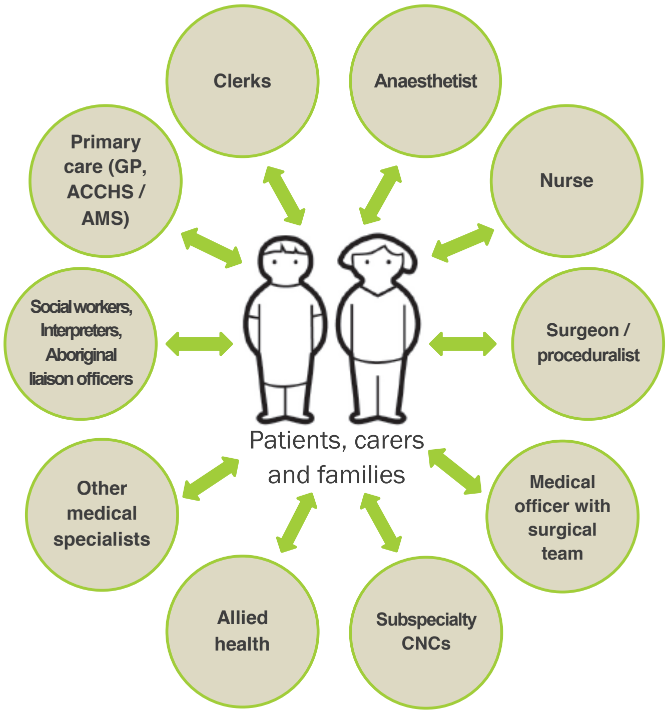
The members of the broader multidisciplinary team, the hospital and the district/network, should expect that the structures and processes of the frontline Perioperative Service are in place and working to facilitate their roles and responsibilities to patients, family and carers. The broader multidisciplinary team – e.g. senior surgeons/proceduralists, GPs and primary healthcare providers, specialist physicians – are consulted as appropriate, for all patients having more major surgery and/or significant chronic medical conditions, especially in the case of variance to planned care or an adverse event. All team members contribute to an optimal perioperative journey (Diagram 5).

At stages of the patient's perioperative journey, different team members more closely provide patient centred care.

- Before and after hospital admission it is the primary healthcare providers.
- During the most critical phase of care – intraoperative – it is the senior surgeon, the procedural anaesthetist and the OT nursing team.
- Preoperatively, it is the anaesthetist, the medical officer with the surgical team and the nurse with the clerk who spend most time with the patient, family and/or carer.
- Postoperatively the patient is primarily cared for by the medical officer of the surgical team and the ward nursing team.
- During all phases of care members of the perioperative team, including the broader multidisciplinary team, can be called upon to contribute their expertise to patient centred care.

Some roles may be delegated across professional groups depending on the resources available and on the size, type and location of the facility. To allow clinical decision making for patient safety and quality of care, there must at all times be readily accessible and updated documentation on each patient's aggregated health and social status. At all stages all members of the multidisciplinary team are responsible for checking that the patient information shows consistency e.g. the RFA, the consent form, correct site surgery, the ward notes, medications.

Diagram 5: The perioperative multidisciplinary team



Element 5: Each patient's individual journey should follow a planned standardised perioperative pathway

5.1 The Standardised Perioperative Pathway

The Standardised Perioperative Pathway (SPP) is the first new tool of the Toolkit. It develops the pre procedure systems, structures and processes towards integrated perioperative care. The SPP is a communication tool for the multidisciplinary team that establishes from the outset – at PPP – what is anticipated as the patient's most likely perioperative journey to best possible functional recovery. The SPP enables variance to anticipated planned care to be marked for timely clinical attention The SPP takes into account a patient's medical status and perioperative risk as well as the impact of the patient's surgery/procedure – as outlined in the patient's ER or CP.

The SPP comprises the following features.

- Each patient's perioperative journey should comprise a series of anticipated common steps agreed upon by the multidisciplinary team during PPP.
- The SPP should be discussed and agreed with the patient.
- The SPP should be placed in the patient's medical records before the clinical notes for easy viewing and reporting.
- Where possible, an ER or CP should be attached to the SPP.
- A risk assessment based on the ASA Score[27] is documented.
- The pre, intra and postoperative risk management plan should be documented.
- Anticipated process indicators should be documented:
    - length of stay and level of ward care for patients post surgery/procedure
    - clinical handover from hospital to primary care
    - patient requirements for transfer of care from hospital.
- Variance to anticipated process indicators and health outcomes, including Rapid Response Team (RRT) calls, should be flagged and marked for attention to the clinical leads – medical (Director, Perioperative Service – Anaesthetist) and nursing (Perioperative Nurse Manager) – within 24 hours of the unanticipated event for continuous quality improvement.
- Ideally, this information, including variance, will be recorded on the tool by the medical officer of the surgical team or ward nursing team as part of the patient's standard care.
- Where variance has occurred, a revised SPP for that patient is required.
- The following should be communicated to the patient's primary healthcare provider:
    - the Anaesthetist (medical) consultation for risk score ASA IV and V patients
    - the event of an unanticipated ICU admission and/or other significant morbidity/mortality.

5.2 Enhanced Recovery and Clinical Pathways

Procedure specific ER or CPs are bundled care tools designed to improve the coordination and continuity of clinical care, particularly where different specialties and disciplines are involved.

Pathways are commonly seen as algorithms as they offer a series of sequential steps, or a flow chart of decisions to be made[28]. The use of structured care pathways are increasingly supported for a range of elective procedures – for example, the ACI Musculoskeletal Network's Evidence review on the pre, peri and postoperative care for patients undergoing a total hip or knee replacement indicated that the use of structured care pathways can reduce length of stay and show non-significant improvement in clinical outcomes[29]. An ER or CP will be determined by the surgery/procedure (i.e. specialty area) and should be adapted locally to meet the needs of the health district/hospital. Examples of LHD Enhanced Recovery pathways are on the Perioperative Toolkit page on the ACI website.

5.3 The Standardised Perioperative Pathway plus the Enhanced Recovery and/or Clinical Pathways

Where possible, information relevant to the patient's surgery/procedure should be recorded in the same format and location for each patient. This will not only streamline processes and ensure patient needs are aligned with resources, but will ensure there is one agreed location or a 'one stop shop' where members of the multidisciplinary team can find information on the patient's planned perioperative journey and/or variance. Ideally, this should be in the patient's electronic medical record.

This SPP plus the ER/CP:

- act as a prompt for the key steps in the perioperative process
- ensure that the management of the patient's perioperative journey continues until their transfer of care from hospital
- guide the medical officers of the surgical team and the ward nursing team (led by the Nurse Unit Manager) in coordinating and monitoring bundled care that is most often routine but may also require input from the senior surgeon/proceduralist and/or other medical specialists.

The SPP is a real time continuous quality improvement tool that is designed to capture health outcomes that patients, family, carers and clinicians value. Outcomes and process indicators are explored in more detail in the Element 6. The Standardised Perioperative Pathway tool is at Appendix 9 and is on the Perioperative Toolkit page on the ACI website.

In the example Model of care 2 on the next page, the SPP tool has been completed based on two patients on a total knee replacement Enhanced Management of Orthopaedic Surgery pathway.

The SPP tool has been used to document aspects of Sam and Sandy's perioperative journeys, including variance to intended outcome. At the outset, Sam (green/bold) is healthy ASA1. Sandy (blue/not bold and italics) ASA 3-4 has more complex chronic multi-system disease that has resulted in definite functional limitation and sometimes has been a threat to life. Unanticipated, Sam has variance requiring unplanned HDU (also known as COU) admission. Documentation and timely notification to the clinical leads – medical and nursing – are required plus notification to the patient's GP. A revised SPP is required for Sam and possibly, although not necessarily, revisions to the enhanced management pathway as well.

Model of care 2: the Standardised Perioperative Pathway using a total knee replacement pathway at one hospital

NSW public hospital	Surname:	MRN:
	Given Name(s):	Male ☐ Female ☐
	D.O.B:	M.O:
New ☒ Revised ☐ **Date:** DD/MM/YY	Address:	
	Location/ward:	

Form completed by:	**Dr J Bloggs**		
Date:	**DD/MM/YY**		
Planned Procedure:	**Total knee replacement**		
Emergency/Elective:	**Elective**		
Planned Care Pathway:	**Enhanced Management – Total Knee Replacement**		
Expected length of stay:	X days / *Y days*	**Variance:**	Sam > X+3 days
Pathway discussed and agreed with the patient:	Yes ☒ No ☐	Notes:	

Risk assessment – (For ASA IV and V please fax Anaesthetist consultation to GP):	
Patient's ASA Score:	Sam – I *Sandy – III-IV*

Perioperative risk management plan includes:		**Variance:**
Pre	As outlined in the pathway / *As outlined in pathway*	
Intra	As outlined in the pathway / *As outlined in pathway*	
Post	As outlined in the pathway / *As outlined in pathway*	

Anticipated level of care for patients post procedure:					**Variance:**
Day Surgery ☐	EDO ward ☐	Ward ☒	HDU ☒	ICU ☐	Sam > HDU

Clinical handover from hospital to primary care:			**Variance:**
General Practitioner ☒	Community Nursing ☒	Family/Carer ☒	

Patient requirements for transfer to primary care:					**Variance:**
Transfer of care summary ☒	Pain Relief / Wean & cease plan ☒	Nominated carer ☒	Medications e.g. Warfarin ☒	Other ☐	

For ALL variance to the pathway (including RRT calls), DOCUMENT the variance and NOTIFY the Director, Perioperative Service (Anaesthetist) and Nurse Manager. A REVISED PLAN IS REQUIRED.		
Notified to:	NM/Director Perioperative Service informed of Sam's admission to HDU instead of ward. *No variance for Sandy so no notification req.*	Date: DD/MM/YY

INFORM GP in the event of an unplanned admission to ICU and/or significant morbidity/mortality:		
Notified to:	Sam's GP informed of her unplanned admission to HDU instead of ward. *No variance for Sandy so no notification required.*	Date: DD/MM/YY

Element 6: Measurement for quality improvement, benchmarking and reporting should be embedded in the perioperative process

The perioperative process aims to ensure that:

- the patient receives the correct surgery/procedure within an appropriate timeframe
- complications are minimised.

To know to what degree these aims are being achieved, it is essential that there is a common understanding of 'what success looks like' and should take into account the perspectives of:

- patients, families and carers
- clinicians and clinical teams
- the hospital and District/Network
- the Ministry of Health.

Data collection should be integrated into the process of care to avoid unnecessary and fragmented documentation. Data collection can be for different purposes. This will determine the measures, metrics, timing and frequency. For example:

- quality improvement – at individual and department level
- benchmarking – with other organisations
- performance reporting – to the district/network or Ministry of Health
- research
- funding.

To meet these requirements, there are three major stages:

1. agreeing on indicators and measures, using data definitions where applicable
2. data collection, storage, analysis and reporting
3. using the data for improvement.

6.1 Developing a measurement framework

As a minimum, a suggested measurement framework should include:

- process measures
- performance indicators
- health outcomes
- patient centred outcomes (see also Element 8).

6.2 Performance indicators

Performance indicators should be monitored monthly. Many relevant indicators are collected monthly and reported on the Surgical Services Taskforce Dashboard. The performance indicator for pre admission triage processes is cancellations on the day of surgery. This should be regularly benchmarked and managed. Causes are divided into:

- patient related factors
- hospital related factors.

6.3 Process measures

Process measures should be monitored daily (see Element 5 SPP) and reported monthly to assist LHDs and hospitals in assessing their Perioperative Service against the:

- elements of the perioperative care pathway
- deviation from the standardised perioperative pathway
- structural elements to support the care pathway
- length of stay.

Some of these process measures can be captured and documented on the SPP. Model of Care 2 outlines an example of two patients and one patient's subsequent variance from the perioperative care pathway. A self assessment tool is also available on the Perioperative Toolkit page on the ACI website.

6.4 Health outcomes

There are a range of health outcomes that may be collected and reviewed as part of process of continuous quality improvement. A suggested minimum set is outlined in the table below.

Outcome	Measure	Metric
Survival	30 day mortality 90 day mortality	
Recovery	Complications	• % Rapid Response Team calls within 24 hrs post-operative • % Unplanned admission overnight • % Unplanned admission to higher level care • % Unplanned return to OT • % Infection rate requiring further antibiotics (variance from ER or CP)
	Adequacy of post-operative pain management	• Presence of an opioid medication discharge wean and cease plan
	Unplanned readmission to hospital at 30 days, 90 days	
	Unanticipated residential aged care facility or nursing home admission with 6 months and 1 year post surgery	

In selecting perioperative process measures, performance indicators and health outcome measures, these should be aligned where appropriate with the ACI's Operating Theatre Efficiency Guidelines (2014). The guidelines outline a minimum set of metrics that should be reviewed in monitoring and measuring OT performance[30].

6.5 Data collection, storage, analysis and reporting

There should be a systematic approach to collecting perioperative data.

- Where possible make use of existing data which can be extracted electronically, avoiding manual collection.
- Data collection is time consuming and must therefore be worthwhile. If the data is not being analysed and reported, it is time wasted.
- International leaders in this field such as the International Consortium on Health Outcomes Measurement (more information on the ICHOM website at www.ichom.org) recommend minimum data sets[31].
- Data definitions must be precise to allow accurate analysis and benchmarking.

Data management and reporting schedules should be determined by the group responsible for the governance of perioperative services. Accountability for the quality and outcomes of the perioperative system will therefore rest with this group as well.

Using the data for Quality Improvement

Regular reports should ideally be provided monthly, and at least quarterly to clinicians and managers. Where performance or outcomes are unsatisfactory, or trends are concerning, a quality improvement process should be initiated. For example, a Plan, Do, Study, Act (PDSA) cycle can be used to carry out small tests of change to address individual, team or organisational issues.

6.6 National Surgical Quality Improvement Program data and analysis

The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)[32] was developed to assist hospitals in measuring the quality of their surgical programs to improve surgical outcomes. The program uses hospital level data to analyse patient outcomes, in particular preventable complications. Clinicians and managers use the NSQIP analysis to inform local quality improvement.

The ACI Surgical Services Taskforce is supporting a pilot program in NSW. More information is available on the NSQIP page on the ACI website.

Element 7: Integration with primary care optimises the patient's perioperative wellbeing

Beyond a hospital admission, it is the primary healthcare provider(s) who provide patient centred care. Primary care providers have a key role in the patient's perioperative journey. The relationship between a patient, family and carer and their primary healthcare provider (e.g. GP or AMS) often encompasses many years. Perioperative teams should take advantage of the primary healthcare provider's knowledge of the patient's physical, psychological, social and spiritual context.

7.1 Contribution of primary care to the Perioperative Service

The role of the patient's primary care provider in their surgical/procedural journey is multifaceted.

- Supports the patient, their families and carers in making decisions regarding surgery/procedures.
- Provides advice to the Perioperative Service on the patient's condition – medical, cognitive, emotional, social, functional. A list of additional information that may be provided by the primary healthcare provider is at Appendix 5.
- Provides advice to the Perioperative Service on the expectations of the patient, family, carer and other clinical specialists.
- Collaborates with the Perioperative Service for the diagnosis and optimisation of medical comorbidities or risk factors, prehabilitation and postoperative care where appropriate for:
    - patients with chronic complex multisystem disease
    - elderly patients
    - frail patients
    - patients with, or at risk of, cognitive decline
    - patients with metabolic syndrome
    - supporting the patient to modify their lifestyle e.g. smoking cessation, weight loss, exercise
    - patients with chronic pain and/or opioid tolerance
    - patients with obstructive sleep apnoea
    - perioperative Diabetes Mellitus management
    - perioperative Blood Management, in particular assessment of the patient's iron status and to organise iron replacement
    - patients on anti-platelet or anticoagulant medications that require cessation, substitution or re-commencement perioperatively
    - patients undergoing cancer treatment.
- Provides investigations and test results to the perioperative team in a timely fashion. This should be facilitated via a single point of contact within the Perioperative Service for the delivery (electronic, hard copy or fax) of reports for appropriate distribution.
- Supports transfer of care home, recovery and preventing readmission in consultation with the surgeon, community nurses and allied health professionals.

- Advises and refers patients to services that may be required postoperatively.
- Advises the Perioperative Service of adverse health outcomes related to the perioperative episode of care and other health outcomes as appropriate. This process should be facilitated via a single point of contact within the Perioperative Service.

7.2 Contribution of the Perioperative Service to primary care

Provision of accurate and timely information to the patient's primary care provider is an essential element of perioperative care. One of the key features of the SPP is to ensure that pertinent information relating to the patient's perioperative journey is shared with the primary healthcare provider. See Element 5.

As outlined in the Care Coordination Reference Manual, every GP, AMS or community nurse should receive a written transfer of care referral within 48 hours of the transfer[11]. Information should include:

- a summary of the patient's clinical episode of care
- a list of medications on discharge with information about:
  - changes to medications
  - follow up management of medications including a written pain management plan, e.g. wean/cease/reduce/increase/check [drug] after [some time interval].
- advice regarding follow-up arrangements, including:
  - those which have already been made
  - those which will be needed in future
  - details of community services involved or residential care arrangements
  - the need for additional services, or where services need to be reactivated, for example home care, residential care, mental health services, or drug and alcohol services.

Particularly for high-risk patients, if the patient has an unplanned admission to ICU, or medication prescriptions have changed perioperatively, upon their transfer of care, this information should be communicated directly via telephone to enable primary healthcare providers to deliver ongoing care for their patient.

7.3 Continuous quality improvement

As outlined in Element 5, it is considered best practice that the primary healthcare provider is notified by the hospital's Perioperative Service of a significant variance to the patient's anticipated perioperative journey. Ideally, the primary care practice will also notify the hospital's Perioperative Service of a patient mortality at 1, 3, 6 and 12 months and of significant variance or morbidity e.g. long term opioid requirements for pain, transfer from home to a residential aged care facility/nursing home for impaired quality of recovery – physical, cognitive, emotional or social.

Model of care 3: Health Pathways

A growing number of health services across NSW are partnering with their primary care organisations and local GPs to develop agreed clinical pathways across primary, community and acute care. These pathways describe the role of each of the providers for particular conditions or situations. Through processes such as HealthPathways (originally developed by the Canterbury District Health Board)[33], there is great potential for broadening current inpatient clinical pathways into perioperative pathways. These pathways delineate the responsibilities of the patient, their primary healthcare provider, the surgeon, anaesthetist and other members of the perioperative team in the perioperative period. Central to this is improved communication between members of the patient's multidisciplinary team, reducing gaps in information, duplication of tests and improving the safety of transfer of care. HealthPathways is currently implemented or being implemented across a number of LHDs.

Element 8: Partnering with patients, families and carers optimises shared decision making for the whole perioperative journey

The patient, family and carer are active members of the perioperative healthcare team. The Anaesthesia Perioperative Care Network has developed a booklet of stories from patients or their carers who have undergone anaesthesia and surgery. The patient stories contain prompts that may be useful for discussion in team meetings and are available under the 'Patient and carer project resources' heading of the Anaesthesia Perioperative Care Network resources page on the ACI website.

8.1 Shared decision making

Providing care using a patient based care model ensures that care is respectful of and responsive to individual patient preferences, needs, and values. The model focuses on the relationships clinicians build with patients, family and carers as partners in health care delivery.

There is growing recognition that the safety and quality of care can be enhanced by engaging with patients, family and carers to improve health outcomes, the patient and staff experience, as well as safety and performance indicators[34]*.*

Partnering with Patients. Clinical Excellence Commission (CEC)

8.1.1 Health literacy and decision support aids

In considering the most appropriate support aids for shared decision making, staff working in the Perioperative Service must be aware of the patient and/or carer's level of health literacy. This is particularly important when communicating perioperative risks to the patient and/or carer[35,36].

Where the patient and/or carer are from a culturally or linguistically diverse background, the NSW Health policy[37] on the use of professional interpreters must be followed to support communication with the patient, their families and carers. The Perioperative Service may also need to consider providing written instructions in a range of different languages, or in a multimodal format, e.g. including pictures and words. The hospital or district/network diversity health/health literacy committee should be engaged to provide advice.

More information to support clinicians, health services and consumers are available on the Health literacy page of the Australian Commission for Safety and Quality in Health Care website and the Partnering with patients: health literacy page of the CEC website.

8.2 A perioperative outcomes framework

Developing a framework for outcomes valued by patients, families and carers supports shared decision making for the perioperative journey.

The template outcomes framework (Diagram 6) has the following key features.

- Actively engages patients, carers, families and clinicians in considering:
    - their information needs pre, intra and post the surgery/procedure
    - their desired outcomes – what they want to get from having the surgery/procedure

    - what they are not prepared to give up or risk by having their surgery/procedure and anaesthesia e.g. the ability to live independently at home.
- The left hand side of the diagram are the steps of the patient journey.
- The top row is the expectations of the multidisciplinary team, including the patient, family and carer.

8.3 Perioperative Patient Information Booklet

The Perioperative Patient Information Booklet – Appendix 6 – is a tool for patients, families and carers to use for.

- Recording information on their upcoming surgery/procedure, including:
    - admission time
    - fasting information
    - what to bring and/or not to bring to hospital
    - tests and medications
    - expected length of stay
    - expected time off work.
- Directions and information on where to go on the day of the surgery/procedure.
- Recording instructions discussed with a nurse in preparation for going home from hospital.

This tool can assist patients, families and carers in ensuring they have key information for their surgery/procedure recorded in one place. The surgeon or anaesthetist may also provide additional information or handouts relevant to the specific surgery/procedure.

An Outcomes Discussion Tool is also included in Appendix 7 for patients, families and carers to document the discussion regarding the perioperative outcomes framework – see 8.2.

A Patient Information Checklist – Appendix 8 – is another tool for clinicians and patients, families and carers for ensuring all the relevant information has been discussed.

Appendices 6, 7 and 8 are also available on the Perioperative Toolkit page on the ACI website.

8.4 Continuous quality improvement

Ideally, the patient, family and carer will also notify the hospital's Perioperative Service of a patient mortality at 1, 3, 6 and 12 months and of significant variance or morbidity e.g. long term opioid requirements for pain, transfer from home to a nursing home for impaired quality of recovery – physical, cognitive, emotional or social. This should be facilitated via a simple process and a single point of contact within the Perioperative Service. This will assist health services in continuous quality improvement through learning from their patients' experiences.

Diagram 6: Outcomes framework for the patient journey

Patient journey	Patient perspective	GP perspective	Surgeon perspective	Anaesthetist perspective	Organisational perspective
Decision to surgery – discussion re shared outcomes	• Communication (risks, survival, opportunity to communicate ideal outcome to surgeon, perioperative pathway) • Referral to appropriate specialist • Access to professional interpreter if needed		• Agreed plan with patient for surgery including intended outcomes, as well as risks and adverse outcomes		
Preoperative preparation – General (Surgery/procedure specific to be determined locally, by procedure)	• Waiting time • Explanation/ communication of planned perioperative pathway			• Patients requiring a PAC referred at an appropriate time before surgery • All patients triaged • Agreed plan for perioperative journey/pathway	• Waiting list categories • Access to relevant services provided for patients/carers e.g. professional interpreter, Aboriginal liaison
Intraoperative	• Planned procedure is undertaken • Anaesthesia or sedation is appropriate • Procedure is safely and successfully		• (Preventable) cancellations on day of surgery • Clinical outcome achieved	• (Preventable) cancellations on day of surgery	• Cancellations on day or surgery • Abandoned procedures • Waiting list requirements • Mortality

	completed				
Postoperative care in hospital	• Pain management • Mobility • Length of stay • Patient experience • Agreed clinical outcome achieved • Quality of recovery	• Unplanned admission to ICU • Serious morbidity / mortality	• Complications e.g. unplanned admission to ICU, unplanned return to theatre, infection. • Length of stay • Deviation from ER pathway	• RRT calls • Unplanned admission to ICU • Deviation from planned perioperative pathway	• Mortality • Length of stay
Transfer of care from hospital to the community	• Where to: Home / residential care etc • Care information communicated to patients and carers • Recovery: Time to return to work/lifestyle • Access to other services e.g. professional interpreter	• Transfer of care communicated to GP • Integrated pain management e.g. S8 scripts	• Readmission	• Readmission • Integrated pain management	• Readmission • Mortality • Access to relevant services provided for patients/carers e.g. professional interpreter, Aboriginal liaison
Care in the community	• Access to advice where needed • Follow up from hospital / with GP • Quality of recovery • Reactivate suspended home care services				

Element 9: Effective clinical and corporate governance underpins the perioperative process

To address the economic challenges of safe access to elective surgery each NSW Health facility should have an integrated service in place for perioperative care and invest in strengthening the model of care. Clinical and corporate governance requires coordination and investment and is critical at the district/network, hospital/facility and Perioperative Service levels.

Importantly, the perioperative service should be supported and led by a clinical champion. Ideally the medical clinical leader or Director, Perioperative Service is an anaesthetist. An anaesthetist's continuing professional development and experience with surgeons and proceduralists informs this role:

- across all sub-specialties of surgery/procedure
- for all ages of patients and comorbid disease
- during the most critical time for patients in the perioperative period – in the OT/procedure room and post-acute care unit.

The medical clinical leader has a range of responsibilities.

- Collaborating closely with the nurse clinical leader each facilitating the other's leadership role.
- The coordination of perioperative multidisciplinary care.
- The collation, analysis and distribution of process indicators and health outcomes and initiation of quality improvement modifications, in consultation with the multidisciplinary team.
- The identification, management and communication of perioperative patient risk at pre admission and the perioperative case management of high-risk patients with the nurse clinical lead or delegate.
- The establishment of local guidelines including PAC triage process, perioperative risk management and prehabilitation, 'choosing wisely' when ordering investigations, tests or treatments, fasting times, medications management, integrated pain management, supporting the patient, family and carer's non-medical needs and with the surgical procedural team, ER CPs, perioperative patient information and criteria for transfer of care.

The nursing clinical leader has a range of responsibilities.

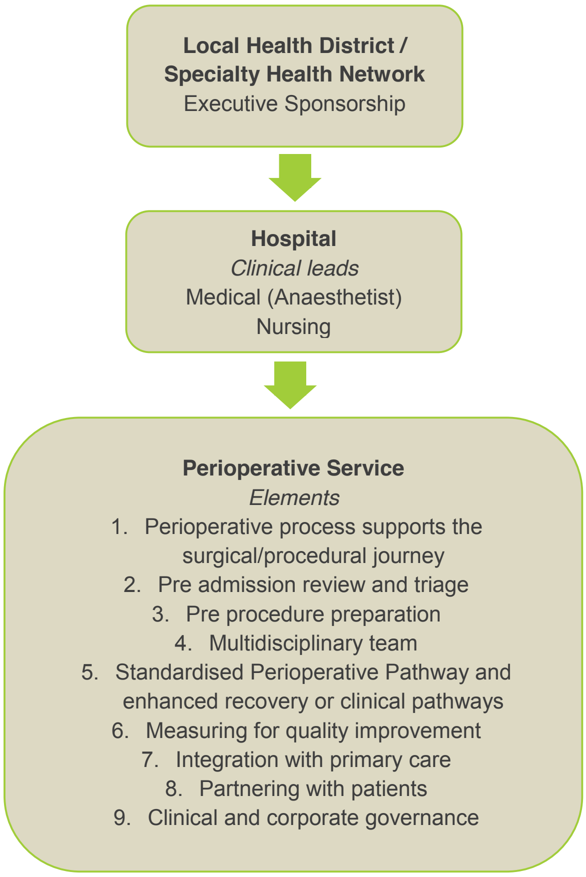
- Collaborating with the medical clinical leader, each facilitating the other's leadership role
- The coordination and oversight of the pre procedure preparation process, day of surgery admission, ward care, transfer of care from hospital to primary care with the involvement of the multidisciplinary team
- The collation, analysis and distribution of process indicators and health outcomes and initiation of quality improvement modifications, in consultation with the multidisciplinary team.

There must at all times be readily accessible and updated documentation on each patient's aggregated health and social status for the complete perioperative journey. Leadership is required for facilitating the latter at the patient level, in developing the electronic medical record and during the transition to a fully integrated electronic medical record, for the complete perioperative journey.

Governance		Activities and Responsibilities
Local Health District / Specialty Health Network	→	• Provides executive sponsorship for the continuing development of Perioperative Services. • Ensures local structures, processes and tools meet the clinical and administrative needs of the patient during their perioperative journey. • Directly engages and supports frontline clinical leaders in this task.
Hospital/facility	→	• Identifies a frontline clinician to be the Director, Perioperative Service and that, wherever possible, this medical clinical lead is an anaesthetist. • Partners the medical clinical leader with a nurse clinical leader for the Perioperative Service. • Supports the Director, Perioperative Service to engage local surgeons, anaesthetists, primary healthcare providers (GPs) and other key stakeholders in ensuring that perioperative structures, processes and outcome measures are well established to ensure patients are optimally prepared and managed for their surgery/procedure and perioperative journey. • Supports the establishment of the frontline Perioperative Service made up of anaesthetists, nurses, clerks along with the broader multidisciplinary team members. • Engages and supports the Perioperative Service, including the multidisciplinary team, in data collection and meeting agreed health outcomes and process indicators for individual patients and as a service team.

Perioperative Service	→	• The Director, Perioperative Service together with hospital/facility management, establishes the leadership team of senior anaesthetist/s and nurse/s to:
		    ○ develop the service framework including local systems and processes, integration with primary care, partnering with patients
		    ○ identify the frontline and broader multidisciplinary perioperative team members
		    ○ liaise with and facilitate the work of key stakeholders also responsible for the surgical / procedural patient journey.
		• Takes responsibility for supervising the collection, reviewing and managing of process indicators and health outcomes for individual patients and for the service.

Diagram 7: Clinical and corporate governance



Implementation and evaluation

Implementation

To support local implementation of the Toolkit, the following components should be considered.

- Planning – develop an implementation plan which defines the overall project objectives, timelines and individuals responsible. High level timeframes should be developed at the start of the process and will further develop as the project evolves.
- Communication – develop a detailed communications plan for all stakeholders. It is a key element of a successful implementation and will facilitate engagement and ownership of the project.
- Finalise the case for change – create a clear definition of the present state, the potential change and the reasons for that change.
- Assessment – collect and analyse data about local current processes to identify and prioritise local issues for action.
- Operationalise – embed the Toolkit in local practice in a way that addresses the issues, gaps and priorities identified during the assessment.

More information is available on the Implementation Support section of the ACI website.

Revision and evaluation

This Toolkit has been developed based on the best available knowledge and evidence at the time of writing. The Toolkit will be periodically reviewed for new information and clinicians and managers across Local Health Districts may provide feedback to the ACI at any time. Contact details for providing feedback to the ACI are available on page (i) of the Toolkit.

A formal evaluation may be undertaken on the Toolkit to review its effectiveness, as well as subsequent implementation processes across the Local Health Districts. This evaluation would inform any review of the Toolkit. This Toolkit is scheduled for review in three to five years.

More information on the ACI's evaluation process is available in Understanding Program Evaluation: an ACI Framework.

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Further reading

Below is a list of further reading or references which are provided in the Appendices.

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Appendices

All tools referenced in this toolkit are available for download on Perioperative Toolkit page on the ACI website.

Appendix 1: Patient Health Questionnaire – Adult

PATIENT HEALTH QUESTIONNAIRE

Surname	MRN
Given Name	Male ☐ Female ☐
D.O.B: ___/___/___	M.O.
Address	
Location/ward	
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	
Planned procedure:	

Name / Known as:

Patient to complete. If help is required ask your family, local doctor or phone:

Are you (is the person) of Aboriginal or Torres Strait Islander origin?

No ☐ Yes, Aboriginal ☐

Yes, Torres Strait Islander ☐ Yes, both Aboriginal and Torres Strait Islander ☐

Please answer the questions by ticking the applicable box/es. Add any necessary details in the space provided. Where there is not enough space, please tick the box and attach an additional information sheet.

1. Do you have any health problems other than your planned surgery? No ☐ Yes ☐
   If yes, please list: (For extra space add another sheet of paper). ____________

2. Have you been in hospital for any health problems including previous surgery? No ☐ Yes ☐
   If yes, what and when were they? (Please list)

Health problem/surgery	Hospital	Year

3. Have you seen any other specialist doctor/s in the last 5 years? If yes, please list: No ☐ Yes ☐

Reason for seeing Dr	Dr's name	Dr's Phone Number	Last visit (date)

4. Do you use any regular medications? (e.g. pills, injections, puffers, implants, herbal, bush medicine and non-prescribed or recreational medications). If yes, please list. Attach list if more space needed. No ☐ Yes ☐

Medication/dose:	When taken:	How often:

5. Do you have any allergies (especially to medicines, sticking plaster, iodine, food, latex). If yes, what are they and what reaction do you have? ____________ No ☐ Yes ☐

6. Have you or any family member had a problem with an anaesthetic (e.g. a bad reaction). If yes, what happened? ____________ No ☐ Yes ☐

7. Please indicate how far you can walk without stopping AND no chest pain or shortness of breath. Circle the one that best describes your condition. Note: A flight of stairs is considered approximately 6 steps.

More than 2 flights of stairs — 1 flight of stairs

2 flights stairs — Half a flight of stairs

Around the house

Office Use Only – **PHQ TRIAGE INSTRUCTIONS**

Appendix 1 – Patient Health Questionnaire – Adult – 1/2

8. Do you have any difficult opening your mouth or have limited neck movement?	No ☐ Yes ☐	
9. Have you had any recent anaesthetics? If yes when was the last one?	No ☐ Yes ☐	
10. Do you have any questions, worries or concerns about the anaesthetic that you would like to talk to us about? If yes, what are they?	No ☐ Yes ☐	

11. Do you have or have you ever had:

High blood pressure	No ☐ Yes ☐	When: ______
Heart attack, chest pain or 'angina'	No ☐ Yes ☐	When/How often: ______
Any other heart condition e.g. heart valve, pacemaker	No ☐ Yes ☐	What type ______
Lung problems needing hospital	No ☐ Yes ☐	What type: ______
Troublesome shortness of breath	No ☐ Yes ☐	When do you get it: ______
Chronic bronchitis	No ☐ Yes ☐	When: ______
Asthma	No ☐ Yes ☐	How often: ______
Should you be using a puffer (e.g. Ventolin)?	No ☐ Yes ☐	How often: ______
Sleep apnoea	No ☐ Yes ☐	CPAP machine (Y/N): ______
Other lung or breathing problems	No ☐ Yes ☐	What type: ______
Reflux of acid or food – heartburn / hiatus hernia	No ☐ Yes ☐	How often: ______
Diabetes	No ☐ Yes ☐	Insulin (Y/N): ___ Tablets: (Y/N) ___
Epilepsy or fits	No ☐ Yes ☐	How often: ______
Stroke	No ☐ Yes ☐	When: ______
Blackouts or fainting	No ☐ Yes ☐	When: ______
Past episodes of Delirium	No ☐ Yes ☐	Describe: ______
Dementia	No ☐ Yes ☐	Describe: ______
Intellectual disability	No ☐ Yes ☐	Describe: ______
Chronic pain	No ☐ Yes ☐	Opioids (Y/N): ______
Blood clots or a bleeding disorder	No ☐ Yes ☐	What type: ______
Anaemia	No ☐ Yes ☐	When: ______
Previous blood transfusion	No ☐ Yes ☐	When: ______
Kidney condition	No ☐ Yes ☐	What type: ______
Hepatitis or liver condition	No ☐ Yes ☐	What type: ______
Is there a condition that runs in the family e.g. thalassemia, muscular dystrophy?	No ☐ Yes ☐	What condition: ______
Do you have any other health issues not mentioned above e.g. poor teeth, rheumatoid arthritis, recent Prednisone?	No ☐ Yes ☐	List: ______
An infectious disease (e.g. 'golden staph', HIV, TB)?	No ☐ Yes ☐	List: ______
Are you pregnant?	No ☐ Yes ☐	
Do you smoke?	No ☐ Yes ☐	How much: ______
Do you drink alcohol?	No ☐ Yes ☐	How much per week: ______

Height: ☐ Weight: ☐

Form completed by: Patient ☐ Carer/relative ☐ Other ☐ Specify:

Signature of person completing form: Date:

Appendix 1 – Patient Health Questionnaire – Adult – 2/2

Appendix 2: Patient Health Questionnaire – Paediatric

PATIENT HEALTH QUESTIONNAIRE

Patient 's parent/guardian to complete. If help is required ask your family, local doctor or phone ______________.

Surname	MRN
Given Name	Male ☐ Female ☐
D.O.B: ____/_____/_____	M.O.
Address	
Location/ward	

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

Patient Name / Known as:	
Who will bring the child to hospital? (Name):	
Relationship to child:	
Phone:	
Are they the legal guardian?	No ☐ Yes ☐

Office use only

Age:	
Weight:	
Height:	
Planned procedure:	

Are you (is the person) of Aboriginal or Torres Strait Islander origin? No ☐ Yes, Aboriginal ☐ Yes, Torres Strait Islander ☐ Yes, both Aboriginal and Torres Strait Islander ☐

Please tick the applicable box/es and add any necessary details in the space provided. Where there is not enough space, please tick the box and attach the additional information sheet.

1. Was your child born prematurely? No ☐ Yes ☐ How many weeks?
2. Does your child have any health problems other than your planned procedure/surgery? If yes, please list: (For extra space add another sheet of paper). No ☐ Yes ☐
3. Has your child been in hospital for any health problems including previous surgery? If yes, what and when were they? (Please list) No ☐ Yes ☐

Health problem/surgery	Hospital	Year

4. Does your child have any diagnosed disabilities or special needs? If yes, please list. No ☐ Yes ☐
5. Has your child seen any other specialist doctor/s? If yes, please list: No ☐ Yes ☐

Reason for seeing Dr	Dr's name	Dr's Phone Number	Last visit (date)

6. Does your child use any regular medications? (e.g. pills, injections, puffers, implants, herbal, bush medicine and non-prescribed medications). If yes, please list below. Attach list if more space req. No ☐ Yes ☐

Medication/dose:	When taken:	How often:

Appendix 2 – Patient Health Questionnaire – Paediatric – 1/2

7. Does your child have any allergies (especially to medicines, sticking plaster, iodine, food, latex).	No ☐ Yes ☐
If yes, what are they and what reaction do they have?	
8. Has your child had previous anaesthetics? If yes, what for and when?	No ☐ Yes ☐
9. Are you aware of any problems your child has with general anaesthetics?	No ☐ Yes ☐
If yes, please describe:	
10. In your child's family, are you aware of any problems with general anaesthetics?	No ☐ Yes ☐
If yes, please describe:	
11. Do you or your child have any questions about the anaesthetic? If yes, what are they?	No ☐ Yes ☐

12. Does your child have at present or have they ever had:		If yes:
A recognised medical condition or syndrome?	No ☐ Yes ☐	Condition/doctor:
Heart problems	No ☐ Yes ☐	Condition/doctor:
Asthma	No ☐ Yes ☐	How often:
Should your child be using a puffer (e.g. Ventolin)	No ☐ Yes ☐	How often:
Other lung or breathing problems (e.g. snoring, stops breathing during sleep – sleep apnoea)	No ☐ Yes ☐	What type:
Reflux of acid or food – heartburn / hiatus hernia	No ☐ Yes ☐	How often:
Diabetes	No ☐ Yes ☐	What type & treatment:
Previous exposure to cortisone, similar steroids	No ☐ Yes ☐	When & what type:
Epilepsy or fits	No ☐ Yes ☐	How often:
Bleeding or bruising problems	No ☐ Yes ☐	What type:
Bleeding or bruising problems in a family member	No ☐ Yes ☐	What type:
Anaemia or previous blood transfusion	No ☐ Yes ☐	When:
Kidney condition	No ☐ Yes ☐	What type:
Hepatitis or liver condition	No ☐ Yes ☐	What type:
Is your child's immunisation up to date?	No ☐ Yes ☐	What type:
Has your child had exposure to in the last three weeks, or do they currently have measles, chicken pox, rheumatic fever, or any other infectious disease?	No ☐ Yes ☐	What type:
Is there a condition that runs in the family e.g. thalassemia, muscle dystrophy?	No ☐ Yes ☐	What condition:

Form completed by: Parent ☐ Carer/relative/guardian ☐ Other ☐ Specify:

Signature of person completing form: Date:

Appendix 2 – Patient Health Questionnaire – Paediatric – 2/2

Appendix 3: Transfer of Care from Hospital Planning Questionnaire

TRANSFER OF CARE FROM HOSPITAL PLANNING QUESTIONNAIRE

Surname	MRN
Given Name	Male Female
D.O.B: ___/___/___	M.O.
Address	
Location/ward	

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

Name / Known as:

Are you (is the person) of Aboriginal or Torres Strait Islander origin?

No ☐ Yes, Aboriginal ☐

Yes, Torres Strait Islander ☐ Yes, both Aboriginal and Torres Strait Islander ☐

If Yes, refer to Aboriginal Liaison Service. ☐

You are presently on the waiting list for surgery at ________________. To assist with planning for your hospitalisation and transfer home, would you please complete these questions by ticking the appropriate box/es. If you require help, ask your family, carer or local doctor.

		Office Use Only
1. Age ________________		
2. Do you speak English at home? If no, which language do you speak: ________________	☐ No ☐ Yes	
3. Do you need a professional interpreter?	☐ No ☐ Yes	Yes? Action: Book interpreter ☐
3. Do you have problems with your memory? Has your doctor talked with you about cognitive impairment, dementia or previous delirium?	☐ No ☐ Yes	Yes? Action: For PAC ☐
4. What is your understanding of how long you will be in hospital? Day only ☐ Overnight ☐ 1-2 days ☐ 2-5 days ☐ Unsure ☐ More than 1 week ☐		Is this correct? Y ☐ N ☐→ Action
5. Have you made arrangements for someone to take you home from hospital? (A responsible adult must accompany Day Only patients home, and must stay with them at least for the first night after surgery).	☐ No ☐ Yes	No? Action: Contact patient ☐
6. Do you live: Alone ☐ With family ☐ With carer ☐ Nursing home ☐ 7. Where do you live: House/unit ☐ Boarding house ☐ Hostel ☐ Other: ________		Alone, boarding house, hostel? Action: Contact patient ☐
8. Do you care for another person on a regular basis?	☐ No ☐ Yes	Yes, then No? Action: Contact patient ☐
9. Have alternative arrangements been made to look after this person?	☐ No ☐ Yes	
10. Do you normally need assistance to walk?	☐ No ☐ Yes	Yes?→ Look at procedure
11. Do you use a walking aid such as a stick or frame? If yes, what type? ________________	☐ No ☐ Yes	Yes?→ Look at procedure
12. Do you have stairs at home? If yes, how many and are they indoors/outdoors: ________________	☐ No ☐ Yes	Yes?→ Look at procedure
13. Do you have difficulties with your sight? Please describe: ________________	☐ No ☐ Yes	Yes?→ Look at procedure
14. Do you have any difficulties with your hearing? Please describe: ________________	☐ No ☐ Yes	Yes?→ Look at procedure

Appendix 3 – Transfer of Care from Hospital Planning Questionnaire – Adult – 1/2

Appendix 3 – Transfer of Care from Hospital Planning Questionnaire – Adult – 2/2

			Office Use Only
14. On discharge, do you think you will have any problems with:			Qs 14 – 17: Yes to any of these?
Bathing / showering	No ☐	Yes ☐	Action:
Dressing	No ☐	Yes ☐	Referral made: ☐
Toileting	No ☐	Yes ☐	Date:__________
Cooking	No ☐	Yes ☐	Discharge planner ☐
Cleaning	No ☐	Yes ☐	Social worker ☐
Shopping	No ☐	Yes ☐	Physiotherapist ☐
Business matters	No ☐	Yes ☐	Occ. Therapist ☐
Family matters	No ☐	Yes ☐	Document discharge plan ☐
Other: ____________________	Describe:		
15. On discharge, do you think you will require help at home (that cannot be provided by your current support network)?	No ☐	Yes ☐	
16. What arrangements have been made for someone to care for you when you get home?			

17. Do you currently use any of the following services?

Community nurse ☐	Personal care assistance ☐	Meals on Wheels ☐
Home Help ☐	Aboriginal Specific Services ☐	Day care / therapy unit ☐
Other: ☐ Describe: ____________________		

Please ask for assistance, as staff are available to assist you with any concerns.
Thank you for completing this form.
The information you have provided will help in planning your transfer of care from hospital.

HOSPITAL USE ONLY

Expected length of stay:		Actions completed:		Intervention required:	No ☐ Yes ☐
Telephone intervention:	No ☐ Yes ☐	Action:			
Screened by: (RN)		Signature:		Date:	

Referrals to be made to:

Social work ☐	CNC Discharge liaison ☐	Physiotherapy ☐
Stomal therapy ☐	Occupational therapy ☐	CA/PAC ☐
Drug & Alcohol ☐	Aboriginal Liaison ☐	Interpreter ☐
Other: ☐ Describe: ____________________		

Requires Pre Admission Clinic				No ☐	Yes ☐
Appointment made by (administrative staff):		Signature:		Date:	
Appointment date:					

Appendix 4: Conditions/considerations for Assessing a Patient's Perioperative Risk

Condition / Consideration	Further Reading and Reference Guidelines
Poor or indeterminable cardiorespiratory reserve or exercise tolerance	Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2014;64(22):e77-e137. doi:10.1016/j.jacc.2014.07.944. Accessed at http://content.onlinejacc.org/article.aspx?articleid=1893784, March 2016.
Chronic Obstructive Pulmonary Disease / Emphysema or people on home O_2/CPAP/NIV/ventilation	Beasley, R., Chien, J., Douglas, J., Eastlake, L., Farah, C., King, G., Moore, R., Pilcher, J., Richards, M., Smith, S. and Walters, H. (2015), Thoracic Society of Australia and New Zealand oxygen guidelines for acute oxygen use in adults: 'Swimming between the flags'. Respirology, 20: 1182–1191. doi:10.1111/resp.12620
High body mass index (BMI)	Queensland Health | Statewide Anaesthesia and Perioperative Care Clinical Network Guideline – Anaesthesia: non-bariatric surgery in obese patients https://www.health.qld.gov.au/qhpolicy/docs/gdl/qh-gdl-395.pdf
Obstructive sleep apnoea	STOPBang Questionnaire http://www.stopbang.ca/osa/screening.php
Older surgical patients	Optimal Perioperative Management of the Geriatric Patient: Best Practice Guideline from ACS NSQIP / American Geriatrics Society https://www.facs.org/~/media/files/quality%20programs/geriatric/acs%20nsqip%20geriatric%202016%20guidelines.ashx The Association of Anaesthetists of Great Britain & Ireland. 2014. Safety Guideline – Perioperative Care of the Elderly. https://www.aagbi.org/sites/default/files/perioperative_care_of_the_elderly_2014.pdf
Patients who will require rehabilitation services or ongoing acute care	TBA (Advice currently being developed).
Frailty	Victorian Government / Health https://www2.health.vic.gov.au/hospitals-and-

	health-services/patient-care/older-people/frailty
Cognitive impairment Dementia, early cognitive decline (at risk of post-operative cognitive dysfunction) or delirium (or past episodes of delirium)	Care of the Confused Hospitalised Older Person http://www.aci.health.nsw.gov.au/chops Australian Commission on Safety and Quality in Health Care | Delirium Clinical Care Standard https://www.safetyandquality.gov.au/our-work/clinical-care-standards/delirium-clinical-care-standard/
Intellectual disability	Intellectual Disability Resources https://www.aci.health.nsw.gov.au/networks/intellectual-disability/resources
Smoking reduction / cessation	Tobacco and Smoking – Tools for Health Professionals http://www.health.nsw.gov.au/tobacco/Pages/tools-for-health-professionals.aspx
Alcohol Dependence	Drug and Alcohol Publications and Resources http://www.health.nsw.gov.au/mentalhealth/Pages/pubs-index-da.aspx
Presence of chronic pain +-/- opioid tolerance (e.g. Opioid use > 40 mg oral ME per day)	NSW Therapeutic Advisory Group Inc Preventing and managing problems with opioid prescribing for chronic non cancer pain July 2016 http://www.ciap.health.nsw.gov.au/nswtag/reviews/practical-guidance.html
Risk of transition to chronic pain after surgery or a procedure	NPS Medicine Wise https://www.nps.org.au/australian-prescriber/articles/postoperative-pain-management#acute-to-chronic-pain-transition
Low ferritin and anaemia	Patient Blood Management Guidelines: Module 2 Perioperative https://www.blood.gov.au/pbm-module-2
Poor blood glucose control	A Perioperative Diabetes and Hyperglycaemia Guideline is currently being developed by the Australian Diabetes Society and the Australian and New Zealand College of Anaesthetists and will be available on those websites upon its release.
Renal function	Guidance from the Renal Society

Appendix 5: Additional Information to be Obtained from the Primary healthcare provider
Ideally, the following information should be obtained from the primary healthcare provider (GP, ACCHS/AMS) by the Perioperative Service:

Data/Information from the Primary healthcare provider
Patient identifiers, including name, date of birth
Was the primary healthcare provider involved in completing the patient health questionnaire? If yes, were the answers accurate?
A Health Summary
Other specialists currently caring for the patient and copies of the recent letter/s from the patient's specialists
Current medications
Recent test results e.g. chest x-rays, serum chemistry, HbA1c for Diabetes, haemoglobin/ferritin and Thyroid Function tests
Copies of investigations that have been done, especially the most recent Cardiac Echocardiogram, Stress Test/s, Coronary Angiogram
Past procedures, within a set timeframe (as requested by the Perioperative Service)
Details of any anaesthetic complications the patient may have had
Details of any allergy testing that might have been done
Control/stability of major chronic medical problems, e.g. Diabetes, hypertension, chronic pain
Details of cognitive impairment including past episodes of delirium
An assessment of the patient's general mobility and functional ability
Any non-medical needs of the patient, including caring for another person, the need for a professional interpreter, social worker, Aboriginal hospital liaison service etc
Name of the practitioner, practice and contact details

The primary healthcare provider should be given one point of contact within the Perioperative Service for providing this information and to discuss any matters relating to the patient's planned perioperative journey.

Appendix 6: Pre Admission Medical Anaesthetic Assessment Form

Pre-Admission Medical-Anaesthetic Assessment

Date:	By:	Anaesthetist: Fellow Registrar 1 2 3 4	Unit No.
Surgeon / Team:		Date Planned:	Surname
Planned Procedure:			Other Names
			DOB / Sex

General: ASA 1 2 3 4 5

Age: Sex: Weight: kg Height: cm BMI: kg/m²

History of present illness:

Intercurrent illnesses:

☐ Nil

Relevant Anaesthetic History:

☐ Nil

Allergies Nil ☐

Cigs........./d ....Pack/yrs Etoh........g/d

Medications: Nil ☐

Anti-Platelet/Aspirin Nil ☐

Alternate Meds: Nil ☐

Perioperative Management Plan:

Admission process explained: ☐

Take usual medications on DOS ☐ except:

☐ Perioperative Options Discussed: PCA: ☐

☐ Perioperative Risks Explained:

Admission Status ☐ Day Only ☐ Extended Day Only ☐ Day of Surgery Admission (>1night) ☐ Full Admission

Signature:

BINDING MARGIN – PLEASE DO NOT WRITE

Appendix 6 – Pre Admission Medical Anaesthetic Assessment Form – 1/2

PRE-ADMISSION EXAMINATION & EVALUATION

CARDIOVASCULAR

BP:........ HR:.......... reg irreg

JVP: ....

Carotids: ....

HS: .... 1 .... 2 ....

....

Ankle oedema: ....

Pulses: ....

Exercise tolerance: .... Limited by: ....

ECG: ....

Thallium / Stress Test / Echo / Angiogram: ....

....

....

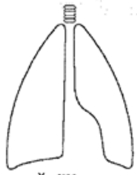
....

....

....

RESPIRATORY

SpO_2: ....%



X = crep
O = wheeze

Breathlessness: Nil Moderate Exertion Mild Exertion At Rest

Examination: ....

....

CXR / CT: ....

Spirometry, Lung Function Tests: ....

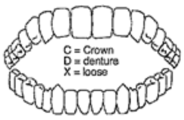
ABG's on .... $\%O_2$: pH .... pO_2 .... pCO_2 .... Bicarb .... BE .... Sat .... %

More: ....

AIRWAY & TEETH

Mallampati / Gatt Score

Class 1 Class 2 Class 3 Class4



Dentures Nil Upper: Full Partial Lower: Full Partial

Teeth: ....

Jaw opening: .... Atlanto-Axial Extension: ....

Neck Flexion: ....

More: ....

....

....

NEUROLOGICAL

	R	L
Power		
UL	/ 5	/ 5
LL	/ 5	/ 5
Pupils		

Hearing: ....

Vision: ....

More: ....

....

....

....

OTHER

....

....

....

BLOOD RESULTS

BIOCHEM: Na .... K .... CL .... $TotCO_2$ .... BSL .... Creat .... Ca .... LFT's ....

HAEM: Hb .... WCC .... Plats .... INR .... APTT .... Groups&Screen ....

OTHER: ....

Binding Margin – Please do no write

Appendix 6 – Pre Admission Medical Anaesthetic Assessment Form – 2/2

Appendix 7: Perioperative Patient Information Booklet

Appendix 7 – Perioperative Patient Information Booklet – 1/3

Patient Information Booklet and Checklist

Your guide to the Perioperative Service at ____________ Hospital. The Perioperative Service is responsible for helping organise your care before, during and after your operation.

You have been given this guide because you are having an operation. You are probably asking 'what do I need to know' and 'what do I need to do'?

This booklet will help with:
- before coming to hospital
- during your hospital stay
- after you leave hospital

It also includes what to bring, what not to bring and where to go. You need to bring this booklet with you when you come to hospital. You may also be provided with detailed information by your surgeon or the anaesthetist.

If you have any questions, please call the Perioperative Service on (02) ____ ____.

Please tell the nurse when you speak with them if you have had:
- changes in how you are feeling
- recent flu or colds
- been to hospital in the past two weeks
- changes to the medicines you take
- injuries or scratches

Preparing to come to hospital

	Need to know	Write here
	Time to arrive at the Perioperative Unit	
	Time to stop eating	
	What you can drink and time to stop drinking	
	The medicines/tablets you should take on the day of your surgery with some water	
	If you have diabetes	
	To bring the results of blood tests and x-rays	
	How long you are likely to stay in hospital	
	Hospital visitor times	
	Discharge times	
	What to bring	
	What to leave at home	

Appendix 7 – Perioperative Patient Information Booklet – 2/3

Arriving at hospital

Car parking is available, however costs may be involved.

The entrance to the car park is at _______________ or _____________________.

When you arrive at the hospital, make your way to _______________.

You can find us by:

____

____

What will happen while I wait?

Once you arrive in the Perioperative Unit/Admissions, please go to the reception area.

You may be asked to sit in the waiting room until it is time to have your operation. Sometimes you may notice people going to have their operation before you. People are seen according to their place on the operating list.

Visitors are welcome, but space is very limited, so we ask you bring no more than two people with you.

A nurse and doctor will then ask you questions and take your pulse, blood pressure and weight and you will be asked to change into a hospital gown in preparation for your operation.

What happens after my operation?

If you are **going home on the same day** you will come back to the Perioperative Unit where you will be given something to eat.

You will be able to leave the hospital once you have recovered from your operation and received your medicines to take home. This is usually between 2-6 hours after your operation. Please make sure you have a responsible adult to take you home and stay with you for the next 24 hours. If this is not possible, please talk with your nurse.

If you are **staying overnight or longer**, you will be taken to a hospital ward. We will tell you which ward on the day of your operation.

What happens when you go home?

Before you go home, a nurse will help you complete the following information. If you had a day procedure, a nurse from the Perioperative Service may telephone you the next day to check how you are doing.

	What do I do about:	You should…
	Pain medicine	Follow the instructions on the packet: ______________
	Wounds and dressing	Leave your dressing intact for ___ days. When you shower you should: ________________
	Activity	Exercise: ________________ Lifting: ________________ Driving: ________________ Working: ________________
	Diet / Food you can eat	____________ diet. Or ________________ food.
	Toilet	Be aware that pain tablets prescribed after your operation can make you constipated. Contact your GP for advice.
	Problems such as bleeding, high temperature, moderate to severe pain	Contact: ____________ on (02) ____ ____ and ask for ___________.
	Follow up appointment	You will need to see: Dr: ____________ Date: ________ Time: ______ Place: ________________
	If you have any questions, please ring:	______________________

Appendix 7 – Perioperative Patient Information Booklet – 3/3

Shared Outcomes Tool – for patient, family and carers

Ideal outcome	Agreed outcome/s	Notes on outcome/s following surgery/procedure	Outcomes following surgery/procedure discussed with surgeon and anaesthetist	Further comments/notes
This tool records the information and agreed outcomes discussed between you, your family/carer, surgeon/proceduralist and the anaesthetist.				
Surgeon/Proceduralist perspective: e.g. reduced knee pain	Surgeon and patient:	i.e. What was the outcome?	Yes/No Provide details of discussion:	Any other notes on the surgery/procedure or patient journey [relating to outcomes]:
Patient perspective: e.g. I want to walk and play golf without pain What I am not prepared to trade/give up in considering having this procedure	Anaesthetist and patient:			
Anaesthetist perspective: e.g. reduced knee pain				

Appendix 8: Patient Information Checklist

Appendix 8 – Patient Information Checklist – 1/1

The following information may be included when the Perioperative Service team is providing written education and instructions for patients and their carers.

Information for patients and their carers should include:	Completed
Details of the operation to be performed.	Yes ☐ No ☐ N/A ☐
Expected benefits of the surgery / procedure and risks involved.	Yes ☐ No ☐ N/A ☐
Details of the anaesthetic – e.g. what is a general anaesthetic.	Yes ☐ No ☐ N/A ☐
Appropriate length of stay in hospital. This should include the length of the procedure, as well as the time that the patient will be waiting and/or time that they will be expected to arrive.	Yes ☐ No ☐ N/A ☐
Overview of usual recovery for the patient's procedure including: • When the patient will usually eat and drink • Mobilisation • Return home	Yes ☐ No ☐ N/A ☐
Degree of pain anticipated and how the pain is relieved, e.g. details of techniques such as patient controlled analgesia.	Yes ☐ No ☐ N/A ☐
Approximate time off work needed.	Yes ☐ No ☐ N/A ☐
When will it be safe to resume normal activities e.g. driving.	Yes ☐ No ☐ N/A ☐
The perioperative screener's contact details for the patient and/or carer to ring if: • They cannot attend on the day of surgery • There has been a significant change to their medical condition • Their medication has changed • They need advice.	Yes ☐ No ☐ N/A ☐
What to bring on the day of admission.	Yes ☐ No ☐ N/A ☐
A hospital map, car parking (including costs) and/or other transport arrangements.	Yes ☐ No ☐ N/A ☐
Hospital visiting times for relatives.	Yes ☐ No ☐ N/A ☐
Fasting times and other pre operative preparation. This should include confirming the instructions (and any jargon) are understood e.g. fasting means no food or drink.	Yes ☐ No ☐ N/A ☐
Where relevant, make the patient and/or carer aware of other services, including interpreter, Aboriginal Liaison Officers etc. Health facilities must adhere to the NSW Health policy on the use of professional interpreters to support communication with patients, their families and carers from culturally and linguistically diverse backgrounds. See *Interpreters – Standard Procedures for Working with Health Care Interpreters (PD2006_053).*	Yes ☐ No ☐ N/A ☐
Costs attached to the surgery / procedure and/or hospital stay.	Yes ☐ No ☐ N/A ☐

1/1

Appendix 9: Standardised Perioperative Pathway

Appendix 9 – Standardised Perioperative Pathway – 1/1

Insert LHD/hospital name here	Surname:	MRN:
	Given Name(s):	Male ☐ Female ☐
	D.O.B: / /	M.O:
New ☐ Revised ☐ **Date:**	Address:	
	Location/ward:	

Form completed by:			
Date:			
Planned Procedure:			
Emergency/Elective:			
Planned Care Pathway:			
Expected length of stay:		**Variance:**	
Pathway discussed and agreed with the patient:	Yes ☐ No ☐	Notes:	

Risk assessment – (For ASA IV and V please fax Anaesthetist consultation to GP):	
Patient's ASA Score:	

Perioperative risk management plan includes:		**Variance:**
Pre		
Intra		
Post		

Anticipated level of care for patients post procedure:					**Variance:**
Day Surgery ☐	EDO ward ☐	Ward ☐	HDU ☐	ICU ☐	

Clinical handover from hospital to primary care:			**Variance:**
General Practitioner ☐	Community Nursing ☐	Family/Carer ☐	

Patient requirements for transfer to primary care:					**Variance:**
Transfer of care summary ☐	Pain Relief / Wean & cease plan ☐	Nominated carer ☐	Medications e.g. Warfarin ☐	Other ☐	

For ALL variance to the pathway (including RRT calls), DOCUMENT the variance and NOTIFY the Director, Perioperative Service (Anaesthetist) and Nurse Manager. A REVISED PLAN IS REQUIRED.

Notified to:		Date:

INFORM GP in the event of an unplanned admission to ICU and/or significant morbidity/mortality:

Notified to:		Date:

Appendix 3 Systematic Literature Review – Emerging models of perioperative, multidisciplinary team-based care

The following results on perioperative models of care, from empirical papers of highest hierarchical levels of research evidence, were obtained through the Systematic literature review process (Part B) outlined in Chapter 2 Literature Review. The data extraction process was via a template providing a structure that ensured that articles included for review were evaluated in a consistent manner (Petticrew 2013a, Rychetnik 2002). The results are presented in Tables 2.1_SLR - 2.4_SLR; the contents are classified by the research citation, followed by the key properties of the papers:

Table 2.1_SLR Research aim, design and study setting
Table 2.2_SLR Intervention, relationships, communication
Table 2.3_SLR Intervention mediators, primary outcome, other outcomes
Table 2.4_SLR Limitations of study, conclusions, recommendations

Table 2.1_SLR Research aim, design and study setting

Key - *Multidisciplinary (MDT) – at least 5 of the following -surgeons, anaesthetists, nurses, physiotherapists, nutritionists, occupational therapists, other doctors, clinician-managers, managers, case-managers, project lead, external change agents
LOS – Length-of-stay

Authors, Year, Country	**Research Aim**	**Research Design and Method**	**Study setting** i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Barakat et al 2016 UK	To assess the impact of a hospital-based, preoperative, medically supervised exercise program outcomes after elective major vascular surgery - abdominal aortic aneurysm (AAA) repair	Randomised controlled trial Statistical analysis Study period: Sept 2009 – Jan 2014	i. Multilevel – MDT guided by national quality improvement program, University teaching hospital – vascular surgery dept ii. Multidisciplinary – academic surgeons, physiotherapy, anaesthetists, HDU and ward based MDT, nurses; Patients - 62 controls, 62 intervention group. iii. Nil, single centre study ensuring minimal variation in exercise intervention iv. Yes, national and hospital physiotherapy-vascular programs
Barberan-Garcia et al 2018 Spain	To assess the impact of a personalised prehabilitation on postoperative complications in high risk patients, 70 years and older and ASA 3/4, having elective major abdominal surgery	Randomised Single-blinded controlled trial Statistical analysis Study period: Feb 2013 - June 2016	i. University teaching hospital – surgery department and community setting ii. Multidisciplinary – respiratory medicine, anaesthesiology, surgery, physiotherapy; Patients - 63 controls, 62 intervention iii. Yes, personalised intervention – tailored to individual patient iv. Yes, hospital pre-admission programs
Bellomo et al 2004 Australia	To determine whether the introduction of an ICU based Medical Emergency Team (MET) would decrease the rate of predefined adverse outcomes in patients having major surgery (expected hospital stay > 48 hours)	Prospective controlled before and after trial Statistical analysis Study period: 1 May 1999 to I Mar 2001	i. University teaching hospital (multiple departments ICU and surgical wards) ii. MET – ICU Fellow (senior trainee) and ICU nurse, ICU specialist attends on request. Control period 1116 patients received 1369 operations, MET period 1067 patients, 1313 operations iii. Yes, iv. Yes

Authors, Year, Country	**Research Aim**	**Research Design and Method**	**Study setting** i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Bellomo et al 2005 Australia	To determine if a 4 bed HDU to facilitate graded admission and discharge with a 17 bed ICU would decrease postoperative serious morbidity and mortality after major surgery (expected hospital stay > 48 hours)	Prospective controlled before and after trial Statistical analysis. Study period: Jan - August 1999	i. University teaching hospital – ICU department ii. MDT from ICU, medical, nurses, allied health. Patients – 1125 before (4 months), 1127 after HDU introduction (4 months) iii. Yes iv. Yes, extension of ICU service
Berggren et al 2019 Sweden	To study whether geriatric interdisciplinary home rehabilitation after hip fracture, reduced the number of complications, readmissions, and total days spent in hospital to 12months after discharge	Randomised controlled trial Statistical and thematic analysis Study period: not specified	i. University teaching hospital departments and participants residential care facilities or ordinary homes ii. Nurse and geriatrician; 205 patients 70 years and older, Intervention group 106, Control 93 iii. No iv. Yes
Bhatt et al 2017 Ireland	To examine whether early aerobic activity with foot pedal exerciser (respiratory rehabilitation) reduced respiratory morbidity after major abdominal surgery	Prospective case control study Statistical analysis Study period: Oct 2011 – Oct 2013	i. University teaching hospital surgical units ii. Surgeons, anaesthetists, respiratory physician; 30 patient cases major general surgery, 30 case matched same general surgical service as controls iii. No iv. Yes
Boden et al 2017 Australia and New Zealand	To assess the efficacy of a single preoperative physiotherapy session to reduce postoperative pulmonary complications (PPC) after major open upper abdominal surgery	Randomised controlled trial Statistical analysis Study period: June 2013 – August 2015	i. Three tertiary public hospitals in Australia and New Zealand, surgical units ii. Physiotherapists of different experience levels, 441 adults 18 years and older, (219 control, 222 intervention) iii. No iv. Yes
Chen et al 2017 Taiwan	To examine whether a modified Hospital Elder Life Program (mHELP) reduces incident delirium and LOS in older patients (65years and older) undergoing abdominal surgery	Cluster randomised clinical trial Statistical analysis Study period: 1 Aug 2009 to 11 Oct 2012	i. University teaching hospital surgical units ii. mHELP trained nurses; 377 patients 65years and older having abdominal surgery with expected LOS > 6days - 196 mHELP group, 179 standard care group. iii. No iv. Yes

Authors, Year, Country	**Research Aim**	**Research Design and Method**	**Study setting** i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Chiwera et al 2018 United Kingdom	To standardise surgical site infection (SSI) data collection, establish SSI rates, facilitate evidence based targeted interventions for adult cardiac patients within clinical governance structures to improve quality, safety, efficiency	Prospective before and after quality improvement study Statistical analysis Study period: 1 Jan 2009 to 31 Dec 2016	i. Multilevel – national, trust, 2 hospitals, clinical departments ii. *Multidisciplinary (MDT) - Infection control experts - doctor, nurse, SSI surveillance team leader; surgeons, nurses, clinical governance facilitator; over 8000 patients over 8 years iii. No iv. Yes
Cima et al 2012 USA	To describe a Lean Six Sigma (LSS) approach to reducing colorectal surgery surgical site infection (SSI) rates at single high volume tertiary academic hospital using ACS NSQIP sampling data	Prospective cohort study Statistical analysis and observation Study period: Pre: 2009-2010 Intervention: 2009-2011	i. Multilevel - national level program (NSQIP) – single university teaching hospital - surgical department (3 level) ii. *Multidisciplinary team (MDT)– (surgeon lead, research fellow, quality advisor, nurse specialists and managers, process engineer, pharmacist, NSQIP data analyst; 531:198 patients before: after iii. No iv. Yes
Cull et al 2013 USA	To evaluate the impact of a Vascular Surgery Hospitalist program to address surgeon workforce shortages and on-call issues, 10 years after its introduction	Prospective cohort study Thematic analysis Study period: Not specified	i. University teaching hospital surgical departments ii. *Designated senior vascular surgeon "doctor of the week' acting as hospitalist-surgeon collaborating in MDTs iii. Yes iv. Yes
De Vries et al 2010 The Netherlands	To examine the effects on patient outcomes of a comprehensive, multidisciplinary surgical safety checklist (SURPASS) surgical patient safety system targeting the entire surgical pathway.	Controlled, multicentre, prospective before and after Statistical analysis Study period: Oct 2007 to Mar 2009	i. Hospital level – 6 intervention and 5 control university teaching Hospitals ii. MDT each hospital had project team and (ward doctor, nurse, surgeon, anesthesiologist, operating assistant, quality control officer); 3760:3820 patients before: after iii. No, compliance expressed as percentage of items that had been completed on checklist iv. Yes

Authors, Year, Country	Research Aim	Research Design and Method	Study setting i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Duclos et al 2016 France	To assess the impact on major surgical complications of adding an aviation-based team training program after checklist implementation	Cluster randomised trial Statistical analysis Study period: Sept 2011 to Mar 2013	i. International research collaboration 31 hospitals operating room teams ii. Educators and operating theatre teams; 5934 before and 16845 post team-training implementation iii. No iv. Yes
Eliott et al 2008 Australia	To assess the impact of an ICU liaison nurse service on patient outcomes	Prospective controlled before and after trial Statistical analysis Study period: 1 Sept 2003 to 31 Aug 2006	i. University teaching hospital – ICU department ii. ICU liaison nurse with ICU and ward MDT medical, nurses, allied health. Patients – 835 before (18 months), 943 after ICU liaison nurse service introduction (18 months) iii. Yes iv. Yes, extension of ICU service
Fan et al 2016 USA	To evaluate the association between safety culture and surgical site infection (SSI)	Prospective surveys Statistical and thematic analysis Study period: Jan – Dec 2013	i. Hospital surgical units in 7 state community hospitals ii. Surgical unit teams 43% response rate to survey iii. No clinical intervention, rather assessment of team culture iv. No, research only
Gorgun et al 2018 USA	To investigate the impact of preventative measures on colorectal surgical site infection (SSI) rates within 30days of the index operation. SSIs are the most common hospital acquired infection after colorectal surgery increasing morbidity, mortality and costs	Prospective cohort study Statistical analysis Study period: Pre: Feb 2013-Feb 2014 Intervention: Feb 2014-Feb 2015	i. Multilevel - National (NSQIP) – University teaching hospital - Surgical department (3 level) ii. *Multidisciplinary providers. Year prior to intervention 986 procedures (43.8%) year after 1264 (56.2%) iii. No iv. Yes

Authors, Year, Country	Research Aim	Research Design and Method	Study setting i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Guilla-mondegui et al 2012 USA	To show that forming a 10-hospital collaborative in Tennessee and using the ACS_NSQIP systems to share surgical process and outcomes data overall patient surgical outcomes would improve	Prospective Interrupted time series study Statistical analysis Study period: (1) Jan-Dec 2009 (2) Jan-Dec 2010	i. National ACI_NSQIP system - state level collaborative of 10-hospitals – hospital surgical departments (3 level) ii. *Multidisciplinary leadership – nurse abstractor of data, CEO, surgeon champion. 14,205 surgical cases period 1, 14,901 cases period 2 iii. Yes iv. Yes
Hall et al 2017 USA	To examine the effect of the Frailty Screening Initiative (FSI) on mortality	Prospective pre-post quality improvement cohort study Statistical analysis Study period: 1 Oct 2007 – 1 July 2014	i. University teaching hospital – facility wide initiative including 12 surgical departments ii. Clinicians from surgery, anaesthesia, critical care, palliative care, 9153 patients assessed as frail and having major non-cardiac elective surgery iii. Yes iv. Yes, QI study design, staggered implementation across surgical specialties to near 100% compliance
Huddleston et al 2004 USA	To examine the impact of hospitalist-medical and surgical co-management after elective hip and knee surgery on postoperative outcomes	Randomised control trial Statistical and thematic analysis Study period: 1 Jul 2000 – 30 Jun 2001	i. University teaching hospital – surgical department ii. Faculty surgeons, residents and 3 general internal medicine hospitalists, nurses; 526 elevated risk patients (>75years old, with significant comorbidity) iii. Yes iv. Yes
Iberti et al 2016 USA	To examine the effects of hospitalist-vascular surgery co-management on complications and mortality	Prospective pre-post cohort study Statistical and thematic analysis Study period: Pre: Jan 2011-Dec 2012 Intervention: Jan 2013-Dec 2014	i. University teaching hospital wide safety and quality initiative – surgical department (2 level) ii. *MDT - Service agreement for Hospitalist in medical care of high risk patients with expected LOS > 1 day, and not in ICU. Ten hospitalists and 9 vascular surgeons. Daily MDT ward rounds. Total patients 2431, 944 pre-, 1487 in-intervention period iii. Yes iv. Yes

Authors, Year, Country	**Research Aim**	**Research Design and Method**	**Study setting** i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Jensen et al 2014 Denmark	To evaluate whether preoperative and postoperative physical exercises and enhanced mobilisation could reduce LOS and early (90days and less) complications in patients having radical cystectomy	Randomised controlled trial Statistical analysis Study period: May 2011 to Feb 2013	i. University teaching hospital surgical department ii. Physiotherapy led programme (within MDT ERAS) – intervention arm. 107 patients, 57 standard control group, 50 intervention group iii. No iv. Yes
Johnston et al 2018 UK	To evaluate the impact of a human factors bundle on the quality of supervision, escalation of care and safety culture in a U.K surgical department	Prospective pre-post cohort study Statistical and thematic analysis Study period: Pre: 1 Aug - 30 Nov 2012 Post-intervention: 1 Dec 2012-31 Mar 2013	i. University teaching hospital surgical department ii. *Multidisciplinary clinical staff (24), 2 focus groups sessions to develop a new model of team working – the intervention bundle including junior doctors who had raised concerns about level of supervision, lack of support when attempting to escalate care to a senior surgeon for the deteriorating surgical patient iii. Yes iv. Yes
Kabata et al 2015 Poland	To assess the need to introduce preoperative nutritional support to non-malnourished cancer patients at decision for surgery	Randomised controlled trial Statistical analysis Study period: May 2011 – April 2013	i. University teaching hospital surgical oncology department ii. Team not specified, nutritional assessments two weeks and again one day prior to surgery; Non-malnourished cancer Patients 48 control, 54 intervention iii. No iv. Yes, standing ERAS protocols for all patients
Kabrhel et al 2016 USA	To report the initial 30 months experience of a novel multidisciplinary pulmonary embolus (rapid) response team	Prospective longitudinal study Thematic analysis Study period: Oct 2012 to Mar 2015	i. University teaching hospital ii. Medical specialists in cardiovascular medicine and surgery, emergency medicine, haematology, pulmonary and critical care, radiology iii. Yes, learning from collaboratively treating patients over time, in real-time iv. Yes

Authors, Year, Country	Research Aim	Research Design and Method	Study setting i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Liu et al 2017 USA	To evaluate the outcomes of ERAS in 2 target populations elective colorectal (CR) surgery and emergency hip repair (EHR)– across 20 hospitals within 12 months of starting program	Prospective pre-post difference in difference study for 2 target populations Statistical analysis Study period: Feb-end 2014	i. Multi-level (3) implementation – private integrated health care delivery system (KP), 20 hospitals, clinical departments ii. * MDT - subject experts, including clinicians, performance improvement staff, patient engagement experts; 3768 patients CR surgery, 5002 HER patients iii. Yes / No iv. Yes
Lower et al 2013 Norway	To describe the national surveillance module for surgical site infection (SSI) and evaluate the completeness of hospital participation, effectiveness of automated data collection and the added value of follow-up after hospital discharge	Prospective longitudinal study Statistical analysis Study period: 2005-2009	i. Multilevel: national and hospitals, hospital departments (Introduced by national regulation 2005) ii. National institute of health, hospital trusts and governance authorities, 55 hospitals, findings reported back to surgeons, clinical staff iii. Yes iv. Yes
McDonald et al 2018 USA	Do older patients undergoing elective abdominal surgery benefit from Perioperative optimisation of senior health (POSH)?	Prospective controlled before and after trial Statistical analysis Study period: Pre: Jan-May 2010 Post: June 2011 -June 2015	i. University teaching hospital ii. MDT collaborative surgeons, geriatrician, anaesthesia nurse practitioner preop, geriatric resource nurse, program administrator; patients 85 years and older or 65 years with cognitive impairment, recent weight loss, multimorbidity or polypharmacy; Patients 143 control, 183 POSH iii. Yes iv. Yes, existing geriatrics-based clinic
Minnella et al 2018 Canada	To investigate whether exercise and nutrition prehabilitation is effective in improving functional status in oesophagogastric resection for cancer	Randomised controlled trial Statistical analysis Study period: Feb 2013 – Feb 2017	i. University teaching hospital ii. MDT – physician, kinesiologist, dietician, surgeon, oncologist; Patients 25 control; 26 intervention iii. Yes, personalised exercise and nutrition program iv. Yes, ERAS pathway standard care

Authors, Year, Country	**Research Aim**	**Research Design and Method**	**Study setting** i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Nelson et al 2016 Canada	To examine the effect of implementing the ERAS colorectal guideline across a provincial healthcare system (Alberta) on LOS, complications, 30-days readmission	Prospective pre- and post-study Statistical analysis Study period: Feb 2013 – Dec 2014	i. Multi-level: State health service and six hospitals surgery departments (that do 75% of state's colorectal surgery) ii. MDT – state health service implementation team and lead surgeon, anaesthetist, nurse at each hospital Patients (consecutive elective) : 1333 total, 350 pre-; 983 post-. iii. No, 'stringent' ERAS compliance iv. Yes, build and compare ERAS to standard care
Oliver et al 2018 UK	To assess if between-hospitals variation in survival after emergency laparotomy surgery can be explained by differences in perioperative process delivery, underpinning organisational structures and associated hospital characteristics (and quantify the magnitude of these associations within NELA data sets)	Prospective patient recruitment and custom-built data set with linked registry data Statistical analysis Study period: Dec 2013 to Nov 2015	i. Multilevel – National emergency laparotomy audit (NELA) database – purpose-built, patient- and hospital level data collection platform (2013) – hospitals currently benchmarked against standards based on expert opinion ii. Patients 39,903 in 185 NHS hospitals, multilevel monitoring – hospitals, patients, organisational factors iii. Yes iv. Yes
Partridge et al 2017 UK	To determine whether standard preoperative assessment or comprehensive geriatric assessment and optimization in vascular surgery contributed to postoperative morbidity and mortality	Randomised controlled trial Statistical analysis Study period: Nov 2012 to Feb 2014	i. University teaching hospital geriatric clinic ii. MDT -geriatrician, clinical nurse specialist, social worker, occupational therapist; Patients 105 control, 104 intervention iii. Yes, personalised iv. Yes, standard care intra-and-post-op.

Authors, Year, Country	Research Aim	Research Design and Method	Study setting i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Peden et al 2019 UK	To study the effectiveness of a national quality improvement (QI) programme to improve survival after emergency abdominal surgery - (EPOCH) (Enhanced PeriOperative Care for High-risk patients	Stepped-wedge cluster-randomised trial; ethnography component Statistical and thematic analysis Study period: 3 Mar 2014 – 19 Oct 2015	i. Multilevel: national QI programme, 15 geographical clusters, 93 UK NHS hospitals, CCUs, wards, devolved QI leadership to local clinical teams ii. MDT, hospitals nominate specialty leads from surgery, anaesthesia, critical care, and investigators. Patients 40 years and older undergoing emergency open major abdominal surgery: usual care 8482, QI group 7374 iii. Yes iv. Yes (Although hospitals already implementing own QI pathways excluded)
Prestmo et al 2015 Norway	To compare the effectiveness and cost-effectiveness of treating 70 years and older, frail patients with hip fracture in a dedicated geriatric ward rather than usual orthopaedic care	Randomised controlled trial Statistical analysis Study period: 18 Apr 2008 – 30 Dec 2010	i. University teaching hospital surgical or geriatric department ii. Geriatricians and surgeons (in different mixed teams) providing care in the geriatrics ward (intervention) or surgical ward (control); Home dwelling patients 70years and older, able to walk 10m before their fracture,) 174 geriatric care, 170 orthopaedic care iii. No iv. Yes
Ravikumar et al 2010 USA	To examine if workflow redesign for dynamic risk stratification coupled with "real-time" risk mitigation in a co-management model for a hospitalised surgical cohort will improve value-based surgical outcomes	Prospective pre-and-post intervention with concurrent cohort control design Statistical and thematic analysis Study period: 2001-2009 (multiple 3 phases conducted in tandem)	i. Surgical Continuum of Care (SCoC) University teaching hospitals (3) surgical departments (2 levels) ii. * MDT - interdisciplinary stratified rounding by intensivists (HAWK) or hospitalists (DOVE) - (co-management model with surgeons), residents, nurses, allied health, managers; Total > 100,000 patient admissions iii. Yes, iterative process 10 years iv. Yes, evolution of structures, processes, outcomes analysis e.g. SICU surgical intensive care unit (intensivists), and new PCU progressive care unit (hospitalists)

Authors, Year, Country	Research Aim	Research Design and Method	Study setting i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Silva et al 2013 Australia	To investigate whether deep breathing exercises adds to early ambulation by physiotherapists after elective open upper abdominal surgery in reducing postoperative pulmonary complications (PPC) and other outcomes.	Cluster randomised controlled trial Statistical analysis Study period: March 2006 to March 2008	i. University teaching hospital ii. Physiotherapists, 86 patients, randomised into 3 groups iii. No iv. Yes
Story et al 2004 Australia	To examine whether critical care outreach would decrease the incidence of postoperative serious adverse events	Prospective cohort study Statistical analysis Study period: April 2001 to April 2002	i. University teaching hospital surgical departments (with research funding from the state Department of Human services) ii. Critical care qualified nurse iii. Yes iv. Yes
Symons et al 2013 UK	To investigate the nature of process failures in postoperative care, to assess their frequency and preventability, and to explore their relationship with adverse events	Prospective observational study Thematic analysis Study period: Nov 2008 to Aug 2010	i. University teaching hospital surgical department ii. *MDT - Senior surgeons (4), surgical trainees, junior doctors, specialty nurses, acute pain team, physiotherapist, occupational therapist; any adult patient having major elective gastrointestinal surgery; 50 patients corresponding to 659 days of inpatient care iii. Yes iv. Yes
Vester-Andersen et al 2015 Denmark	Evaluate the effect and feasibility of intermediate care compared with ward care in patients following high-risk emergency abdominal surgery (InCare trial)	Randomised multicentre feasibility trial Statistical analysis Study period: Oct 2010 – Nov 2012	i. Seven Danish hospitals, surgical departments ii. Intermediate care – surgeons and intensivists, anaesthetist, nurses; Patients 142 control, 144 intervention. iii. No, protocol-based evaluations and continuous patient vital signs monitoring iv. Yes, intermediate care between ICU and surgical wards

Authors, Year, Country	**Research Aim**	**Research Design and Method**	**Study setting** i. Organisational level(s) ii. Interacting components – participants, teams* iii. Degree of intervention flexibility iv. Self-organisation, evolution over time
Wick et al 2012 USA	To examine whether adapting CUSP (comprehensive unit based safety program) to the surgical setting, front line providers can use their local wisdom combined with a best-practice based, multidisciplinary approach to decrease SSI rates in a high risk surgical population	Prospective cohort pre-and-post study Statistical analysis Study period: July 2009 to July 2011	i. University teaching hospital surgical department ii. * MDT of frontline providers (surgeons, nurses, operating room technicians, anaesthesiologists, hospital epidemiology, infection control experts, and team coach and hospital executive administrator) – 36 people; Pre- 278 patients, Post- 324 patients iii. No / Yes iv. Yes

Table 2.2_SLR Research citation, intervention, relationships, communication

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
Barakat et al UK 2016	Six weeks exercise program before elective major vascular surgery (AAA repair) – specified exercise program mixture of timed tolerable aerobic and resistance stations, for one hour, three times per week	Linear relationship input to output, through phases of care pre-op.	i. Hospital based exercise classes - physiotherapy department, instructions provided at gym ii. Instructions and timetable iii. Cardiopulmonary exercise testing (CPET) to assess progress in cardiovascular fitness, measurement of biomarkers (blood tests)
Barberan-Garcia et al 2018 Spain	Four weeks or more exercise personalised prehabilitation program with 3 actions – motivational interview (tailored to individual patient), high-intensity exercise training, and promotion of physical activity	Linear relationship input to output, through phases of care pre-op.	i. Personalised intervention – primary disease, physical function; proximity to hospital, patient’s social dependence; motivation to adhere to program leading to a facilitated community-based exercises ii. Self-assessment motivation diary, instructions, timetable iii. CPET to assess progress in cardiovascular fitness
Bellomo et al 2004 Australia	Introduction of a hospital-wide ICU based MET (Fellow and Nurse) to evaluate and treat patients deemed by clinical staff to be at risk of developing an adverse outcome	Non-linear, MET activation as required based on preset criteria	i. MET activation criteria, clinical handover post resuscitation to parent team ii. Criteria for MET activation available in the form of a large red poster displayed prominently in each ward iii. Nil
Bellomo et al 2005 Australia	Addition of a 4 bed HDU adjacent to ICU for facilitate graded ICU admission and discharge; Nurse:Patient ratio 1:2	Linear relationship input to output, through ICU	i. Communication between doctors and intensivists for admission to HDU or ICU ii. Hospital policy on admission criteria to HDU iii. Nil
Berggren et al 2019 Sweden	Geriatric interdisciplinary home rehabilitation intention to prevent, detect and treat complications after discharge	Linear relationship input to output, through phases of care pre-op and post-op.	i. Regular meetings on patients’ individualised goals ii. Include - Falls calendar iii. Nil

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
Bhatt et al 2017 Ireland	Postoperative exercise program using pedal exerciser whilst sitting on chair – starting day 2 postop or when able to sit in chair independently.	Linear relationship input to output, through phases of care post-op.	i. Twice daily (10 minutes per) application of postoperative respiratory rehabilitation (o physiological goals) program with pedal exerciser ii. Intervention protocol iii. Nil
Boden et al 2017 Australia	Preoperatively Control group receive an information booklet; Intervention group received in addition 30 minutes physiotherapy education (for PPC prevention - early ambulation) and breathing exercise coaching (of self-directed breathing exercises) to begin straight after surgery	Linear relationship input to output, through phases of care pre-op, and post-op.	i. Intervention – physiotherapy education, coaching, memory-cues - single session (30 minutes) within 6 weeks of surgery in pre-admission clinics ii. Patient information booklet - written and pictorial information about PPCs and potential prevention with early ambulation and breathing exercises (piloted in focus groups of recent past similar patients at primary site) iii. Nil
Chen et al 2017 Taiwan	3 protocols – orientating communication, oral hygiene, and nutritional assistance (postop dietary education) and (and early mobilisation)	Linear relationship input to output, through phases of care post-op.	i. Daily application of mHELP 3 protocols by mHELP nurse ii. Written protocols, adherence to protocols tracked daily iii. Nil
Chiwera et al 2018 UK	MDT of clinical governance, clinicians and managers using locally adapted and implemented robust surveillance data on SSIs, to inform locally developed care bundle approach (based on department of health high impact interventions and national institute clinical excellence guidelines)	Linear relationship input to output, through phases of care pre-op, intra-op and post-op.	i. Regular MDT meetings, audit, feedback and active campaigns to promote SSI safety and rationale, preoperative skin decolonisation and postoperative wound care ii. Paper surveillance forms in line with Public Health England recommendations, Patient information leaflets regarding preoperative skin decolonisation and recognising SSI iii. Electronic wound documentation (2014)

Authors, Year, Country	Research Intervention	Relationships, phases of care i. Linear ii. Non-linear	Communication i. Method ii. Tools iii. Specialised information technology
Cima et al 2012 USA	Multidisciplinary team use Lean Six Sigma (LSS) approach to reducing colorectal surgery surgical site infection (SSI) rates.	Linear relationship input to output, through phases of care pre-op, intra-op and post-op.	i. 3 stage process – (1) literature and NSQIP data review, construct process map (2) reduce variance among surgeons (3) establish infrastructure to support changes and staff education ii. Written protocols, adherence to protocols tracked daily across care continuum iii. Yes, control charts to track process
Cull et al 2013 USA	Designated rotating senior vascular surgeon acting as hospitalist-surgeon (0700-1800, Monday-Friday) – high priority to early completion of morning ward round, expedited discharge of patients, prompt evaluation of ED and inpatient consults, proceed to surgery with non-elective cases	Linear and non-linear Linear postoperative rounding and discharge of patients. Non-linear operating on non-elective patients presenting on the day	i. Handoffs critical to role 0645 handover morning report with all vascular surgeons, residents, nurses, medical students – status report for each patient and daily plan developed, plus communication with primary surgeon as needed. 1800 sign-out to on-call team ii. Documentation of decisions made in clinical notes iii. No
De Vries et al 2010 The Netherlands	SURPASS checklist targeting the entire surgical pathway – all MDT responsible for completion of parts of the checklist e.g. review of tests, accounting for equipment, marking of operative site, handovers, discharge prescriptions etc	Linear relationship input to output, through phases of care pre-op, intra-op and post-op.	i. Implementation was presented to all departments by each Hospital's project team, as a quality improvement project ii. SURPASS checklist iii. No
Duclos et al 2016 France	Operating room aviation-based team training focused on crew resource management (CRM) to facilitate adherence to checklist and the acquisition of non-technical skills	Linear relationship input to output, through phases of care: intra-op	i. Two and a half days teaching sessions for operating theatre teams in intervention hospitals – CRM situational awareness, team synergy, interpersonal communication ii. Checklist, video, CRM leaflets iii. Nil

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
Eliott et al 2008 Australia	Introduction of an ICU liaison service to post-discharge wards	Linear and non-linear Linear ICU step-down (1:2 nurse to patient ratio) to wards Non-linear Number of visits per patient varied depending on needs of individual patients including referrals from MDT and need for ICU readmissions	i. ICU liaison nurse service 0800-1600, 7 days per week initially for patients discharged from ICU (and service grew to include referrals from MDT ward doctors, nurses, allied health). Service provided transition support and education for patients, families; respiratory ventilation and cardiovascular haemodynamic clinical support for MDT ii. Clinical markers tool identified patients suitable for discharge from service iii. Access database to record activities of the three rotating ICU liaison nurses plus ANZICS database
Fan et al 2016 USA	Application of Hospital survey on patient safety culture (HSOPS)	Not applicable	i. Not applicable ii. Nil iii. Nil
Gorgun et al 2018 USA	14 pre-, intra- and post-operative measures involving multiple interdisciplinary providers including choice, timing and route of antibiotics, intraop. techniques, wound care	Linear relationship input to output, through phases of care pre-op, intra-op and post-op.	i. Monthly meeting of MDT team analysing and communicating process and outcomes data ii. SSI datasheet – used as checklist and completed by multiple multidisciplinary providers across pre-, intra-, post-operative phases of care iii. Nil
Guilla-mondegui et al 2012 USA	10-hospital regional state collaborative since 2008, with MDT leadership – nurse data abstractor, CEO, surgeon champion - to share data ACS-NSQIP, audit practice patterns to improve patient outcomes	Linear relationship input to output, through phases of care pre-op, intra-op and post-op.	i. Regular meetings with peer review, timing not specified ii. NSQIP database and local audit sheets iii. NSQIP dataset and tools e.g. for hospital costs per adverse event NSQIP return on investment calculator (ROI)

Authors, Year, Country	Research Intervention	Relationships, phases of care i. Linear ii. Non-linear	Communication i. Method ii. Tools iii. Specialised information technology
Hall et al 2017 USA	Frailty assessment pre-operative using Risk Analysis Index (RAI), records of all frail patients reviewed by chief surgeon and based on review MDT - clinicians from surgery, anaesthesia, critical care, palliative care notified, and if indicated perioperative plans modified	Linear relationship input to output, through phases of care pre-op, intra-op and post-op.	i. Regular MDT meetings timing as required by RAI assessment of patient records by chief surgeon ii. RAI iii. No
Huddleston et al 2004 USA	Hospitalist – orthopaedic team co-management - daily patient reviews as needed on sicker patients until the medical condition resolved, contacting local physicians as required, write discharge summaries	Linear relationship input to output, through phase of care post-op.	i. Hospitalists saw patients more than once daily and usually interacted with residents (on 3 monthly rotations) and orthopaedic nurses. 24/7 hospitalists availability to nurses ii. Nil iii. Nil
Iberti et al 2016 USA	Daily MDT rounds with hospitalist, surgery team member, nurses, case manager, allied health, social worker. Hospitalists help to manage preop and postop chronic medical comorbidities, acute medical conditions and postop complications, specialty referrals. Hospitalist hours 0800-1700hours,7days/week, and advise, afterhours senior medical resident	Linear relationship input to output, through phases of care pre-op and post-op.	i. At medical-surgical ward level, daily multidisciplinary ward rounds. At departmental level monthly multidisciplinary meetings to address issues and using quality improvement methodology continually improve service ii. Nil reported iii. Yes, prospective data collection using medical school Patient care Reporting System – primary endpoints being in-hospital mortality, LOS, overall and related 30day readmission rates, pain scores
Jensen et al 2014 Denmark	Standardised preop (2 weeks) home-based exercise program twice daily,to individualised by increasing the number of repetitions and postoperative strength and endurance exercises and progressive post-operative mobilisation	Linear relationship input to output, and phases of care pre-op and post-op.	i. 3 specialist physiotherapists starting 2 weeks pre-surgery. Information, discussion setting mutual goals for mobilisation, exercise training and managing urinary diversion. ii. Written information, patient diary with instruction to record the number of training sessions and exercise repetitions daily iii. Nil

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
Johnston et al 2018 UK	Intervention bundle with 4 components (1) twice daily senior surgeon ward rounds (GIT surgery) (2) a 'chief resident of the week' designation - available on the ward to junior doctors during working hours, (3) an escalation of care protocol and (4) team contact cards	Non-linear, escalation of care for the deteriorating patient - activation as required by junior doctors needing supervision	i. Twice daily ward rounds with senior doctors, chief resident available to ward ii. Escalation of care protocol, team contact cards iii. Nil
Kabata et al 2015 Poland	Intervention in non-malnourished cancer patients – in addition to normal diet - oral nutritional supplements – two bottles/day hypercaloric and 20g protein for 14 days	Linear, pre-op	i. Nutritional assessments two weeks and again one day prior to surgery ii. Nil iii. Nil
Kabrhel et al 2016 USA	Multidisciplinary PERT (pulmonary embolus response team) brought together in real-time to determine and integrate the multiple new approaches and techniques for managing high risk PE	Non-linear, PERT activation as required based on checklist criteria	i. PERT activation as required via a 24 hours telephone number - real-time multi-disciplinary meetings via telephone or email or face-to-face as required ii. Checklist for activation of PERT iii. Electronic medical record (eMR) to review clinical data and progress and radiology images real-time
Liu et al 2017 USA	Multifaceted ERAS program designed with a particular focus on perioperative pain management, mobility, nutrition and patient engagement	Linear relationship input to output, and phases of care pre-op, intraop and post-op.	i. ERAS program implemented in a staggered non-randomised fashion targeting leadership interest, regional ERAS summit inviting all key stakeholders ii. For patients – infographics calendar iii. For patients – informational video series; for staff new eMR data sets (13) order sets to facilitate standardised practice, and performance dashboards to facilitate reviews at multiple levels

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
Lower et al 2013 Norway	Mandatory national surveillance module for surgical site infection (SSI) – annual reporting 3 months (Sept.-Nov) for specific surgeries e.g. cardiac, hip, colon	Linear relationship input to output, and phases of care pre-op, and post-op.	i. Regulation, hospital governance systems, annual conference, and webpage ii. National SSI surveillance protocols and definitions; 25 days post surgery hospital sends patients a customized and personalised follow-up letter based on national template asking for signs of SSI (or phone call with same questions) iii. National computerised system for automated data harvesting
McDonald et al 2018 USA	POSH – MDT engaged patients, families in preop risk assessment and modification – cognition, mobility, functional status, nutrition, hydration, pain, advanced care planning (60-90minutes) including non-surgical options aligning to personal goals. Postop. Daily geriatrician follow-up	Linear relationship input to output, and phases of care pre-op, and post-op.	i. MDT team communication with patient preop and postop daily geriatrician follow-up, co-management with surgeons including preparation for discharge ii. Advance care planning and other tools iii. Nil
Minnella et al 2018 Canada	Intervention is preop. optimisation of exercise and nutrition for median 36 days	Linear relationship input to output, and phases of care pre-op and post-op.	i. Preop. consultation and weekly followup with exercise physician and kinesiologist; and dietician ii. Patient food record log books for exercise and diet iii. Nil
Nelson et al 2016 Canada	ERAS society colorectal guideline – bundle of 22 care elements (pre-intra-post-operative) Table 1 p1095	Linear relationship input to output, and phases of care pre-op, intraop, and post-op.	i. State health service implementation program, ERAS team at two then further four hospitals – lead surgeon, anaesthetist, nurse ii. ERAS colorectal protocol iii. ERAS interactive audit system
Oliver et al 2018 UK	NELA database used to understand variations in mortality – multilevel analysis: hospital, patient, organisational factors	Linear relationship input to output, and phases of care pre-op, intraop and post-op.	i. Nil ii. Nil iii. NELA use of purpose-built patient and hospital data collection platforms, linked with an externally validated national mortality data registry

Authors, Year, Country	Research Intervention	Relationships, phases of care i. Linear ii. Non-linear	Communication i. Method ii. Tools iii. Specialised information technology
Partridge et al 2017 UK	Comprehensive geriatric assessment optimizing physical, psychological, functional and social issues in patients 65 years and older	Linear relationship input to output, and phases of care pre-op, and post-op.	i. Preop. comprehensive geriatric assessment and individualised multi-domain optimisation ii. An 'individualised care plan' was available in the patient's electronic medical record iii. Nil
Peden et al 2019 UK	Key features of EPOCH QI methodology – reframing high patient mortality as a social problem requiring re-organisation of existing care processes rather than technical innovation; Re-organisation of existing care processes to a 37 component interventions complex care pathway	Linear relationship input to output, and phases of care pre-op, intra-op and post-op	i. Re-organisation of existing care processes at 93 NHS hospitals to implement a 37 component interventions complex care pathway supported by EPOCH QI team teaching, facilitating interprofessional teamwork, audit and feedback ii. Multiple tools available to support the 37 component interventions pathway and assess the implementation process iii. Yes, NELA (National emergency laparotomy audit) database and four national registries
Prestmo et al 2015 Norway	Comprehensive geriatric care provided in the geriatrics ward with only the fracture assessment and surgical treatment done by the orthopaedic surgeons	Linear relationship input to output, and phases of care pre-op and post-op.	i. Comprehensive geriatric care ward with internal interdisciplinary ward rounds and communication – doctors, nurses, physiotherapists, occupational therapists ii. National guidelines for orthogeriatric care iii. Nil
Ravikumar et al 2010 USA	Micro level - workflow redesign for dynamic risk stratification coupled with "real-time" risk mitigation in a stratified co-management model for a high risk hospitalised surgical cohort (a) Intensivists (HAWK) and (b) hospitalists (DOVE) rounding and units, (a) SICU -surgical intensive care and (b) PCU - progressive care unit, respectively	Linear and non-linear Linear relationship input to output, through phases of care pre-op, intra-op and post-op. Non-linear, interdisciplinary stratified rounding activation as required based on checklist criteria	i. Comprehensive workflow redesign, multiple forums for multidisciplinary key stakeholder engagement e.g. clinical leadership groups, medical staff meetings, performance improvement committees, Heads of departments, Hospitalists group, Care manager group, individual physicians (over 3 months periods for each organisation) ii. Tools developed e.g. the multidisciplinary rounding tool (MRT) developed to facilitate and standardise ward rounds using specially developed IT software

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
	Meso level – study included multiple hospitals and campuses (including extending to medical patients)		iii. Yes, e.g. specially developed IT programmes to facilitate multidisciplinary tools embedded in electronic health record. Also, wireless communication devices to enhance real-time communication between hospitalists and other clinical stakeholders
Silva et al 2013 Australia	Postoperative physiotherapy – 3 groups – (A) early mobilisation (Day 1), (B) early mobilisation and deep breathing exercises (DBE), (C) delayed mobilisation with DBE	Linear relationship input to output, and phases of care: post-op.	i. Randomised controlled trial in single hospital so participants, other clinicians 'blinded' although some cross-contamination of care observed ii. Standard patient information book iii. No
Story et al 2004 Australia	A critical care qualified nurse reviewed (and clinically responded when needed) high risk patients for the first three days after returning to the general wards from the operating theatres recovery room or intensive care unit.	Linear relationship input to output, and phases of care: post-op.	i. Critical care nurse reviewing high risk postoperative ward patients (vascular, orthopaedic, colorectal) ii. Yes, 11 categories of serious adverse events pre-defined for research iii. No
Symons et al 2013 UK	Observational study, the implicit methodology for identifying process failures is based on the expert opinion of senior surgeons. So that any nonroutine care can be identified rather than adhering to a predetermined list. Study/ patient recruitment was discontinued once content saturation achieved.	Linear relationship input to output, and phases of care: post-op.	i. Ethnographic field notes by academic surgeons (1-2) making observations, documents review, semi-structured interviews with clinical staff on non-routine events on surgical wards from Day 1 postop to discharge home ii. No predetermined check list outlining process failures or adverse events to look for iii. No

Authors, Year, Country	**Research Intervention**	**Relationships, phases of care** i. Linear ii. Non-linear	**Communication** i. Method ii. Tools iii. Specialised information technology
Vester-Andersen et al 2015 Denmark	Intermediate care ward for 48hours continuous monitoring of ECG, SaO2; and q1h BP, RR when awake -for deterioration and escalation of care to ICU level care	Linear relationship input to output, and phases of care: post-op.	i. Daily review by surgeon and intensivist, protocol based discharge by anaesthetist ii. Protocol-based: rounds using a standard form; and discharge note and form iii. Nil
Wick et al 2012 USA	Monthly MDT meetings plus 5 strategies to reduce SSI – science of safety education, staff safety survey (problem and solution), senior executive partnership, structured tool for learning from defects, teamwork and communication tools	Linear relationship input to output, and phases of care pre-op, intra-op and post-op.	i. Monthly MDT meetings, for education and learning - local experts and subgroup project teams - to improve systems ii. Yes, multiple structured tools for learning from defects, teamwork and communication iii. Yes, ACS NSQIP; high risk pilot for all consecutive patients (rather than routine random sampling) for SSI (super, deep, organ space) and patient comorbidities

Table 2.3_SLR Research intervention mediators, primary outcome, other outcomes

Authors, Year, Country	**Intervention mediators** i. Moderators ii. Feedback loops	**Primary outcome**	**Other outcomes**
Barakat et al UK 2016	i. National quality program / pathway; gym instructors ii. Clinical feedback including CPET, biomarkers	Postoperative cardiac, pulmonary and renal complications – less in intervention group 14 patients compared with 26 in non-exercise group (p=0.02)	Median LOS was 1 day shorter for intervention group (p=0.025). No difference in HDU LOS, postop bleeding requiring transfusion over 4U, need for reoperation. 30-days mortality - two patients in each group died.
Barberan-Garcia et al 2018 Spain	i. Personalised prehabilitation program ii. Yes, multiple (self and facilitator)	Reduced number of patients with postop complications by 51% (RR 0.5, 95% CI 0-3-0.8 p=0.001) and rate of complications 1.4 (1.6) and 0.5 (1.0) cf. controls p=0.001	Lower mean number of complications per patient; reduced LOS ICU 3 days (vs 20 days) for intervention p=0.046. No effect on quality of life.
Bellomo et al 2004 Australia	i. Nil ii. Nil	Incidence of serious adverse events relative risk reduction 57.8%, p<0.0001 and death relative risk reduction 36.6%, p=0.017	Emergency ICU admissions relative risk reduction 44.4%, p<0.001.Significant decreases in respiratory failure, stroke, severe sepsis, acute renal failure Decreased LOS 23.8days to 19.8days, p=0.0092
Bellomo et al 2005 Australia	i. Yes, ICU consultant ii. Nil	Introduction of HDU failed to reduce incidence of postop serious adverse events, mortality and hospital LOS	Associated with marked increase in unscheduled surgery and pulmonary oedema and reintubation
Berggren et al 2019 Sweden	iii. Nil iv. Yes, regular meeting on patients' goals	No significant difference between groups in outcomes, complications, falls, readmissions, days spent in hospital post-discharge up to 12 months follow-up	Some evidence (although not strong) that patients with dementia can benefit from conventional geriatric hip fracture care and rehabilitation
Bhatt et al 2017 Ireland	i. Nil ii. Nil	Reduced incidence respiratory tract infection (CXR diagnosis, increased temperature, white cells, productive cough, antibiotics): 16.6% to 43.3% (p=0.024). DVT/PE– none in groups	Subjective breathlessness – less in intervention group on Day 4 postoperative (p=0.002) LOS reduced 8.5 +/- 5 days compared with 11 +/- 7.5 days (p=0.049)

Authors, Year, Country	**Intervention mediators** i. Moderators ii. Feedback loops	**Primary outcome**	**Other outcomes**
Boden et al 2017 Australia	i. Nil ii. Nil	Postoperative pulmonary complications incidence halved (p=0.001), absolute risk reduction 15%, number needed to treat 7 – including hospital acquired pneumonia	No significant difference in other secondary outcomes – LOS, ICU utilisation, hospital costs, patient reported quality of life, physical function, post-discharge complications 6 weeks, mortality 12months
Chen et al 2017 Taiwan	i. mHELP nurse tracked daily adherence to 3 protocols ii. Nil	Postop delirium occurred in 6.6% in mHELP group, 15.1% in control group; relative risk 0.44. Shorter median LOS mHELP group 12days, 14days in control group (p=0.04)	Cost-benefit analysis – mHELP nurse daily application of protocols 30minutes per patient, for a median of 7days (interquartile range 6-10days) for 2days LOS savings. Participants and family care givers reports on care positive
Chiwera et al 2018 United Kingdom	i. Yes ii. Yes	Overall cardiac surgery SSI fell from 6.5% (2009) to 1.2% (2016) (p<0.001)	An established SSI detailed investigation protocol. SSI rates of Trust now lower than Public Hospitals Egland rates.
Cima et al 2012 USA	i. Yes ii. Yes	Pre-intervention SSI rate 9.8%, one year after intervention overall SSI 4% (p<0.05), no change organ space SSI 2.6% (p=0.1)	Subsequent to initial reductions in SSI no change to SSI rate, benefits sustained
Cull et al 2013 USA	i. No ii. Yes	Surveys of surgeons found the service improved personal productivity and time management, and LOS 100%; Timeliness and overall quality of patient care, patient satisfaction and resource utilisation (88%), and resident training, education and supervision somewhat (67%)	Daily feedback (surgeon to surgeon) to the primary surgeon about the status of his patients and offers guidance from the primary surgeon to the patient management plan
De Vries et al 2010 The Netherlands	i. Yes, quality control officer as part of the project team ii. Yes	Total number of complications decreased from 27.3 to 16.7 per 100 patients. Decrease in-hospital mortality, second procedure required, temporary disability,	There was a difference amongst the hospitals with the effect of the checklist. Hospitals above compared to below median checklist compliance had 7.1 to 18.8 per 100 patients, complication rate

Authors, Year, Country	**Intervention mediators** i. Moderators ii. Feedback loops	**Primary outcome**	**Other outcomes**
Duclos et al 2016 France	i. No ii. No	Predetermined major adverse events during surgery or postoperative hospital stay or to 30 days post-discharge - No difference between trial arms	Nil
Eliott et al 2008 Australia	i. No ii. Yes, patient's clinical condition and MDT referrals	ICU step down days decreased by 48% (71 to 37 days, p<0.001); patient group readmitted to ICU there was a 1 day (25%) decrease ICU LOS a trend towards decreased mortality in ICU (18% to 16%) and hospital (35% to 26%)	No change in median ICU LOS (2.2 to 2.1 days), median hospital LOS (12 to 11.5 days) or ICU (15 to 14%) or hospital (23 to 22%) mortality
Fan et al 2016 USA	iii. No iv. No	9 out of 12 dimensions of surgical unit safety culture associated with colon SSIs	Teamwork across units, organisational learning, feedback and communication about error, overall perception of safety, management support for patient safety, teamwork within units, communication openness, manager's expectations, non-punitive response to error - frequency of events reported
Gorgun et al 2018 USA	i. Yes, ACS-NSQIP national benchmarking found this a high outlier hospital for SSIs and offered education and improvement support ii. Yes, monthly review	SSI within 30days of index operation Pre-bundle 11.8% to 6.6% Bundle period (p< 0.001) for all type SSI, with a significant reduction in organ space infections 5.5% to 1.7%; p< 0.001	Compliance process measures reported for bundle interventions. Surprisingly, other associated outcomes not reported e.g. decrease LOS, unplanned return to theatre, sepsis, delirium, organ dysfunction, unplanned critical care admission, 30 days readmission
Guilla- mondegui et al 2012 USA	i. Yes, ACS NSQIP data ii. Yes, regional 10-hospitals collaborative sharing data and auditing feedback patterns	Postoperative complications (any of the 21 postoperative events as defined by NSQIP) – significant improvement in prosthesis/graft/ flap failure (-60%,p<0.0001), wound disruption (-34%, p0.011), acute renal failure (-25%, p=0.023), ventilation > 48hours (-15%,p=0.012)	30day mortality – no significant difference between two period. Net hospital costs avoided between periods were calculated as $2,197,543 per 10,000 general and vascular surgery cases Maybe cost neutral by minimising adverse events

Authors, Year, Country	Intervention mediators i. Moderators ii. Feedback loops	Primary outcome	Other outcomes
Hall et al 2017 USA	i. Yes ii. Yes	Decreased 30 day Mortality from 1.6% to 0.7% for all patients, but most for frail patients 12.2% to 3.8%, and the magnitude of improvement increased at 6 months and 1 year for frail patients (although not at 30 days)	Feasibility of facility wide frailty screening using RA in elective surgery patients, MDT review and optimisation of perioperative plans e.g frailty-specific anaesthetic plans, clarified goals of care and improved postoperative management.
Huddleston et al 2004 USA	i. Nil ii. Nil	Perioperative medical morbidity (categorised a priori) – more patients in Hospitalist group discharged with no complications (61.5% vs 49.8%). LOS – no difference between groups	Patient satisfaction – no difference. Surgeons and nurses strongly preferred Hospitalist model. Costs of hospital care - same, physician costs higher in Hospitalist group
Iberti et al 2016 USA	i. Monthly MDT meetings for quality improvement ii. Nil	With co-management patient complications decreased from 3.5 to 2.2 events/1000 patients (p=0.045) Mortality decreased from 2% to 1% (p=0.049) Risk adjusted observed to expected mortality rate ratio 1.22 to 0.53 (p=0.01)	No difference in risk-adjusted LOS (5-6 days). 30day readmission rate unchanged (20%) Nurses found improvements in co-management plans, the hospitalists were easier to contact, patient's clinical issues readily addressed e.g. more effective pain management
Jensen et al 2014 Denmark	i. Yes, exercise repetitions individualised ii. In hospital follow-up and at 1 week to ensure programme adherence	LOS same for both new intervention and control standard group - 8 days (p=0.68)	90 days complications number and severity equal between groups for mortality, 30 days readmission (23%/30%), major complications. Challenge physical rehabilitation did not harm patients.
Johnston et al 2018 UK	i. Nil ii. Nil	Surveys of junior and senior doctors indicate significant improvement post-intervention of supervision, senior surgeon approachability, and safety culture; confirmed by interviews findings.	No difference in patient mortality, cardiac arrest, reoperation or readmission rates pre-and post- intervention
Kabata et al 2015 Poland	i. Nil ii. Nil	Control group suffered significantly higher postoperative serious complications 11 versus 5 (p<0.001)	Higher incidence of anastomotic leak and evisceration in control group

Authors, Year, Country	Intervention mediators i. Moderators ii. Feedback loops	Primary outcome	Other outcomes
Kabrhel et al 2016 USA	i. Yes, cumulative clinical, process and outcomes data analysed six 6monthly, MDT five times ii. Yes, real-time collaborative feedback	In 30months, 394 PERT activations, 80% were confirmed PE, 46% sub-massive, 26% massive PE. 69% were treated with anticoagulation alone, 11% had systemic or catheter-directed thrombolysis.	All-cause 30days mortality for PERT patients with confirmed PE 12%, massive PE 24%. PERT rapidly adopted, activations increased by 16% at each 6 months review. Bleeding complications were rare overall.
Liu et al 2017 USA	i. Yes, private integrated system driven project ii. Yes, surveillance and feedback loops	LOS significantly lower in ERAS groups	Postoperative complication rates for high risk surgery significantly lower in ERAS groups; rate ratios for CR 0.65, EHF 0.64 (p <0.05). ERAS CR decreased hospital mortality 0.17 (p<0.05) and EHF increased rate of home discharge1.24 (p<0.05)
Lower et al 2013 Norway	i. Yes, national integrated system driven project ii. Yes, surveillance, feedback loops	Within 5 years, 95% hospital participation (52/55) with 65% submitting voluntary data also, 23.3% data has at least 1 missing value. 30 days follow-up 90.7% (19,747/21,772 procedures)	81% of infections (765/948) detected after discharge from hospital
McDonald et al 2018 USA	i. Nil ii. Nil	Lower median LOS 4 days vs 6 days p < 0.01 Lower Readmission rates 7-days 3% vs 10% p=0.07; 30-days 8%vs 18% p=0.04 Discharge disposition – discharged home to self-care 62% vs 51% p=0.04	Higher rates Delerium 28% vs 6% p<0.01 Other major complication
Minnella et al 2018 Canada	i. Initial consultation with physician, dietician and then ii. Weekly follow-up	Prehab group had better functional capacity before and after surgery for 6MWD p<0.001	No between group difference in number and severity of complications, LOS, readmission rates
Nelson et al 2016 Canada	i. State health service and ii. Hospitals implementing teams	Median overall compliance 39% vs 60% in post ERAS patients. Reduced Median LOS 6 days vs 4.5 days p<0.0001	Complication rate 11.7% decrease post-ERAS p=0.0139. Net cost saving per patient between $2806-5989 USD

Authors, Year, Country	Intervention mediators i. Moderators ii. Feedback loops	Primary outcome	Other outcomes
Oliver et al 2018 UK	i. Nil ii. Nil	Between-hospital mortality variation significant. Patients managed with perioperative care pathways and emergency surgical units had better outcomes	Postoperative geriatric medicine for patients 70 years had substantially lower mortality.
Partridge et al UK 2017	i. Nil ii. Nil	Comprehensive geriatric preop assessment and optimisation had shorter LOS, 3.3 vs 5.5 days, p<0.001	Lower rate of complications (delirium, cardiac, bladder, bowel), less likely to be discharged to a higher level of dependency 4/85 vs 12/91, p=0.05 and lower readmission rates
Peden et al 2019 UK	i. Yes, National QI programme ii. Yes, extensive EPOCH QI team	All-cause mortality within 90 days post-surgery: 1210 (16%) usual care group, 1393 (16%) QI group – no survival benefit was observed from this QI programme	No beneficial effects for mortality within 180 days post-surgery; LOS after surgery; hospital readmissions 180 days post-surgery. Plus 10 process measures – wide variation in intervention fidelity between hospitals
Prestmo et al 2015 Norway	i. Yes, National orthogeriatric care guidelines ii. Nil	Mobility measured by Short Physical Performance Battery (SPPB) – standing balance, walking speed, ability to rise from chair – assessed 4 months post-surgery for the fracture – analysed as intention to treat. Mobility and independence, quality of life, fear of falling - comprehensive geriatric ward care had better outcomes	Fewer admissions to short-term nursing home care. For dementia rating scale and depression scale - no significant difference. Staff numbers and LOS higher in comprehensive geriatrics ward. Index hospital stay more costly but total cost of care per patient including QALYs no significant cost difference
Ravikumar et al 2010 USA	i. Yes, SCoC is a moderating model ii. Yes, multilevel feedback loops including stratified co-management	Mortality – Pre (1.3-1.5%) Post (0.9-1.1%) = 25% reduction, progressive decline trending over 7 years period (p<0.02). Progressive decrease LOS in SICU, PCU, hospital SICU/PCU – less ICU beds needed, transferred to less resource intensive PCU	No adverse impact on re-admission rates. Reduction in overall costs for top diagnostic related groups (DRGs) and variable costs (radiology, blood bank, pharmacy, nursing)

Authors, Year, Country	**Intervention mediators** i. Moderators ii. Feedback loops	**Primary outcome**	**Other outcomes**
Silva et al 2013 Australia	i. No ii. No	Mobility alone can reduce the risk of PPC following high risk abdominal surgery without deep breathing exercises (DBE). PPCs tended to be diagnosed on Day 1 postop, the patients who developed after Day 2 PPC tended to be secondary or associated with other postop complications anastomotic leak, delirium, cardiac, pulmonary oedema, gastrointestinal issues	Delayed mobilisation increased physiotherapy input and the number of days until discharge from physiotherapy. LOS greater in groups with addition of DBE (mean 16.7 SD 9.7 days) and delayed mobilisation (mean 15.2 SD 9.8 days) compared with early mobilisation alone (mean 10.7 SD 5 days)
Story et al 2004 Australia	i. Yes, CCO nurse review high risk patients (and initiating or escalating care) ii. Yes	Serious adverse events: Myocardial infarction rates per 100 patients: 4 vs 7 in surveillance and intervention phases, respectively. Other 10 serious events per 100 patients: 19 vs 11.	30-day mortality was 9% and 7% in the surveillance and intervention phases (a non-significant decrease) The number of MET calls increased from 17 to 25 per 100 patients
Symons et al 2013 UK	i. No ii. No	A total of 256 process failures were identified, of which 85% were preventable, 51% led to direct patient harm. Process failures accounted for 57% of all preventable adverse events; communication failure and delays were the main causes leading to 54% failures	The most frequent process failures - medication prescribing and administration, the management of lines, tubes, drains and pain control interventions
Vester-Andersen et al 2015 Denmark	i. Nil ii. Nil	Postop. Intermediate care had no statistically significant effect on 30-days mortality after emergency abdominal surgery in high risk patients	No effect on secondary outcomes. Trial was stopped due to slow recruitment and much lower than expected effect on mortality
Wick et al 2012 USA	i. Yes, hospital executive administrator to address institutional barriers ii. Yes, team coach to facilitate MDT meetings, monthly review of unit - level safety data and manage improvement projects	12 months Pre-CUSP SSI rate 27.3% (76/ 278 patients), after commencement of CUSP next 12 months 18.2% (59/324 patients) – a 33% decrease (95% CI, 9-58%, $p<0.05$)	36 interdisciplinary participants (from all phases of care) identified 95 areas of process concerns for SSI Process compliance for SCIP (surgical care improvement project) remained similar for pre- and post- intervention groups

Table 2.4_SLR Research limitations of study, conclusions, recommendations

Authors, Year, Country	**Recommendations**	**Conclusions**	**Limitations of study**
Barakat et al 2016 UK	An exercise program should be considered in all patients before AAA repair. Compliance with the program was associated with superior outcomes, and perhaps this knowledge will promote patient uptake and adherence to the program	Preoperative exercise program before AAA repair is safe and effective in reducing postoperative complications	Single centre study, patient and researcher blinding not possible, participation bias, over one-third of patients approached declined to participate, 11 patients in intervention group did not attend gym at all; not a cost-effectiveness study
Barberan-Garcia et al 2018 Spain	Should be a core intervention in the pre-op. setting. Cost-effectiveness studies, reimbursement strategies, business models for sustainability needed. Info-Communication-Technologies (ICT) should be explored	Prehabilitation is safe in high-risk patients and effective in protecting against postop complications in high risk patients having major abdominal surgery	Single centre study, not double-blinded but clinicians collecting data were blinded, resource intensive despite comprehensive preoperative preparation program as control
Bellomo et al 2004 Australia	Important improvement in patient outcomes and LOS. Cluster randomised controlled trial in a variety of hospital and geographic settings to prove efficacy of intervention	Introduction of an ICU based MET reduced incidence of adverse events after major surgery, death and LOS	Single centre study makes RCT unethical (and difficult due to possible contamination of control arm). Limitations of a before and after study
Bellomo et al 2005 Australia	Cluster randomised controlled trial (where hospitals and not patients) are randomised. However such study would pose considerable organisational challenges	Introduction of a 4 bed ICU not associated with a beneficial effect on reducing serious complications after major surgery but increased incidence pulmonary oedema, resp.failure	Single centre study. Could not explain negative result although several contextual factors postulated and related to existing literature
Berggren et al 2019 Sweden	Complication rates unacceptably high so future research interventions need to be more comprehensive.	Geriatric interdisciplinary home rehabilitation did not result in better outcomes up to 12 months compared to conventional geriatric care and rehabilitation	Difficulties with randomisation in a single institution study.

Authors, Year, Country	**Recommendations**	**Conclusions**	**Limitations of study**
Bhatt et al 2017 Ireland	Further large scale randomised studies required. Physiological and endurance benefits of postoperative respiratory rehabilitation may thus be considered for ERAS.	Early moderate aerobic activity with feet pedal exerciser halves respiratory complications and reduces LOS	Case-control study, no randomisation so potential for observer bias Single site study, small sample numbers
Boden et al 2017 Australia	Further research on: Other physiotherapy interventions (e.g. preop. inspiratory muscles conditioning) particularly targeting high risk patients. The effect gradient according to experience level; Halving PPC association stronger where an experienced physiotherapist provided the education.	A single face-to-face physiotherapy education and training session provided within 6 weeks of surgery halved the incidence of postoperative pulmonary complications including hospital acquired pneumonia after major abdominal surgery compared with information booklet alone	No associated LOS reduction – paradox may be due to inadequate sample numbers or that other observational studies have not adjusted for surgery complexity, age, comorbidities. Factors limiting generalisability: non-English speaking patients excluded, hospitals in developed Western countries, and unequal distribution-(large proportion in one hospital)
Chen et al 2017 Taiwan	Daily application and adherence to protocols critical Cluster randomized clinical trial inefficient compared with individual randomisation; used to blind staff and avoid cross contamination of protocol if room mixed with mHELP and control group patients	For patients 65 years and older undergoing major abdominal surgery mHELP intervention reduced delirium by 56% and LOS by 2 days	Single centre randomised control trial, cross contamination of control arm. Mechanism(s) of 4 intervention effects unknown but postulated. Usual care did not include ERAS, this may enlarge positive outcomes and/or effect transferability
Chiwera et al 2018 United Kingdom	The use of multidisciplinary collaboration reduces the burden of data collection for SSI surveillance teams and enhances infection control audits and timely feedback. Potential practice concerns can be positively addressed as part of continuous quality improvement	Comprehensive evidence-based infection control practices were successfully implemented through SSI surveillance leadership and a multidisciplinary collaborative approach	Unclear which elements of intervention bundle improved outcomes Beyond SSI rates, no reporting on expected associated outcomes of importance e.g. reduction in LOS, morbidity, 30 days readmission. No cost-benefit analysis. Did not pursue post-discharge from hospital SSI rates

Authors, Year, Country	Recommendations	Conclusions	Limitations of study
Cima et al 2012 USA	Using a Lean Six Sigma (LSS) approach a multidisciplinary team was able to develop a number of context specific interventions across the entire surgical episode of care. Prior to and post the LSS approach, other interventions had no effect on reducing SSI rate.	Using ACS NSQIP outcomes and LSS methodology a colorectal SSI reduction bundle across all phases of care resulted in significant and sustained SSI reduction	Single hospital surgical subspecialty limits transferability Unclear which elements of intervention bundle improved outcomes Beyond SSI rates, no reporting on expected associated outcomes of importance. No cost-benefit analysis
Cull et al 2013 USA	Elements of this model of care may be applicable to other subspecialty surgical settings	Vascular senior surgeon as hospitalist model improved surgeon satisfaction level, timeliness of patient care, interdisciplinary communication, resident teaching	Generalisability to smaller vascular unit (8 surgeons or less) may be difficult Residents could not compare the service before and after due to no experience of past service.
De Vries et al 2010 The Netherlands	Improved outcomes explained by a number of mechanisms – checklist designed to incorporate all existing protocols and checks in order to provide a comprehensive framework for the complete surgical pathway, minimise information loss during transfers from one stage of the pathway to the next and promote interdisciplinary communication.	In hospitals with “a high baseline standard of care” providing a blueprint checklist for the ideal situation, the system reveals safety risks and triggers improvements in all stages of the surgical pathway. However, when substantial improvement in patient safety is desired merely developing and enforcing a checklist will not suffice. A “culture of safety” is required in the organisation.	Documentation of complications limited to in-hospital period; Under-estimated compliance rate only monitored in a sample of patients in whom the checklist was implemented. Concomitant change in hospitals during study period – this included new prospective documentation of complications during hospital stay with a daily plenary meeting at which staff discuss all complications for patients being discharged
Duclos et al 2016 France	Cluster randomised trial is a rigorous study of an intervention proven in an aviation setting however inability to show an impact does lead to questions – was the intervention inherently ineffective, inadequately applied or applied in inappropriate context? E.g. no feedback, follow-up coaching so inadequate intervention for behaviour change	No difference in trial arms in reducing major adverse surgical events with team training and checklist. Successful implementation requires adaptation to the surgical context Linking intraoperative education with major adverse outcomes intra- and postop may be too ambitious a causal association	Lack of support from local leadership and administrators led to participant non-attendance Staff attitudes to the surgical safety checklist may have devalued the education intervention No research methods beyond numerical outcome measures e.g. survey for staff attitudes

Authors, Year, Country	**Recommendations**	**Conclusions**	**Limitations of study**
Eliott et al 2008 Australia	For resourcing an important local evaluation to confirm feasibility and generalisability of the benefits of an ICU liaison nurse service and ascertain the return on investment. Contextual variables included the tasks and responsibilities, ward skill mix and organisational structure.	ICU liaison nurse service associated with increased ICU efficiency of throughput and improved survival of ICU patients requiring readmission but overall ICU and hospital LOS and ICU readmission rates unchanged	Single site study. Study not powered to detect differences in ICU readmission group. Before and after design did not permit cause and effect relationships to be established. Other potential qualitative benefits not reported e.g. teamwork and support
Fan et al 2016 USA	Larger scale study in larger hospitals, more detailed analysis of other factors affecting SSI needed.	There is an important role for positive safety and teamwork culture and engaged hospital management to reduce surgical complications	Possible inadequate representation of provider types (postoperative and outpatient) or numbers (43% response rate survey bias). Smaller community hospitals may not generalise to larger units.
Gorgun et al 2018 USA	Benchmarking and education -previously an outlier hospital for SSIs, improvement from multifaceted initiatives with multiple team members across all perioperative phases and comprehensive data use and feedback	Enduring collaborative efforts of multiple interdisciplinary providers are critical to achieving a sustained reduction in SSIs	Unable to predict the specific contribution the constituent bundle intervention. Beyond SSI rates, no reporting on expected associated outcomes of importance No cost-benefit analysis
Guilla-mondegui et al 2012 USA	State collaborative of 10-hospitals allowed organisation scrutiny of patient outcomes data, frank peer communication (without institutional retribution) as best practice is identified and shared and standardised practices adopted.	Developing a state regional collaborative that allows outcome data sharing and peer discussion (without institutional retribution) may have led to some of the patient outcome successes found	The main limitation of this study is that the reasons for the improved outcomes is not readily obvious and are likely to be multifactorial. Participation in a quality improvement program may initially have a Hawthorne effect
Huddleston Et al 2004 USA	Additional research on the clinical and economic impact of the hospitalist model in other surgical populations is warranted	Hospitalist-Orthopaedic team co-management for higher risk orthopaedic patients reduced minor postoperative complication rates	Sample number did not have power to detect severe morbidity or mortality Single institution study limits generalisability

Authors, Year, Country	Recommendations	Conclusions	Limitations of study
Iberti et al 2016 USA	Hospitalists-surgery co-management dependent on selecting complex high-risk patients,clear protocols delineating responsibilities, ensuring a collaborative relationships among participants	After 2 years implementation hospitalist-vascular surgeon co-management reduced complications, mortality and pain scores	De-identified data collection limited analysis of specific populations or associations demonstrated benefits. Unsure of effects of concurrent hospital wide quality improvement activities
Jensen et al 2014 Denmark	Encouraging patients and care providers to adopt a proactive physical functional approach with prehabilitation and immediate post-surgery mobilisation is believed to result in various clinical benefits. Alternative parameters for assessing early physical functional recovery may be more appropriate e.g. ability to independently perform personal activities of daily living e.g. 6 self-care skills	Whilst a RCT study is the gold standard evaluation, blinding of fast-track pathways in clinical practice is difficult, the authors find some intervention components may have transferred, incorporated over time to the control group. Other context factors confounders included 30% intervention group lived alone.	No difference in outcomes thought due to fast track pathways already well implemented in the department including immediately preceding period where - the introduction of less invasive surgical technique, anaesthesia, pain management had decreased LOS 11 to 8 days No cost-benefit analysis for new physiotherapist-led intervention
Johnston et al 2018 UK	Further work on correlating improving supervision with the intervention bundle and the impact on patient outcomes needed. If positive, implement roll out of the intervention to other hospitals	Simple measures such as increased senior support – twice daily ward rounds and chief resident allocated to ward, clear escalation of care protocol with contact numbers of senior surgeons can improve supervision and decrease time to senior help reaching the deteriorating patient	Single-centre study with small sample limits generalisability Database used for patient outcomes did not allow for case-mix adjustments making outcomes findings difficult to interpret
Kabata et al 2015 Poland	Preoperative nutritional support with no immunomodulation should be given to non-malnourished patients with abdominal and gastrointestinal cancer for 14 days pre-surgery	Preoperative nutritional support for non-malnourished patients with abdominal and gastrointestinal cancer reduces the incidence of serious complications, anastomotic dehiscence and leakage	Single centre study Nutrition intervention stressed, limited detail into team context of care No cost-effectiveness analysis

Authors, Year, Country	**Recommendations**	**Conclusions**	**Limitations of study**
Kabrhel et al 2016 USA	Treatment options for patients with massive and sub-massive PE have rapidly expanded recently, there is little comparative research data and therapeutic decision making is complex and dependent on multiple specialists' experience and expertise. PERT allows real-time unbiased assessment of a patient, open discussion, and collective learning.	The PERT approach to collaborative multi-specialist decision making on treatment options for PE rapidly adopted and sustained over 30months. Consensus usually easily obtained, in few cases when clinicians disagree shared decision making with the patient and family useful.	Not a prospective clinical trial comparing treatment options eMR used for data collection so completeness dependent on eMR data entry. (Although as a prospective study attempts were made to fill in necessary clinical information real-time) No cost-benefit analysis
Liu et al 2017 USA	Practice change for two heterogenous populations – elective colorectal and emergency hip fracture patients; before ERAS care processes differed significantly. Study showed effectiveness of a systems level approach to ERAS implementation even across widely divergent target populations	Rapid, large scale implementation of a multidisciplinary ERAS program is feasible and effective in improving patient outcomes	Highly integrated private healthcare system, may not be generalisable Not a randomised control trial, bias in staggered implementation, no direct comparison group, incomplete complications data, no long-term outcomes such as functional and cognitive recovery beyond 30 days
Lower et al 2013 Norway	Important success factors are mandatory system, automated data harvesting system in hospitals and active post-discharge surveillance	Implementation of SSI surveillance system successful in hospitals participation, completeness of data and 30 days followup	Database review only, no information on use of data by clinicians for quality improvement
McDonald et al 2018 USA	Need to capture high quality data in clinical settings and refining analysis to determine which elements of team-based care has the highest impact in this complex interdisciplinary collaborative program	Compared with control group, older adults participating in POSH had shorter LOS, lower 7 days and 30 days readmission rates, more likely to be discharged to home care, less complications except higher delerium	Single centre study, POSH patients accrued during a longer time than control group; more laparoscopic surgery in POSH group Unable to determine which elements in a complex intervention had most impact. No cost analysis
Minnella et al 2018 Canada	Structured physical and nutritional preoperative conditioning is feasible, safe and efficacious for preventing functional impairment before and after oesophageal cancer surgery. Functional outcome should be core perioperative outcome	Prehab resulted in perioperative functional improvement for patients undergoing surgery for oesophageal cancer (where poor physical fitness and malnutrition are prevailing conditions secondary to the cancer)	Single centre study. Small sample size precluded testing of secondary outcomes, complications. Variability in neoadjuvant treatment on functional status. Potential selection bias in patients who declined to be in the study - start a physical intervention

Authors, Year, Country	Recommendations	Conclusions	Limitations of study
Nelson et al 2016 Canada	Lowest compliance in postoperative care elements showing greatest area for practice change. Future work to focus on enablers and barriers to implementation in large healthcare systems	ERAS colorectal guideline implementation across a healthcare system has improved patient outcomes, similar to standalone single centre implementation	Eligible patients of surgeons that did not participate in the ERAS protocol were not analysed. In future this will be done using administrative data
Oliver et al 2018 UK	The findings represent opportunities to substantially improve survival in this high-risk population after emergency laparotomy. The greatest benefit being in large subgroup of older people, of which around 25% die within 90 days	Low technology structures (periop. care pathways, emergency surgical units) and processes (consultant-delivered intraoperative care and postoperative geriatrician review) were associated with improved survival	NELA database – restricted set of processes, remote access to data - determined in part by coding, self-reporting, missing data, potential regional variation in risk factor weighting
Partridge et al 2017 UK	Recommend economic evaluation, better understanding of mechanisms underlying observed improvement in LOS, and larger scale evaluation of the intervention – using implementation science	Patients 65 years and older undergoing major vascular surgery having comprehensive geriatric assessment was associated with reduced LOS, complications, readmissions and discharge to a higher level of dependency	Single centre study, between group contamination possible. Data collection secondary to input by hospital administrative staff and junior rotating doctors. Primary entries may be incomplete. No economic evaluation
Peden et al 2019 UK	Future national complex care pathway QI programmes should implement fewer, more discrete changes and ensure leadership teams have adequate time to achieve sustained improvements in patient care	Context can be a crucial factor in the success or failure of QI programmes Undue emphasis on success stories from small early studies might lead QI experts to underestimate the requirements for successful QI interventions.	The findings show that the context of QI is far more complex than previously thought, especially in large national programmes. There was good engagement with the QI programme but local staff had limited time and resources to implement change. There was a wide variations in intervention fidelity between hospitals, with differences in components of processes that teams tried to change, the rate of change and eventual success. No cost analysis

Authors, Year, Country	Recommendations	Conclusions	Limitations of study
Prestmo et al 2015 Norway	Treatment of older patients with hip fractures should be organised as orthogeriatric care in the acute geriatrics ward where all assessments and treatments except surgery are provided by an interdisciplinary team, focusing on long term results	Immediate admission of patients aged 70years and older with a hip fracture to a comprehensive geriatric care in a dedicated ward improved mobility and functionality at 4 months and for at least 1 year after surgery	Single centre study limits transferability Masking of patients, staff and assessors not possible and may have affected performance-based tests and questionnaires
Ravikumar et al 2010 USA	For successful implementation – (a) staffing model flexibility (b) need for leadership approval and buy-in from all constituencies through individual and group discussions throughout implementation (c) education and team building across all stakeholders (d) periodic feedback communication at hospital wide meetings (e) demonstration to surgeons using data and otherwise that their 'ownership' of patients and referral relationships are not abrogated by medical co-management	Quality improvement program - Surgical continuum of care model adaptable across three hospitals in an integrated health system (and also applicable to other patient cohorts)	Longitudinal study, secular trend, not controlled, a confounding variable so linking the effects of interventions to mortality should be done with caution (institute of Healthcare Improvement – IHI advice)
Silva et al 2013 Australia	Frequency of treatment – postoperative physiotherapy – has resource and cost implications. Delayed mobilisation tended to require increase physiotherapy input and other hospital resources to achieve the same outcome	The addition of deep breathing exercises (DBE) to physiotherapist directed early mobilisation did not reduce PPC compared with mobilisation alone. PPCs can be reduced by a once daily physiotherapy if the patients are mobilised to a moderate level of exertion	Small sample numbers – outcomes may have been affected by PPC associated with other complications named e.g. anastomotic leak, cardiac etc. Single centre study – randomised cluster, controlled study is affected by unintentional and intentional bias with respect to masking of participants, carers, research assessors; cross contamination of care e.g. DBE encouraged by nurses, doctors

Authors, Year, Country	Recommendations	Conclusions	Limitations of study
Story et al 2004 Australia	Reluctance to use medical emergency team (MET) may be due to failure in recognising clinical deterioration and/or a reluctance to call the MET A multi-site randomised clinical trial is recommended	Critical care outreach may have led to greater detection of myocardial infarctions whilst reducing the incidence of other serious events	Research funding for 18 months, research intervention on weekdays, data collection and analysis was unblinded. Qualitative data e.g. changes in attitudes of general ward staff nurse and doctors, impact of holidays and changeover of junior medical staff not studied.
Symons et al 2013 UK	Process failures frequently become the background against which surgeons work, particularly if there is no direct harm to the patient. A methodology has been developed to investigate postoperative ward care and provides a baseline measurement of process failures	Process failures are common in postoperative care, are highly preventable and frequently cause harm to patients. Interventions to prevent process failures will improve the reliability of surgical postoperative care and reduce resource wastage.	Single centre study, results may not be representative of other units Observational studies such as this require significant resources to perform (dedicated time for team of senior surgeon observers). Observational studies can be distorted by the Hawthorne effect
Vester-Andersen et al 2015 Denmark	A future trial should enrol at least 2000 patients and participating sites should guarantee available beds for the intermediate care intervention to be actualised in a real-world context with limited discontinuation of research beds	Postoperative intermediate care had no significant effect on 30 day mortality due to logistics issues in the hospitals. However, the InCare research design is feasible with adjustments – guarantee of available beds, sample number 2000 patients (not 400)	Trial terminated at 73% recruitment due to interim analysis showing low overall mortality. Trial thus not powered to show a relative risk reduction No guaranteed beds for the research intervention across the seven hospitals, no dedicated research funding
Wick et al 2012 USA	Increasingly SSI and readmissions are being used as a quality metric in surgical care by payers. Formation of small groups of front-line providers to address patient harm using local wisdom and local evidence and feedback can improve patient safety Additional research is required to develop the efficacy of this approach in other patient populations and in other hospitals	Implementation of CUSP combined with a best practice multidisciplinary approach and feedback of performance was associated with a significant reduction (33%) in SSI	Single centre study, select high risk group (colorectal) results may not be representative. Not a randomised design so cannot establish causation. Not able to evaluate the contribution of each element of a bundled approach. Postintervention research period only 12 months so long term sustainability unknown Burden of data collection and limited resources

Appendix 4: Perioperative study tools

Protocol Title: **Evaluating Perioperative policy for dynamic capability and capacity**

Perioperative Study Tools

Background

Extensive literature review informs the 5 research questions of our study. We are using 7 research methods. We are presenting the methods in 2 groups. We will be using the first group (A1-A5) on staff in 4 hospitals in 1 local health district (LHD). The second group (B1 and B2) will apply to the LHD and its related policy from the Ministry of Health (MOH) or adapted from the MOH, and other. Study tools A1-A4 will be applied concurrently with B1, followed by the group reflective interviews first, A5 at each of the 4 hospitals and then B2 at the LHD.

Group 1 Research Methods – PERIOPERATIVE SITE AUDIT TOOL

The perioperative site audit tool is designed for efficiently collecting information about each hospital's case-mix, structures, processes and outcomes, their perioperative service resources and the documents they use to facilitate this work.

A1. Perioperative Site Audit Sheet

A2. Document collection checklist

A3. Field interviews – Question sheet

A4. Staff attitudes survey

A5. Group interview – Question sheet

Group 2 Research methods – LOCAL HEALTH DISTRICT (LHD) POLICY TOOL

B1. LHD Document collection checklist

B2. LHD Group interview– Question sheet

Sampling:

The target population are staff that provide and/or manage perioperative health care delivery for patients having surgery or a procedure. They include at the LHD the Surgery and Anaesthesia Stream clinician-leads and managers, and at the hospitals - doctors (senior and junior) anaesthetists, surgeons, intensive care, high dependency, physicians, general practitioners; nurses (managers, senior and junior); clerical staff, allied health, pharmacy.

Purposive sampling will be used to access key informants who provide care to patients in the policy area. An expected sample of up to:

(a) 30 multidisciplinary staff at each hospital for the field interviews

(b) 8 senior clinicians and managers (a subset of the 30 multidisciplinary hospital staff) at each hospital for the group interview

(c) 12 staff at the LHD.

Timeframe:

The expected total time at each hospital is 3 non-consecutive days and at the LHD head office 1 day. Data collection should be completed in within 6 months of starting. Data analysis and writing will take up to 18 months.

PERIOPERATIVE SITE AUDIT TOOL

A1. Perioperative Site Audit Sheet (V1_16052016)

The perioperative site audit sheet is to be used at hospitals its purpose is to guide data collection for the mapping of structure, process and outcomes for low, medium and high-risk patients having surgery or a procedure and anaesthesia. The perioperative site audit sheet is made up of 5 categories (A-E) of the information sought. (A) Hospital demographics, (B) Hospital structure, (C) Hospital processes – clinical decision making and clinical handover, (D) Hospital process indicators and health outcomes – the patient journey (E) Governance and (F) Questions (G) Additional notes

A. **HOSPITAL DEMOGRAPHICS**

HOSPITAL		Number of operating theatres	
Designation		Surgical subspecialties (and allocated OTs time)	
Number of beds (total)			
Number of beds (surgery)			
Emergency department		Out of theatre procedures requiring anaesthesia and location	
High dependency unit / intensive care unit			

B. **HOSPITAL STRUCTURE**

	AO	PHQ triage	DPQ triage	PAC	MD-PAC	DOSA	OTs	DOS	SSW	Ward	Pain team	CCO	HDU/ ICU
Physical space													
Yes(Y) No(N)													
Distance apart or colocation													
STAFF numbers & TASKS													
Clerk													
Nurse snr													
Nurse													
Anaesth. snr													
Anaesth. jnr													
Surgeon snr													
Surgeon jnr													
Other, specify													

C HOSPITAL PROCESSES

C.1 CLINICAL DECISION MAKING

		PHQ triage	DPQ triage	PAC	MD-PAC	DOSA	OTs	DOS	SSW	Ward	Pain team	CCO	HDU/ICU
% percentage of elective patients receiving care													
LOW RISK													
Moderate RISK													
HIGH RISK													
Staff member(s) making decision Y/N													
Nurse snr													
Nurse													
Anaesth. snr													
Anaesth. jnr													
Surgeon snr													
Surgeon jnr													
Other, specify													

C.2 CLINICAL HANDOVER

CODE: (W) written on paper (E) electronic medical record (Ph.) phone (FTF) face to face

Specify role and seniority of person(s) delivering and receiving handover. Reliability: Expected 5 4 3 2 1 Never

	GP or GPAF/PC	PHQ triage	PAC	MD-PAC	DOSA	OTs	DOS	SSW	Ward	Pain team	CCO	HDU/ICU	GP/PC
LOW RISK patient													
MOD. RISK patient													
HIGH RISK patient													
Age >85													

Age >75													
Age >65													
	GP or GPAF/ PC	PHQ triage	PAC	MD-PAC	DOSA	OTs	DOS	SSW	Ward	Pain team	CCO	HDU /ICU	GP/ PC
Frailty													
Dementia													
VTE Mx													
ABs Mx													
ACg / APlt Mx													
DM_Ins Mx													
Bld Mx													
OSA Mx													
Opioid pain Mx													
Other high risk categories													

D **HOSPITAL PROCESS INDICATORS AND HEALTH OUTCOMES – THE PATIENT JOURNEY**

Process indicators	e.g. cancellations on the day of surgery							
Process indicators collected								
Site(s) of collection								
Date first collected								
Ease of maintaining dataset Difficult 5 4 3 2 1 Easy								
Health outcomes	e.g. CCO, unplanned HDU, ICU, mortality							
Health outcomes collected								
Site(s) of collection								
Date first collected								

Ease of maintaining dataset Difficult 5 4 3 2 1 Easy								

E. **GOVERNANCE**

E.1 Hospital governance structure for patients having surgery or a procedure and anaesthesia	
E.2 How is variance to PI or HO measured?	
E.3 Feedback on variance	
E.3a Who reports variance and to whom?	
E.3b Timeliness of feedback – time since variance?	
E.3c How is variance managed?	

F. Questions

Informed consent

G. Additional notes

PERIOPERATIVE SITE AUDIT TOOL

A2. Document collection checklist (V1_16052016)

The document collection checklist is to be used in hospitals. It has 2 purposes, firstly (A) to guide the collection of communication tools and other paper or electronic based information used sequentially by staff in the perioperative care of for low, medium and high-risk patients having surgery or a procedure and anaesthesia. The sequencing of the communication tools provides information on the expected perioperative progress of each patient. Secondly (B) to discover governance for the collection of hospital-utilised datasheets, paper or electronic for the collation and analysis of process indictors or health outcomes.

A. **SEQUENCING OF COMMUNICATION TOOLS**

1. Standardised perioperative pathways	Yes / No	Year introduced	Risk stratification Yes / No
Standardised perioperative pathway – generic Preoperative expectation for type of admission e.g. DOSA, LOS, postoperative DOS, SSW, Ward, HDU, ICU with markers for variance and notification			
Clinical pathways for specific procedures – specify,			
2. Pre-admission documents			
Recommendation For Admission form			
Patient Health Questionnaire			
Discharge Planning Questionnaire			
GP Assessment Form			
Other communication from GP or primary care to hospital			
Guidelines for triage to PAC, or multidisciplinary PAC			
Guidelines for pre-operative investigations			
Guidelines for the perioperative management of diabetes mellitus			
Guidelines for perioperative blood management			
Guidelines for perioperative management of medications e.g. ACg/APlt			
Guidelines for the clinical handover of high risk patient information to procedural anaesthetist, surgeon			
Guidelines for pre-operative fasting			
Patient information sheets on fasting, medications, surgery or procedure, anaesthesia, pain management, expected post-operative recovery.			

	Yes / No	Year introduced	Risk stratification Yes / No
Communication from hospital to GP or primary care e.g. new diagnosis, perioperative management of medications ACg/APlt			
Nursing risk templates – falls risk, bariatric patients, infection risk			
Other, specify			
3. Forms used by patients admitted to hospital day(s) prior to surgery or procedure			
Specify,			
4. Forms used on the day of surgery **- pre-operatively**			
Anaesthetic chart (ASA score)			
Medical admission			
Nursing admission			
Observation chart(s)			
Medication chart(s), specify			
Fluid charts			
Other, specify			
5. Forms used intra-operatively			
Anaesthetic chart			
Operation report			
Recovery room chart			
Discharge criteria from Recovery room			
Other, specify			
6. **Forms used post-operatively in the wards**			
Continuation notes			
Observation chart(s)			
Medication chart(s), specify			
Fluid charts			
Other, specify			

	Yes / No	Year introduced	Risk stratification Yes / No
7. **Forms used for transfer of care from hospital**			
Discharge summary			
Patient information sheet(s) on pain management, expected post-operative recovery, other followup.			
Other, specify			
8. **Communication forms post-transfer of care home**			
Communication from hospital to GP or primary care			
Communication from GP or primary care to hospital			
Other, specify			

Questions	Additional notes

B. **GOVERNANCE, PROCESS INDICATORS, HEALTH OUTCOMES**

	Yes / No	Year introduced	Risk stratification Yes / No
Operating theatres lists			
Operating theatres activity reports			
Minutes of meetings – Quality Improvement - Surgery			
Minutes of meetings – Quality Improvement - Anaesthesia			
Minutes of meetings – Quality Improvement - Perioperative			
Minutes of meetings – Ward(s) based meetings			
Other			

Questions	Additional notes

HOSPITAL DATA FORMS FOR PROCESS INDICATORS AND HEALTH OUTCOMES

Process indicators	e.g. cancellations on the day of surgery							
Name of data sheet								
Process indicators collected								
Site(s) of collection								
Date first collected								
Access or distribution list for data collated and analysed								
Voluntary or mandatory reporting								

Questions:	Additional notes:

Health outcomes	e.g. CCO, unplanned HDU, ICU, mortality or							
Name of data sheet								
Health outcomes collected								
Site(s) of collection								
Date first collected								
Access or distribution list for data collated and analysed								
Voluntary or mandatory reporting								

Questions:	Additional notes:

PERIOPERATIVE SITE AUDIT TOOL

A3. Field interviews – Question sheet (V1_16052016)

The field interviews question sheet is to be used in hospitals its purpose is to guide questions in 5 main topics areas (A) Sequencing and connections between the documents, paper or electronic (B) Boundaries of each individual's work involvement with the complete document sequence (C) Experience of each staff member in applying the tools or documents (D) Evidence of risk stratification for low, medium and high-risk patients having surgery or a procedure and anaesthesia (E) Impact of PPPT (2007) and (F) Questions (G) Additional notes.

The 20 minutes interviews will begin with (i) a statement that the interview will be digitally audiotaped and ask for the participant's (ii) work role and (iii) length of time in the role. In the 20 minutes, subset questions (A) to (D) in *italics* will be prioritised.

(A) Sequencing and connections between the documents, paper or electronic

What forms – paper or eMR do you use in your day-to-day work?

How do they link (or work) together?

What do they tell you?

Which do you use most often?

What do you do with each of them?

Who do you use them with? And when?

(B) Boundaries of each individual's work involvement with the complete document sequence

What information do you need to be able start using these forms?

Who provides the information?

Who downstream will use what you have done with the forms?

(C) Experience of each staff member in applying the tools or documents

How did you learn what to do with the forms?

What do you think about the forms – are they easy to use, are there things that could be removed or added?

Have the forms changed much over the years? Is so, how so?

(D) Evidence of risk stratification for low, medium and high-risk patients having surgery or a procedure and anaesthesia

Do the forms tell you if it is a low, medium or high-risk patient (having surgery or a procedure and anaesthesia)?

If so, how do they do tell you that?

Are there more (number of) forms used for sicker patients? If so, how does that work?

(E) Impact of PPPT (2007)

Are you familiar with the PPPT 2007 tools (will provide) – do they look like any of the forms you use?

How are they similar, different, better?

If you have a problem using any of the forms we have discussed e.g. difficulty getting the right information, understanding what is needed, passing important information on …who do you go to for help?

Are you involved with the 'cancellations on the day of surgery' process indicator?

(F) Questions

Is there something else you would like to say about your work and experience?

(G) Additional notes.

PERIOPERATIVE SITE AUDIT TOOL
A4. Staff attitudes survey (V1_16052016)

The staff attitudes survey is to be used in hospitals its purpose is to assess staff attitudes to the Pre-procedure preparation toolkit (PPPT 2007) principles, tools, risk stratification, multidisciplinary teams, process indicators, health outcomes and governance structures for low, medium and high-risk patients having surgery or a procedure and anaesthesia. The survey will take 20 minutes to complete and is made up of 3 categories (A-E) of the information sought. (A) Demographics, (B) Staff practices, (C) Staff attitudes and (D) Additional information or comments

A. Demographics

What hospital do you work at?	
What department do you work in?	
What is your professional role?	
How many years have you worked in this role?	
How many years have you worked in this department?	

Please indicate the response that corresponds best to the work that you do, in each of the following statements, by circling the appropriate number

1 = strongly disagree, 5 = neutral, 10 = strongly agree

Should you need more space to expand on your answers, you can find this at the end of the survey

B. Staff practices

1. To obtain important information about the patient's medical condition and surgical risk I use:	Level of agreement									
1.1 The Patient health questionnaire	1	2	3	4	5	6	7	8	9	10
1.2 The Discharge planning questionnaire	1	2	3	4	5	6	7	8	9	10
1.3 The Pre-admission Medical-Anaesthetic assessment form	1	2	3	4	5	6	7	8	9	10
1.4 The GP Assessment tool	1	2	3	4	5	6	7	8	9	10
2.1 We use the PPPT tools to risk stratify and direct more resources to high risk patients	1	2	3	4	5	6	7	8	9	10

1 = strongly disagree, 5 = neutral, 10 = strongly agree										
2.2. We use our own hospital's forms to risk stratify and direct more resources to high risk patients	1	2	3	4	5	6	7	8	9	10
3. I am involved with making decisions about whether patients need to attend:										
3.1 Pre-admission clinic	1	2	3	4	5	6	7	8	9	10
3.2 Post-operative HDU or ICU	1	2	3	4	5	6	7	8	9	10
4. If you answered agree to question 3, When I make decisions based on the patient's medical condition and risk, I work closely with:										
4.1 Clerical staff	1	2	3	4	5	6	7	8	9	10
4.2 Nurses	1	2	3	4	5	6	7	8	9	10
4.3 Anaesthetists	1	2	3	4	5	6	7	8	9	10
4.4 Surgeons	1	2	3	4	5	6	7	8	9	10
4.5 The patient's G.P.	1	2	3	4	5	6	7	8	9	10
4.6 The G.P.s secretaries	1	2	3	4	5	6	7	8	9	10
4.7 The patient's Physicians	1	2	3	4	5	6	7	8	9	10
4.8 The Physicians' secretaries	1	2	3	4	5	6	7	8	9	10
4.9 Other Physicians – making new referrals	1	2	3	4	5	6	7	8	9	10
5. I use the Allied Health Referral Tool in my work	1	2	3	4	5	6	7	8	9	10
6. I am kept up to date on our 'cancellations on the day of surgery' key performance indicator	1	2	3	4	5	6	7	8	9	10
7. I have the opportunity to work with each patient in all phases of their surgical journey	1	2	3	4	5	6	7	8	9	10
7.1 Before the day of surgery	1	2	3	4	5	6	7	8	9	10
7.2 When they are having their surgery	1	2	3	4	5	6	7	8	9	10
7.3 The day after their surgery	1	2	3	4	5	6	7	8	9	10

8. I am kept up to date on what happens to most of my patients after they leave my department's care (up until they leave hospital after having had surgery or a procedure and anaesthesia)	1	2	3	4	5	6	7	8	9	10

(C) Staff attitudes

Please indicate the response that corresponds best your beliefs, about each of the following statements, in each of the following statements, by circling the appropriate number

1 = strongly disagree, 5 = neutral, 10 = strongly agree

Should you need more space to expand on your answers, you can find this at the end of the survey

8.1 The pre-procedure preparation process prepares the patient and carer for the whole surgical journey (from pre-admission to discharge)	1	2	3	4	5	6	7	8	9	10
8.2 Your hospital's pre-admission process prepares the patient and carer for the whole surgical journey (from pre-admission to discharge)	1	2	3	4	5	6	7	8	9	10
9.1 All patients require pre-admission review using a triage system	1	2	3	4	5	6	7	8	9	10
9.2 All patients require pre-admission review at a pre-admission clinic	1	2	3	4	5	6	7	8	9	10
10.1 The pre-procedure preparation process optimises the patient's condition for their planned surgery or procedure, anaesthesia and recovery	1	2	3	4	5	6	7	8	9	10
10.2 Your hospital's pre-admission process optimises the patient's condition for their planned surgery or procedure, anaesthesia and recovery	1	2	3	4	5	6	7	8	9	10
11. The multidisciplinary team collects, analyses and integrates information for the surgical journey	1	2	3	4	5	6	7	8	9	10
12. I feel that my contribution to the multidisciplinary team is valued	1	2	3	4	5	6	7	8	9	10
13. I feel that I make a contribution to the decisions made to use resources based on each patient's needs	1	2	3	4	5	6	7	8	9	10
14. In my experience, one patient having surgery or procedure and anaesthesia is much the same as any other, in the amount of care they need	1	2	3	4	5	6	7	8	9	10

15. Effective clinical and corporate governance underpins the pre-procedure preparation process	1	2	3	4	5	6	7	8	9	10
16. In my experience I know:										
16.1 How our service has developed over the years	1	2	3	4	5	6	7	8	9	10
16.2 How many patients we have cared for	1	2	3	4	5	6	7	8	9	10
16.3 Our 'cancellations on the day of surgery'	1	2	3	4	5	6	7	8	9	10
1 = strongly disagree, 5 = neutral, 10 = strongly agree										
16. In my experience I know:										
16.4 Health outcomes of all our patients	1	2	3	4	5	6	7	8	9	10
16.5 Health outcomes of our high risk patients – elderly or sick patients having surgery	1	2	3	4	5	6	7	8	9	10
16.6 Our patients that have had unplanned increased length of stay	1	2	3	4	5	6	7	8	9	10
16.7 Our patients that have had unplanned admissions to HDU and ICU	1	2	3	4	5	6	7	8	9	10
16.8 Our patients that have died in hospital	1	2	3	4	5	6	7	8	9	10
16.9 Our patients that have died within 30 days of leaving hospital	1	2	3	4	5	6	7	8	9	10
17. To improve perioperative patient care we need to know in a timely fashion what happens to our patients	1	2	3	4	5	6	7	8	9	10
17. I would like the opportunity to help improve perioperative patient care	1	2	3	4	5	6	7	8	9	10
18. I would like the opportunity to work more:										
18.1 with people in our department	1	2	3	4	5	6	7	8	9	10
18.2 with other departments in the hospital	1	2	3	4	5	6	7	8	9	10
18.3 with our local health district (LHD)	1	2	3	4	5	6	7	8	9	10
18.4 with patients	1	2	3	4	5	6	7	8	9	10
18.5 with carers	1	2	3	4	5	6	7	8	9	10
18.6 with GPs	1	2	3	4	5	6	7	8	9	10
18.7 with other professionals in primary care	1	2	3	4	5	6	7	8	9	10
18.8 with community carers	1	2	3	4	5	6	7	8	9	10

(D) Additional information or comments

PERIOPERATIVE SITE AUDIT TOOL
A5. Group interview– Question sheet (V1_16052016)

The group interview at each of the hospitals will take place after methods – tools A1 to A4 (Site audit – sheet, document collection, field interviews, staff attitudes survey) and B1 (LHD – document collection) have been completed and data analysis for each hospital progressed to the stage that a preliminary draft description of each hospital's perioperative systems may be presented to the focus group for this reflective exercise.

The group interview question sheet is to be used in each of the 4 hospitals its purpose is to guide questions in 5 main topics areas (A) Sequencing of hospital perioperative tools and boundaries of communities of practice (CoPs) (B) Enablers and barriers to knowledge development and sharing, (C) Impact of the PPPT 2007 (D) The hospital's perioperative system and its association with process indicators and health outcomes, (E) The hospital's perioperative system and its association with dynamic capacity and (E) Questions (F) Additional notes.

The 60-90 minutes interviews will begin with (i) a statement that the views expressed within the group interview should remain confidential, (ii) a statement that the interview will be digitally audiotaped and ask for each participant's (iii) work role and (iv) length of time in the role.

A. Sequencing of tools, CoPs and boundaries (for knowledge flow and clinical handover)

Is this a complete set and sequence of your hospital's perioperative tools?

Who routinely uses each tool?

Are professionals interchangeable for the sequencing and use of the various forms?

Are the high-risk categories interchangeable for the sequencing and use of the various forms? (e.g. moderate to major surgery for the frail elderly, complex chronic multisystem disease, perioperative diabetes mellitus, blood, dementia, medications management)

Can we process map the points of clinical handover at (a) change of shift and (b) between different physical areas of care (pre-, intra- post-operative, primary care) (c) within a professional team (d) between professional teams

What form does the communication take – written on paper or electronic, phone call or face-to face?

B. Enablers and barriers to knowledge development and sharing

What makes knowledge sharing and flow comprehensive?

What makes knowledge sharing and flow difficult?

C. Impact of the PPPT 2007

Have you developed or adapted other methods for your hospital's use to share knowledge about a patient's medical condition and their (evolving) perioperative risk?

D. Perioperative system and its association with process indicators and health outcomes

How is knowledge of process indicators shared and used?

How is knowledge of patient health outcomes shared and used?

E. Perioperative system and its association with dynamic capacity

Have you developed or adapted other methods for your hospital's use to share knowledge about:

(a) A patient's medical condition and their (evolving) perioperative risk?
(b) Each patient's perioperative journey – integrating pre-, intra- post-operative, primary care
(c) Do you use clinical pathways or a standardised perioperative pathway with markers of variance and real-time reporting or feedback
(d) A patient's perioperative risk and shared decision making
(e) Other innovations for partnering with patients and their carers peri-operatively

Do you consider E(a-e) important? What would be needed to achieve any or each of the above?

F. Questions

Do you have any questions for the research team?

Is there something further you may wish to tell us?

G. Additional notes.

PERIOPERATIVE LHD POLICY TOOL
B1. LHD Document collection checklist (V1_16052016)

The document collection checklist is to be used at the LHD. It has 2 purposes, (A) to guide the collection of LHD perioperative policy for patients having surgery or a procedure and anaesthesia in the LHD, and related policy from the Ministry of Health (MOH) or adapted from the MOH, and (B) the governance arrangements around each policy in terms of process indicators, health outcomes and resourcing.

A. LHD perioperative policy

	Yes / No	Year introduced	Risk stratification Yes / No
NSW Ministry of Health (MOH) - Waiting list management			
Agency for Clinical Innovation (ACI) – Surgical services taskforce			
Agency for Clinical Innovation (ACI) – Pre-procedure preparation			
Across LHD standardised tools			
Medication charts			
Acute pain management charts			
Clinical pathways or standardised perioperative pathways			
Management of high risk patients e.g. Frailty, Dementia			
Management of high risk patients e.g. Diabetes Mellitus			
Patient information sheets			
Informed consent			
Other,			

Questions	Additional notes

B. LHD governance

	Yes / No	Year introduced	Risk stratification Yes / No
Each hospitals demographic data – size, classification, number of beds, number of surgical beds (seasonal bed distribution), credentialing for surgery, procedures, Operating theatres activity reports)			
NSW Ministry of Health (MOH) – Elective surgery waiting times (ESWT) management			
Agency for Clinical Innovation (ACI) – Surgical services taskforce dashboard for DOSA, DOS, high volume short stay surgery, cancellations on the day of surgery, OT efficiency			
In-hospital mortality			
30 day mortality			
30 day re-admission			
Other morbidity data e.g. wound infection			
Length of stay (LOS) in hospital data			
Minutes of LHD meetings – Quality Improvement - Surgery			
Minutes of LHD meetings – Quality Improvement - Anaesthesia			
Minutes of LHD meetings – Quality Improvement - Perioperative			
Clinical services planning information			
Financial information			
Other			

Questions Timeliness of feedback De-identified, aggregated feedback or specific for individual patients	Additional notes

PERIOPERATIVE LHD POLICY TOOL

B2. LHD Group interview – Question sheet (V1_16052016)

The group interview at the LHD will take place after methods – tools A1 to A4 (Site audit – sheet, document collection, field interviews, staff attitudes survey) and B1 (LHD – document collection) and A5 (the group interviews at each of the 4 hospitals) have been completed. Data analysis for each hospital - to the stage that a description of each hospital's perioperative systems, enablers and barriers to knowledge sharing and flow, and reflective exercise on systems associations with process indicators, health outcomes and dynamic capability and capacity - can be presented to the LHD focus group for this LHD based reflective exercise.

The group interview question sheet is to be used at the LHD its purpose is to guide questions in 3 main topics areas (A) Associations between the 4 hospitals perioperative systems and LHD, MOH process indicators and health outcomes, (B) Associations between the 4 hospitals perioperative systems and their dynamic capability and capacity to meet LHD, MOH policy, (C) How may MOH – LHD- Hospitals governance be improved and (D) Questions (E) Additional notes.

The 60-90 minutes interviews will begin with (i) a statement that the views expressed within the group interview should remain confidential, (ii) a statement that the interview will be digitally audiotaped and ask for each participant's (iii) work role and (iv) length of time in the role.

A. Associations between the 4 hospitals perioperative systems and current LHD, MOH process indicators and health outcomes

B. Associations between the 4 hospitals perioperative systems and their dynamic capability capacity to meet further LHD, MOH policy

C. Governance

What makes knowledge sharing and flow comprehensive across hospitals and between MOH – LHD- Hospitals?

What makes knowledge sharing and flow difficult across hospitals and between MOH – LHD- hospitals?

How may MOH – LHD- hospitals governance be improved?

D. Questions

E. Additional notes.

Appendix 5: PISCF

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PARTICIPANT INFORMATION SHEET AND CONSENT FORM

DEVELOPING PERIOPERATIVE SYSTEMS

Invitation
You are invited to participate in a research study on how best to improve perioperative health care delivery for patients having surgery or a procedure and anaesthesia.

The study is being carried out by the following researchers: *Dr Su-Jen Yap, Staff specialist anaesthetist, Director Perioperative Unit, Prince of Wales Hospital* is conducting this study as the basis for the degree of Doctor of Philosophy at The University of New South Wales. This will take place under the supervision of *Professor Ken Hillman, The Simpson Centre for Health Services Research, UNSW Faculty of Medicine; Adjunct* Professor David Greenfield, Australian Institute of Health Service Management, University of Tasmania and UNSW* Faculty of Medicine and Dr Reece Hinchcliff, School of Public Health and Community Medicine, UNSW Faculty of Medicine.* No members of the research team have any affiliation with provider(s) of funding support, or a financial interest in the outcome of the research.

Before you decide whether or not you wish to participate in this study, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

1. What is the purpose of this study?

The purpose is to investigate the impact of health policy in different workplace settings to better understand how best to further develop perioperative systems, structures, processes and outcomes in the face of mounting challenges. Namely, an increasingly elderly population, a higher incidence of complex chronic disease, and public expectations for timely access to surgery.

2. Why have I been invited to participate in this study?

You are eligible to participate in this study because in your workplace you contribute to the provision of, and/or manage, health care delivery for patients having surgery or a procedure and anaesthesia.

3. What does participation in this study involve?

If you agree to participate in this study you will be asked to:

(1) A field interview that will take approximately 20 minutes. During the interview you will be asked questions at your workplace about the work you do and the tools your team uses. With your permission we would like to digitially audiotape record the interview.
(2) A questionnaire that will take you up to 20 minutes to complete. The questions will ask for your point of view on certain principles, tools and governance of perioperative health care delivery.
(3) A small number of you will be asked to take part in a focus group interview that will take up to 60-90 minutes to complete. The questions will ask you as a group to reflect on your workplace perioperative systems and their impact on process indicators, health outcomes and the ability to make changes for further quality improvement. With your permission we would like to digitially audiotape record the interview.

- The investigator, Su-Jen Yap will be conducting all interviews – field and focus group interviews – with the participants.
- Field interviews will take place at your workplace. Focus group interviews will take place in a meeting room in the vicinity of your workplace.

If you agree to participate in this study, you will be asked to sign the Participant Consent Form.

4. What if I don't want to take part in this study, or if I want to withdraw later?

Participation in this study is voluntary. It is completely up to you whether or not you participate. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason.

5. Are there risks to me in taking part in this study?

The research will involve your time and a certain degree of inconvenience. In an unobtrusive way you will be observed whilst in the process of work, asked to assist in the collection of forms and data, answer some questions on the forms, fill out a survey. Some of you will also be asked to take part in a 60-90 minutes interview on quality improvement for perioperative patient care. The research may incur a risk to reputation to you, the SESLHD and possibly the researchers but this risk is offset by the gains in understanding the opportunities for quality improvement this study identifies. Aggregated de-identified data will be used in this study.

6. Will I benefit from the study?

We hope to use the information we get from this research study to benefit patients and carers accessing, and staff providing care for, patients having surgery or a procedure and anaesthesia. However the study may not directly benefit you.

7. Will taking part in this study cost me anything, and will I be paid?

Participation in this study will not cost you anything, nor will you be paid.

8. How will my confidentiality be protected?

No identifiable information will be collected about you in connection with this study. Only the researchers named above will have access to your details and that will be held securely at UNSW secure locations

9. What happens with the results?

By signing the consent form you consent to the research team collecting and using information about your work for the research study. We will keep your de-identified data for seven years after the completion of the study. We will store information about you at secure locations of UNSW. Your information will only be used for the purpose of this research study. It is anticipated that the results of this research study will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be published in a way such that you will not be individually identifiable. You have the right to request access to the information about you that is collected and stored by the research team. You also have the right to request that any information with which you disagree be corrected. You can do this by contacting a member of the research team. In any publication, information will be provided in such a way that you cannot be identified.

10. What if I want to withdraw from the research study?

If you do consent to participate, you may withdraw at any time. If you do withdraw, you will be asked to complete and sign the 'Withdrawal of Consent Form' that is provided at the end of this document. Alternatively you can telephone *Su-Jen Yap* (02 XXXX XXXX) to say you no longer want to participate. If you decide to leave the research study, the researchers will not collect additional information from you.

(1) For field interviews you are free to stop the interview at any time. Unless you say that you want us to keep them, any recordings will be erased and the information you have provided will not be included in the study results. You may also refuse to answer any questions that you do not wish to answer during the interview.
(2) For the questionnaire you can withdraw your responses any time before you have submitted the questionnaire. Once you have submitted it, your responses cannot be withdrawn because they are anonymous and therefore we will not be able to tell which one is yours.
(3) If you take part in the focus group interview, you are free to stop participating at any stage or to refuse to answer any of the questions. However, it will not be possible to withdraw your individual comments from our records once the group has started, as it is a group discussion.

- **What should I do if I want to discuss this study further before I decide?**

  When you have read this information, the researcher *Dr Su-Jen Yap* will discuss it with you and any queries you may have. If you would like to know more at any stage, please do not hesitate to contact her on 02 XXXX XXXX.

- **Who should I contact if I have concerns about the conduct of this study?**

  This study has been approved by the {*xxxLHD*} Local Health District Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this study should contact the Research Support Office which is nominated to receive complaints from research participants. You should contact them on 02 XXXX XXXX, or email RSOxxxlhd@XXXXXXX.health.nsw.gov.au
  and quote [*HREC 16/160*].

Thank you for taking the time to consider this study.
If you wish to take part in it, please sign the attached consent form.
This information sheet is for you to keep.

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CONSENT FORM
DEVELOPING PERIOPERATIVE SYSTEMS

1. I,...
of...
agree to participate in the study described in the participant information statement set out above

2. I acknowledge that I have read the participant information statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.

3. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer as a result of my participation and I have received satisfactory answers.

4. I understand that I can withdraw from the study at any time without prejudice to my relationship to the XXXLHD

5. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.

6. I understand that if I have any questions relating to my participation in this research, I may contact Dr Su-Jen Yap on telephone 02 XXXX XXXX, who will be happy to answer them.

7. I acknowledge receipt of a copy of this Consent Form and the Participant Information Statement.

Complaints may be directed to the Research Support Office, XXX Local Health District, XXX Hospital, XXX NSW 2XXX Australia (phone 02-XXXX XXXX, fax 02-XXXX XXXX, email RSOxxxlhd@XXXXXXX.health.nsw.gov.au

Signature of participant	**Please PRINT name**	**Date**
____________________	____________________	__________
Signature of witness	**Please PRINT name**	**Date**
____________________	____________________	__________
Signature of investigator	**Please PRINT name**	**Date**
____________________	____________________	__________

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<u>DEVELOPING PERIOPERATIVE SYSTEMS</u>

REVOCATION OF CONSENT

I hereby wish to **WITHDRAW** my consent to participate in the study described above and understand that such withdrawal **WILL NOT** jeopardise my relationship with the XXXLHD

Signature of participant	**Please PRINT name**	**Date**
______________________	______________________	______________

The section for Revocation of Consent should be forwarded to Dr Su-Jen Yap, c/o Department of Anaesthesia, XXX Hospital

Appendix 6 Additional evidence for Chapter 5

The index for Appendix 6 below, is followed by the detailed results that accompanies the presentation of data found in Chapter 5.

Data	Detailed results presentation accompanying Chapter 5	Added detail
Box 5.1	STC: Increasing specialty specific knowledge for surgical high-risk	Identification of participants by profession, number and hospital
Table 5.4	TDEQ: Increasing specialty specific knowledge for organisational high-risk	Presents thematic display of all exemplar quotes across professions and hospitals. Identification of participants by profession, number and hospital.
Table 5.10	TDEQ: Lack of availability of patient health outcomes	Presents thematic display of all exemplar quotes across professions and hospitals. Identification of participants by profession, number and hospital.
Box 5.11	STC: Lack of availability of meaningful patient health outcomes information	Identification of participants by profession, number and hospital

Box 5.1 STC: Increasing specialty specific knowledge for surgical high-risk

<table>
<tr><td>General knowledge of surgical high-risk</td><td>Participant</td></tr>
<tr><td>“High risk procedure – invasive e.g. open versus lap.chole, acute surgery or trauma versus elective”
Junior doctor (1), Hospital A</td><td>Junior doctor (1) Hospital A; (5) and (6) Hospital C; (7), (8), (9) Hospital D; Anaesthetist (1), (2), (3) Hospital A; (6), (8) Hospital C; (10), (11), (12), (13), (14) Hospital D. Nurse (2), (3), (5), (7), (9), (11), (12), (14) Hospital A; (30), (31), (33), (34) , (35), (37), (40) Hospital C; (43), (45), (49), (50), (51) Hospital D. Physiotherapist (4) (3) Hospital A; (2) Hospital C; (1) Hospital D. Dietician (4) Hospital A; (3) Hospital B; (2) Hospital C, (1) Hospital D, Physician (3) Hospital A; (8) and (9) Hospital C; (10) Hospital D</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Specialty specific knowledge of surgical ‘high-risk’</td><td>Senior surgeons: (1), (2) Hospital A; (3), (4), (5) Hospital B; (6), (7) Hospital C; (8), (9) Hospital D.</td></tr>
<tr><td colspan="2">“Type of operation - Bowel resections are major surgery. Minor surgery anal, haemorrhoids, hernia, skin tags – day-only surgery. Length of surgery – major is more than 3-4 hours”
Surgeon (2), Hospital A</td></tr>
<tr><td colspan="2">“Margin of error proportional to operation complexity and risk; low complexity less impact of complication, easier to rescue. Surgical procedure, anatomical, technical and if patient sicker
e.g. Oesophagectomy higher than Lap. Chole; within procedure - high versus low oesophagectomy; cholecystitis if stent required. Patient factors e.g. bleeding risk”
Surgeon (1), Hospital A</td></tr>
</table>

Table 5.4 TDEQ: Increasing specialty specific knowledge for organisational high-risk

Hospital A	Hospital B	Hospital C	Hospital D		LHD
"Patient - clinician issue and poor outcome, organisation bares part of the responsibility" Clinician-Manager (2), Hospital A *"Two roles with different risks, sometimes they merge: Operational - day to day challenges (i) patient access and flow, patients in and out in a timely manner, balance emergency and elective and (ii) organisational risk – e.g. power failure, the '7 Codes'…and Professional – building the capacity and capability of the nursing workforce, skill-mix, managing standards of care. 1200 nurses at Hospital A, how to make sure they are all competent and that there is an appropriate culture for them."* Manager (11), Hospital A	*(High risk) "the stuff that makes me nervous …the stuff that keeps me up at night (is) assume, I have to assume, I have to rely on systems that are robust to provide good care for patients. I have to rely on, assume rather than can test it myself…High risk medical practice where clinicians have lost track of where the patient is"* Manager (1), Hospital A and B *"A new procedure or uncommon patients e.g. paediatric patients are a risk – needs education, development, competency – serious ramifications for patients – eyesight, life or death so not going to deny patients but need to cover (all) staff, confidence of team"* Manager (7) Hospital B & Manager (11),Hospital A	*"Providing right (care, patient, time) whilst managing competing needs. Budgetary resource constraints not going to match all potentialities so decision making, resource allocation and priorities".* Manager (4), Hospital C *"Being able to provide a service. Aging infrastructure, 4 OTs 24 years old, older wards problem with air conditioning, leaks when rain etc. New building servicing issues and problems …"* Manager (6), Hospital C *"An emerging risk is capacity and the ability to do a whole lot of stuff, interventions offered or imposed onto patients, families and their ability to make good judgments. The appropriateness of care agenda – the very high-risk patient and non-beneficial treatments"* Manager (4), Hospital C	*"Running operating theatres that are 35 years old because no rebuild, no new equipment, anaesthetic machines are 18 years old and not up to current Australian Standards – with advances in electronics and the OT surface area of 36m^2 not 60m^2"* Clinician-Manager (5), Hospital D	*"Where to start?" Not good governance … undertaking activities that are not approved or a new procedure not credentialed for; Patient risk areas – constitution – falls, medication safety, CERS; vulnerable subgroups – disability, social complications, behaviours putting patients and staff at risk; Workforce risks – shortages and profiles e.g. ED puts servicing at risk; Site specific – Hospital D does not have access to all services or diagnostics e.g. MRI so there are transporting risks – negotiating, delays etc; Financial risks – constraints in developing services, maintaining services; Corporate risks…"* Manager (5), Hospital D	*"Patient or things where you need to put in more work, emphasis or effort …Things more likely to go wrong …or there is a greater interest in the outcome - as a manager for the Ministry of Health or local politics"* Manager (2), Hospitals A, B, C, D; LHD *"Risk of breeching clinical priority, for surgery within 1,3,12 months. Risk of no (or not enough) theatre time, a real problem and patients cancelled and rebooked particularly, a problem if they are not well e.g. on anticoagulants for cardiac or stroke – med's that have been stopped for surgery."* Clinician-Manager (8), Hospital A, LHD

Table 5.10 TDEQ: Lack of availability of patient health outcomes

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Lack of availability of patient health outcomes / Lack of access to meaningful patient health outcome measures	*"Outcomes – immediate whilst patient is with me and in PACU Postop days 1-3, visit or have registrar visit but only the patients worried about"* Anaesthetist (11), Hospital A, D *"M&M – voluntary reporting, otherwise hard to find out, I only come here once a week.* Anaesthetist (13), Hospital D *"Hospital daily ward round. Follow-up at 2 weeks, usually last review then back to GP-(review wound healing, pain, diet, eating, bowels."* Surgeon (2), Hospital A *"A weak point is if patients do not turn up for the 2 weeks followup – we don't hear about what we don't hear about"* Surgeon (8), Hospital D *"Cancer survival at 3, 6 12 months and 2 years. Don't drill down on your results enough, no other data collection, barrier to research, learning from outcomes"* Surgeon (1), Hospital A	*"Outcomes less than 5%, I know sounds really bad, but no-one tells us. May hear if patient passes away or unplanned HDU/ICU through a casual chat, bump into the anaesthetist, by coincidence"* Nurse (4), Hospital A *"Up to date until discharge from ward, sometimes a little further depending on what has happened in hospital and where discharged to"* Nurse (3), Hospital A *"We are an acute ward don't get to see what happens next"* Nurse (2), Hospital A *"Wards are silos. Don't really know what is going on in the ward across the road from me. Maybe if there is an RCA going on … maybe find out in a corridor chat not official"* Nurse (22), Hospital B *"Not sure, KPIs, IIMs, rarely get feedback, sometimes compliments, complaints from patients; not really from doctors"* Nurse (45), Hospital D	*"Now, mainly how patients are progressing in front of your eyes day-to-day. To be honest, not much out of ICU. Ad hoc, I would have to ask maybe in Rehab"* Physiotherapist (4), Hosp A *"Informally I guess I do know about the ones I am managing"* Dietician (4), Hospital A *"None, only what we look for ourselves. PSQ – IIMS SAC 1 & 2 trends. Escalation of concern through family"* Speech therapist (1), Hospital D *"More of an outcome when the outcome is bad. More outcomes would be ideal, but we are very stretched with time so don't need outcomes on everyone, not the low risk drugs, but the in-betweens, it would be good – not so much of a guess"* Pharmacist (3) Hospital C *"None, only coincidental"* Dietician (1), Hospital D	*"Meaningful clinical outcomes, answer is 'NO' 'still got a way to go' "* Manager (11), Hospital A *"In infancy … using data to drive innovation and performance" – Hospitals A and B, and more broadly even around the world"* Manager (1), Hospital A and B *"Know outcomes – No, not in a meaningful way. LOS, unplanned readmission, death - yes, at 30 days maybe.LHD think $s and KPIs"* Manager (4), Hospital C *"Outcomes – 'Go by anecdote', I am told of every bad event. Read IIMS, RCAs. Administration don't want to know, don't want to reveal, cover up of what actually happened. Don't really want to bring the truth out"* Clinician-Manager (X), Hosp A, C or D

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
	"ICU – ANZICS, ACI extensive, mandatory. Outside ICU – outcomes are difficult, we are not looking at these outcomes except return to ICU" Physician (8), Hospital C *"Actually, a distressing part of our job, when bad things happen no-one tells you but you, as the anaesthetist is referenced. You find out incidentally, usually from another anaesthetist"* Anaesthetist (X), Hospital A, D *"I am not interested in the education of staff with outcomes, … the outcomes are good, I follow them up, I do as I like"* Surgeon (X), Hosp A, C or D *"Outcomes? –* (shakes head)- *No don't get any. Ad hoc, all word of mouth, verbal or I just came across it. Or 'big data' from journal articles.* Anaesthetist (4), Hospital B and A *"Not a lot, some…"* Physician (9), Hospital C	*"Good access to all outcomes. See patients pre and post-op so get the full circle, sometimes we have got them for the rest of their lives e.g. we are a quaternary eye service"* Nurse (20), Hospital B *"Outcomes important, informs practice. Outcomes for our ward – postop in hospital score 10/10, after discharge 2/10. Orthopaedic CNC to collect data but no CNC so no time for data collection, clinical workload. Doctors do some but not daily. Time consuming if done in pieces"* Nurse (31), Hospital C *"Don't follow up on adequately, QOL at 6M, 12M; no outcome data to reflect on. Our care can leave people with a lot of deficits, (we) don't know the impact on patients, family, society … ongoing harm or benefit."* Nurse (32), Hospital C *"Outcomes – nil after leaving ward, 'that's it' even if patient admitted to HDU"* Nurse (21), Hospital B	*"Very difficult to get patient outcome info, so probably no … Know number of interventions …Know patient outcome for SSIs – decrease SSIs, cases of resistant organisms"* Pharmacist (1), Hospital A *"90% no follow-up, don't know. In hospital – yes, physical functional trend and progress, can they progress SOOB, stand, etc, do they get a complication VTE, PE but don't speak to them after they go home. Can check if they are referred to a Rehab facility before okay for home."* Physiotherapist (2), Hosp C *"Know from literature that adequate nutrition decreases wound infection and LOS, but no objective day-to-day, case-by-case clinical data, only subjective correlate patient's weight changes and energy levels, fatigue. Nutrition related would be risk factors affecting intake e.g. fistulas or anastomotic leaks – no direct daily understanding of impact of adequate or inadequate nutrition"* Dietician (2), Hospital C	*"Data is so obtuse, difficult to get hold of, you really have to chase what you need"* Clinician-Mx.er (2), Hospital A *"None. Service agreement outcomes, KPIs, ESWT, IIMS Want to know patients in/out 'no harm', fixed and not with another issue. More resources needed, on how best to deliver care. Only as good as the information that you get delivered. Data to engage teams, start the conversation, get the understanding."* Manager (12), Hospital B *Know – Not much we don't do much auditing…benchmarking through 'Health roundtable', but that doesn't really do outcomes. There should be peer review, but organisation cannot expect, hard for disparate VMOs with no administrative support, no budget for administrative support to collect and present outcomes. It is up to the individual."* Manager (5), Hospital D

Box 5.11 STC: Lack of availability of meaningful patient health outcomes information

Lack of availability of patient health outcomes – subtheme constituent		Participant
1. Immediate care only	*"Outcomes – immediate whilst patient is with me"* *"Now, mainly how patients are progressing in front of your eyes day-to-day"*	Anaesthetist (11), Hospital D Physiotherapist (4), Hosp A Anaesthetist (1), (2), (3) Hospital A; (4), (5) Hospital B; (6), (7), (8), (9) Hospital C; (10), (12), (13), (14), (15) Hospital D. Physician (5) Hospital A; (12) Hospital D. Nurse (9), (10), (11), (14) Hospital A; (23) Hospital B; (35) (37) (38) (39) (40) (42) Hospital C; (49) (50) (51) Hospital D
2. Within department or hospital only	*"Outside ICU – outcomes are difficult, we are not looking at these outcomes except return to ICU"* *"We are an acute ward don't get to see what happens next"* *"Outcomes for our ward – postop in hospital score 10/10, after discharge 2/10"*	Physician (8), Hospital C Nurse (2), Hospital A Nurse (31), Hospital C Nurse (3), (5), (7), (12), (13), (15), (16), (17) Hospital A; (18) (19) (20) (21) (22) (24) (25) (26) (27) Hospital B; (28) (29) (30), (32), (33), (34), (35), (37), (40) (41) Hospital C; (43), (44), (45), (46), (47), (48) Hospital D. Physiotherapist (4) Hospital (A), (3) Hospital B; (2) Hospital C; (1) Hospital D. Dietician (4) Hospital A; (3) Hospital B; (2) Hospital C, (1) Hospital D, Speech therapist (1) Hospital D Physician (2) (4) Hospital A; (6) Hospital B; (9) Hospital C; (10) (11) (12) Hospital D
3. Do not receive much or at all beyond immediate care	*"Outcomes? - No don't get any.* *"When bad things happen, no-one tells you"* *"Outcomes less than 5%, I know sounds really bad, but no-one tells us"* *"Rarely get feedback"*	Anaesthetist (4), Hospital B Anaesthetist (X), Hospital A, D Nurse (4), Hospital A Nurse (45), Hospital D Anaesthetist (1), (2), (3) Hospital A; (5) Hospital B; (6), (7), (8), (9) Hospital C; (10), (12), (13), (14), (15) Hospital D. Nurse (2), (3), (5), (7), (12), (13), (15), (16), (17) Hospital A; (18) (19) (20) (21) (22) (24) (25) (26) (27) Hospital B; (28) (29) (30), (31), (32), (33), (34), (35), (37), (40) (41) Hospital C; (43), (44), (46), (47), (48) Hospital D. Physiotherapist (4) Hospital (A), (3) Hospital B; (2) Hospital C; (1) Hospital D. Dietician (4) Hospital A; (3) Hospital B; (2) Hospital C, (1) Hospital D, Speech therapist (1) Hospital D. Junior doctors (1) Hospital A, (2), (3), (4) Hospital B, (5), (6) Hospital C, (7), (8) Hospital D. Physician (2) (4) Hospital A; (6) Hospital B; (8) and (9) Hospital C; (10) (11) (12) Hospital D
4. Receive 'ad hoc'	*"Ad hoc, all word of mouth, verbal or I just came across it"* *"Through a casual chat, bump into the anaesthetist, by coincidence"* *"Maybe find out in a corridor chat not official"*	Nurse (4), Hospital A Nurse (22), Hospital B Nurse (45), Hospital D Anaesthetist (4), Hospital B; (X), Hospital A, D Nurse (9) (16) (17) Hospital A;

Lack of availability of patient health outcomes – subtheme constituent		Participant
5. Need to find on own	*"None, only what we look for ourselves"* *"It is up to the individual"*	Speech therapist (1), Hospital D Manager (5), Hospital D Surgeons: (1) (2) Hospital A; (4) (5) Hospital B; (6) (7) Hospital C; (8), (9) Hospital D. Anaesthetist (1), (2), (3) Hospital A; (4), (5) Hospital B; (6), (7), (8), (9) Hospital C; (10), (11) (12), (13), (14), (15) Hospital D. Physician (1) (2) (3) (4) Hospital A; (8) and (9) Hospital C. Nurse (8) (9) (10) (11) (14) Hospital A; (23) (24) Hospital B; (32) (34) (35) (36) (37) (41) Hospital C; (49) (50) (51) Hospital D
6. Lack of resources	*"More outcomes would be ideal, but we are very stretched with time"* *"No budget for administrative support to collect and present outcomes"*	Pharmacist (3) Hospital C Nurse (31), Hospital C Manager (5), Hospital D Anaesthetist (1), (2), (3) Hospital A; (4), (5) Hospital B; (6), (7), (8), (9) Hospital C; (10), (11) (12), (13), (14), (15) Hospital D. Nurse (8) (9) (11), Hospital A. Dietician (1), Speech therapist (1), Physiotherapist (1) Hospital D
7. Lack of meaning, capability.	*"In infancy … using data to drive innovation and performance"* *"Don't drill down on your results enough, barrier to learning from outcomes"* *"Not a lot, some…"*	Manager (1), Hospital A, B Surgeon (1), Hospital A Physician (9), Hospital C Manager (11), Hospital A; (12), Hospital B; (4), Hospital C; (5), Hospital D Senior surgeons: (2) Hospital A; (6) Hospital C
8. Use of surrogate outcomes	*"M&M – voluntary reporting, otherwise hard to find out"* *Or 'big data' from journal articles"* *"Know from literature that…"*	Anaesthetist (13), Hospital D Anaesthetist (4), Hospital B, A; Dietician (2), Hospital C Anaesthetist (1), (2), (3) Hospital A; (5) Hospital B; (6), (7), (8), (9) Hospital C; (10), (12), (13), (14), (15) Hospital D. Surgeons: (1) (2) Hospital A; (3) (4) (5) Hospital B; (6) (7) Hospital C; (8), (9) Hospital D. Physiotherapist (2) Hospital C; Dietician (1), Speech therapist (1), Physiotherapist (1) Hospital D. Physician (1) (2) (3) (4)(5) Hospital A; (8) and (9) Hospital C; (10) Hospital D Manager (1), Hospital A, B

Appendix 7 Additional evidence for Chapter 6

The index for Appendix 7 below, is followed by the detailed results that accompanies the presentation of data found in Chapter 6.

Data	Detailed results presentation accompanying Chapter 6	Added detail
Table 6.4	TDEQ: Knowledge development as individuals – Professional practice	Presents thematic display of all exemplar quotes across professions and hospitals. Identification of participants by profession, number and hospital.
Table 6.5	TDEQ: Knowledge development as individuals – Professional peer learning	Presents thematic display of all exemplar quotes across professions and hospitals. Identification of participants by profession, number and hospital.
Box 6.7	DA: Clinical pathways for low risk surgery	Summarises and analyses the impact of clinical pathways for low risk surgery
Box 6.8	DA: Clinical pathways for intermediate risk surgery	Summarises and analyses the impact of clinical pathways for intermediate risk surgery
Box 6.9	DA: Clinical pathways for high-risk surgery	Summarises and analyses the impact of clinical pathways for high-risk surgery

Table 6.4 TDEQ: Knowledge development as individuals – Professional practice

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Importance of 'scaffolded' learning, gaining greater independence from exposure to increasingly challenging cases or skills within a profession – the Novice to the Intermediate.	*"Learn from individual consultants…. learn from making small mistakes … after hours … when I can be more independent"* Anaesthetist (2), Hospital A *"Deteriorating patients afterhours when I get to examine patients myself and figure things out"* Junior doctor (1), Hospital A *"Ask Fellows, teach junior doctors … Work closely with the multidisciplinary team, ward nurses, clinical nurse consultants etc"* Surgeon (7), Hospital C	*"Buddy system, senior staff teaching less experienced"* Nurse (16), Hospital A and C *"Mentoring from senior nurses NUMs - groomed me for the role"* Nurse (17), Hospital A *"Experience as afternoon-in-charge, apprenticeship, succession planning, learn from my own and others' mistakes … notice potential risks and then I could prepare for afterhours airways, cardiac arrests"* Nurse (4), Hospital A *"Succession planning, acting in-charge, from senior staff nurse from junior …"* Nurse (21), Hospital B	*"Started at bottom… fell into ICU as second ICU senior (complex and high acuity. Initially it was a 'baptism of fire', my colleague a more senior physiotherapist (an educator) was a close mentor."* Physiotherapist (4), Hospital A Answer to question - 'how do you learn, understand, communicate and manage high risk perioperative patients?' *"Senior physiotherapists"* Physiotherapist (2), Hospital C Physiotherapist (3), Hospital B Physiotherapist (1), Hospital D *"Senior pharmacists"* Pharmacist (3), Hospital C *"Senior dieticians"* Dieticians (4), Hospitals A Dieticians (3), Hospitals A, B	*"Bosses and mentors and you know they are different things that have informed my thinking, colleagues that I have stolen shamelessly from and learnt from…and developed 'my philosophy' i.e. hierarchical governance structure and devolved governance for innovation"* Manager (1), Hospital A,B; LHD *"Getting to know different perspectives, emotions and dealing with challenging people. I learnt a lot about myself and other people in these squabbles. Reflection is most important after every encounter but especially after difficult cases – could do better, learn for next time. All work is about learning."* Manager (3), Hospital B

Subtheme	Profession			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Importance of 'scaffolded' learning, gaining greater independence from exposure to increasingly challenging cases or skills within a profession – the Expert	*"Registrar oversees the ward junior doctor looks after the ward and updates registrar if patient deteriorating and can initiate simple investigations and pathways. Registrar is there to support and teach. Senior surgeon decides on the important care.* Surgeon (3), Hospital B *"My teaching responsibility is that they are safe by the end of the term for: Surgical Fellows need to do safe operations, Surgical registrars rely on them to see the not standard, to notice deterioration that is their main role on the team, then also safe assistance in theatres; the RMOs are still undifferentiated and I am not very demanding of them, they should just enjoy the term"* Surgeon (6), Hospital C	*"Managing risk is not recording clinical variance … clinical pathways variance is not knowledge of what to do. The teaching and learning from senior RNs (nurses) is more important e.g. what to do with a deteriorating patient. Some things are just not written down on a clinical pathway."* Nurse (22), Hospital B *"As CNC learn not to be frontline, but one step back, no patient load (unless things are going very badly for the patient), allow frontline staff their exposure to the deteriorating patient, facilitating learning into their experiences, assimilate learning into their tasks"* Nurse (49), Hospital D	Answer to question - 'how do you learn, understand, communicate and manage high risk perioperative patients?' "*Other Allied Health… in regular meetings to prioritise what is best for the patient"* Dietician (1), Hospital D Speech Therapist (1), HospitalD Physiotherapist (1), Hospital D *"Now I am a Physio. Consultant, today … most of my clinical skills have reached their potential, I have developed my own expertise in developing my skills. Now on a leadership journey."* Physiotherapist (4), Hospital A	*"When I was junior -first 5 years there was one senior person I would call. Now after 30 years, done, seen most things, so don't have to call"* Manager (2), Hospitals A,B,C,D and LHD Names several senior specialists (surgeons and other) and their leadership *"however they had no financial or operational responsibilities 20 years ago. They managed clinical professions and departments. A new system of clinician-manager was established 20 years ago. Mentors – I have got to an age when I have no mentors, they are looking at me from the walls"* (speaking of framed photos or portraits of retired colleagues). Manager – Clinician (1), LHD – Hospital A

Table 6.5 TDEQ: Knowledge development as individuals – Professional peer learning

Subtheme	**Profession**			
	Doctors	**Nurses**	**Allied Health**	**Managers**
Within profession discussion of challenging cases	*"Senior surgeon or colleague in same specialty, other surgeons, Fellows, consultants."* Surgeon (2), Hospital A *"Consult anaesthetic colleagues for new procedure or condition"* Anaesthetist (13), Hospital D *"Clinical practice mainly over years. And CPD, conferences. and - validate with other pain specialists very important* Physician (1), Hospital A *"CPD, consult with endocrinology colleagues (LHD and other), literature search EBM, Diabetes society, international protocols"* Physician (5), Hospital A *"Learning from other surgeons (that are) presenting good outcomes"* Surgeon (6), Hospital C	*"Other nurses – depends on the topic …other NUMs that have been a surgical NUM for longer or other NUMs on how best to do things or Direct report, or NM on safety issues and staffing"* Nurse (45), Hospital D *"Succession planning (in place) so I can discuss care with acting-in-charge or senior staff – nurses"* Nurse (21), Hospital B *"Learn by asking peers, or the Quality and Safety Manager for the ward (nurse) or a NUM mentor"* Nurse (28), Hospital C and A *"Use EBP – evidence-based-practice, and discuss evidence with my colleague (name) and my direct report (name)"* Nurse (34), Hospital C	*"Also, professional CPD and QI within the department of Dietetics … Know from literature that adequate nutrition decreases wound infection and LOS etc… "* Dietician (2), Hospital C *"Very strong collegial Allied Health department multiple meetings and other communication – corridor, emails, projects – weekly meetings HoDs Allied Health and HoDs with their (professional) teams, and one HoD rotates to represent AH in safety huddles in the wards"* Dietician (1), Hospital D Speech therapist (1), Hospital D Physiotherapist (1), Hospital D *"Pharmacy department … (human) resources so stretched we talk about risk stratification"* Pharmacists (1,2,3), Hospitals A, B, C	*"Bosses and mentors (and you know they are different things) that have "informed my thinking", "colleagues that I have stolen shamelessly from and learnt from"* Manager (1), Hospital A,B; LHD *"There is not one person, it depends on the issue. I would call someone I knew had more experience, that may sometimes be external, for advice or to confirm what I think is correct"* Manager (2), Hospitals A,B,C,D and LHD *"With DON and peers in consultation with all nurses developed a values, mission diagram, chart. DON has given a mandate. We have taught them to problem solve. That we 'have got their back…but don't take advantage'."* Manager (6), Hospital C

Boxes 6.7 – 6.9 Clinical pathways for low, intermediate and high-risk surgery

Boxes 6.7 – 6.9 provides the evidence for the clinical pathways (CP) that were introduced by the LHD for low, intermediate and high-risk surgery, respectively. The results in Boxes 6.7-6.9 are presented in two parts; first the CPs are described, followed by an analysis of the impact of the CPs based on the observations of the staff using the CPs.

Background: The LHD Surgical Stream led CPs initiative was designed to improve patient care through standardisation and coordination of perioperative care processes for specific surgical operations. From interviews and observations, it was determined that from around mid-2017 the LHD had been releasing a suite of CPs for low, intermediate and high-risk surgery, increasing in number and for increasingly higher risk surgeries. From interviews, site observations, secondary documents review including group emails organising meetings, and widespread dissemination of clinical pathways during the drafting phase, it was confirmed that the origin of the CPs and their implementation had been predominantly nurse-led in writing and implementation, with surgeon and anaesthetist support, at the LHD and hospitals. During site observations the CPs were collected at all four hospitals at various locations – pre-admission clinics, post-anaesthesia care unit (PACU), and postoperative units and wards. The CP booklets were consistently found on various ward shelves and on occasion in the appropriate patient's medical records, and on occasion appropriately completed to the day of each patient's progress.

Presentation: The CPs came in the form of a A4 sized paper booklet with a standardised format and light blue striped first page. The booklets each have an LHD alphanumeric code and are stated to be "*part of the medical record and therefore a legal document* (page 1)". Page 1 was identical for all the different surgery types of LHD CPs. In terms of main headings and instructions were '*Use of Clinical Pathways', 'Guide to care' and 'Variance documentation'*.

Box 6.7 DA: Clinical pathways for low risk surgery

Part A: The LHD had produced a suite of CPs for low risk surgery

- The peer average length of stay (Peer ALOS) as per the Activity Based Management portal is less than 3 days.
- However, for these CP booklets the number of pages supplied for daily postoperative care documentation on the pathway is limited to 2 days or less.
- On page 1 of the CPs
    - # indicates - "Intended users: Patients, Nurses, Medical officers, Allied Health"
    - Variance to care was to be documented and reported

- The CPs included:
    - **Cataract** clinical pathway day procedure (LHDXXX245) (Date reviewed April 2017)
    - # **Hand surgery** clinical pathway intended to be used for hand surgical cases with an expected length of stay of less than 2 days (examples of types of hand operations provided) (LHDXXX144) (Review September 2020). # Designed to be used by MDT – Nurses, Medical officer, Hand therapist, Physiotherapist, Social worker.
    - **# Unilateral hernia repair** (LHDXXX143) (Peer ALOS 1.04 days) (Review September 2017)
    - **#Laparoscopic cholecystectomy** (LHDXXX142) (Peer ALOS 1.8 days) (Review June 2019)
    - **# Laparoscopic appendicectomy** (LHDXXX270) (Peer ALOS 2.17 days) (Review Sept 2017)

Note: Hand CP only found at Hospital B, General surgery -hernia, laparoscopies found at Hospitals A, C, D but not B

Part B: Analysis of impact of CPs for low risk surgery on work practice and organisation:

- General – all five CPs were present at all four hospitals in the DOSA, PACU or HVSSS wards. The CPs were observed to be used in most wards.
- The cataract CP was used for all patients in Hospital B, and patchily at the other hospitals. There was neither disruption nor value added to the Cataract CP as the process of documentation was little changed other than aesthetic. The process and efficiency of care remained the same (Nurse 21 and nursing staff, Hospital B DSU).
- The hernia and cholecystectomy CPs were patchily used in Hospitals A, C, D but reports from nurses were that they duplicated work e.g. documentation onto the eMR and other observation forms so that the forms were often started and not completed for shift changes of nurses. (Nurse 1, 4, 12, 15 and staff Hospital A HVSSS; Nurse 29 and staff Hospital C DSU; Nurse 46 and staff Hospital D HVSSS)
- # Use by MDT - The CPs when in use were used almost exclusively by nurses. Patients and Medical officers were not aware of the CPs in practice and did not use the forms. Allied health for example physiotherapists and dieticians were aware of the forms and occasionally documented into CPs but the primary documentation for Allied Health was the eMR.
- Variance documentation was observed but tracking, audit and feedback regarding variance was not observed and reported to not occur
- **Laparoscopic appendicectomy** particularly demonstrated variance according to nursing staff, depending on the severity of the appendicitis. Patients with mild appendicitis could be discharged within 2 days, patients with gangrenous or perforated appendix and sepsis required much longer stay. For these patients, nurses would have to improvise by adding extra loose leave clinical notes pages into the CP booklet or abandon its use.
- See Patient 1 (Box 5.6)

Box 6.8 DA Clinical pathways for intermediate risk surgery

Part A: The LHD had produced a suite of CPs for Intermediate risk surgery.
The CP were either in draft form or implemented.

- The implemented CPs included:

- **# Elective total knee replacement** (LHDXXX256) (Peer ALOS 5.95 days) (Review September 2017) – found at Hospitals A and D, (Documentation to Postop Day 5)
- **# Elective total hip replacement** (LHDXXX260) (Peer ALOS 7.3 days) (Review September 2017) - found at Hospitals A and D (Documentation to Postop Day 5)

- *Also found at Hospital A, LHD blue striped form format -* ***# ERAS_****(HA)* ***– CP total knee replacement*** (LHDXXX262) Documentation to Postop Day 3) and ***# ERAS_****(HA)* ***– CP total hip replacement*** LHDXXX261) (Documentation to Postop Day 5)

- *Also found at Hospital D (introduced August 2007, Last review February 2014 –* ***# ERAS_****(HD)* ***arthroplasty knee CP and ERAS_****(HD)* ***arthroplasty hip*** *(for specific surgeon – named)* ***(20-page booklet****) – measures variance codes, medication protocol, "Estimated length of stay 5 days" (p5) for both knee and hip surgery. Also, patient information pamphlet regarding surgery, postoperative course and exercises*

Found only at Hospital C**,**

- ***# ERAS_****(HC)* ***- Closure of ileostomy*** (LHDXXX164) (Postop Day 3)
- ***# ERAS_****(HC)* **- Closure of colostomy** (LHDXXX162) (Postop Day 3)
- ***# ERAS_****(HC)* **- Bowel resection without stoma** (LHDXXX161) (Postop Day 4)
- ***# ERAS_****(HC)* **- Bowel resection with stoma** (LHDXXX163) (Postop Day 7)

- The CPs in draft form distributed for consultation included:

DRAFT LHD (ERAS) Clinical pathways for: (Distributed for review June 2018)	Day of operation is “Post op Day 0” Daily postoperative care documentation up to:
Transurethral resection of prostate (TURP) (LHDXXX141)	Postoperative Day 3
Nephrectomy (LHDXXX201)	Postoperative Day 5
Endoluminal abdominal aortic aneurysm (LHD202)	Postoperative Day 5
Femoral popliteal bypass surgery (LHDXXX205)	Postoperative day 7
Closure of ileostomy (LHDXXX164)	Postoperative day *5*
Closure of colostomy (LHDXXX162)	Postoperative day *5*
Bowel resection without stoma Form #	Postoperative day *7*
Bowel resection with stoma (LHDXXX163)	Postoperative day 7

Part B: Analysis of impact of implemented CPs for intermediate risk surgery on work practice and organisation:

- LHD_Historical - The LHD was observed to be very committed to promulgating an increasing number of CPs. Sign off was by the LHD Surgery senior surgeon. A committee of senior nurses mainly from Hospitals A and C met regularly with the LHD Surgery senior nurse to draft new CPs [Nurse 9,11,12, 36; Clinician Manager 6]. Surgeons and other relevant clinical staff were consulted, followed by distribution for LHD-wide consultation. However, some CPs were found on hospital ward shelves, dating back to 2013, unused and re-released for LHD-wide review e.g. (LHDXXX141).

• # Use by MDT - The CPs when in use were used almost exclusively by nurses. Patients and Medical officers were not aware of the CPs in practice and did not use the forms. Allied health for example physiotherapists and dieticians were aware of the forms and occasionally documented into CPs but the primary documentation for Allied Health was the eMR.
• The impact of the implemented CPs varied at the different Hospitals A, C and D **For example,**
<u>**Hospital A – ERAS**</u> ○ ***# ERAS CP total knee replacement*** and ***# ERAS CP total hip replacement*** ○ Both #ERAS found in the Pre-admission clinics, Operating suite, Post-Anaesthesia Care Unit (PACU) and Surgical wards. ○ Unique ERAS as both CPs included standardisation of intraoperative care anaesthesia and surgery, including early physiotherapy in the PACU ○ Unique ERAS in that patients were selected to be on pathway based on comorbidities and level of motivation with postoperative rehabilitation ○ Clinical nurse consultant for ERAS - Nurse (11), medical, nursing, allied health staff of wards familiar with ERAS initiative, variance documentation observed, tracking, audit and feedback regarding variance was observed and reported to occur ○ Multidisciplinary support for ERAS from senior management Department of Orthopaedic surgery, senior nurses Nurse (2), (11), Allied Health – physiotherapists (3), occupational therapists, senior doctors Anaesthetist (11), Geriatrician ○ Formal reporting of remarkable gains in decreasing LOS in the majority of selected patients over time - Nurse (11). ○ See Patient 2 (Box 5.6) ○ ERAS has been recognised as an example of transformational leadership in Hospital A Nurse (11) Manager (1), and has won LHD and state-wide accolades - Nurse (11)

Hospital C – ERAS

- ***# ERAS CP Closure of ileostomy, # ERAS Closure of colostomy, # ERAS Bowel resection without stoma, # ERAS Bowel resection with stoma***
- All four #ERAS found in the Pre-admission clinics and Surgical wards.
- Clinical nurse consultant for ERAS - Nurse (34), nursing staff of wards familiar with ERAS initiative, variance documentation observed, tracking, audit and feedback regarding variance was observed and reported to occur
- Multidisciplinary support for ERAS from senior management nursing Manager (6), senior nurses Nurse (36), senior doctors Anaesthetists (6) and (8), Surgeon (6), Physician (9) a Geriatrician
- Formal reporting of gains in decreasing length of stay in some patients over time - Manager (6), Nurse (36). Hospital C has won a state-wide award for its ERAS initiative - Anaesthetist (8)
- Challenges when patients' postoperative course to recovery does not follow CP, CP then reported to be 'abandoned', this was quite often the case – Nurses (33), (37), (40)

Hospital D – ERAS

- ***# ERAS CP arthroplasty knee*** *and* ***ERAS arthroplasty hip*** *(for specific surgeon – named)* ***(20-page booklets****)*
- *Booklets specific to Hospital D, not the blue-striped LHD format of all the other CP_IRS*
- Both booklets found in the Pre-admission clinics and in the orthopaedic ward, pages of booklet for example on prescribing pain relief medications was on junior doctors' smart phones. #ERASeferred to by Clinician-Manager (5) Anaesthetist, as having been in use for many years, nearly 10 years.
- Plan Postop day 5 for discharge, same as for LHD CPs for same operations
- No clinical nurse consultant position for ERAS
- No formal reporting of impact on LOS; no variance documentation, tracking, audit and feedback regarding variance was observed, reported to not occur

Box 6.9 DA Clinical pathways for high risk surgery

Part A: The LHD produced in draft form and distributed for comment a suite of CP for high risk surgery

- The CPs in draft form for consultation included:

DRAFT LHD CPs for: (Distributed for review June 2018)	Day of operation is “Post op Day 0” Daily postoperative care documentation up to:
Gastrectomy surgery (excluding sleeve gastrectomy) (LHDXXX206)	Postoperative Day 9
Minimally invasive oesophagectomy (LHDXXX204)	Postoperative Day 11
Open oesophagectomy (LHDXXX203)	Postoperative Day 13

Part B: Impact of CPs on work practice and organisation:

Impact of CPs not observed as CPs had not been implemented at the time of data collection.
Evidence of complex postoperative ward nursing care documented each shift in eMR.
Similar to that described for Patient 1, 2 and 3 (Box 5.7), postop. open oesophagectomy, subtotal gastrectomy.