Achieving Flexible & Adaptable Healthcare Facilities - findings from a systematic literature review (presentation)

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Event details:
Health and Care Infrastructure Research and Innovation Centre (HaCIRIC) 3rd Annual Conference: Better Healthcare Through Better Infrastructure
Edinburgh, Scotland

Publication Date:
2010

DOI:
https://doi.org/10.26190/unsworks/1137

Centre for Health Assets Australasia

HaCIRIC Conference, Edinburgh, 2010

Achieving Flexible & Adaptable Healthcare Facilities – findings from a systematic literature review

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OUTLINE OF PRESENTATION

1. Health Infrastructure NSW: Future Directions Project
2. Flexibility: Beyond the buzzword
3. Some considerations when designing new hospitals
4. Lessons from 4 of the case studies
   a. Martini Teaching Hospital, Groningen, Netherlands
   b. Insel Hospital, Bern, Switzerland
   c. St Olav's Hospital, Trondheim, Norway
   d. Clarian Health, Indianapolis, Indiana USA
5. Future Research
6. Next Phase of Research

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1. HEALTH INFRASTRUCTURE NSW: FUTURE DIRECTIONS PROJECT

Purpose of the project:

Guide the planning and delivery of NSW health infrastructure for the next 20-30 years

Problem being studied:

Lack of flexibility leads to early obsolescence & expensive replacements/upgrades

1. FUTURE DIRECTIONS PROJECT: FLEXIBILITY STUDY

Research question:

How can hospitals be designed for flexibility and adaptability to increase their lifespan, meet changing demands and reduce operational costs over the whole facility lifecycle?

For the study this was framed as:

Drawing on international case studies, what useful cost-effective lessons can be learnt for Australia facilities that could prolong for up to 30 years or so?

1. FUTURE DIRECTIONS PROJECT: FLEXIBILITY STUDY

Method:

International systematic literature review (49 publications, 11 nationalities)

Result:

19 case studies identified (with sufficient information for analysis purposes)

Outcome (anticipated):

Cost-effective ways to future-proof health assets

2. FLEXIBILITY: BEYOND THE BUZZWORD

- What does *flexibility* mean?
- "Flexibility is often described as an option – the right but not obligation to a specific future action" *(Neufville, et al., 2008)*
- Such actions might involve:
  - Managing different modes of treatment for patients within existing space;
  - Adapting to technological advances with minor modifications to existing space;
  - Designing room layouts to accommodate fluctuations in patient demand e.g. moving walls, adding and altering;
  - Future expansions on site to accommodate increased demand, etc

2. FLEXIBILITY: BEYOND THE BUZZWORD

19 Case Studies – main functional strategy adopted for flexibility (adopted definitions):

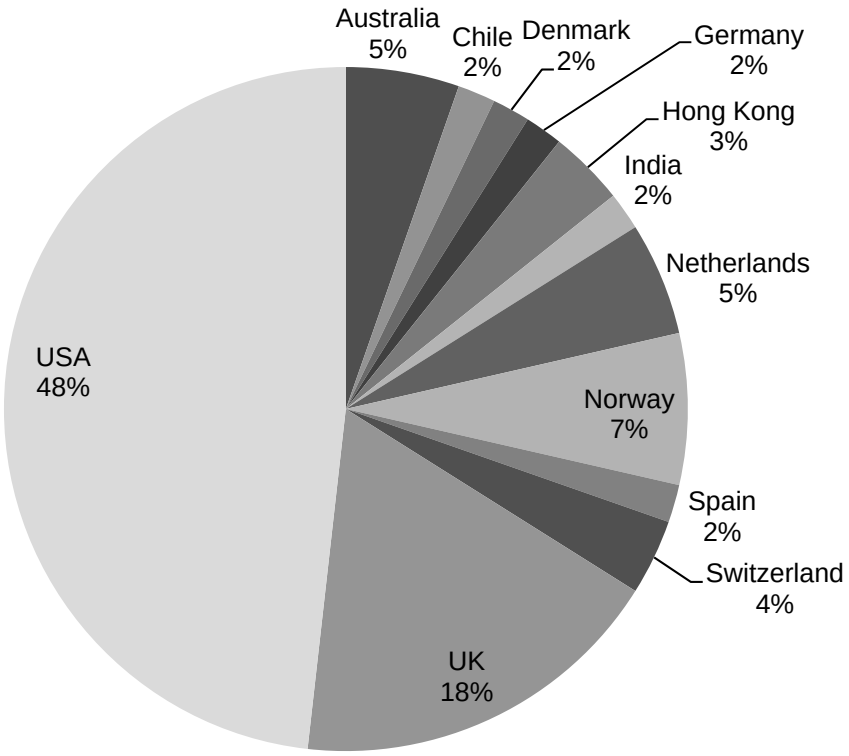
1. **Adaptability**
   (Ability to adapt existing space to operational changes
   e.g. workplace practices – no / minimal building work required) **9**
2. **Expandability**
   (Ability to expand or contract the
   building envelope and increase/decrease capacity for
   specific hospital functions – major building work required) **6**
3. **Convertibility**
   (Ability to convert rooms to different functions –
   some building work required) **4**

2. FLEXIBILITY: BEYOND THE BUZZWORD

Drawn from the literature: 'Who is using the word & for what purpose?'

Focus	Managerial considerations	Functional requirement	Building system
Micro ↓ Macro	**Operational** Easy to reconfigure, low impact on time and cost (e.g. furniture and interior spaces)	**Adaptability** Ability to adapt existing space to operational changes e.g. workplace practices	**Tertiary** 5-10 years lifespan, no structural implications e.g. furniture
	Tactical Involves commitment of capital expenditure; changes not easy to undo (e.g. design of operating theatres, provision of interstitial floors)	**Convertibility** Ability to convert rooms to different functions	**Secondary** 15-50 years lifespan, e.g. walls and ceilings, building services capacity
	Strategic Substantial increase in the lifetime of the infrastructure (e.g. long term expansion plans, future conversion to other functions)	**Expandability** Ability to expand (or contract) the building envelope and increase/decrease capacity for specific hospital functions	**Primary** 50-100 years lifespan, e.g. building shell
Source	(Neufville, Lee, & Scholtes, 2008)	(Pati, et al., 2008)	(Kendall, 2005b)

2. FLEXIBILITY: BEYOND THE BUZZWORD



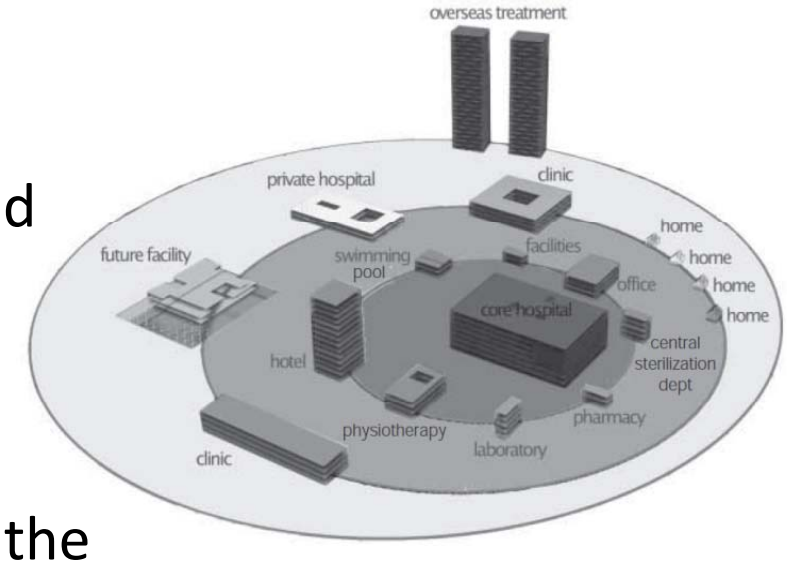
Sources of 19 Case Studies

2. FLEXIBILITY: BEYOND THE BUZZWORD

No	Hospital / Facility Strategies adopted for flexibility / adaptability	Year Completed	Location	Classification of Strategy(ies) adopted Major (/ minor)
1	Addenbrooke's Hospital, Cambridge (Neufville, et al., 2008) The old hospital (1,100 beds) was relocated to cope with expanding functions	1984 NB final transition to new hospital	UK	Expandability (strategic /primary)
2	Banner Estrella Medical Center, Phoenix (Eagle, 2006) Designed to facilitate future expansion by adding two new towers in the future to cope with increased demand. (DPR Constructions, 2010)	2005	USA	Expandability (strategic /primary)
3	Celebration Health, Orlando (Gallant & Lanning, 2001) Universal room design - reduction in average lengths of stay and nursing hours per patient day.	Not specified	USA	Adaptability (operational / tertiary)
4	Clarian West Medical Center, Avon, Indianapolis (Eagle, 2007) Universal patient rooms - size of the room and configuration can serve all the purposes from medical-surgical to labour / delivery to intensive care.	2004	USA	Adaptability (operational / tertiary)

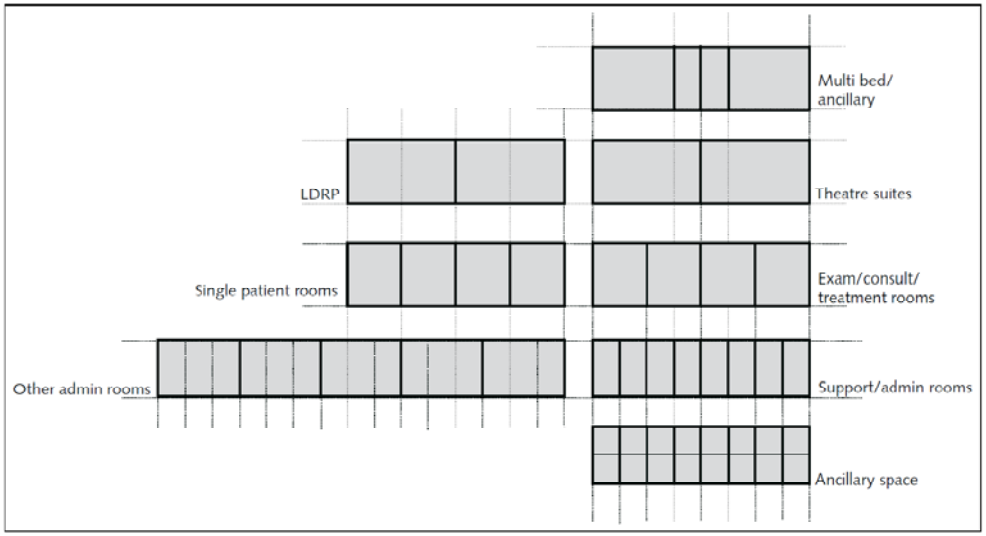
3. SOME FINDINGS: MASTERPLANNING

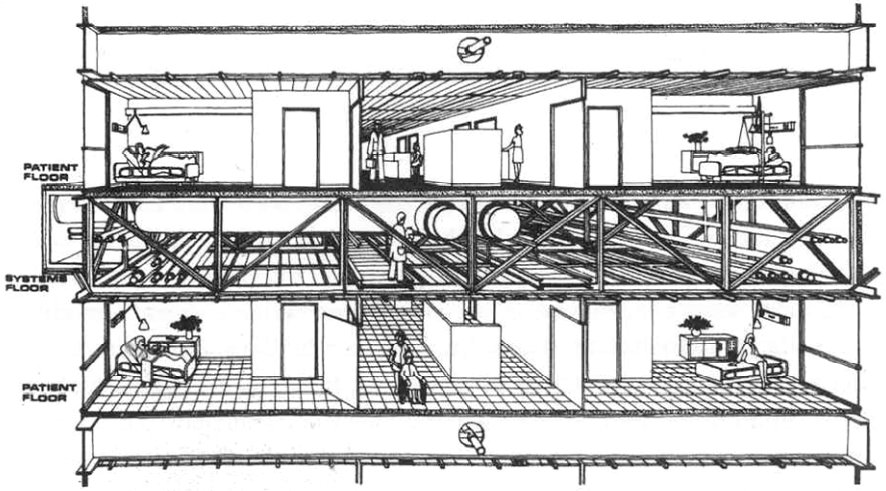
- The “Core hospital”: up to 50% of hospital functions as ancillary buildings *(Bjørberg & Verweij, 2009)*
- The “hospital-on-demand”: 30% permanent / “fixed” space, 40% short lease, 30% hired on demand *(Neufville, et al., 2008)*
- Incorporated in contract using option fees *(Lee, 2007)*
- “Empty chair” strategy based on the “four quadrants” principle *(Thiadens, et al., 2004)*



3. SOME FINDINGS: BUILDING DESIGN

- Modular Architecture: Based on uniform grid that is then subdivided to suit a range of functions *(Diamond, 2006)*
- Interstitial Floors: full height (> 1.8m) servicing floors between “patient floors”, to allow for universal wall-less cabling and servicing *(Verderber & Fine, 2000)*



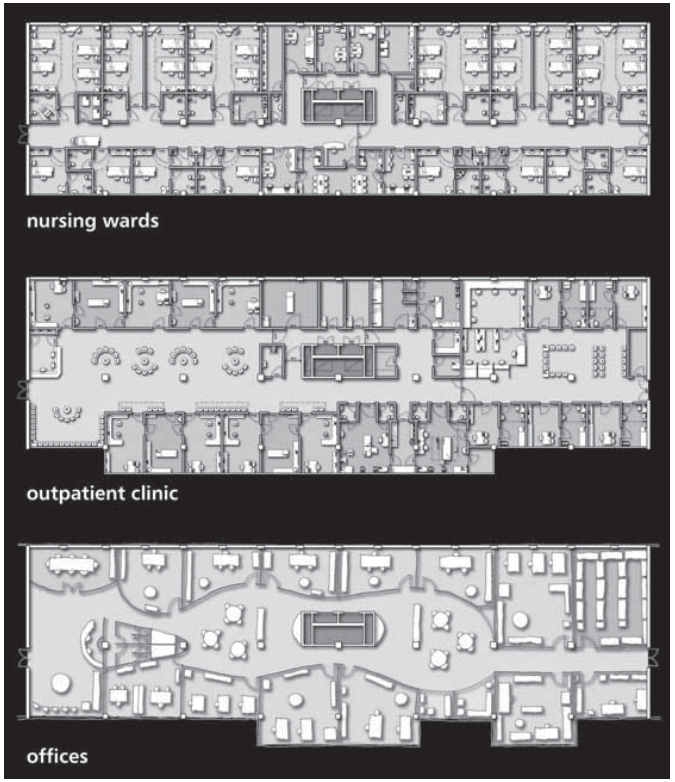


3. SOME FINDINGS: FUNDING / TENDERING

- Life-cycle approach - total construction costs = 2-3 years operational cost *(Valen & Larssen, 2006)*
- Beware of over-specifying contracts *(Building Design Partnership, 2004)*
- Engage with hospital staff and committee members to understand long term needs *(Bush, et al., 2005) & (Rechel, et al., 2009)*
- Past PFI in UK “stifles innovation” - should consider design stage separate to tendering process *(Barlow & Koberle-Gaiser, 2009)*
- Quantifiable measures for flexibility should be written as conditions to PFI agreement *(Neufville, et al., 2008)*

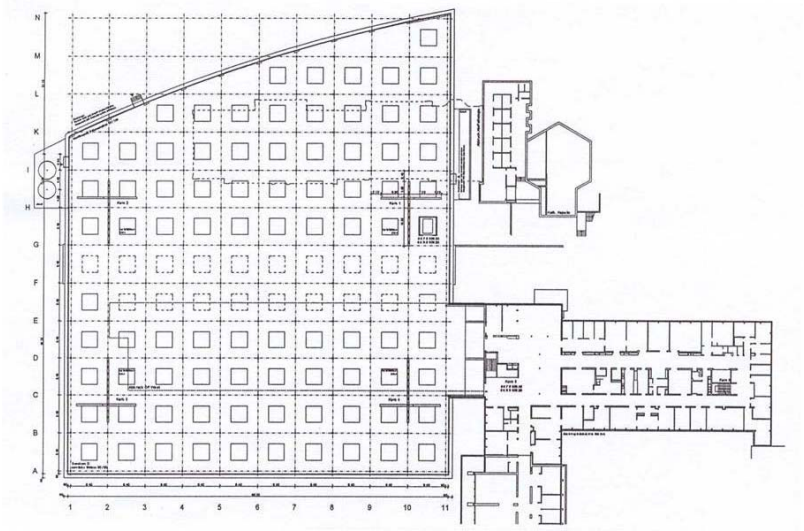
4. CASE STUDY: MARTINI TEACHING HOSPITAL, GRONINGEN, NETHERLANDS

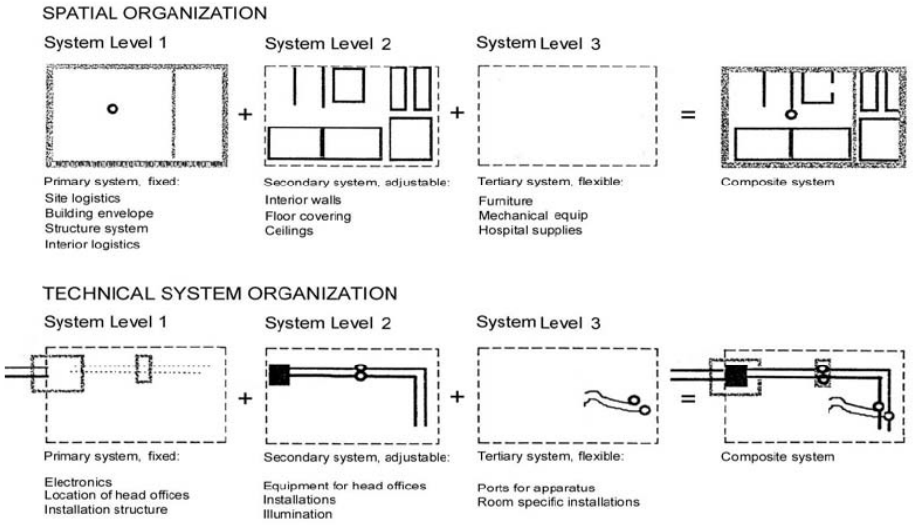
- "Empty chair" strategy
- 16m x 60m floor plan



4. CASE STUDY: INSEL HOSPITAL, BERN SWITZERLAND

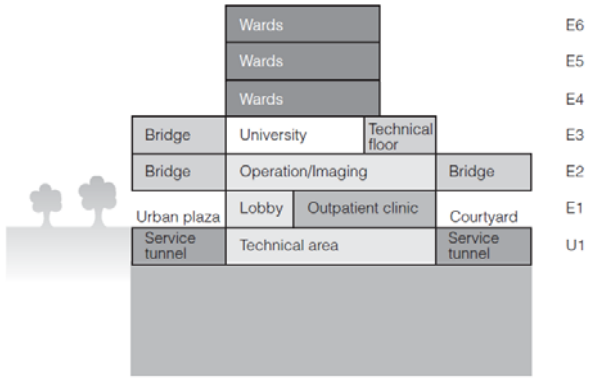
- Primary, secondary, tertiary systems
- Floor structure grid of 8.4m x 8.4m2, with openings of 3.6m x 3.6m2, which can be opened later for vertical access, cables, pipes, lift shafts or light shafts *(Geiser, 2004)*

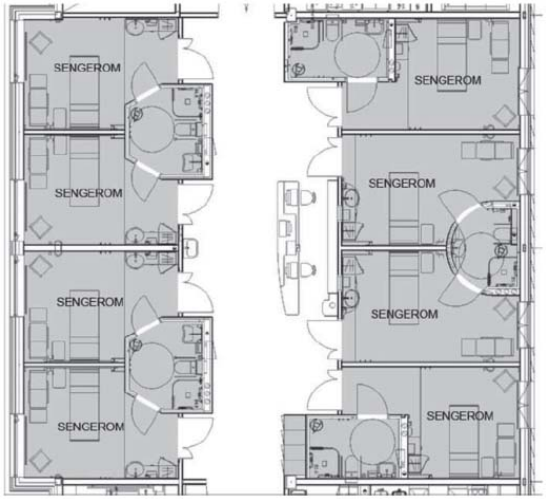




4. CASE STUDY: ST OLAV'S HOSPITAL, TRONDHEIM, NORWAY

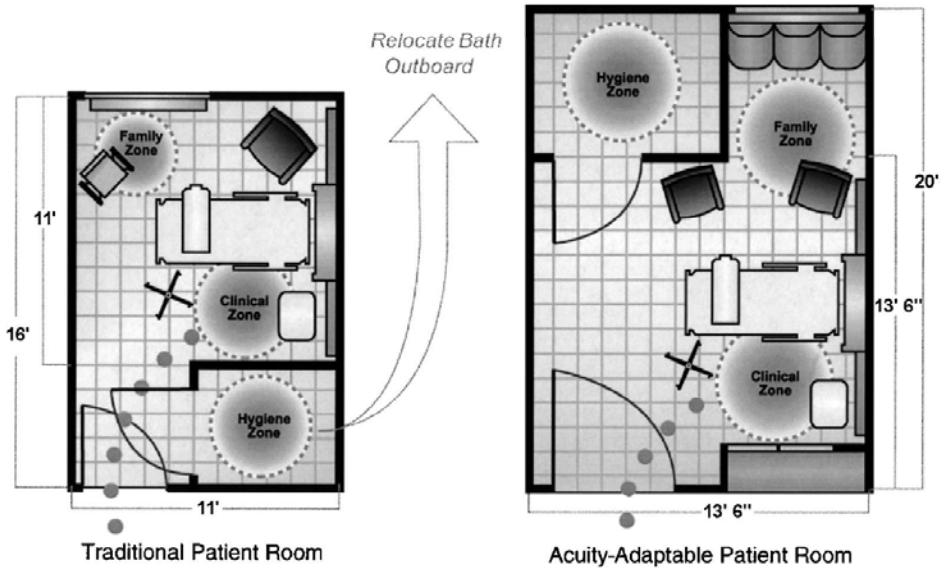
- "Generic Clinic": identical locations of functions on each floor *(Jensø & Haugen, 2005)*
- User participation: engagement with hospital staff *(Rechel et al, 2009)*
- Surplus HVAC capacity of 20-30% *(Valen & Larssen, 2006)*





4. CASE STUDY: CLARIAN HEALTH PARTNERS, INDIANAPOLIS, INDIANA USA

- Patient-focussed care: acuity-adaptable rooms
- Transports of patients decreased by 90% and medication errors decreased by 70% *(Hendrich, et al., 2004)*
- Decentralised nursing stations



5. CONCLUSIONS

- Due to limitations on the search frame, not many facilities operational for long enough to be able to study how well they have adapted over time.
- There is little consistency in how the terms for flexibility are used – need for clearer and agreed definitions to be able to test how health facilities are doing.
- Local conditions can impact on successful strategies.
- Pressler (2006) ‘good design should proved an adequate amount of flexibility, but no more than that’. What does this actually mean?
- Further research suggestions are given.

5. FUTURE RESEARCH – NEXT STEPS

- Need to widen search frame to include older facilities
- Focus on Australian hospitals
- Review existing facilities

EXAMPLE AUSTRALIAN CASE STUDIES

- Westmead Hospital, NSW (1978)
- Mount Druitt Hospital, NSW (1980)
- Prince of Wales Hospital, NSW (1995)
- St Vincent's Hospital, NSW (2002)
- Blacktown Hospital, NSW (2002)
- Coffs Harbour Hospital, NSW (2002)
- Toowoomba Base Hospital, QLD (1997)
- Princess Alexandra Hospital, QLD (2002)
- Townsville Hospital, QLD (2002)
- Royal Melbourne Hospital, VIC (1942-95)
- The Alfred Hospital, VIC (1990)
- Sunshine Hospital, VIC (2002)

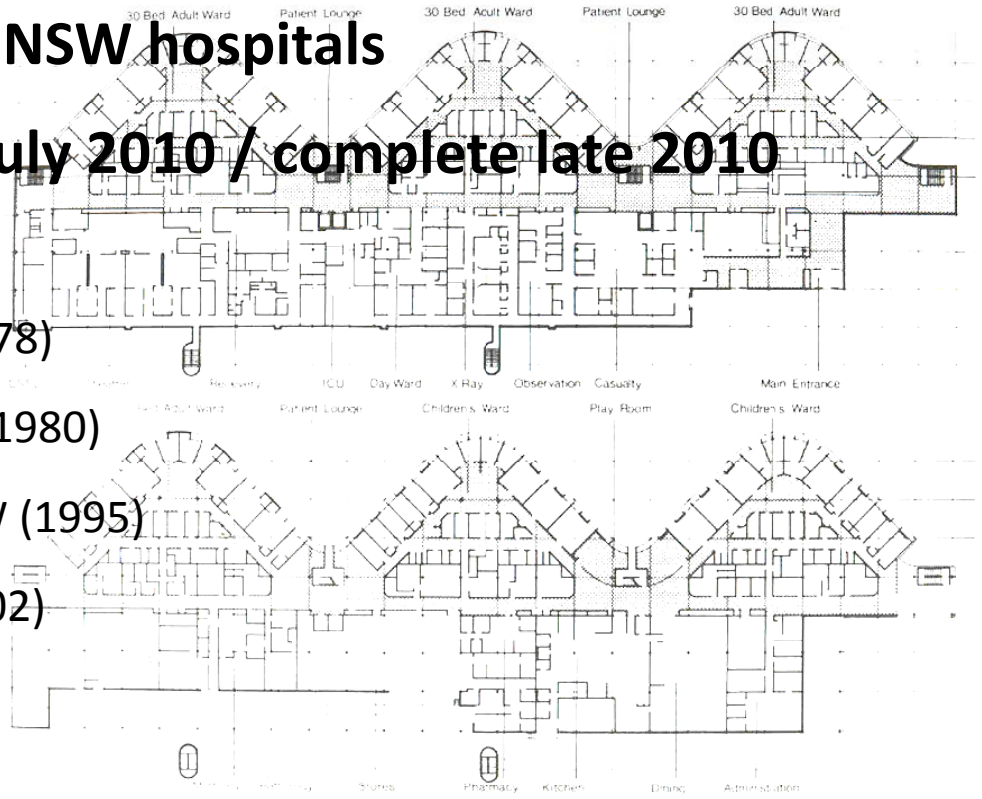
6. NEXT PHASE OF RESEARCH

Health Infrastructure NSW Stage 2 project – 2010

- Search frame widened to include older facilities
- Focus on Australian / NSW hospitals
- Project commenced July 2010 / complete late 2010

NSW Case Studies

- Westmead Hospital, NSW (1978)
- Mount Druitt Hospital, NSW (1980)
- Prince of Wales Hospital, NSW (1995)
- Blacktown Hospital, NSW (2002)



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THANK YOU

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***CHAA acknowledges the support of the Australasian Health Infrastructure Alliance (AHIA), of which NSW Health is a member, and the Built Environment Faculty at the University of NSW*