Report of the Australian and New Zealand Neonatal Network 2002

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Donoghue, Deborah

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Deborah Donoghue

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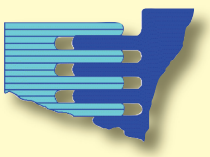

NSW Pregnancy and Newborn Services Network and
the Centre for Perinatal Health Services Research

The
University
of Sydney

The ANZNN would like to thank our sponsors,
the level III nurseries of Australia and New Zealand,
Abbott Australasia Pty Ltd and
Abbott Laboratories New Zealand

Report of the

Australian and New Zealand Neonatal Network

2002

Deborah Donoghue

ANZNN Executive:
Kaye Bawden
David Cartwright
Brian Darlow
John Doran
David Henderson-Smart

The Australian and New Zealand Neonatal Network is located at:

Centre for Perinatal Health Services Research

Queen Elizabeth II Research Institute
Building DO2
Blackburn Circuit
University of Sydney NSW 2006 AUSTRALIA

Phone: 61 2 9351 7745
Fax: 61 2 9351 7742
Email: ANZNN@perinatal.usyd.edu.au
www.usyd.edu.au/cphsr/anznn

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Acknowledgements

The Australian and New Zealand Neonatal Network is now in its 11th year. Throughout all this time it has been assisted by many many people who care for the newborn in both countries. The ANZNN's ability to achieve its aims and objectives has only been through the voluntary cooperation and hard work of these people. With only two staff members, much of the work of the ANZNN, especially its audit, is done in the participating units. We have listed these people individually according to their nursery of affiliation. The ANZNN wishes to formally acknowledge each of them for their continuing support beyond the call of duty.

Across both countries there are people in nearly 300 hospitals who also gives us their time so that we can track the outcomes of the audited babies. We would also like to thank those people.

We again thank the members of our Advisory Committee who continue to provide conceptual, intellectual and financial contributions, all of which have helped make this network the respected and world-recognised organisation that it is today.

We especially thank the members of the ANZNN Executive, Kaye Bawden, David Cartwright, Brian Darlow, John Doran, David Henderson-Smart and Paul Lancaster for their commitment, time, guidance and vision and for reviewing this manuscript.

We continue to have ongoing support from our major sponsors, Abbott Australasia Pty Ltd and Abbott Laboratories, New Zealand. Their sponsorship allows us to continue the work of the ANZNN and we thank them for this.

Finally, Deborah Donoghue would like to thank her colleagues from the NSW Pregnancy and newborn Services Network, especially the NSW Neonatal Intensive Care Units Study and the Centre for Perinatal Health Services Research for their continued support and encouragement.

Level III nurseries:

New South Wales

Children's Hospital at Westmead:

Births: 0; nursery beds: 20
Nadia Badawi, Peter Barr, Robert Halliday (Director) and Karen Walker.

John Hunter Hospital:

Births: 3278; nursery beds: 29
Lynne Cruden and Chris Wake (Director).

Liverpool Health Service:

Births: 3014; nursery beds: 23
Ian Callendar, Robert Guaran (Director), Catherine Medlin, Jacqui Stack and Sara Wilson.

Nepean Hospital:

Births: 3375; nursery beds: 27
Mee Fong Chin and Lyn Downe (Director).

NSW newborn & paediatric Emergency Transport Service:

Andrew Berry (Director).

Royal Hospital for Women:

Births: 3964; nursery beds: 34
Diane Cameron and Kei Lui (Director).

Royal North Shore Hospital:

Births: 1442; nursery beds: 26
Jennifer Bowen (Director), Tushar Bhuta, Vicky Gallimore and Martin Kluckow.

RPA Women and Babies:

Births: 3573; nursery beds: 32
Philip Beeby, Nick Evans (Director) and Shelley Reid.

Sydney Children's Hospital:

Births: 0; nursery beds: 20
Barry Duffy (Director), Denise Georgakopoulos and Janelle Young.

Westmead Hospital:

Births: 3991; nursery beds: 39
Jane Baird, Marilyn Rochefort (Director), William Tarnow-Mordi (Director and Professor of Neonatal Medicine) and John Vandyk.

Australian Capital Territory

The Canberra Hospital:

Births: 1792; nursery beds: 24
John Edwards and Graham Reynolds (Director).

Victoria

Mercy Hospital for Women:
Births: 4851; nursery beds: 54
Catherine Fleming, Simon Fraser and Andrew Watkins (Director).

Monash Medical Centre:
Births: 3339; nursery beds: 48
Kaye Bawden, Rose Li, Andrew Ramsden (Director) and Victor Yu (Professor of Neonatology)

Newborn Emergency Transport Service (Vic):
Michael Stewart (Director).

Royal Children's Hospital:
Births: 1; nursery beds: 22
Jo Brooks, Peter Loughnan, Peter McDougall (Director) and Liz Perkins.

Royal Women's Hospital:
Births: 4765; nursery beds: 50
Caroline Collis, Lex Doyle (Professor of Neonatology), Mei Mok, Colin Morley (Professor of Neonatal Medicine), Geraldine Norman, Sheryle Rogerson, Neil Roy (Director) and Wendy Simmons.

Queensland

Mater Misericordiae Mother's Hospital:
Births: 7164; nursery beds: 60
Vicki Flenady, Peter Gray, Lyndon Kaye and David Tudehope (Director and Professor of Paediatrics and Child Health).

Royal Women's Hospital:
Births: 4036; nursery beds: 66
Kate Bobbermein, David Cartwright (Director), Lyn Chapple, Paul Colditz (Professor of Perinatal Medicine), Tim Donovan, Lesley Eliason, Sue Jenkins-Manning, Kellie McGrory

The Townsville Hospital:
Births: 1575; nursery beds: 28
Caroline Allen, Jenny Binney, Donna Gandini, Guan Koh, Jacinta Lee and John Whitehall (Director).

South Australia

Flinders Medical Centre:
Births: 2200; nursery beds: 35
Cordula Blank and Peter Marshall (Director).

Women's and Children's Hospital:
Births: 3833; nursery beds: 49
Elizabeth Gent, Ross Haslam (Director) and Andy McPhee.

Western Australia

King Edward Memorial and Princess Margaret Hospitals:
Births: 4337; nursery beds: 80
Annette Butler, Noel French, Ronnie Hagan, Rolland Kohan, Corrado Minutillo, Naomi Rynne, Karen Simmer (Director and Professor of Neonatal Medicine) and Margaret Trotter.

Western Australia Neonatal Transport Service:
Jenni Sokol

Tasmania

Royal Hobart Hospital:
Births: 1702; nursery beds:
Graham Bury (Director), Karen Butterley, Peter Dargaville (Director), Heather Giannaros and Simon Parsons (Director).

Northern Territory

Royal Darwin Hospital:
Births: nursery beds: 18
Charles Kilburn (Director), Alan Ruben, Gurmeet Singh (Director) and Margaret Stewart

New Zealand

Christchurch Women's Hospital:
Births: 4238; nursery beds: 37
Nicola Austin (Director), Brian Darlow (Professor of Paediatrics) and Nina Mogridge.

Dunedin Hospital:
Births: 1708; nursery beds: 16
Roland Broadbent (Director).

Middlemore Hospital:
Births: 6530; nursery beds: 20
Lindsay Mildenhall (Director) and Maisie Wong

National Women's Hospital:
Births: 7952; nursery beds: 59
Coila Bevan, Gill Cahill, Jane Harding (Professor of Neonatology), David Knight and Carl Kuschel (Director).

Waikato Hospital:
Births: 2979; nursery beds: 29
David Bourchier (Director), Deborah Harris and Phil Weston.

Wellington Women's Hospital:
Births: 3361; nursery beds: 35
Dawn Elder, Keith Fisher, Michael Hewson, Vaughan Richardson (Director) and Joel Sadowsky.

Level II nurseries:

Tasmania

Launceston General Hospital:

Births: 1523; nursery beds: 12
Chris Bailey (Director), Jennifer James and Robyn Morey.

New Zealand

Gisborne Hospital:

Births: 698; nursery beds: 6
Graeme Lear (Director).

Hawkes Bay Hospital:

Births: 1826; nursery beds: 12
Lorna Asquith, Marion Bates and Jenny Corban (Director).

Lower Hutt Hospital:

Births: nursery beds: 8
Deryn Hogan, Robyn Shaw (Director) and Adele Sullivan.

Nelson Hospital:

Births: 856; nursery beds: 10
Peter McIlroy (Director).

Palmerston North Hospital:

Births: 1772; nursery beds: 17
Jeff Brown (Director) and Eta Raicebe.

Rotorua Hospital:

Births: 1291; nursery beds: 10
Stephen Bradley (Director), Phillipa Clark, Gaye France and Judi Tapp.

Southland Hospital:

Births: 1109 nursery beds: 6
Paul Tomlinson (Director).

Taranaki Base Hospital:

Births: 1315; nursery beds: 8
Geoff Aiken, Jane Bocock and John Doran (Director).

Tauranga Hospital:

Births: 1732; nursery beds: 10
Hugh Lees (Director), Heather McAlley and Sue Rodda.

Timaru Hospital:

Births: 546; nursery beds: 3
Philip Morrison (Director) and Sheliah O'Sullivan.

Wairau Hospital:

Births: nursery beds: 4
Graham Cross and Ken Dawson (Director).

Wanganui Hospital:

Births: nursery beds: 4
John Goldsmith (Director).

Whakatane Hospital:

Births: 670; nursery beds: 5
Chris Moyes (Director), Marlon Radcliffe and Dharm Ramadas.

Whangarei Area Hospital:

Births: 1844; nursery beds: 8
Lynne Clarke, Toni Fergus, Mark Goodman and Peter Jankowitz (Director).

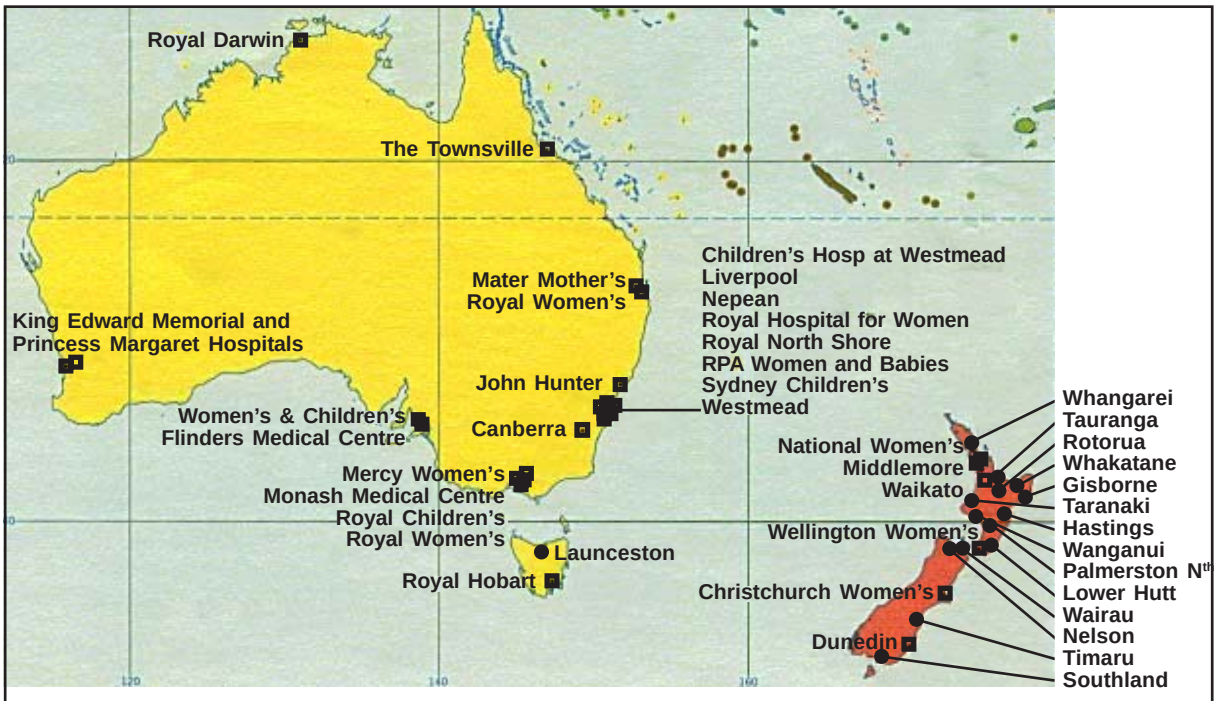

Figure 1: A map of Australia and New Zealand with the hospitals that comprise the ANZNN

1. Organisation of the ANZNN

1.1 History

In July 1993, the Directors of the Australian level III Neonatal Intensive Care Units collaborated to establish a network to monitor the care of high-risk newborn infants. This was to be accomplished by pooling data to provide quality assurance for this resource-consuming care. Such networking, collaboration and cooperation have long been hallmarks of perinatal care in the region.

The National Health and Medical Research Council (NHMRC)'s Expert Panel on Perinatal Morbidity recommended that 'The Australian Institute of Health and Welfare National Perinatal Statistics Unit, in collaboration with the directors and staff of all neonatal intensive care units, should develop a national minimum data set and implement a data collection to monitor mortality and morbidity of infants admitted to such units'. (Health Care Committee Expert Panel on Perinatal Morbidity, 1995).

The prospective audit of high-risk infants commenced for babies born from 1st January 1994. All level III units in Australia and New Zealand have contributed to the audit for babies born from 1st January 1995.

In 1998, all the level II units in New Zealand joined the network and began contributing to the audit. The level II unit in Tasmania joined ANZNN in 1999.

1.2 Funding

Abbott Australasia Pty Ltd together with Abbott Laboratories New Zealand, have been our major sponsors since 1997. ANZNN again thanks them for their ongoing and generous support. The ANZNN was established from seeding funding generously provided from 1994 by Glaxo Wellcome Australia Ltd and Glaxo Wellcome New Zealand Ltd.

Funding also comes from an annual contribution from each of the hospitals with a level III nursery in recognition of their network membership and the annual individual unit feedback. This was a voluntary and unanimous decision undertaken by the tertiary centres, and the amount was increased at the 2004 Advisory Committee meeting.

1.3 Structure

The Australian and New Zealand Neonatal Network (ANZNN) consists of an Advisory Committee and an Executive Committee.

The Advisory Committee consists of the Directors (or their nominee) of each participating unit and the academic neonatologists / neonatal nurses in the region. The role of the Advisory Committee is to monitor and direct the ANZNN, and to approve use of the data. This Committee meets annually in association with the Perinatal Society of Australia and New Zealand's annual congress. These congresses are in a different city each year and were held in Christchurch New Zealand in 2002, in Hobart, Tasmania in 2003 and in Sydney NSW in March 2004.

The Executive Committee represents various areas of the network and is concerned with the general running and decision making. This committee comprises Kaye Bawden bringing her expertise as an audit officer and follow-up coordinator for Monash Medical Centre, Victoria; David Cartwright, who is Director of Neonatology at Royal Women's Hospital in Brisbane and has a special interest in databases; Brian Darlow, who is Professor of Paediatrics at Christchurch School of Medicine and a neonatologist at Christchurch Women's Hospital, New Zealand; John Doran, who is Director of the Special Care Nursery at Taranaki Base Hospital, New Plymouth, New Zealand; David Henderson-Smart, who is Professor of Perinatal Medicine at the University of Sydney and Director of the NSW Pregnancy and newborn Services Network and the Centre for Perinatal Health Services Research; and Assoc. Professor Paul Lancaster, who is a perinatal epidemiologist. Our consumer representative position has been vacant since March 2001.

Staff members of the network include Deborah Donoghue who has been the coordinator / researcher since the network's inception. Rachel Jones was our Project Officer until her return to the clinical setting in January 2003. The Project Officer is primarily responsible for the level II nurseries and the day to day running of the audit. During 2002 and 2003 we also had a research officer, Jolie Hutchinson working on a NHMRC funded project for ANZNN.

2. Dataset

2.1 Registration criteria

The Australian & New Zealand Neonatal Network's (ANZNN) audit of high-risk infants admitted to a newborn nursery includes all live born babies who were admitted to a hospital with a level III neonatal intensive care unit (NICU) at less than 28 days (and during their first hospitalisation), or who were transferred from a labour ward with the intention of admission to the unit and met the following criteria:

- born at less than 32 completed weeks' gestation; or
- weighed less than 1500 grams at birth; or
- received assisted ventilation (mechanical ventilation including intermittent positive pressure ventilation (IPPV) or continuous positive airways pressure (CPAP)) for four or more consecutive hours, or died while receiving mechanical ventilation prior to four hours of age; or
- received major surgery.

Babies who died at less than 4 hours who were receiving assisted ventilation are also included.

From 1st January 1998, the audit was extended to include all babies meeting the above criteria who were admitted for care to a level II nursery in New Zealand. From January 1st 1999, the level II nursery in Tasmania also joined the audit.

The hospital of registration for a baby is the first level III NICU that the baby remained in for four or more hours during the first 28 days of life. Babies who received their entire care in a level II hospital or who were not transferred to a level III NICU during the first 28 days were registered to the first level II centre that they remained in for four or more hours .

For the purpose of this report, babies transferred were considered to be admitted to the hospital to which they were transferred from the time the transport team arrived to collect them.

2.2 Dataset variables

The variables and their definitions for the 2002 audit are listed in Appendix 1. There were two changes to the variables collected this year. To bring the collection into accord with the NICU Infection Surveillance group of the Australian Infection Control Association, the variables collecting the number separate episodes of infection is now:

Early infection: The presence of at least one episode of systemic sepsis with initial symptoms occurring prior to 48 hours after birth.

Number of episodes of late infection: The presence of at least one episode of systemic sepsis with initial symptoms occurring from 48 hours after birth.

As reported in previous years most units collected the complete data set and we continue to use the data available for the audit as long as it meets the agreed definitions.

Data which are expressed as percentages exclude missing and unknown data.

2.3 Data collection

Data are collected in the participating units by either filling out the specific ANZNN forms or by incorporating the ANZNN data items into the local audit. Data are then transferred to the ANZNN database either electronically or on paper forms. Confidentiality guidelines (Appendix 3.3) are followed. Identifying information is removed and replaced by codes at the individual units.

2.4 Data verification

Missing or anomalous data are identified and queried soon after entry onto the main database. Quantification of errors and the implementation of practices to minimise errors are continually refined. A data verification study was conducted in 1996 and reported in the 1995 annual report (Donoghue, 1997).

3. Results - babies registered to level III nurseries

3.1 In general

In 2002, there were 7045 babies born who met the criteria for the Australian and New Zealand Neonatal Network's (ANZNN) high-risk audit and were admitted to one of the 28 level III neonatal intensive care units (NICUs) throughout Australia and New Zealand. Of these babies, 3281 were born at less than 32 completed weeks gestation (Figure 3, page 11; Table 1, page 27) and 2803 were born weighing less than 1500 grams (Table 2). Intermittent positive pressure ventilation (IPPV) and / or continuous positive airways pressure (CPAP) was given to 6309 babies and 863 had major surgery.

The ANZNN level III cohort now represents 2.30% of the 305009 live births in the two countries (Australian Bureau of Statistics, 2003; Statistics New Zealand, 2003). This rate has increased since ANZNN began reporting in 1995 (1.87%, Figure 2) and appears to be due to the increasing number of very preterm babies born alive (Nassar and Sullivan, 2001) and increasing numbers of babies receiving assisted ventilation.

While the 'high-risk' criteria generally represent the babies requiring the most care, they do not include all babies admitted to a NICU. Many babies require other assistance and observation.

In our region, gestation is documented accurately and measured in completed weeks. In this report, babies are referred to as 'extremely preterm' if they are born at less than 28 weeks gestation; 'very preterm' if they are of less than 32 weeks; 'preterm' if born at less than 37 gestation, and 'term' if born at 37 weeks gestation or more.

Data in the tables are by birthweight group and gestational age group (adapted from WHO groups and NSW Health's role delineation guidelines). Data in figures are in gestational age divisions as it is gestation that is known prior to the birth.

3.1.1 Babies born in Australia

In 2002, 250988 babies were registered as liveborn in Australia (Australian Bureau of Statistics, 2003). Of the babies cared for in the 22 neonatal intensive care units in Australia, 5383 (2.14% of Australian live births) met the ANZNN high-risk criteria.

There were 2637 babies born at less than 32 weeks gestation (1.05% of live births) and 2217 babies weighed less than 1500 grams at birth (0.88%). Assisted ventilation was given to 4744 babies (1.89% of live births) with 1462 (30.8%) babies having CPAP as their only form of ventilation. Seven hundred and thirty-eight babies had surgery.

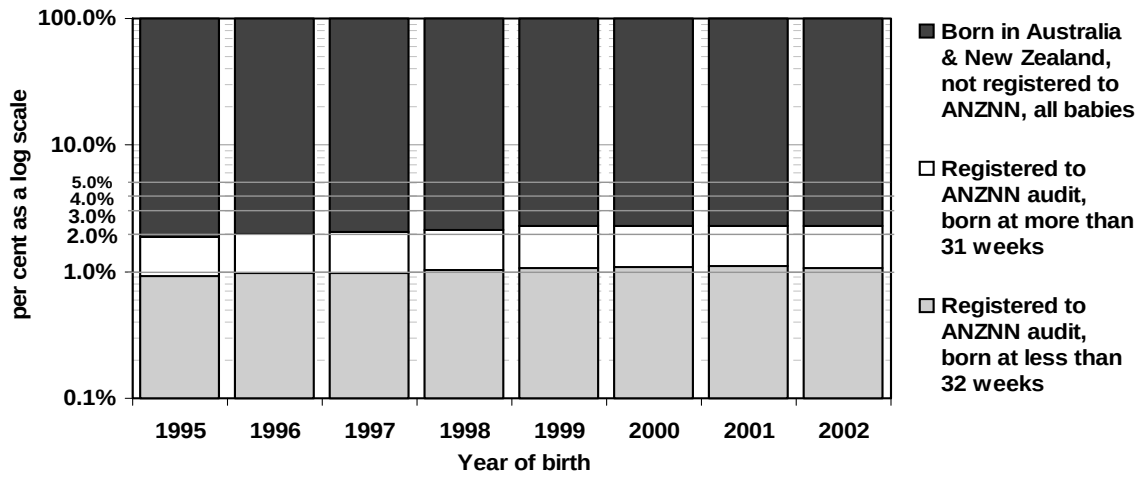

Figure 2: Babies registered to the ANZNN audit in level III nurseries as a proportion of all liveborn babies, by yearof birth, 1995-2002

Interpreting the data for maternal ethnicity remains a problem with 13.7% missing data. Of those with a reported ethnicity, 85.4% of babies were from Caucasian mothers and 5.85% were Asian. There were 5.96% babies whose mothers who identified as Aboriginal or Torres Strait Islander, a rate higher than that seen in the Australian population (3.4%, Australian Bureau of Statistics 2001).

3.1.2 Babies born in New Zealand

In New Zealand there were 54021 babies born alive in 2002 (Statistics New Zealand, 2003). Of these, 1662 (3.08% of live born) babies were cared for in one of the 6 New Zealand level III units and met our registration criteria.

There were 644 babies born at less than 32 weeks gestation who received level III care; 1.19% of the live births for that year. Babies admitted for care and born at less than 1500 grams made up 1.08% (n: 586) of live births. Major surgery was received by 127 babies. Assisted ventilation was given to 1566 babies (2.90% of live births), with two-thirds (n: 980, 62.6%) receiving CPAP only.

In contrast to Australia, ethnicity of the mother is reported for 99.0% of babies registered in New Zealand. The mothers of 20.1% of babies in the audit identified themselves as Maori, and another 10.5% as Pacific Islander. Caucasian made up another 60.3% of babies. These figures are similar to those reported for the New Zealand population (Statistics New Zealand, 2003).

In 2002, an additional 325 babies met our criteria for the audit and were registered to a participating level II unit. These babies are discussed in Section 4 (page 23). Currently, the 14 level II nurseries in New Zealand and the level II nursery in Tasmania are members of the ANZNN.

3.1.3 Number of registrants per unit

In 2002, the number of babies meeting the ANZNN's high-risk criteria for audit ranged from approximately 60 babies per unit to nearly 600 (Figure 4). These numbers reflect the overall size of the unit, the case mix of their patients and the geography and population distributions in both countries. Both New Zealand and Australia are evenly represented across the distribution.

All but one perinatal unit cared for more than 50 babies born at less than 32 weeks gestation during the year. Nine units had a 'throughput' of 50 to 100 very preterm babies, and the remaining 15 units admitted more than 100 very preterm babies during the year. The children's hospitals were the primary registration hospital for the care of fewer than 25 very preterm babies.

3.1.4 Levels of neonatal care

Both Australia and New Zealand have systems of regionalised care. This involves centring resources in the major population areas. Care for the newborn is provided at three levels. 'Level I' care is for normal healthy term babies, some of whom may need short-term observation during the first few hours of life. This level of care exists in all hospitals offering maternity facilities.

Level II or 'special care' refers to a nursery that generally has babies born at 32 to 36 weeks gestation or weighing around 1500 to 2500 grams at birth. It includes the care for babies who require intravenous therapy or antibiotics, and/ or those who are convalescing after intensive care, and/ or those who need their heart rate or breathing monitored, and/ or those who need short-term oxygen therapy.

Level III or intensive care refers to the care of newborn infants who require more specialised care and treatment. It includes most babies born at less than 32 weeks gestation or less than 1500 grams birthweight, and others who may require such interventions as intravenous feeding, and/ or surgery, and/ or cardiorespiratory monitoring for management of apnoea or seizures, and/ or assisted ventilation (via an endotracheal tube or CPAP), and/ or supplemental oxygen over 40% or long-term oxygen. This level of care involves complex, multisystem life support which may last for an indefinite period and utilizes the skills of medical, nursing and other staff trained and experienced in the management such problems.

Hospitals with a level III newborn intensive care unit provide all of the above levels of care and are referred to in this report as tertiary hospitals. There were 28 level III NICUs in Australia and New Zealand in 2002. It is important to note that some hospitals may have other beds for babies that do not come under the auspices of the NICU. Those hospitals which do not have a level III NICU may provide the level II and level I care needed for babies and are referred to as non-tertiary hospitals.

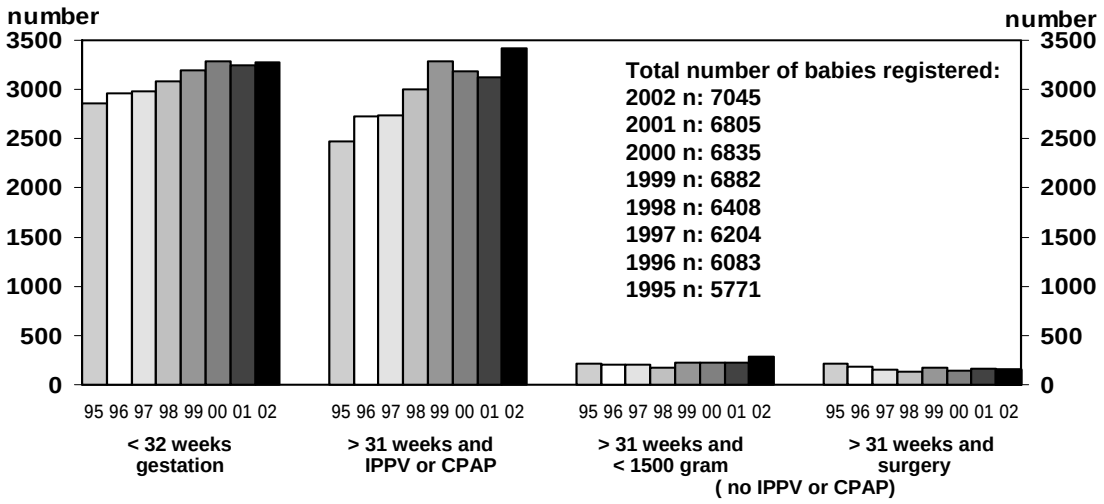

Figure 3: Number of babies in the ANZNN cohort by registration criteria and yearof birth, 1995-2002

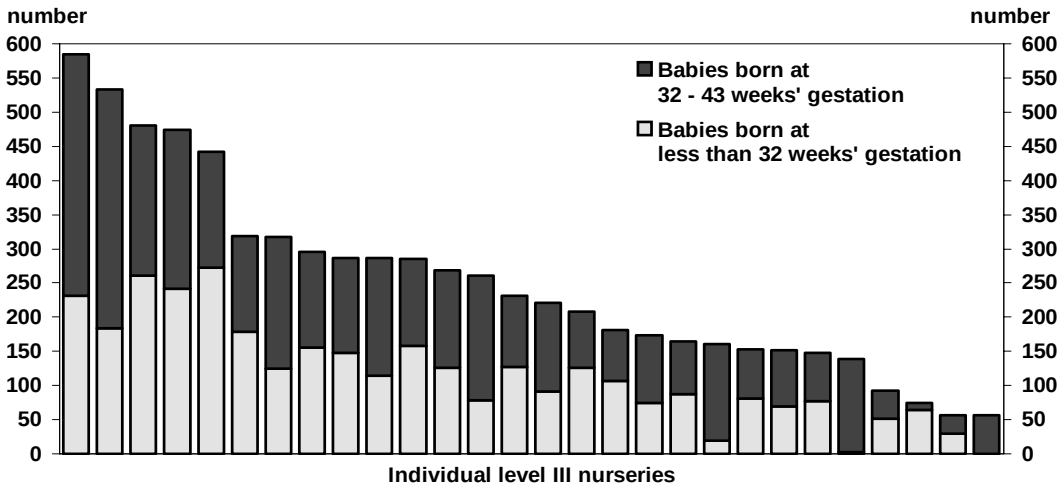

Figure 4: Number of babies in the ANZNN cohort by registration nursery (NICU, neonatal intensive care unit), 2002

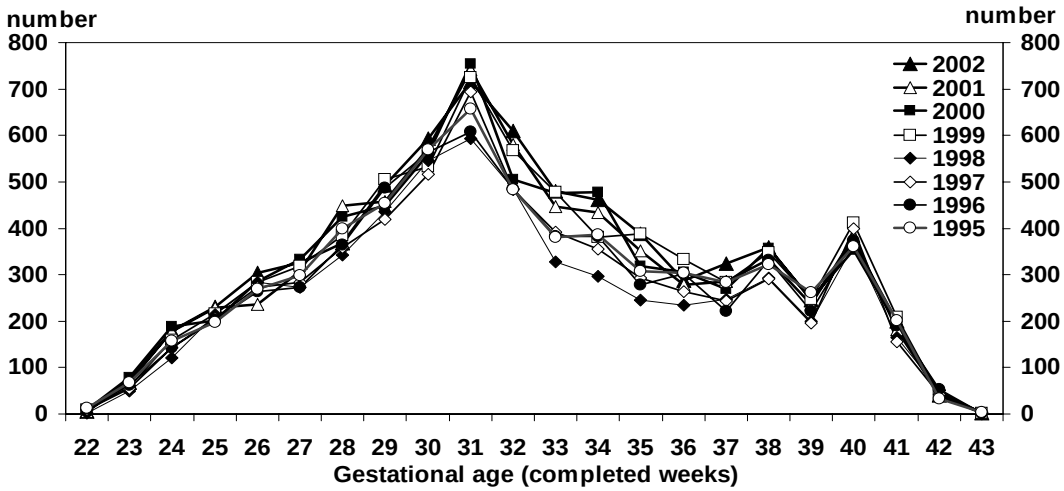

Figure 5: Number of babies in the ANZNN cohort by week of gestation and year of birth, 1995-2002

3.2 The mother

The focus of this audit is on the outcomes of high-risk babies, and data are collected per baby, not by confinement or pregnancy. Factors known to affect the risk of preterm birth are noted, for example, very young and older mothers are at increased risk of poor pregnancy outcome.

In our cohort, babies born at less than 32 weeks gestation are significantly more like to be born to teenage mothers ((5.97%, CI: 5.19-6.84% (95% Confidence Intervals (CI)) compared to the Australian figure of 5.0%) and to mothers over 34 years ((20.4% CI: 19.0-21.8%) compared to 17.1% for Australia in 2000; AIHW NPSU 2003, Stats New Zealand).

3.3 Antenatal events

3.3.1 Antenatal corticosteroids

Corticosteroids are administered to the mother to enhance the maturation of her baby's lungs when it is thought she will give birth before 34 weeks gestation. The first randomised controlled trial of steroid use was in New Zealand in 1970 (Liggins & Howie, 1972). A systematic review reported that a single course of steroids is efficacious in helping to mature the lungs and to prevent death (Crowley, 2003). This therapy also has a protective effect on other systems, without harmful effects for mother or baby. In 1996, it was recommended that maternal corticosteroids be considered before all births at less than 34 weeks in order to improve neonatal outcomes (NHMRC, 1997).

This therapy was given to the mothers of 2774 (85.2%) babies born at less than 32 weeks gestation. (Tables 3 and 4, Figure 6). Treatment is considered to be 'complete' when two or more doses of steroids are given with at least one dose 24 hours prior to the birth. 'Incomplete' is when steroids are given less than 24 hours or more than a week before the birth; data were available for 99.2% of babies). The increasing proportion of babies with a course given more than a week prior to birth (Figure 6) may reflect recent questions about the effect of multiple doses and a local randomised controlled trial is currently underway.

When looking at the range of use between individual NICUs, antenatal corticosteroids were given to the mothers of a median of 91.8% inborn babies born at less than 32 weeks gestation (interquartile range: 87.9%, 94.4%).

3.3.2 Antenatal conditions

Data were collected on the antenatal problem that led to the mother's most recent stay in hospital, which lead to the baby's birth and subsequent admission to NICU. Data are presented for the number of babies (not number of confinements) and recorded in 99.2% of cases.

Preterm labour was the leading (n: 1332, 40.7%) presenting problem for babies of less than 32 weeks gestation (Figure 7). The less mature the baby, the more likely preterm labour was to be the precipitating factor for birth (from 60.5% of those born at less than 24 weeks to 33.2% at 34 to 36 weeks). Prelabour, preterm rupture of the membranes (PPROM) accounted for another 20.5% (n: 672) of babies.

In the mildly preterm group (32 to 36 weeks gestation), the main presenting problem remained preterm labour (n: 737, 33.4%). However, PPROM (n: 307, 13.9%) and hypertension in pregnancy (n: 322, 14.6%) accounted for another third of the problems. Nearly half (n: 622, 41.3%) of the term babies did not have an antenatal problem that could be identified. However, in this selected group of high-risk babies, 312 (20.8%) were noted to have 'fetal distress' and 162 (10.8%) had a fetal malformation detected antenatally.

3.4 The baby

3.4.1 Multiple births

Babies born to multiple births have an increased risk of being preterm and of having other morbidities independent of their prematurity (NHMRC, 1997). There were 1527 (21.7%) babies in our cohort from a multiple pregnancy. Only 119 (1.70%) were from triplet pregnancies and 8 from quadruplet pregnancies (Tables 5 and 6, Figure 8). Most (97.5%) of these babies were born preterm. Two-thirds of the triplets (68.1%) and all of the quadruplets were very preterm. Nearly a third (30.3%, n: 994) of all babies born at less than 32 weeks were from a multiple birth and nearly a quarter (22.2%) of the babies born at 32 to 36 weeks gestation were from multiple births. However, term babies had a similar rate of multiple pregnancies (2.53%) as the general population of Australia (2.8%, Australian Bureau of Statistics 1997) and New Zealand (3.17%, Stats NZ, 2003).

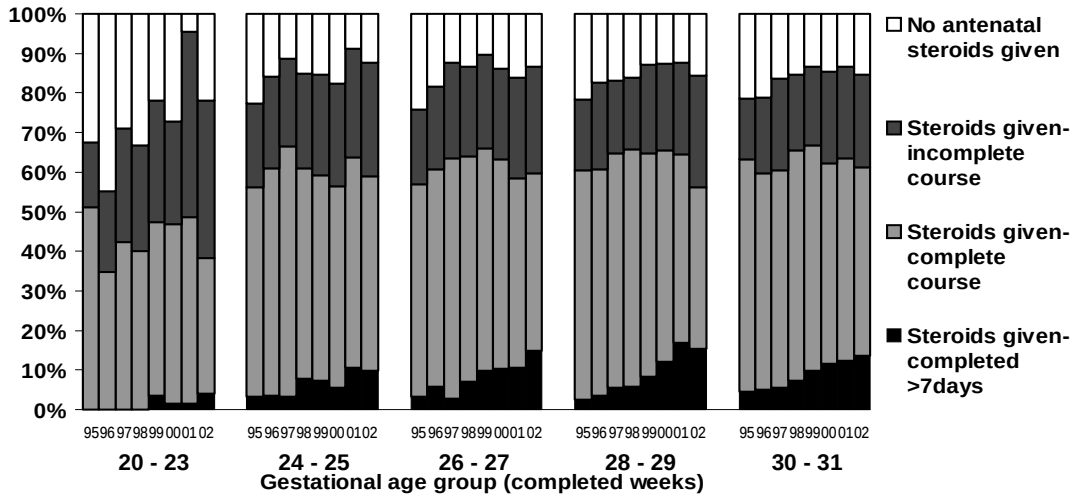

Figure 6: Antenatal corticosteroids for babies born at less than 32 weeks gestation by gestational age group and year of birth, 1995-2002

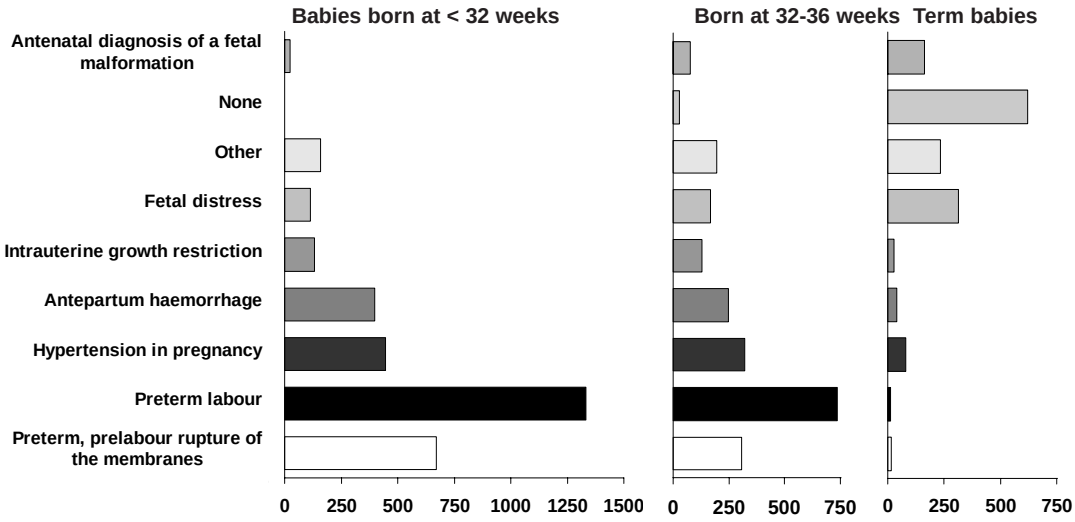

Figure 7: Presenting antenatal problem that lead to the baby's birth by gestational age group, 2002

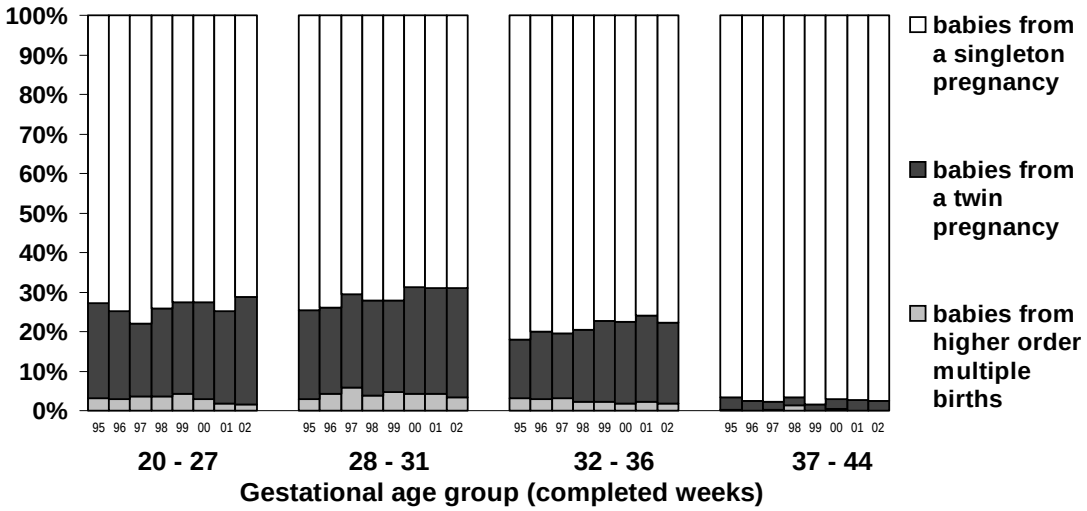

Figure 8: Proportion of ANZNN registered births that are from a multiple birth by gestational age group and year of birth, 1995-2002

3.4.2 Gender

Each year there are more male babies born than female babies with boys accounting for 51.3% of livebirths in Australia in 2002 (Australian Bureau of Statistics, 2003). In our cohort, there were 4075 males (57.9%) and 2968 females (42.1%). For babies of less than 32 weeks gestation, 54.5% (n: 1789) were male. This proportion rose to 61.9% for babies born at term and meeting ANZNN registration criteria. Gender was not able to be determined for two of the mildly preterm babies.

3.5 The birth

3.5.1 Place of birth

Babies are usually cared for in the hospital of their birth. However, some babies need a hospital with a level III NICU. When this can be anticipated, both the mother and baby may be transferred before the birth (in-utero) or the mother can 'book' at that hospital. The NHMRC's clinical practice guidelines (1997) recommend that wherever possible, births at less than 33 weeks should occur in a perinatal centre with a NICU.

Nearly all births in Australia occur in a hospital (97.1%, AIHW NPSU, 2003). Most of the babies born at less than 33 weeks gestation in our cohort were born in a hospital with a NICU (n: 3369; 86.7%). Of those, half (49.8%, n: 1678) had mothers who had booked into that perinatal hospital.

3.5.2 Method of birth

The method of the birth varied with gestational age (Tables 9 and 10). However more than half (59.2%) of the babies were born by Caesarean section, and of these half (58.4%) occurred before the onset of labour (also known as an 'elective' Caesarean). Data were available for 99.9% of babies. The Caesarean section rate for all confinements in Australia in 2000 was 23.3% (AIHW NPSU, 2003).

At term, babies are usually born with their head presenting in the vagina (94.8% of confinements in Australia, AIHW NPSU, 2003). Most (92.1%) of the cohort's term babies were born this way. However, 100 (6.76%) were breech and 84 of those were born by Caesarean section. For the babies born at less than 32 weeks gestation, 31.0% were a breech presentation.

3.5.3 Condition at birth

The Apgar score is a clinical indicator noting a baby's condition at birth with a score from 0 to 10. A low score (less than 4) at one minute indicates that a baby that needs assistance with their adaptation to extrauterine life in the form of specialised resuscitation and this occurs in 2.3% of Australian babies (AIHW NPSU, 2003). In the ANZNN cohort, 20.2% (n: 309) term babies had a low Apgar score as did 572 (17.6%) babies born at less than 32 weeks (data available for 99.4%). This suggests that a need for assistance at birth can occur at any gestation, and that all staff attending a birth should be skilled in resuscitation.

NHMRC's clinical practice guidelines for care around preterm birth (1997) recommends that ideally, very preterm births should be attended by NICU staff, and those less than 34 weeks should be attended by someone with up-to-date skills in endotracheal intubation (passing a tube into the windpipe). Overall, 1924 babies in our cohort were intubated in labour ward to aid resuscitation at birth, including 1378 (42.0%) babies of less than 32 weeks and 294 babies born at term (99.4% data available), while the rate for Australian babies is 1.1% (AIHW NPSU, 2003).

3.5.4 Transfer after birth

A baby may need to be transferred after birth due to a precipitate preterm birth in a hospital without a NICU or because no cot was available in the hospital of birth. The birth may be planned to occur in a hospital with a NICU to ensure a managed transfer to a specialised children's unit, or a term baby may have an unexpected need for intensive care treatment, such as ventilation for meconium aspiration syndrome.

A specialist team, trained and equipped to care for the sick newborn "retrieved", 1409 babies in 2002, nearly half (42.9%, n: 605) of whom were born at term (Tables 11 and 12). Most of the retrieved babies (n: 1307, 92.8%) were born in a non-tertiary centre, but 74 (5.25%) were transferred between hospitals with NICUs. Of the babies born at less than 28 weeks, 110 (13.8%) were retrieved after birth, six between NICUs.

There were 466 babies transferred by a non-specialist team such as an ambulance or the flying doctor service. Most of these babies were term (n: 379) or mildly preterm (n: 130) and transferred from a non-tertiary hospital (n: 369, 79.2%).

3.6 Morbidity

This audit reports only on those babies most at risk of morbidity or mortality amongst the babies who are admitted to a level III neonatal intensive care unit. These morbidities are principally associated with preterm birth, with a baby's difficulty with adapting to life outside the uterus or to other complications such as congenital malformations. This audit also only reports those outcomes that are identifiable while the baby is in hospital, and do not include the long-term consequences of requiring newborn intensive care. The selected morbidities relate to the objectives of the ANZNN or to clinical indicators that have been developed by the ANZNN.

3.6.1 Respiratory distress

Adapting to life outside the uterus can cause problems for both preterm and term babies. Respiratory distress is a major cause of morbidity and mortality and accounts for a large proportion of the use of resources in these high-risk babies. Only 10.4% (n: 735) of the babies did not have respiratory assistance for four or more hours (an eligibility criterion for this audit).

The two main forms of respiratory assistance with breathing are mechanical ventilation / intermittent positive pressure ventilation (IPPV) which involves endotracheal intubation, and continuous positive airways pressure (CPAP). Both forms require specialised nursing, medical and para-medical care and utilise a large component of the available resources.

In 2002, 6309 babies received assisted ventilation (Tables 13 and 14). The most common form of ventilation was a combination of IPPV and CPAP (n: 2530). 'CPAP only' was given to 2442 babies, an increase on last year and a continuing trend observed since 1995 (Figure 6). 'IPPV only' was given to 1337 babies.

Since 2001 the duration of ventilation has been collected in 'hours' rather than the previous 'days' (a 'day' was defined as four or more hours in any one 24 hour period). IPPV was given to babies in our cohort for a total of 634120 hours (26421 days) and CPAP was delivered for 972802 hours (40533 days, Tables 13 and 14; Appendix 1). This 1606922 hours of assisted ventilation equates to each baby receiving 10 days each.

However, the aetiology, type and treatment of respiratory distress changes with the individual and with maturity (Figure 9). For this reason, respiratory distress is discussed in three separate gestational age groups.

3.6.1.1 Babies born at less than 32 weeks gestation

All babies admitted for care at less than 32 weeks gestation are included in this audit. Of these, only 272 babies (8.29%) did not receive any respiratory support. Another 114 (3.47%) babies had only supplemental oxygen, 373 had only IPPV and 1678 babies had both IPPV and CPAP. However, 844 (29.2%) babies had CPAP as their only form of ventilation (Figures 10 and 11), of whom 225 has less than four hours of supplemental oxygen or none at all.

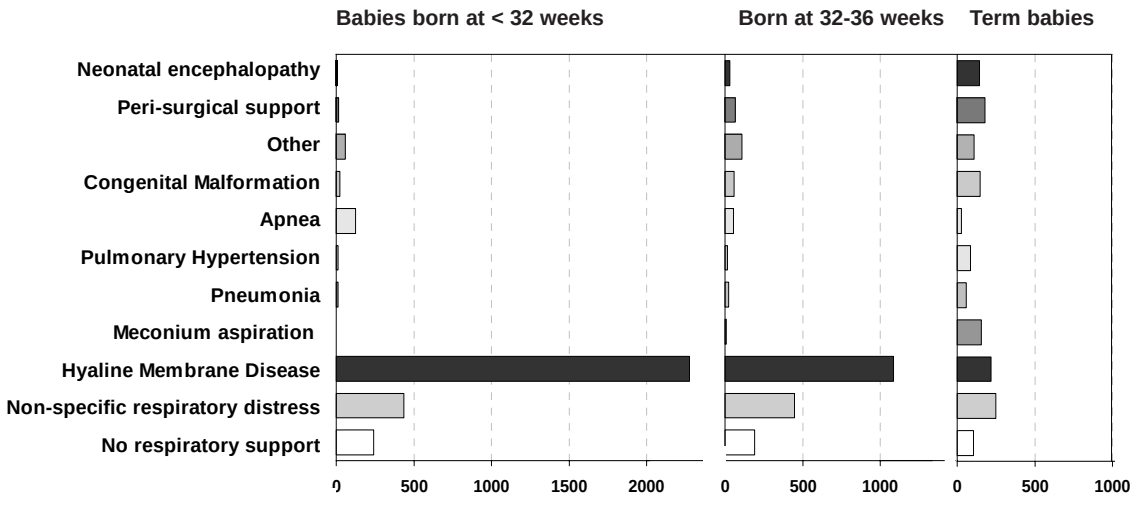

Figure 9: Reason for respiratory support by gestational age group, 2002

The duration of ventilation increases on average, with decreasing gestational age (Tables 13 and 14). The total duration of IPPV for these very preterm babies was 464 618 hours and there were 851 590 hours of CPAP administered. Hyaline membrane disease (HMD) or respiratory distress syndrome was the most common respiratory diagnosis for babies born at less than 32 weeks gestation (n: 2275, 71.0%, Figure 9).

High-frequency oscillation is a specialised form of mechanical ventilation given at 8-15 cycles per second, in contrast to conventional IPPV which is given at about one breath per second. Of the 2051 very preterm babies who received IPPV, 342 (16.7%) had high-frequency oscillation, a figure than was the same as in 2001 .

Nitric oxide is a gas inhaled in very tiny amounts to dilate the pulmonary blood vessels and is used primarily to treat pulmonary hypertension (Barrington & Finer 2003; Finer & Barrington 2003). Nitric oxide was given to 109 babies (5.31% of those receiving IPPV).

A pulmonary airleak that requiring some form of drainage was reported in 177 babies (6.11% of those ventilated). Four of these babies received 'CPAP only'.

Oxygen therapy continues to be measured in 'days', with a 'day' defined as 4 or more continuous hours in any 24 hour period. Most (88.1%) babies received oxygen, and a total of 93905 'oxygen days' was given. In 2002, 286 babies (9.82% of very preterm survivors) went home from hospital on while still requiring supplemental oxygen. The less mature the baby, the more likely they were to need home oxygen (40% of survivors of less 24 weeks and 25% of survivors born at less than 28 weeks gestation, Table 15).

Chronic lung disease (CLD) is a condition in babies born at less than 32 weeks, and is when they receive any form of respiratory support (supplemental oxygen and/ or assisted ventilation) for their initial, chronic respiratory disease at 36 weeks post menstrual age (PMA, gestational age plus age after birth, in weeks). This definition was met by 692 babies (23.5% of the survivors at 36 weeks PMA, Tables 15 and 16, Figure 10). Again, the rate is higher for the babies born at the lower gestations (100% of survivors at 22 weeks, 79.2% of babies of less than 24 weeks and 52.2% when born at less than 28 weeks). The rate of CLD has increased significantly since 1997 (X_{MH}=16.8 P<0.0001).

3.6.1.2 Babies born at 32 to 36 weeks gestation

ANZNN audit criteria primarily involves ventilatory assistance in this gestational age group. Only 187 (8.40%) of these mildly preterm babies did not have any respiratory support while 895 (40.2%) babies received IPPV and/ or CPAP.

CPAP only continues to be the dominant mode of ventilatory support in this age group and was given to 1100 (55.1%) babies (Figure 12), 264 of whom received less than 3 hours of oxygen. Again, the predominant respiratory disease was HMD (n: 1085, 51.9%, Figure 9). High frequency ventilation was given to 55 babies (6.15% of those receiving IPPV) and 41 received nitric oxide (Table 13). Pulmonary airleak was seen in only 86 babies, 15 of whom received "CPAP only" and 16 babies required oxygen after discharge home (Tables 15 and 16).

3.6.1.3 Babies born at term

The indication for respiratory support in term babies is mixed (Figure 9). A total of 1420 term babies received some form of assisted ventilation, with 498 receiving CPAP alone (35.1% of those ventilated). High frequency ventilation was given to 78 term babies, nitric oxide was given to 138 babies and 65 received both therapies. The seven babies receiving extracorporeal membrane oxygenation were born at term. Pulmonary airleaks requiring drainage was detected in 95 babies, of whom 18 received CPAP only and one had no ventilatory support.

3.6.1.4 Exogenous surfactant

Exogenous surfactant is a treatment primarily for respiratory distress syndrome (HMD) and is given soon after birth via the endotracheal tube. Its efficacy was confirmed by a systematic review (Soll, 2003) and this treatment is recommended (NHMRC, 1997). Exogenous surfactant was given to 2185 of the 2498 babies who received IPPV for HMD in 2002 (87.6%, data unavailable for 4) of these babies. The range of use between the level III units had a median of 90.7% and interquartile range from 84.1% to 95.1%.

Surfactant was given to 43 babies with HMD who were ventilated for less than an hour (ie not IPPV). Another 235 babies were treated with for other diagnoses such as meconium aspiration syndrome (n: 43) and congenital malformation (n: 33).

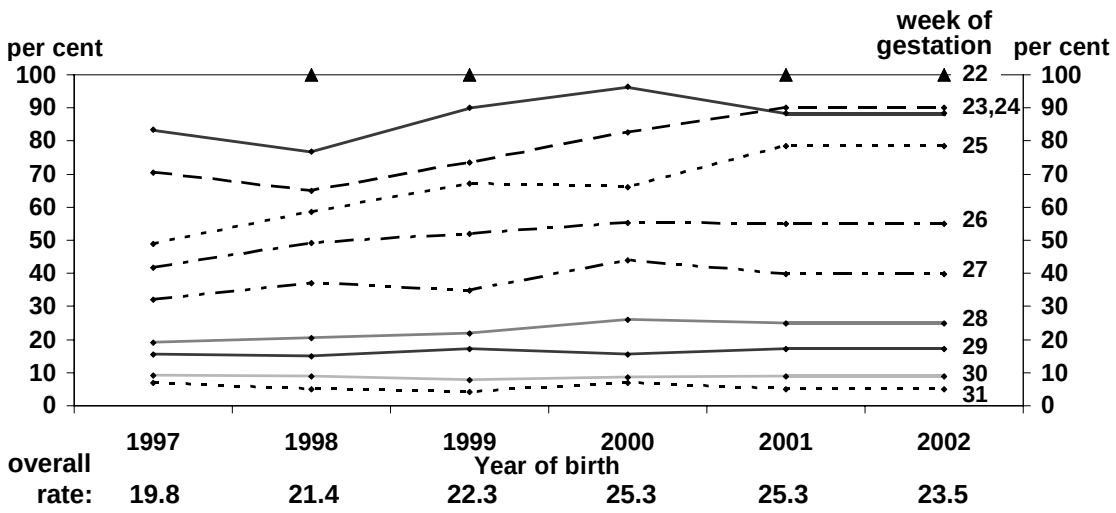

Figure 10: Rate of chronic lung disease in babies born at less than 32 weeks who survive to 36 weeks, by week of gestation and year of birth, 1997-2002

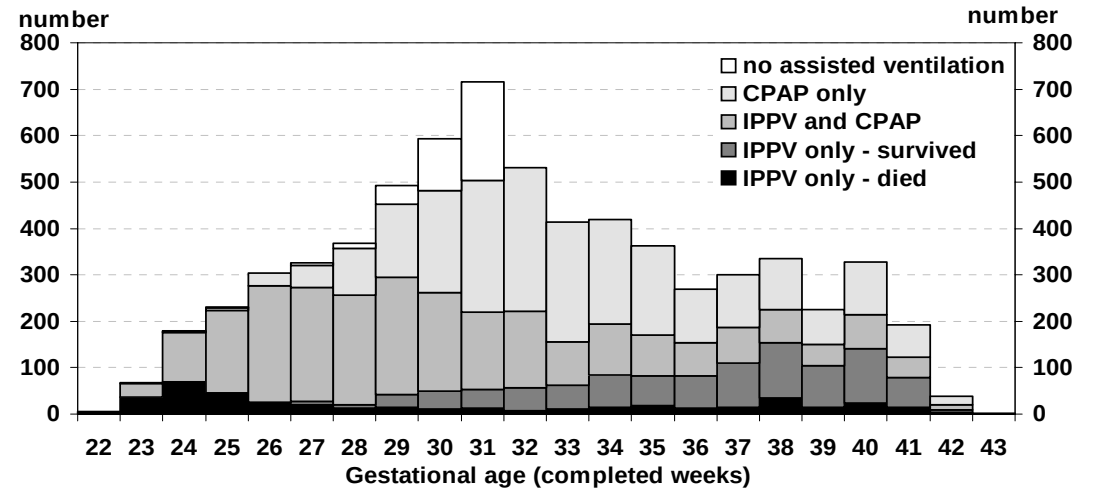

Figure 11: Method of assisted ventilation by week of gestation, 2002

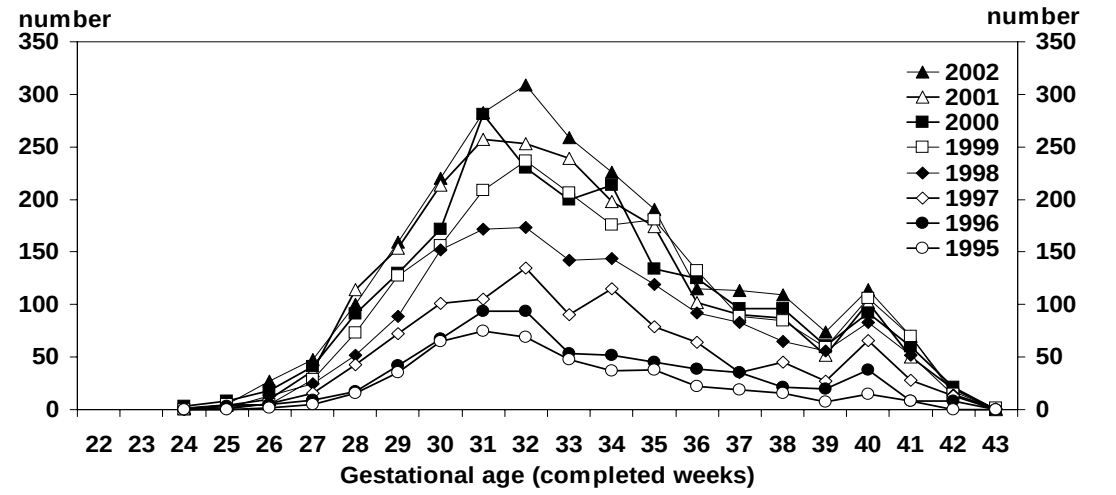

Figure 12: Number of babies with continuous positive airways pressure as their only form of assisted ventilation, by week of gestation and year of birth, 1995-2002

3.6.2 Cerebral ultrasound

Ultrasound imaging of the head of very preterm babies is used to detect both intraventricular haemorrhage (IVH), and the formation of cysts and ventricular dilatation (hydrocephalus). An initial ultrasound is generally performed during the first week of life to detect signs of IVH, and is graded according to an internationally recognised method (Papile et al. 1978). More severe grades are when the ventricle is dilated with blood (grade III) or there is blood in the body of the brain (grade IV), and these are markers of possible later disability.

Of the babies born at less than 32 weeks gestation, 2393 (79.8% of babies examined) did not have an IVH detected on ultrasound (or at post mortem, Figures 12 and 13, Tables 19 and 20). There were 281 babies (8.56%) who did not have an early ultrasound report, of whom 65 (23.1%) died before day 3, and 181 (64.4%) were born at more than 29 weeks gestation, indicating that some units are not screening this group.

A significant haemorrhage (grade III or IV) was detected in 189 (6.3%) babies, half (n: 100, 52.9%) of whom died. The proportion of babies with significant haemorrhage increases as gestation decreases (Table 19, Figure 13). The median rate of significant haemorrhage in the individual units is 6.51% (with an interquartile range of 4.59% to 8.32%).

Later ultrasound examinations detect cystic lesions (e.g. porencephalic cysts, periventricular leukomalacia or encephaloclastic porencephaly) and post-haemorrhagic hydrocephalus, all strong predictors of later problems. There were 2974 very preterm babies who survived to day 27 and did not have congenital hydrocephalus. Only 2003 (67.4%) babies had an ultrasound dated at least 3 weeks after birth, and 95.2% (n: 1906) of these had a normal report.

Abnormal late head ultrasounds were reported for 97 (4.84%) babies, one third of whom had multiple lesions. Hydrocephalus was reported for 35 babies (1.75% of those with later ultrasounds recorded), porencephalic cysts for 36 (1.80%) and 41 (2.05%) had periventricular leukomalacia. No encephaloclastic porencephaly was reported during 2002.

If the ultrasounds performed between day 14 and day 27 are included (n: 687) then six additional babies had abnormal scans, resulting in two more cases of hydrocephalus and four with cysts.

3.6.3 Eye examinations

The eyes of very preterm babies are examined to monitor their vascularisation which, if disrupted, can result in retinopathy of prematurity (ROP). Staging criteria for ROP were agreed by the International Committee for the Classification of Retinopathy of Prematurity (1984). ANZNN's audit records the worst stage of ROP, even if the retinopathy resolves with the subsequent development of the eye.

The criteria most commonly used for ROP screening in our region are birth at less than 31 weeks gestation or weighing less than 1250 grams. There were 2384 babies who met these criteria and survived to 36 weeks post menstrual age (ie when the eye is fully vascularised) of whom 2070 (86.8%) had the results of their examination recorded (Tables 21 and 22, Figure 15).

Of the examined babies, 1474 (71.2%) had normal examinations and 138 (6.7%) had severe eye disease (Stages III or IV).

Babies with threshold disease have been shown to benefit from treatment (The cryotherapy for retinopathy of prematurity cooperative group, 1990). Our cohort had 64 babies with threshold disease reported and 78 babies who received treatment. One baby who required treatment for threshold disease was above the usual screening criteria for both weight and gestation.

3.6.4 Necrotising enterocolitis

Necrotising enterocolitis (NEC) is a disease of the gut . While rare, it has a high rate of morbidity and mortality in preterm infants and occasionally in term infants. The prevalence of this disease varies widely but in 2002, 139 babies were proven to have definite NEC (see Appendix 1 for definition). Half of these babies (n: 79, 53.2%) were born at less than 28 weeks gestation. While most of the babies with NEC (n: 115, 82.7%) were of less than 32 weeks, the incidence of NEC in the whole group was 3.51%. Half (n: 79, 56.8%) of the babies with proven NEC required surgery.

A third (n: 54, 32.4%) of all babies with NEC died and the disease was implicated in the death of 28 (51.9%) babies. This given a death rate in our cohort of two out of every ten babies who are diagnosed with definite NEC. Thirty of those who died were born at less than 28 weeks gestation and NEC was implicated in a similar proportion (n: 17, 56.7%) of those deaths.

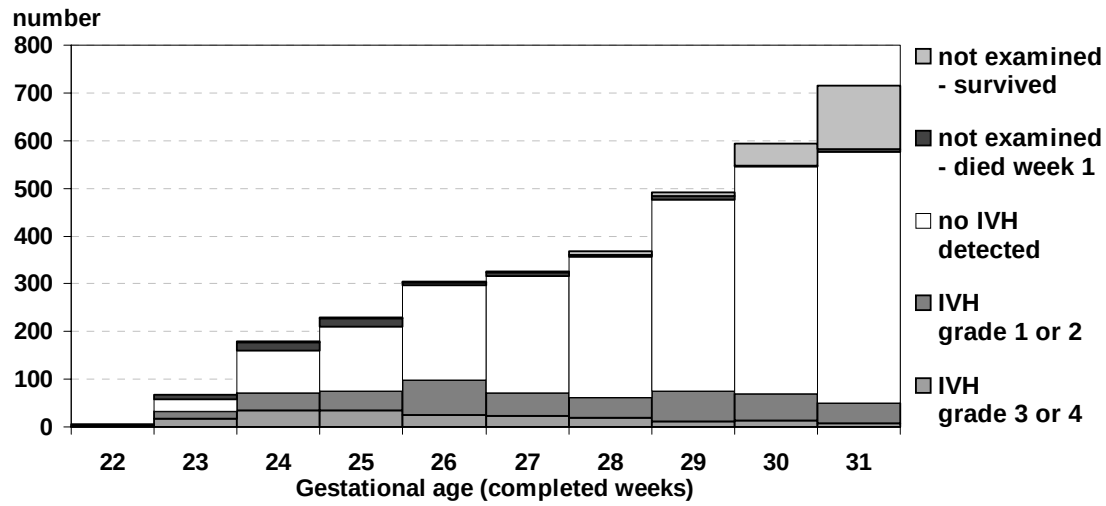

Figure 13: Early head ultrasound results by week of gestation, babies born at less than 32 weeks gestation, 2002

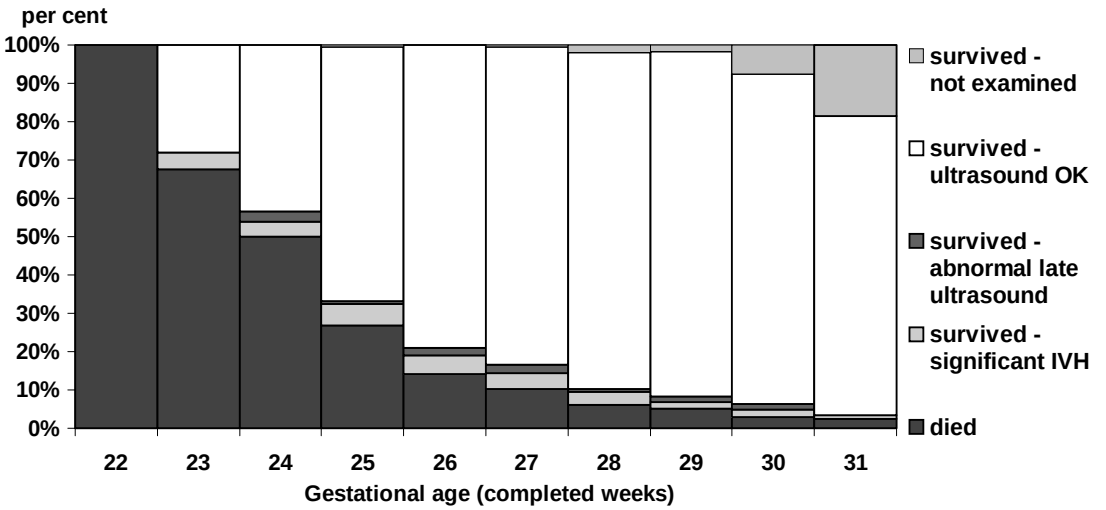

Figure 14: Survival to go home and head ultrasound status by week of gestation, babies born at less than 32 weeks gestation, 2002

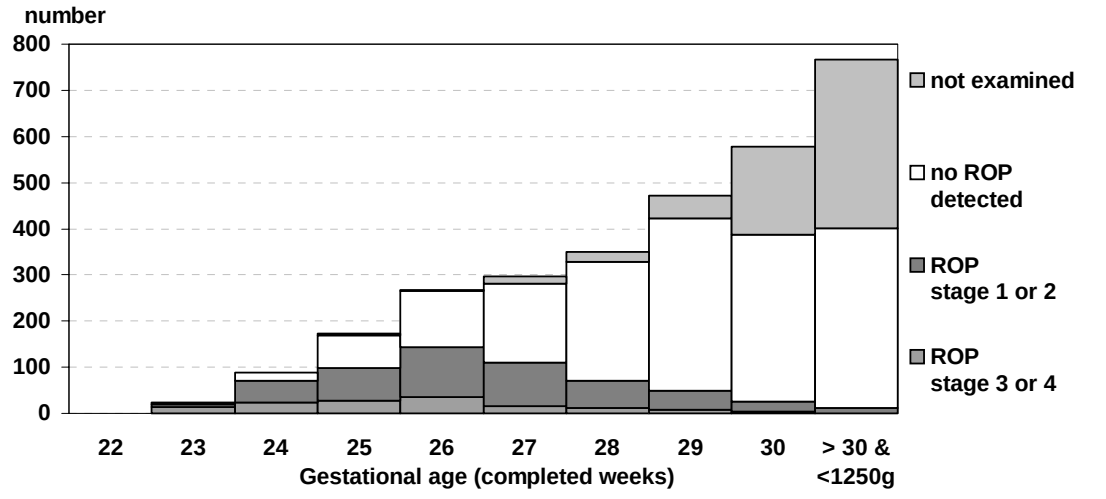

Figure 15: Results of screening for retinopathy of prematurity by week of gestation, babies born at less than 31 weeks gestation or less than 1250g birthweight, 2002

3.6.5 Neonatal surgery

Major surgery involving the newborn is a very specialised field, conducted in only a limited number of centres such as children's hospitals, or perinatal centres in general hospitals with substantial paediatric departments. Babies having surgery need specialist care to stabilise their condition before, during and after the operation. Some less complex procedures (eg laser treatment for significant retinopathy of prematurity (section 3.6.4)) occur in perinatal centres. The ANZNN cohort includes only babies admitted to a NICU as part of their first time in hospital. Many other babies undergo surgery during their first weeks of life but they either go home first, or go to paediatric units, such as for cardiac surgery.

In 2002, 862 babies in our cohort had major surgery. However, only 160 (2.27%) babies had surgery as their entry criterion for the audit (this includes ventilated babies with "peri-surgical" as their indication for respiratory support).

Of the babies who had major surgery, half (n: 421, 48.8%) were born at term. Half of these babies (n: 221, 52.6%) were born in a perinatal centre. Two-thirds of those babies (n: 145, 61.1%) had a congenital malformation diagnosed before birth, allowing the birth to be planned to be close to expert care. Major malformations were detected in many (n: 369, 87.6%) term babies having surgery. Twenty-three of the 27 (85.2%) babies born at term who died after surgery had a congenital malformation that directly contributed to their death (a lethal congenital malformation). The average length of stay in hospital for the term babies requiring surgery was a month (30.5 days). The 269 (64.1%) babies who had mechanical ventilation for congenital malformation / peri-surgical reasons received a total of 40703 hours of IPPV (average of 6.3 days each).

One hundred and eighty babies born at 32 to 36 weeks gestation had major surgery. A congenital malformation was correctly diagnosed antenatally in half (56.0%, n: 80) of the 143 (79.4%) babies with a malformation. Sixteen (8.89%) babies died and their death was attributed to a congenital malformation in 13 (81.3%) cases.

The very preterm babies who had major surgery were a far more mixed group, with the reasons for surgery ranging from treatment for necrotising enterocolitis to correction of a congenital malformation. Of the 261 (7.95%) babies who had surgery, 42 died (16.1%) but only three had a lethal malformation.

3.6.6 Neonatal infection

In 2002, the definition of infection changed from episodes of any type of systemic infection to only those that are blood-borne (septicaemia). This will reduce the number of babies reported as having infection. Each episode of sepsis is also recorded as early (during the first 48 hours of life) or late (after 48 hours) and episodes involving the same organism must be at least 14 days apart. The ANZNN complies with and belongs to the NICU Infection Surveillance group of the Australian Infection Control Association. There are no missing data for infection, but 15 (1.90% of those with septicaemia) babies did not have the timing recorded (Tables 23 and 24).

Symptomatic, blood culture positive septicaemia was noted in 788 (11.2%) babies, 104 (13.2%) of whom were know to have symptoms before 48 hours of life. At least 686 babies had septicaemia with late-onset symptoms. Of the 1019 babies born at less than 28 weeks gestation who survived beyond day 2, a third (n: 365, 35.8%) had an episode of late-onset sepsis. This proportion rose to 45.0% of those born at less than 24 weeks and 41.8% of those born weighing less than 750 grams. Fewer than 5% of mildly preterm or term babies had late onset sepsis.

Of the babies with septicaemia, 138 (17.5%) died and 73 of these babies had infection implicated in their demise (9.26% of those with sepsis, 12.4% of all babies who died). Early onset sepsis was noted in 41 of the babies who died and implicated in 27 of those deaths.

3.7 Outcome

3.7.1 Survival

Most (91.6%) babies in this selective, high-risk cohort survive to go home. Survival is dependent on many factors, including maturity and size at birth. Data are presented as survival to 7 days, to 28 days (neonatal death) and to discharge home by week of gestation and by birthweight group (Figures 16 and 17, Tables 27 and 29; available for all but 112 babies (1.59%)). These data include babies who are back-transferred to level I or II nurseries, and those who are transferred to another level III unit. However, these data differ from those usually reported as they represent only high-risk babies admitted to a level III NICU, and do not include babies who were stillborn or who died in labour ward, or in hospitals without a NICU.

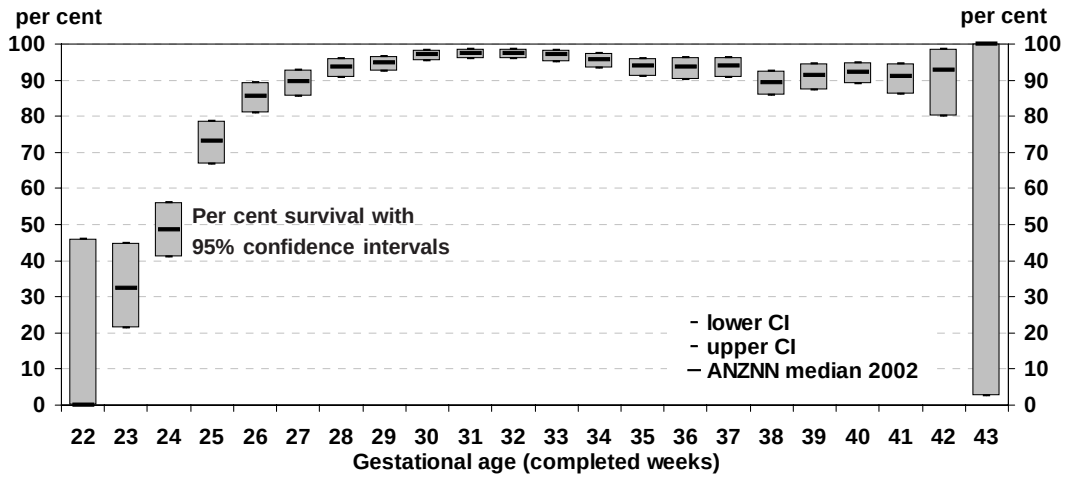

Figure 16: Survival to discharge home by week of gestation, 2002

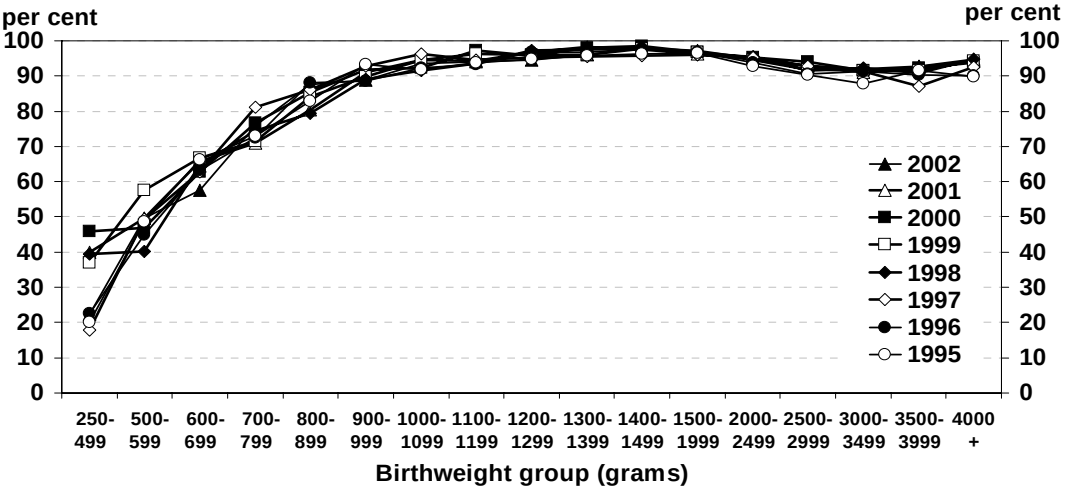

Figure 17: Survival to discharge home by birthweight group and year of birth, 1995-2002

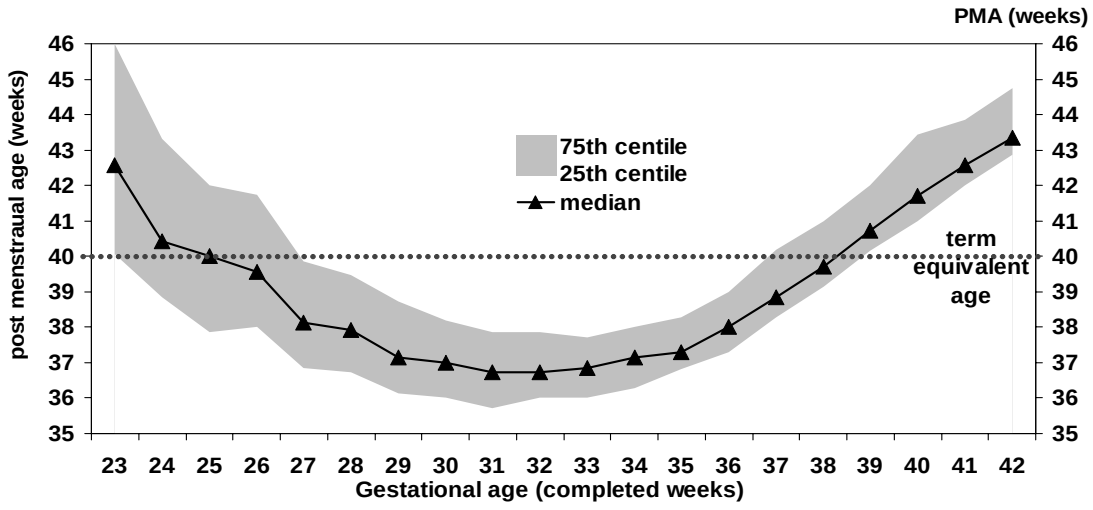

Figure 18: Age at discharge to home relative to the due date for the baby (term equivalent age) by week of gestation, 2002

There were 589 babies from our cohort who died while in hospital. Death occurred during the first day of life for 79 (13.4%) babies and within the first week for more than half (n: 327, 55.5%) of the babies who died. Most (n: 493, 83.7%) babies died before 28 days of life (known as a neonatal death). However, a further 96 infants died after 28 day, but before they went home from hospital.

The presence of a major congenital malformation that is known to have contributed to the death of the baby (a lethal congenital malformation) is noted. In 2002, the death of 123 babies (20.9% of those who died) could be directly attributed to a major malformation. Nearly half (n: 54, 43.9%) of these babies died before one week of age.

Better than 95% survival is seen for babies born from 30 to 34 weeks gestation (Figure 16). The survival of the more mature babies is around 90%, indicating the high-risk criteria that we have applied to the cohort. The lower survival rate at term is also due to the inclusion of the 59 babies with a lethal congenital malformation. Excluding these babies from the data, the survival for term babies increases from 91.6% to 95.5%. In fact, the survival rate for the whole cohort rises from 91.6% to 93.4% when all babies with a lethal congenital malformation are excluded. Some of the major causes of death have been described in earlier sections of this report; the others include deaths related to hypoxia (n: 67), to the respiratory system (n: 111), to immaturity (n: 108) and to cerebral injury (n: 48).

The perinatal death rate for all Australia in 1999 was 8.7 per 1000 births using the Australian definition of 20 weeks gestation or 400 grams birthweight; or 4.8 per 1000 using the WHO definition of 22 weeks gestation or 500 grams birthweight (Nassar and Sullivan, 2001).

3.7.2 Discharge from registration NICU

After their stay in newborn intensive care, babies go to a level II nursery in either the same hospital or elsewhere to convalesce before going home. In 2002, nearly half (n: 3037, 47.0%) of the 6456 babies who survived went home from their registration hospital. This rate was higher for term babies (n: 876, 62.1%) than for babies who were born mildly preterm (n: 1002, 47.0%) and those who were very preterm (n: 1159, 39.8%). Another 3419 (53.0%) survivors were transferred to another hospital before going home, with most (n: 2784, 81.4%) going to a level I or II nursery. The duration of their stay in the nursery of registration ranged widely from 1 day to 11 months. However, more than 80% of term babies had transferred to another unit by day 14, while only 25% of the very preterm babies had done so. The remainder of the babies were transferred to either a children's hospital (n: 340, 5.27%) or another hospital with a NICU (n: 295, 4.57%). A quarter (n: 141, 22.2%) of these surviving babies were transferred on the day they were born and half (n: 379, 59.7%) had transferred by day 14.

The date of discharge for these babies has been received from over 300 hospitals across Australia and New Zealand to provide the outcome data for the babies in this audit. Babies who were transferred to a participating level II nursery are discussed in Section 4.6. The data in Tables 25 and 26 pertain to all babies, not only the survivors.

3.7.3 Going home

The amount of time a baby spends in hospital is also related to many factors (especially maturity at birth) and there is wide variation in the length of stay between individuals. It is important to include data from the baby's entire stay in hospital or hospitals to given a complete picture of hospital stay. Due to the tremendous effort from our collaborating units, the date of discharge home is now available for 98.4% (n: 6933) of babies.

Over the period 1995 to 2002, there has been little change in the median length of stay of ANZNN babies when considering the time spent in hospital against gestational age at birth.

Extremely preterm babies are usually discharged home just after their due date (the day that they were due to be born, known as term equivalent age or 40 weeks post menstrual age (PMA), Figure 18). However, there is a very wide range here with an interquartile range of up to 6 weeks. Babies born at beyond 34 weeks, who tend to be in our audit for respiratory or other acquired reasons, go home at a median of two weeks after birth. This is usually a few weeks before they were due to be born, and there is generally less range in their post menstrual age at discharge. When term babies have intensive care for surgery or respiratory support, they tend to stay in hospital for one to three weeks (median: 12 days, interquartile range 8-22 days, Table 28). Data for Australian babies born in 2001 shows that most (89.4%) go home before seven days old and nearly all have been discharged by 21 days (98.5%, AIHW NPSU, 2003).

4. Results - babies registered to level II nurseries

4.1 In general

Nurseries with facilities to manage mildly or moderately ill babies are known as Level II or special care nurseries. Individual nurseries may have varying levels of resources for giving 'special' care (Section 3.1.4). Since 1998, all New Zealand hospitals with a level II nursery have been part of the ANZNN and contributed to the audit of high-risk infants. The actual number of hospitals has varied over this period, but all eligible units are involved. The Tasmanian level II nursery joined the ANZNN in 1999.

The registration criteria for level II and level III nurseries are the same (Section 2.1). This allows the audit of the full cohort of babies admitted to a nursery in New Zealand and in Tasmania who are born at less than 32 weeks gestation, or less than 1500 grams birthweight, or who received assisted ventilation for four or more hours. Infants receiving surgery were also included, although those who went directly to a hospital with a paediatric or cardiac unit, but not a neonatal unit, are not included.

Babies who were transferred to a level III nursery within 28 days of birth are registered to that level III unit, and are reported in Section 3 of this report. Babies are registered to a level II nursery if their hospital stay was entirely within non-tertiary nurseries, or if they were transferred to a level III NICU after 28 days, or they were transferred to a children's hospital without being admitted to a level III nursery.

In 2002, 325 babies fulfilled the ANZNN criteria and were registered to one of the fifteen level II nurseries (Figures 19 and 20, Tables 31 and 32). These numbers appear to be stabilising after the sharp increase from 1998 (when only New Zealand Level II units were part of the ANZNN).

In the current cohort, 48 (14.8%) babies were born at less than 32 weeks gestation, 41 (12.6%) weighed less than 1500 grams at birth, 295 (90.8%) received assisted ventilation and six (1.85%) had major surgery. For two units, no babies were eligible for the audit this year while the maximum number registered to a unit was 60 babies (Figure 20).

4.2 Antenatal

Antenatal corticosteroids were administered to the mothers of 34 of the 48 (70.8%) babies born at less than 32 weeks gestation. Most mothers of the babies (85.8%) were booked into the non-tertiary hospital of the baby's birth, and thus the registration hospital.

The most common obstetric complication leading to the baby's birth for preterm babies was preterm labour (45.8% for babies of less than 32 weeks and 39.1% for those at 32-36 weeks). At term, more than half (n: 72, 59.5%) of the babies did not have an identifiable antenatal problem, but a quarter (n: 28, 23.1%) had obstetric intervention for signs of distress in the fetus.

4.3 The baby and birth

As expected from the level III data, there were more male babies (n: 202, 62.1%) and more babies born from a multiple pregnancy (n: 31, 9.54%) than in the usual population.

The Caesarean section rate was high (43.5%) with 64 (19.7%) receiving a section after labour began. A low Apgar score (less than 4 at 1 minute) was recorded for 45 babies (13.8%) and 26 babies required endotracheal intubation in labour ward to assist in their adaptation to extrauterine life.

4.4 Morbidity

4.4.1 Respiratory disease

Respiratory support (any combination of IPPV, CPAP or supplemental oxygen) was given to all but 20 (6.15%) babies. Of the 305 babies who received such support, 136 (43.7%) had a diagnosis of nonspecific respiratory distress and 78 (25.0%) had hyaline membrane disease. Term infants again had a high proportion of meconium aspiration syndrome (n: 26, 21.8%).

Supplemental oxygen was given to 260 babies (80.0% of the cohort) for a total of 1109 'days' (Table 34). Two babies had chronic lung disease and subsequently went home on oxygen therapy.

Assisted ventilation was given to 295 babies of whom 261 (88.5%) received CPAP only (Figure 21). The duration of assisted ventilation was short when compared to babies registered to level III units (Table 34), with a total of 983 hours of IPPV and 9470 hours of CPAP.

Exogenous surfactant was given to 13 of the 15 babies (86.7%) receiving of IPPV for hyaline membrane disease. Thirteen babies had a pulmonary airleak needing drainage. Neither nitric oxide nor high frequency oscillation ventilation are used in a level II nursery.

4.4.2 Cerebral ultrasound

The early (first week of life) head ultrasound was normal (no intraventricular haemorrhage (IVH)) for 31 (88.6%, Table 35) babies. One baby did have a significant IVH (grade III or IV). However, another 11 (22.9%) eligible babies did not have a head ultrasound recorded. Twelve babies had the later ultrasound reported (27.3% of eligible babies), with two reporting abnormal results; one baby had hydrocephalus and another had both hydrocephalus and periventricular leukomalacia.

4.4.3 Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 22 (75.9%) of the 29 eligible babies (i.e. born at less than 31 weeks or less than 1250 grams). One infant had Stage I ROP and the rest (95.4% of those examined) were normal.

4.4.4 Other morbidities

Septicaemia was proven in 19 (5.85%) babies, of whom 11 had symptoms before day two. Two babies died as a result of infection.

There were no cases of necrotising enterocolitis.

The six babies who had major surgery were born at term with major congenital malformations and all survived.

4.5 Outcome

In 2002, 315 of the 325 babies registered to a level II unit survived to go home (96.9%, Table 31). This high survival rate reflects the more mature gestations and lower-risk nature of the pregnancy or babies, compared to those babies requiring intensive care (Section 3).

Nine of the 10 babies died on the first day of life. One baby had a congenital malformation that was implicated in the death; two babies were extremely preterm, two babies had early onset infection and the five term babies had problems associated with adapting to extrauterine life. At the time of publication, discharge data were available for all but one baby (99.7%).

Only 27 (8.31%) babies were transferred to another hospital prior to going home. Of these, 9 went to a hospital with a level III nursery after day 28, and 10 babies were transferred to a hospital with facilities for major surgery.

Babies who were born at term and survived to go home tended to stay in hospital for a week (median days: 7; interquartile range (IQR): 5-11 days). For babies born at 34 to 36 weeks gestation, the median stay was two weeks (median: 16 days; IQR: 10 - 20 days) and babies born at 32 to 33 weeks tended to be in hospital for a month (median: 27 days IQR range: 22 - 35 days). Babies born at 30-31 weeks were in hospital for a median stay of 42 days (IQR: 34 - 47 days), equating to going home at 36 to 37 weeks post menstrual age.

Few babies born at less than 30 weeks remained in a level II nursery (n: 15). Three died on day 1. The remainder went home around the time that they were due (term equivalent age).

4.6 Level III to level II transfers

Of the 7045 babies registered to an ANZNN level III nursery, 278 were transferred to one of the level II hospitals described in this section. For 61 (21.9%) babies this was their hospital of birth.

Many babies continued their respiratory support after back-transfer. Thirty-one (11.2%) received at least one day of continuous positive airways pressure ventilation after transfer and 52 babies received supplemental oxygen.

Babies born at less than 32 weeks gestation tended to be transferred to a level II unit at around three weeks of age (median: 23 days; IQR: 12-42; n: 188). The more mature babies (born at more than 31 weeks) stayed in the level III unit for a median of 10 days (IQR: 6-15 days).

A few (n: 15, 5.40%) babies were transferred back to a tertiary centre for care prior to going home. This may have been due to a new illness, or to have surgery, such as repair of an inguinal hernia.

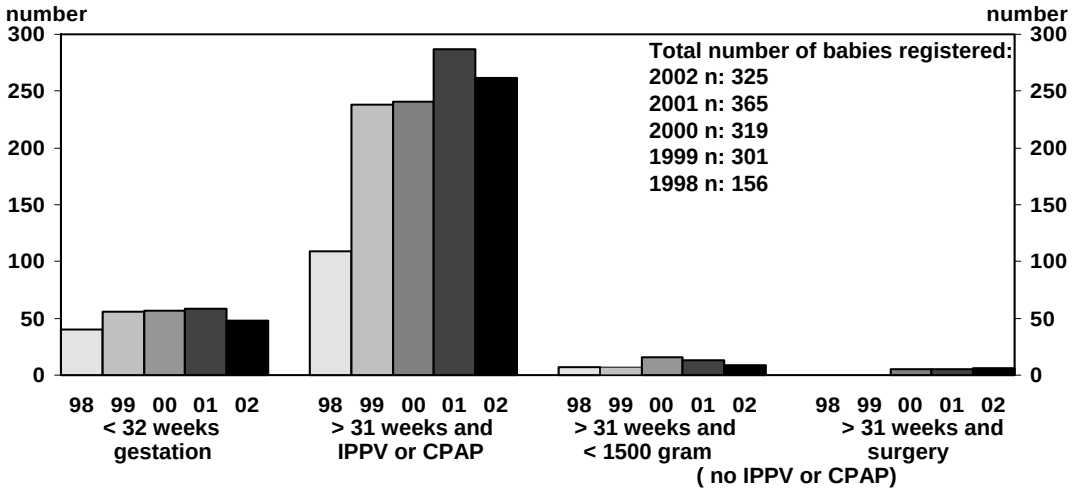

Figure19: Number of babies registered to level II units by registration criteria and year of birth, 1998-2002

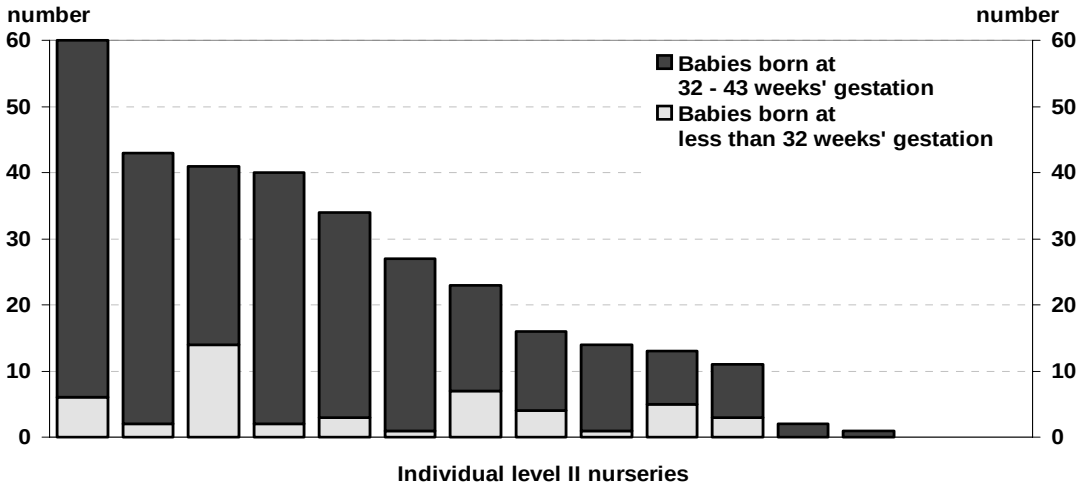

Figure 20: Number of babies registered to level II units by registration nursery, 2002

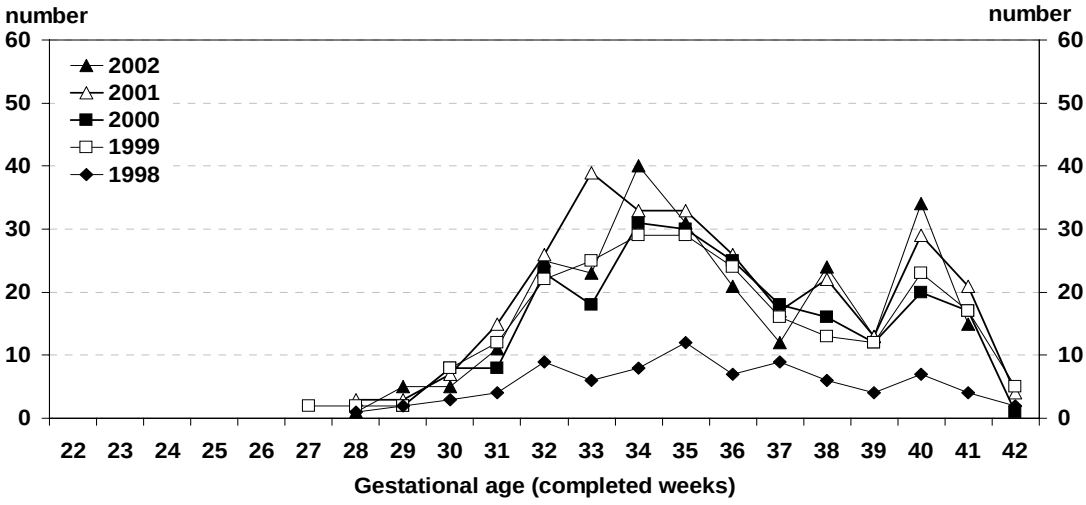

Figure 20: Number of babies registered to level II units with continuous positive airways pressure as their only form of assisted ventilation, by week of gestation and year of birth, 1998-2002

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6 Tables

6.1 Babies registered to level III nurseries

Table 1: Number of babies at each week of gestation, 2002

Gestational age (completed weeks)	Number	Cumulative per cent
21	—	—
22	6	0.09
23	68	1.05
24	179	3.59
25	230	6.86
26	304	11.2
27	325	15.8
28	368	21.0
29	492	28.0
30	594	36.4
31	715	46.6
All babies < 32 weeks	*3281*	
32	609	55.2
33	479	62.0
34	461	68.6
35	388	74.1
36	288	78.2
37	324	82.8
38	358	87.8
39	246	91.3
40	369	96.6
41	200	99.4
42	41	99.9
43	1	100.0
44	—	100.0
All babies	**7045**	

Table 2: Number of babies at each each birthweight group, 2002

Birthweight group (grams)	Number	Cumulative per cent
250-499	36	0.51
500-599	103	1.97
600-699	200	4.81
700-799	262	8.53
800-899	235	11.9
900-999	275	15.8
1000-1099	295	20.0
1100-1199	286	24.0
1200-1299	326	28.6
1300-1399	377	34.0
1400-1499	408	39.8
All babies less than 1500g	*2803*	
1500-1999	1306	58.3
2000-2499	923	71.4
2500-2999	724	81.7
3000-3499	634	90.7
3500-3999	444	97.0
4000 +	211	100.0
All babies	**7045**	

Note: ANZNN cohort includes all babies born at less than 32 completed weeks gestation or weighing less than 1500 grams. Those babies born above that gestation or birthweight must require assisted ventilation or major surgery to be included in the cohort.

Table 3: Antenatal corticosteroid use by gestational age group, babies of less than 34 weeks gestation, 2002

Antenatal steroid use	20-23	24-25	26-27	28-29	30-31	32-33	Babies < 34 weeks
				Number			
None	16	50	83	134	198	299	780
Incomplete course	29	118	168	239	305	241	1100
Course completed	25	201	279	350	618	416	1889
Course completed >7 day	3	40	93	130	176	115	557
Unknown	1		6	7	12	17	43
All babies	**74**	**409**	**629**	**860**	**1309**	**1088**	**4369**
				Per cent			
None	21.9	12.2	13.3	15.7	15.3	27.9	18.0
Incomplete course	39.7	28.9	27.0	28.0	23.5	22.5	25.4
Course completed	34.2	49.1	44.8	41.0	47.6	38.8	43.7
Course completed >7 day	4.19	9.78	14.9	15.3	13.6	10.7	12.9
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes: 1. Corticosteroids given antenatally via any route to the mother at a time likely to enhance fetal lung maturation is considered 'complete' when more than one dose of corticosteroids is given, and first dose was given more than 24 hours and less than 8 days before the baby's birth.

2. 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 4: Antenatal corticosteroid use by birthweight group, babies of less than 2500g birthweight, 2002

Antenatal steroid use	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	Babies < 2500 g
					Number			
None	—	26	76	112	158	286	427	1085
Incomplete course	9	106	138	180	164	252	111	960
Course completed	23	206	273	355	397	479	147	1880
Course completed >7 day	6	38	66	101	124	148	84	567
Unknown	6	33	36	71	86	103	80	415
All babies	**44**	**409**	**589**	**819**	**929**	**1268**	**849**	**4907**
					Per cent			
None	—	6.9	13.7	15.0	18.7	24.5	55.5	24.2
Incomplete course	23.7	28.2	25.0	24.1	19.5	21.6	14.4	21.4
Course completed	60.5	54.8	49.4	47.4	47.1	41.1	19.1	41.9
Course completed >7 day	15.8	10.1	11.9	13.5	14.7	12.7	10.9	12.6
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes: 1. Corticosteroids given antenatally via any route to the mother at a time likely to enhance fetal lung maturation is considered 'complete' when more than one dose of corticosteroids is given, and first dose was given more than 24 hours and less than 8 days before the baby's birth.

2. 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 5: Plurality by gestational age group, all babies, 2002

Plurality	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Singleton	53	740	1494	785	946	1500	5518
Twins	19	283	603	279	177	39	1400
Triplets	2	15	64	24	14	—	119
Quadruplets	—	—	8	—	—	—	8
Unknown	—	—	—	—	—	—	—
All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**
				Per cent			
Singleton	71.6	71.3	68.9	72.2	83.2	97.5	78.3
Twins	25.7	27.3	27.8	25.6	15.6	2.53	19.9
Triplets	2.70	1.45	2.95	2.21	1.23	—	1.69
Quadruplets	—	—	0.35	—	—	—	0.11
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

Table 6: Plurality by birthweight group, all babies, 2002

Plurality	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
							Number					
Singleton	25	307	444	530	649	899	744	647	620	442	211	5518
Twins	10	110	191	191	265	373	171	73	14	2	—	1400
Triplets	1	7	15	17	33	34	8	4	—	—	—	119
Quadruplets	—	—	1	7	—	—	—	—	—	—	—	8
Unknown	—	—	—	—	—	—	—	—	—	—	—	—
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**	**7045**
							Per cent					
Singleton	69.4	72.4	68.2	71.1	68.5	68.8	80.6	89.4	97.8	99.6	100.0	78.3
Twins	27.8	25.9	29.3	25.6	28.0	28.6	18.5	10.1	2.21	0.45	—	19.9
Triplets	2.78	1.65	2.30	2.28	3.48	2.60	0.87	0.55	—	—	—	1.69
Quadruplets	—	—	0.15	0.94	—	—	—	—	—	—	—	0.11
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

Table 7: Level of hospital of birth by gestational age group, all babies, 2002

Level of hospital	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Not born in a hospital	1	9	18	7	9	20	64
Hospital, no level III NICU	5	137	256	172	387	740	1697
Hospital with level III NICU	68	892	1894	909	741	778	5282
Unknown	—	—	1	—	—	1	2
All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**
				Per cent			
Not born in a hospital	1.35	0.87	0.83	0.64	0.79	1.30	0.91
Hospital, no level III NICU	6.76	13.2	11.8	15.8	34.0	48.1	24.1
Hospital with Level III NICU	91.9	85.9	87.4	83.6	65.2	50.6	75.0
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 8: Level of hospital of birth by birthweight group, all babies, 2002

Level of hospital	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
						Number						
Not born in a hospital	1	2	6	12	8	6	8	4	6	8	3	64
Hospital, no level III NICU	1	33	82	88	129	188	247	305	310	233	81	1697
Hospital with level III NICU	34	389	563	644	810	1112	667	415	318	203	127	5282
Unknown	—	—	—	1	—	—	1	—	—	—	—	2
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**	**7045**
						Per cent						
Not born in a hospital	2.78	0.47	0.92	1.61	0.84	0.46	0.87	0.55	0.95	1.80	1.42	0.91
Hospital, no level III NICU	2.78	7.78	12.6	11.8	13.6	14.4	26.8	42.1	48.9	52.5	38.4	24.1
Hospital with level III NICU	94.4	91.8	86.5	86.6	85.5	85.1	72.3	57.3	50.2	45.7	60.2	75.0
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 9: Method of birth by gestational age group, all babies, 2002

Mode of birth	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Vaginal	59	427	714	301	391	686	2578
Vaginal with instruments	1	14	59	26	47	148	295
Caesarean section – emergency (labour)	10	314	567	299	240	302	1732
Caesarean section - elective (no labour)	4	282	828	462	455	400	2431
Unknown	—	1	1	—	4	3	9
All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**
				Per cent			
Vaginal	79.7	41.2	32.9	27.6	34.5	44.7	36.6
Vaginal with instruments	1.35	1.35	2.72	2.39	4.15	9.64	4.19
C. section with labour	13.5	30.3	26.2	27.5	21.2	19.7	24.6
C. section without labour	5.41	27.2	38.2	42.5	40.2	26.0	34.6
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 10: Method of birth by birthweight group, all babies, 2002

Mode of birth	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
							Number					
Vaginal	10	174	205	223	284	475	371	263	265	201	107	2578
Vaginal with instruments	—	3	9	9	24	46	38	46	52	49	19	295
Caesarean section – emergency (labour)	3	94	189	202	257	357	208	175	125	74	48	1732
Caesarean section – elective (no labour)	23	153	248	310	381	427	303	239	192	120	35	2431
Unknown	—	—	—	1	1	1	3	1	—	—	2	9
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**	**7045**
							Per cent					
Vaginal	27.8	41.0	31.5	30.0	30.0	36.4	40.3	36.4	41.8	45.3	51.2	36.6
Vaginal with instruments	—	0.71	1.38	1.21	2.54	3.52	4.13	6.36	8.20	11.0	9.09	4.19
C. section with labour	8.33	22.2	29.0	27.1	27.2	27.4	22.6	24.2	19.7	16.7	23.0	24.6
C. section without labour	63.9	36.1	38.1	41.7	40.3	32.7	32.9	33.1	30.3	27.0	16.7	34.6
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 11: Transport mode by gestational age group, babies transferred soon after birth, 2002

Transportation method	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Non-specialised transport[(a)]	—	43	54	38	92	239	466
Specialist transport team[(b)]	5	105	219	149	326	605	1409
All babies	**5**	**148**	**273**	**187**	**418**	**844**	**1875**
				Per cent			
Non-specialised transport[(a)]	—	29.0	19.8	20.3	22.0	28.3	24.9
Specialist transport team[(b)]	100.0	71.0	80.2	79.7	78.0	71.7	75.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Baby is transferred by a non-specialist transfer method, including transport by ambulance.

(b) A specialist neonatal transport retrieval team using appropriate equipment retrieves the baby.

Note: These data represent those babies who qualify for the ANZNN cohort only, and do not include neonates who are transferred to a paediatric intensive care unit, or who are transferred after the perinatal period.

Table 12: Transportation mode by birthweight group, babies transferred soon after birth, 2002

Transportation method	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
						Number						
Non-specialised transport[(a)]	—	10	24	24	32	35	66	82	91	75	27	466
Specialist transport team[(b)]	1	25	64	74	104	171	213	253	243	194	67	1409
All babies	**1**	**35**	**88**	**98**	**136**	**206**	**279**	**335**	**334**	**269**	**94**	**1875**
						Per cent						
Non-specialised transport[(a)]	—	28.6	27.3	24.5	23.5	17.0	23.7	24.5	27.2	27.9	28.7	24.9
Specialist transport team[(b)]	100.0	71.4	72.7	75.5	76.5	83.0	76.3	75.5	72.8	72.1	71.3	75.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Infant is transferred by a non-specialist transfer method, including transport by ambulance.

(b) A specialist neonatal transport retrieval team using appropriate equipment retrieves the baby.

Note: These data represent those babies who qualify for the ANZNN cohort only, and do not include neonates who are transferred to a paediatric intensive care unit, or who are transferred after the perinatal period.

Table 13: Respiratory support by gestational age group, all babies, 2002

Type of respiratory support		20-23	24-27	28-31	32-33	34-36	37-44	All babies
IPPV	n	70	948	1033	376	519	922	3867
	median (hours)	201.5	153	41	37	45	49	
	interquartile range (hours)	42–733	44–514	20–97	20.5 –70	24–82.5	24–102	
	no IPPV (n)	4	90	1136	712	618	617	3148
	data not available	—	—	—	—	—	—	—
ECMO	n	—	—	—	—	—	7	7
Nitric oxide	n	3	68	38	13	28	139	289
High freq ventilation	n	29	234	79	18	37	78	475
Air leak (with drainage)	n	12	88	77	31	55	95	358
CPAP	n	29	862	1631	825	802	824	4973
	median (hours)	527.5	600	69	29	25	20	
	interquartile range (hours)	281 – 681	289 – 952	24 – 168	12 – 65	12 – 54	8 – 46	
	no CPAP (n)	45	176	538	263	335	715	2072
	data not available	—	—	—	—	—	—	—
Oxygen	n	71	990	1579	802	882	1221	5563
	median (days)	11	53	5	3	4	4	
	interquartile range (days)	2 –87.5	12 – 95	2 – 26	2 – 6	2 – 7	2 – 9	
	no oxygen (n)	3	40	574	281	248	312	1440
	data not available	—	8	16	5	7	6	42
	All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**

Note: Median and range (hours or days) are for those babies who received this therapy.

Table 14: Respiratory support by birthweight group, all babies, 2002

Type of respiratory support		250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
IPPV	n	32	397	537	457	383	508	438	391	354	264	106
	median (hours)	239	247	132	49	36	39	42	45	52	53.5	48
	interquartile range (hours)	91–692	54–740	45–408	20–129	17–85	20–72	23–76	24–88	24–96	29–104	31–116
	no IPPV (n)	4	27	114	288	564	798	485	333	280	180	105
	data not available	—	—	—	—	—	—	—	—	—	—	—
CPAP	n	17	284	570	605	619	980	679	477	361	251	130
	median (hours)	548	635	535	165	56	33	25	26	23	18	24
	interquartile range (hours)	61–870	317–1019	198–901	60–450	22–135	14–75	12–56	10–57	10–50	7– 44	10–52
	no CPAP (n)	19	140	81	140	328	326	244	247	273	193	81
	data not available	—	—	—	—	—	—	—	—	—	—	—
Oxygen	n	34	412	591	589	612	946	743	592	506	361	177
	median (days)	12.5	53.5	50	20	4	3	4	4	4	4	3
	interquartile range (days)	4–70	5–109	11–90	4–51	2–21	1–6	2–7	2–7	2–8	2–9	2–9
	no oxygen (n)	2	11	51	147	329	356	175	130	125	80	34
	data not available	—	1	9	9	6	4	5	2	3	3	—
	All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**

Note: Median and range (hours or days) are for those babies who received this therapy.

Table 15: Supplemental oxygen dependency by gestational age group, all babies, 2002

Oxygen dependency	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Oxygen therapy at day 28	25	660	384	41	40	63	1213
Per cent survivors with oxygen therapy on day 28	100.0	77.7	18.3	3.9	3.7	4.4	18.5
Chronic lung disease [(a)]	19	430	243	—	—	—	692
Per cent of survivors with chronic lung disease [(b)]	79.2	52.2	11.6	—	—	—	23.54
Oxygen therapy after discharge to home	9	203	74	8	8	24	326
Data not available	—	8	16	5	7	6	42
All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**

(a) Chronic Lung Disease (CLD) is defined as requiring respiratory assistance, ie supplemental oxygen and/or mechanical ventilation and/or continuous positive airways pressure) at 36 weeks post menstrual age (PMA, gestational age plus chronological age) for babies born at less than 32 weeks gestation.

(b) Calculated as the total number with CLD as a percentage of those alive at 36 weeks PMA who have oxygen therapy information available.

Note: 1. 'Unknown' or 'not available' data are excluded from per cent calculations.

2. 'Data not available' here is different to that for Table 13. The final date that oxygen therapy ceased, and thus the total duration of oxygen may be unavailable, however, it may be known that the baby received supplemental oxygen beyond a certain date, and thus qualifies for CLD.

Table 16: Supplemental oxygen dependency by birthweight group, all babies, 2002

Oxygen dependency	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
Oxygen therapy at day 28	13	246	386	259	119	80	41	29	20	15	5	1213
Per cent survivors with oxygen therapy on day 28	100	89.1	66.6	36.5	12.9	6.37	4.62	4.26	3.40	3.62	2.50	18.525
Chronic lung disease [(a)]	8	189	253	137	62	38	4	1	—	—	—	692
Per cent of survivors with chronic lung disease [(b)]	72.7	72.7	45.2	21.2	9.31	5.18	7.14	—	—	—	—	23.5
Oxygen therapy after discharge to home	5	91	112	48	24	14	8	5	12	5	2	326
Data not available	—	1	9	9	6	4	5	2	3	3	—	42
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**	**7045**

(a) Chronic lung disease is defined as requiring respiratory assistance, ie supplemental oxygen and/or mechanical ventilation and/or continuous positive airways pressure) at 36 weeks post menstrual age (PMA,) for babies born at less than 32 weeks gestation.

(b) Calculated as the total number with chronic lung disease as a percentage of those alive at 36 weeks PMA who have oxygen therapy information available.

Note: 1. 'Unknown' or 'not available' data are excluded from per cent calculations.

2. 'Data not available' here is different to that for Table 13. The final date that oxygen therapy ceased, and thus the total duration of oxygen may be unavailable, however, it may be known that the baby received supplemental oxygen beyond a certain date, and thus qualifies for CLD.

Table 17: Exogenous surfactant use by gestational age group, all babies, 2002

Surfactant use	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
None	5	221	1319	826	830	1335	4536
Survanta	67	813	829	251	300	200	2460
Exosurf, other or both	—	—	2	1	—	—	3
Unknown	2	4	19	10	7	4	46
All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**
				Per cent			
None	6.94	21.4	61.3	76.6	73.4	87.0	64.8
Survanta	93.6	78.6	38.6	23.3	26.6	13.0	35.2
Exosurf, other or both	—	—	0.09	0.09	—	—	0.04
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: Unknown' or 'not available' data are excluded from per cent calculations.

Table 18: Exogenous surfactant use by birthweight group, all babies, 2002

Surfactant use	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
							Number					
None	6	77	186	378	628	952	670	564	520	372	183	4536
Survanta	30	343	460	363	306	345	246	159	112	70	26	2460
Exosurf, other or both	—	—	—	—	1	1	1	—	—	—	—	3
Unknown	—	4	5	4	12	8	6	1	2	2	2	46
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**	**7045**
							Per cent					
None	16.7	18.3	28.8	51.0	67.2	73.3	73.1	78.0	82.3	84.2	87.6	64.8
Survanta	83.3	81.7	71.2	49.0	32.7	26.6	26.8	22.0	17.7	15.8	12.4	35.2
Exosurf, other or both	—	—	—	—	0.11	0.08	0.11	—	—	—	—	0.04
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

Table 19: Intraventricular haemorrhage by gestational age group, babies of less than 32 weeks gestation, 2002

Head ultrasound result	20-23	24-25	26-27	28-29	30-31	Babies < 32 weeks
			Number			
None	27	224	443	698	1001	2393
Grade I	7	37	73	80	80	277
Grade II	7	40	48	26	20	141
Grade III	9	25	22	13	9	78
Grade IV	11	44	27	17	12	111
Not examined	13	39	16	26	187	281
All babies	**74**	**409**	**629**	**860**	**1309**	**3281**
			Per cent			
None	44.3	60.5	72.3	83.7	89.2	79.8
Grade I	11.5	10.0	11.9	9.59	7.13	9.23
Grade II	11.5	10.8	7.83	3.12	1.78	4.70
Grade III	14.7	6.76	3.59	1.56	0.80	2.60
Grade IV	18.0	11.9	4.40	2.04	1.07	3.70
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Not examined' and 'not available' data are excluded from per cent calculations.

Table 20: Intraventricular haemorrhage by birthweight group, babies of less than 1500g birthweight, 2002

Head ultrasound result	250-499	500-749	750-999	1000-1249	1250-1499	Babies <1500
			Number			
None	23	236	467	586	736	2048
Grade I	2	39	63	70	60	234
Grade II	3	41	39	34	18	135
Grade III	1	27	22	13	8	71
Grade IV	3	43	31	19	10	106
Not examined	4	38	29	23	115	209
All babies	**36**	**424**	**651**	**745**	**947**	**2803**
			Per cent			
None	71.9	61.1	75.1	81.2	88.5	79.0
Grade I	6.25	10.1	10.1	9.70	7.21	9.02
Grade II	9.38	10.6	6.27	4.71	2.16	5.20
Grade III	3.13	6.99	3.54	1.80	0.96	2.74
Grade IV	9.38	11.1	4.98	2.63	1.20	4.09
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: 'Not examined' and 'not available' data are excluded from per cent calculations.

Table 21: Retinopathy of prematurity (ROP) by gestational age group, babies of less than 31 weeks gestation or less than 1250g birthweight, 2002

Eye examination result	20-23	24-25	26-27	28-29	30-31	32-44	Eligible babies
				Number			
No ROP	4	89	295	630	416	40	1474
Stage I	4	54	121	64	21	—	264
Stage II	3	63	82	37	6	3	194
Stage III	13	49	45	19	3	—	129
Stage IV	—	3	5	—	1	—	9
Threshold disease	4	31	19	8	1	4	63
Received therapy	7	35	25	9	1	7	77
Not examined	—	3	16	70	200	26	315
Babies eligible for exam.	**24**	**261**	**564**	**820**	**647**	**69**	**2385**
				Per cent			
No ROP	16.7	34.5	53.8	84.0	93.1	93.0	71.2
Stage I	16.7	20.9	22.1	8.53	4.70	—	12.7
Stage II	12.5	24.4	15.0	4.93	1.34	6.98	9.37
Stage III	54.2	19.0	8.21	2.53	0.67	—	6.23
Stage IV	—	1.16	0.91	—	0.22	—	0.43
Eligible babies examined	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes; 1. Indicates worst stage of ROP reported.
2. 'Not examined' and 'data not available' data are excluded from per cent calculations.
3. 'Babies eligible for exam.' includes all babies born at less than 31 weeks gestation or less than 1250 grams who were alive at 36 weeks postmenstrual age (when the eye is usually fully vasularised). These criteria may not comply with local experience, which may artificially elevate the number of babies in the 'not examined or data not available' category.

Table 22: Retinopathy of prematurity (ROP) by birthweight group, babies of less than 31 weeks gestation or less than 1250 g birthweight, 2002

Eye examination result	250-499	500-749	750-999	1000-1249	1250-1499	1500-2999	Eligible babies
				Number			
No ROP	1	91	307	507	388	180	1474
Stage I	2	48	105	77	26	6	264
Stage II	2	61	85	36	7	3	194
Stage III	4	51	56	17	1	—	129
Stage IV	1	3	5	—	—	—	9
Threshold disease	1	33	22	6	—	1	63
Received therapy	4	36	29	7	—	1	77
Not examined	1	8	14	69	89	134	315
Babies eligible for exam.	**11**	**262**	**572**	**706**	**511**	**323**	**2385**
				Per cent			
No ROP	10.0	35.8	55.0	79.6	91.9	95.2	71.2
Stage I	20.0	18.9	18.8	12.1	6.16	3.17	12.7
Stage II	20.0	24.0	15.2	5.65	1.66	1.59	9.37
Stage III	40.0	20.1	10.0	2.67	0.24	—	6.23
Stage IV	10.0	1.18	0.90	—	—	—	0.43
Eligible babies examined	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 23: Septicaemia timing by gestational age group, all babies, 2002

Infection status	20-23	24-25	26-27	28-29	30-31	32-36	37-44	All babies
					Number			
No infection noted	47	235	424	731	1224	2139	1457	6257
Sepsis, onset at less than 48 hours	1	14	15	11	13	16	17	87
Sepsis, onset at more than 48 hours	25	156	177	114	69	68	60	669
Sepsis, early and late onset	—	2	5	2	2	2	4	17
Sepsis, timing not noted	1	2	8	2	1	—	1	15
Data not available	—	—	—	—	—	—	—	—
Babies surviving beyond day 2	54	353	612	850	1300	2204	1499	6872
All babies	**74**	**411**	**631**	**861**	**1310**	**2225**	**1539**	**7045**
					Per cent			
No infection noted *	63.5	57.2	67.2	84.9	93.4	96.1	94.7	88.8
Sepsis, onset at less than 48 hours *	1.35	3.41	2.38	1.28	0.99	0.72	1.10	1.23
Sepsis, onset at more than 48 hours +	46.3	44.2	28.9	13.4	5.31	3.09	4.00	9.74
Sepsis, early and late onset +	—	0.57	0.82	0.24	0.15	0.09	0.27	0.25
Sepsis, timing not noted *	1.35	0.49	1.27	0.23	0.08	—	0.06	0.21

* Denominator for these calculations are all babies, n: 7045

\+ Denominator for this calculation is babies surviving beyond day 2, n: 6872.

Note: 'Not examined' and 'not available' data are excluded from per cent calculations.

Table 24: Septicaemia timing by birthweight group, all babies, 2002

Infection status	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000+	All babies
					Number			
No infection noted	25	253	452	619	860	1241	2807	6257
Sepsis, onset at less than 48 hours	—	10	14	14	10	12	27	87
Sepsis, onset at more than 48 hours	11	151	177	110	74	52	94	669
Sepsis, early and late onset	—	3	4	1	1	1	7	17
Sepsis, timing not noted	—	7	4	1	2	—	1	15
Data not available	—	—	—	—	—	—	—	—
Babies surviving beyond day 2	28	367	625	734	937	1300	2881	6872
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**2936**	**7045**
					Per cent			
No infection noted *	69.4	59.7	69.4	83.1	90.8	95.0	95.6	88.8
Sepsis, onset at less than 48 hours *	—	2.36	2.15	1.88	1.06	0.92	0.92	1.23
Sepsis, onset at more than 48 hours +	39.3	41.2	28.3	15.0	7.90	4.00	3.26	9.74
Sepsis, early and late onset +	—	0.82	0.64	0.14	0.11	0.08	0.24	0.25
Sepsis, timing not noted *	—	1.65	0.61	0.13	0.21	—	0.03	0.21

* Denominator for these calculations are all babies, n: 7045

\+ Denominator for this calculation is babies surviving beyond day 2, n: 6872.

Table 25: Transfer status and level of hospital if transferred, by gestational age group, all babies, 2002

Hospital level	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Not transferred	61	573	858	473	605	983	3553
Hospital with level I or II nursery	5	316	1125	535	453	354	2788
Hospital with level III NICU	3	58	100	45	28	77	311
NICU in children's hospital	5	91	86	35	51	125	393
Data not available	—	—	—	—	—	—	—
All babies	**74**	**1038**	**2169**	**1088**	**1137**	**1539**	**7045**
				Per cent			
Not transferred	82.4	55.2	39.6	43.5	53.2	63.9	50.4
Hospital with level I or II nursery	6.76	30.44	51.9	49.2	39.8	23.0	39.6
Hospital with level III NICU	4.05	5.59	4.61	4.14	2.46	5.00	4.41
NICU in children's hospital	6.76	8.77	3.96	3.22	4.49	8.12	5.58
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes
1. Where a baby was transferred many times, the level of hospital was recorded for the stay of most significance, or as the level 1 or II transfer if this was not apparent. This was to allow computation of stay in level III NICUs compared to step-down or level 1 or 2 stay.
2. 'Not transferred' refers to babies who went home from or died in their hospital of registration.
3 'Not available' data are excluded from per cent calculations.

Table 26: Transfer status and level of hospital if transferred, by birthweight group, all babies, 2002

Hospital level	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000 +	All babies
							Number					
Not transferred	29	266	321	315	392	527	461	406	407	282	147	3553
Hosp. with level I/II nursery	3	83	244	358	494	668	369	261	166	103	39	2788
Hospital with Level III NICU	1	22	42	37	30	63	35	20	23	28	10	311
NICU in children's hospital	3	53	44	35	31	48	58	37	38	31	15	393
Data not available	—	—	—	—	—	—	—	—	—	—	—	—
All babies	**36**	**424**	**651**	**745**	**947**	**1306**	**923**	**724**	**634**	**444**	**211**	**7045**
							Per cent					
Not transferred	80.6	62.7	49.3	42.3	41.4	40.4	50.0	56.1	64.2	63.5	69.7	50.4
Hosp. with level I/II nursery	8.33	19.6	37.5	48.1	52.2	51.2	40.0	36.1	26.2	23.2	18.5	39.6
Hospital with level III NICU	2.78	5.19	6.45	4.97	3.17	4.82	3.79	2.76	3.63	6.31	4.74	4.41
NICU in children's hospital	8.33	12.5	6.76	4.70	3.27	3.68	6.28	5.11	5.99	6.98	7.11	5.58
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes
1. Where a baby was transferred many times, the level of hospital was recorded for the stay of most significance, or as the level 1 or 2 transfer if this was not apparent. This was to allow computation of stay in level 3 NICUs compared to step-down or level 1 or 2 stay.
2. 'Not transferred' refers to babies who went home from or died in their hospital of registration.
3' Not examined' and 'not available' data are excluded from per cent calculations.

Table 27: Survival to discharge home at each week of gestation, all babies, 2002

Gestational age (weeks)	All babies admitted	No. with discharge home date	Number with lethal cong. malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
22	6	6	—	1	—	—	—
23	68	67	—	37	25	22	32.4
24	179	177	—	119	98	87	48.6
25	230	228	1	197	178	168	73.0
26	304	299	—	283	274	260	85.5
27	325	322	1	308	299	291	89.5
28	368	362	3	360	352	345	93.8
29	492	478	5	480	472	466	94.7
30	594	585	1	585	580	576	97.0
31	715	704	9	702	697	697	97.5
32	609	596	3	603	596	594	97.5
33	479	469	5	471	466	465	97.1
34	461	451	10	455	449	441	95.7
35	388	383	13	374	367	364	93.8
36	288	284	13	279	275	270	93.8
37	324	315	10	312	305	304	93.8
38	358	354	24	334	323	320	89.4
39	246	244	6	235	229	225	91.4
40	369	368	12	355	344	340	92.1
41	200	199	6	188	184	182	91.0
42	41	41	1	39	38	38	92.7
43	1	1	—	1	1	1	100.0
44	—	—	—	—	—	—	—
All babies	**7045**	**6933**	**123**	**6718**	**6552**	**6456**	**91.64**

Notes 1. Per cent survival to discharge is calculated from 'number alive at discharge' divided by 'all babies admitted' (to the level III NICUs). Hence, these survival calculations include those babies with congenital malformations that are considered to have directly contributed to their death (lethal malformations).

2 Where babies have been transferred to a peripheral hospital and the date of discharge to home is not available (2.70% of all babies) these babies have been assumed to have survived to go home.

Table 28: Days until discharge from hospital by gestational age group, 2002

Days to discharge	20-23	24-27	28-31	32-33	34-36	37-44
Median (days)	138	93	51	31	18	12
Interquartile range	121 – 162	79 – 111	41 – 64	25 – 38	13 – 26	8 – 22
Survivors with discharge data	**21**	**794**	**2044**	**1036**	**1056**	**1393**

Notes 1. Discharge data are available for 6052 of the 6235 (97.1%) surviving babies.

2. Data are for all babies, regardless of level of hospital at discharge.

Table 29: Survival to discharge home by birthweight group, all babies, 2002

Birthweight group (grams)	All babies admitted	No. with discharge home date	Number with lethal cong. malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
250-499	36	36	—	22	13	8	22.2
500-599	103	103	—	72	59	51	49.5
600-699	200	198	1	149	127	115	57.5
700-799	262	260	1	224	209	199	76.0
800-899	235	232	1	218	212	206	87.7
900-999	275	267	2	257	249	244	88.7
1000-1099	295	289	3	290	282	276	93.6
1100-1199	286	275	—	275	272	269	94.1
1200-1299	326	318	6	319	312	308	94.5
1300-1399	377	369	4	367	363	362	96.0
1400-1499	408	405	4	403	403	400	98.0
1500-1999	1306	1286	12	1288	1276	1271	97.3
2000-2499	923	905	33	904	888	877	95.0
2500-2999	724	715	25	697	683	674	93.1
3000-3499	634	629	24	605	589	584	92.1
3500-3999	444	437	6	424	415	412	92.8
4000 +	211	209	1	204	200	200	94.8
All babies	**7045**	**6933**	**123**	**6718**	**6552**	**6456**	**91.64**

Notes
1. Per cent survival to discharge is calculated from 'number alive at discharge' divided by 'all babies admitted' (to the level III NICUs). Hence, these survival calculations include those babies with congenital malformations that are considered to have directly contributed to their death (lethal malformations).
2. Where babies have been transferred to a peripheral hospital and the date of discharge to home is not available (2.70% of all babies) these babies have been assumed to have survived to go home.
3. Data are divided into 100 grams group from 500 grams to 1500 grams, then 500 grams groups.

Table 30: Days until discharge from hospital by birthweight group, 2002

Days to discharge	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
Median (days)	134	110	88	65	48	37	23	16	12	12	10
Interquartile range	120–144	95–136	74–105	54–78	39–58	30–45	17-31	11–23	8–19	8–20	6–17.5
Survivors with discharge data	**8**	**247**	**553**	**677**	**902**	**1251**	**859**	**665**	**579**	**405**	**198**

Notes
1. Discharge data are available for 6052 of the 6235 (97.1%) surviving babies.
2. Data are for all babies, regardless of level of hospital at discharge.

6.1 Babies registered to level II nurseries

Table 31: Number of babies registered to level II units units by gestational age group, 2002

Gestational age (completed weeks)	Number	Cumulative per cent
Less than 28	3	0.92
28-29	12	4.62
30-31	33	14.8
All babies less than 32 week	*48*	
32-33	58	32.6
34-36	98	67.8
37-39	61	81.5
More than 39	60	100.0
All babies	**325**	

Table 32: Number of babies registered to level II units by birthweight group, 2002

Birthweight group (grams)	Number	Cumulative per cent
< 1000	5	1.54
1000-1249	12	5.23
1250-1499	24	12.6
All babies less than 1500g	*41*	
1500-1999	48	27.4
2000-2499	71	49.2
2500-2999	68	70.2
3000-3499	42	83.1
3500-3999	34	93.5
4000-7000	21	100.0
All babies	**325**	

Note: ANZNN cohort includes all babies born weighing less than 1500 grams. Those above this birthweight must be born at less than 32 weeks completed gestation, or must require assisted ventilation or major surgery.

Table 33: Survival to discharge, babies registered to level II units by gestational age group, 2002

Gestational age (weeks)	All babies admitted	No. with discharge home date	Number with lethal cong. malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
Less than 28	3	3	—	—	—	—	—
28-29	12	12	—	12	12	12	100.0
30-31	33	33	—	33	33	32	97.0
32-33	58	58	1	57	57	57	98.3
34-36	98	98	—	98	98	98	100.0
37-39	61	60	—	59	59	59	96.7
More than 39	60	60	—	58	58	58	96.7
All babies	**325**	**324**	**1**	**316**	**316**	**315**	**96.92**

Note:
1. Per cent survival to discharge is calculated from 'number alive at discharge' divided by 'all babies admitted' (to the level II units). Hence, survival calculations include the babies with congenital malformations that are considered to have directly contributed to their death (lethal malformations).
2. Where babies have been transferred to a peripheral hospital and the date of discharge to home is not available (n: 1, 0.3% of all babies) these babies have been assumed to have survived to go home.

Table 34: Respiratory support, level II units, by gestational age group, 2002

Type of respiratory support		less than 28	28-31	32-33	34-36	37-44	All babies
IPPV	n	3	7	5	2	16	34
	median (hours)	7	52	16	42	9	
	no IPPV (n)	—	38	53	96	105	291
	data not available	—	—	—	—	—	—
Air leak (with drainage)	n	—	3	1	4	5	13
CPAP	n	—	31	52	94	105	280
	median (hours)	—	47	23	18	15	
	interquartile range (hours)	—	19-94	12-54	10-46	7-24	
	no CPAP (n)	3	14	6	4	16	45
	data not available	—	—	—	—	—	—
Oxygen	n	3	34	51	74	100	262
	Median (days)	2	5	3	2	2	
	Interquartile range (hours)		2-14	2-5.5	2-3	1-3	
	no oxygen (n)	—	9	7	24	21	63
	data not available	—	—	—	—	—	—
Oxygen therapy after discharge to home		—	2	—	—	—	2
All babies		**3**	**45**	**58**	**98**	**121**	**325**

Note: Median and range (days) are for those babies who received this therapy.

Table 35: Intraventricular haemorrhage by gestational age group, babies of less than 32 weeks gestation registered to level II units, 2002

Head ultrasound result	<29	30-31	Babies less than 32 weeks
		Number	
None	9	22	31
Grade I or II	3	—	3
Grade III or IV	1	—	1
Not examined	2	11	13
All babies	**15**	**33**	**48**
		Per cent	
None	69.2	100	88.6
Grade I or II	23.1	—	8.57
Grade III or IV	7.69	—	2.86
All babies	**100**	**100**	**100**

Note: 'Not examined' data are excluded from per cent calculations.

Appendix 1: Definitions of the data items for audit in 2002

The definitions for the audit are authorised by the Advisory Committee of the Australian and New Zealand Neonatal Network prior to being introduced into the dataset. The sources of these definitions include those that exist in the National Health Data Dictionary (of Australia); from Australasian collaborative groups; from multi-centre randomised controlled trials involving ANZNN units; and finally those in general use in Australia and New Zealand.

For brevity, only the sections relating to the definition, classification or coding, guide for use and comments have been presented here. A more detailed explanation of the definitions is at: http: //www.usyd.edu.au/cphsr/anznn/defn.html

The items changed from the 2001 audit relate to the recording of infection which now complies with the NICU Infection Surveillance group of the Australian Infection Control Association. Criteria for audit registration are in section 2.1.

1.1 Minimum dataset variables

Registration hospital

Definition: The hospital of registration is the first level III NICU that the baby remained in for four or more hours during the first 28 days of life. Babies who received their entire care in a level II hospital, or who were not transferred to a level III NICU during the first 28 days are registered to the first level II centre that they remain in for 4 or more hours.
Coding: numeric code representing registration hospital.
Guide for use: Babies who were transferred are considered to be at the hospital to which they are transferred from the time the specialist retrieval team (ie level III care) arrives at the bedside. If a specialist team do not transfer them, admission occurs when they reach level III care. If a baby dies within 4 hours, they are registered to unit where they die.

Maternal age

Definition: Age in completed years of the woman giving birth on the date of her baby's birth.
Coding: 2-digit number representing maternal age in completed years.

Previous preterm birth

Definition: This mother has had a previous birth that was at less than 37 weeks gestation and more than 20 completed weeks, regardless of outcome.
Coding: 99: unknown
0: no previous preterm birth
-1: yes, there was a previous preterm birth

Previous perinatal death

Definition: This mother has had a previous perinatal loss.
Coding: 99: unknown
0: no previous perinatal death
-1: yes, has had a previous perinatal death
Guide for use: A perinatal loss is when an baby with a birth weight of more than 400 grams or a gestational age of more than 20 completed weeks died during the first 28 days of life.

Assisted conception in this pregnancy

Definition: The type of infertility treatment used during the conception or used to conceive this pregnancy.
Coding: 0: unknown - information not available
1: none - used for this pregnancy.
2: hyperovulation - any hormone therapy used to stimulate ovulation.
3: IVF / GIFT etc. - any method of in vitro fertilisation. Incl. in-vitro fertilisation gamete intra-fallopian transfer, zygote intra-fallopian transfer, and IC sperm injection.
4: other - infertility treatment used, that is not mentioned above, incl. artificial insemination.
Guide for use: Disregard any treatment for any previous pregnancies.

Ethnicity of mother

Definition: Ethnic origin of the mother of baby, as identified by the mother.
Coding: 0: unknown - information not available
1: Aboriginal or Torres Strait Islander (TI) - of Aboriginal or TI descent who identifies as an Aboriginal or TI and is accepted as such by the community with which she is associated
2: Asian - from countries of Asia, South East Asia Indian subcontinent. Incl. say Fijian Indian.
3: Caucasian - of Caucasoid heritage, includes Arabic, European, Russian Middle Eastern.
4: Other - includes African Negroes, Inuit, American Blacks and Indians, Melanesian.
5: Pacific Islander - Pacific Islander background
6: Maori - maternal self-identification

Source of referral

Definition: Source of referral to registration unit
Coding: 0: unknown - information not available
1: booked at tertiary obstetric hospital - mother booked at hospital with a NICU and not transferred during the most recent admission.
2: in-utero transfer from obstetric hospital - mum transferred during admission, baby in utero.
3: ex-utero retrieval - baby transferred from any hospital by a specialist neonatal retrieval team using appropriate equipment.
4: ex-utero transfer - baby transferred from any hospital by non-specialist team, includes transport by ambulance.
5: other - includes born in transit, not booked.
6: booked at this level II unit - mother booked into this hospital, no NICU.
7: in-utero transfer to this level II unit - mother transferred during admission, baby in utero.
8: ex-utero retrieval to this level II unit - baby 'retrieved' from any other hospital.
9: ex-utero transfer to this level II unit - baby 'transferred' from any other hospital.
Guide for use: Use most recent referral.

Presenting antenatal problem

Definition: The antenatal complication that the mother presented with in this pregnancy, that started the train of events leading to the birth.
Coding: 0: unknown - information not available
1: preterm pre-labour rupture of membranes- confirmed spontaneous rupture of membranes occurring prior to the onset of labour and before 37 weeks' gestation. ROM defined[11]
2: preterm labour
3: hypertension in pregnancy
4: antepartum haemorrhage
5: suspected intrauterine growth restriction
6: fetal distress
7: other
8: none - no presenting problem. Born at term.
9: antenatal diagnosis of fetal malformation.

Other antenatal complications

Definition: Any other antenatal complications.
Coding: 99: unknown
0: no other antenatal complications present
-1: yes other antenatal complications present

Prolonged rupture of membranes (ROM)

Definition: Confirmed spontaneous ROM (obvious gush of clear amniotic fluid from vagina, or (if fluid available) by differentiation with urine vaginal secretions[11]) for > 24 hrs before birth.
Coding: 99: unknown
0: no, membranes intact or ruptured for < 24 hrs
-1: yes, membranes ruptured for > 24 hours

Preterm labour

Definition: Regular painful contractions, leading to progressive effacement and dilatation of the cervix, eventually leading to the birth of the baby[5], and commencing before 37 weeks gestation
Coding: 99: unknown
0: no, labour did not commence before term
-1: yes, labour commenced in the preterm period

Hypertension in pregnancy

Definition: A systolic blood pressure (BP) >140 mmHg and/ or diastolic BP >90 mmHg, or a rise in systolic BP >25 mmHg and /or a rise in diastolic BP >15 mmHg from a reading before conception or in 1st trimester; confirmed by 2 readings 6 hours apart[1.]
Coding: 99: unknown
0: no hypertension in pregnancy detected
-1: yes, hypertension in pregnancy diagnosed

Antepartum haemorrhage

Definition: Significant haemorrhage in the time from 20 weeks gestation to the end of second stage of labour. This excludes a 'show'.
Coding: 99: unknown
0: no antepartum haemorrhage noted
-1: yes, antepartum haemorrhage

Suspected intrauterine growth restriction

Definition: A condition of the fetus in which it fails to reach its genetically predetermined full growth potential due to intrinsic or extrinsic factors[14]- based on > 1 obstetric ultrasound.
Coding: 99: unknown
0: no intrauterine growth restriction present
-1: yes, intrauterine growth restriction suspected

Fetal distress

Definition: Any 'distress' of this fetus leading to intervention by the obstetric team.
Coding: 99: unknown
0: no intervention necessary
-1: yes, obstetric intervention required

Antenatal diagnosis of fetal malformation

Definition: A fetal malformation is diagnosed prior to the baby's birth, by any method.
Coding: 99: unknown
0: no
-1: yes, malformation detected prior to birth
Guide for use: The diagnosis of the malformation may or may not be confirmed after birth.

Other antenatal complication

Definition: Significant complication, not specified
Coding: 99: unknown
0: no other significant antenatal complication
-1: yes, other significant antenatal complication

Antenatal corticosteroids

Definition: Corticosteroids given antenatally via any route to the mother at a time likely to enhance fetal lung maturation.

Coding: 0: unknown - information not available
1: none - steroids not given to enhance fetal lung maturation.
2: less than 24 hours - first dose given < 24 hours prior to this baby's birth.
3: complete - More than 1 dose of steroids given, and 1st dose at >24 hrs and <8 days before birth.
4: more than 7 days - given at more than 7 days before baby's birth

Guide for use: If two courses given, and one is fulfils the 'complete' criteria, use 'complete'. If the time of doses given is not available, but two doses are known to have been given appropriately, also use 'complete'. Excludes corticosteroids given to mother for other reasons.

Plurality

Definition: The total number of births resulting from this pregnancy.

Coding:
0: singleton - only one baby born.
1: twins - two babies
2: triplets - three babies
3: quads - four babies
4: more! - Quintuplets, sextuplets etc.

Guide for use: Plurality of a pregnancy is determined by the number of live births or by the number of fetuses that remain in utero at 20 weeks gestation that are subsequently born separately. In multiple pregnancies or, if gestational age is unknown, only live births of any birthweight or gestation, or fetuses weighing >= 400 g are taken into account in determining plurality. Fetuses aborted at < 20 weeks or fetuses compressed in the placenta at >= 20 weeks are excluded.

Birth order

Definition: Order of each baby of a multiple birth.

Coding: Single-digit number representing birth order.
0: singleton.
1: first of a multiple birth
2: second of a multiple birth
3: third of a multiple birth. etc.
8: other.

Date of birth

Definition: Date of birth of the patient.

Coding: DD / MM / YYYY

Admission date

Definition: The date on which an inpatient or same-day patient commences an episode of care.

Coding: DD / MM / YYYY

Sex

Definition: The sex of the patient.

Coding: 0: unknown - information not available
1: male -
2: female -
3: ambiguous - or indeterminate.

Infant weight

Definition: The first weight of baby after birth.

*Coding:*4-digit number representing birthweight in grams.

Guide for use: The weight is usually measured to the nearest five grams and is obtained within one hour of birth, or shortly after the infant has been admitted.

Gestational age

Definition: The estimated gestational age of the baby in completed weeks as determined by certain maternal dates or by early ultrasound.

Coding: 2-digit number representing the number of completed weeks of gestation.

Guide for use: Derived from clinical assessment when accurate information is not available.

Place of birth

Definition: Place of baby's birth

Coding: 0: unknown - information not available
1: non tertiary hospital - born in a hospital with no level III neonatal intensive care (NICU).
2: tertiary hospital - born in hospital with a NICU
3: homebirth - birth planned for and occurs at home
4: born before arrival - baby was born at home (unplanned), or in an ambulance, a car etc.

Presentation at birth

Definition: Presenting part of the fetus (at lower segment of the uterus) at birth.

Coding: 0: unknown - information not available
1: cephalic - including face and brow
2: breech - legs or feet were facing the cervix
3: other - includes transverse.

Mode of birth

Definition: The method of complete expulsion or extraction from its mother of a product of conception.

Coding: 0: unknown - information not available
1: vaginal - vaginal birth, includes vaginal breech.
2: instrument - vaginal birth using instrument. Includes forceps, rotations, vacuum extraction.
3: Caesarean section in labour - Caesarean performed after the commencement of labour. Also known as emergency Caesarean section.
4: Caesarean section, no labour - Caesarean section performed prior to labour commencing Also known as elective Caesarean section.

Apgar score (1 minute)

Definition: Numerical score to evaluate the baby's condition at one minute after birth.
Coding: 2-digit number representing Apgar score
Guide for use: The score is based on the five characteristics of heart rate, respiratory condition, muscle tone, reflexes and colour.

Apgar score (5 minute)

Definition: Numerical score to evaluate the baby's condition at 5 minutes after birth.
Coding: 2 digit number representing Apgar score
Guide for use: as for Apgar score (1 minute).

Intubated at resuscitation

Definition: An active measure taken shortly after birth to establish independent respiration and heart rate, or to treat depressed respiratory effort by endotracheal intubation.
Coding: 99: unknown
0: no, intubation not necessary in labour ward
-1: yes, intubation necessary in labour ward
Guide for use: Does not include intubation for tracheal aspiration or intubation in the NICU after resuscitation is complete.

Congenital malformations

Definition: Structural abnormalities (including deformations) present at birth and diagnosed prior to separation from care (discharge home).
Coding: 99: unknown
0: no major congenital malformations noted
-1: yes, major congenital malformation noted
Comment: Exclusion list of minor abnormalities is at the end of this set of definitions.

Specified congenital malformations

Definition: Detail of the major congenital malformation.
Coding: free text field representing congenital malformation coded by ICD-10 AM.

Temperature on admission

Definition: Temperature on admission to NICU or closest to admission to registration unit. Use rectal temperature or, if not available, per axillae.
Coding: 4-digit number representing temperature measured in degrees Celsius to 1 decimal place.
Guide for use: NICU is considered to commence when newborn intensive care specialists arrive at the baby's bedside. Usually, this is at birth, but if the baby is transported from a peripheral area by a specialist neonatal retrieval team, admission (for the purpose of this audit) is considered to commence when the team arrive at the baby's bedside. If the baby is more than 12 hours NICU care arrives, or if an admission temperature is not recorded, use '0' to denote missing.

Highest appropriate inspired oxygen

Definition: Highest appropriate inspired oxygen (FiO_2), between admission to NICU and 12 hours after birth. Appropriate range is when:
arterial PaO_2 or $TcPO_2$ is 50-80 mmHg,
or if FiO_2 is > 25%, SaO_2 is 88-95%,
or if FiO_2 is < 25%, SaO_2 is > 88%.
Coding: 3-digit number representing FiO_2 recorded as a percentage.
Guide for use: as for temperature on admission; use '0' to denote missing.

Lowest appropriate inspired oxygen

Definition: Lowest appropriate FiO_2, between admission to NICU and 12 hours after birth - as for Highest appropriate inspired oxygen.
Coding: 3-digit number representing FiO_2 recorded as a percentage.
Guide for use: as for temperature on admission; use '0' to denote missing.

Worst base excess

Definition: Worst base deficit recorded between admission to NICU and 12 hours after birth.
Coding: 3 digit numbered field representing base excess measured in mml/l. May be negative.
Guide for use: as for temperature on admission; use '99' to denote missing.

Main respiratory diagnosis

Definition: Main indication for respiratory support.
Coding: 0: unknown - information not available
1: normal - no respiratory disease; no respiratory support.
2: non specific - any non-specific respiratory distress (RD) in a term or preterm infant requiring respiratory support (combines previous items transient tachypnoea of newborn and immature lung).
3: hyaline membrane disease - increasing RD or oxygen (O_2) requirements, or the need for ventilator support from the first 6 hours of life with a chest x-ray showing generalised reticulogranular pattern, plus or minus air bronchogram.
4: meconium aspiration - RD presenting from immediately after birth to 12 hours of age. Hypoxia, tachypnoea, gasping respirations, and often signs of underlying asphyxia. Chest x-ray shows over-expansion of lungs with widespread coarse, fluffy infiltrates[6].
5: pneumonia - RD with proven or suspected infection (toxic blood count), and chest x-ray showing persisting opacities.
6: persistent pulmonary hypertension - echo-cardiac (shunting or clinical evidence - O_2 need unexplained by chest x-ray or loud P_2, or differential pre /post ductal $TCPO_2$).

8: apnoea - recurrent pauses in breathing for more than 20 seconds, or for less than 20 seconds associated with bradycardia or any desaturation requiring intervention.
9: congenital malformation - malformation is the primary reason for RD, e.g. diaphragmatic hernia (list malformation in appropriate field).
10: other - unspecified other RD.
11: peri surgical - no RD, support given for surgical intervention.
12: newborn encephalopathy - a syndrome of disturbed neurological function in an infant with difficulties initiating or maintaining respiration, depression of tone reflexes or consciousness and often with seizures[12a]

Guide for use: For a diagnosis other than 'normal' the baby must receive respiratory support (O_2 or assisted ventilation for > 4 consecutive hours, or have died at less than 4 hours of respiratory therapy). If more than one diagnosis is possible, use the most serious condition e.g., severe hyaline membrane disease requiring exogenous surfactant therapy and mechanical ventilation plus later apnoea requiring CPAP would be coded as '3'; for diaphragmatic hernia and mild hyaline membrane disease, use '9'.

Exogenous surfactant

Definition: Any treatment with exogenous surfactant
Coding: 0: unknown - information not available
1: none - no exogenous surfactant ever given.
2: Exosurf - any treatment using 'Exosurf'
3: Survanta - any treatment using 'Survanta'
4: both - any combination of surfactant.
Guide for use: Includes incomplete administration

Air leak requiring drainage

Definition: Any form of pulmonary air leak requiring drainage (transient or continuous). Include pneumothorax, pulmonary interstitial emphysema, pneumomediastinum, pneumo-pericardium, pneumoperitoneum, subcutaneous / surgical emphysema[12]
Coding: 99: unknown
0: no air leak requiring drainage present.
-1: yes, air leak requiring drainage

Hours of intermittent positive pressure ventilation (IPPV)

Definition: Total number of hours of IPPV given via an endotracheal tube, at any rate.
Coding: 4- digit number representing IPPV hours.
Guide for use: The hours of all forms of assisted ventilation via an endotracheal tube are summed. The usual rounding up applies, eg 1 hr 30 mins is 2 hrs. For prolonged use of this therapy, ie more than 72 hrs, round up to the nearest day (24 hrs).

Hours of continuous positive airways pressure (CPAP)

Definition: Total number of hours of CPAP via any route, and of nasopharyngeal ventilation.
Coding: 4-digit number representing CPAP hours
Guide for use: as for hours of IPPV.

High frequency ventilation

Definition: Mechanical ventilation presented at high frequencies (small tidal volumes with frequencies > 4Hz) initiated for this baby[7].
Coding: 99: unknown
0: no high frequency ventilation initiated
-1: yes, high frequency ventilation was initiated

Nitric oxide

Definition: Nitric oxide was used in any form or dose for respiratory support of the baby.
Coding: 99: unknown
0: no, nitric oxide therapy never used
-1: yes, nitric oxide therapy used

Extracorporeal membrane oxygenation

Definition: An extracorporeal circuit was established to divert baby's blood to a membrane lung for oxygenation, was initiated for the baby.
Coding: 99: unknown
0: no ECMO initiated
-1: yes, extracorporeal membrane oxygenation (ECMO) initiated

Date of final added oxygen therapy

Definition: Date supplemental oxygen (O_2) ceased appropriately.
Coding: DD / MM / YYYY
Guide for use: Four consecutive hours in any 24 hour period constitutes a 'day'. Any route for O_2 administration is included. If O_2 is ceased and then required again for the same illness, use the final date of O_2. Do not include O_2 days for subsequent illnesses eg RSV or surgery. Date is used to calculate O_2 use.

Chronic lung disease

Definition: The baby received respiratory support (supplemental O_2 or any form of assisted ventilation) for a chronic pulmonary disorder at 36 weeks post menstrual age (PMA).
Coding: 99: unknown
0: no chronic lung disease.
-1: yes, chronic lung disease.
Guide for use: 4 consecutive hrs in any one 24 hr period constitutes respiratory support on that day. To calculate PMA add the gestational age (weeks) to the chronological age (in days). Eg a baby born at 28 weeks and 4 days gestation on January 1st, is 36 weeks PMA on 26th February. This item is only for infants born at < 32 weeks .

Home oxygen therapy

Definition: Supplemental oxygen therapy was used by the baby at home after discharge from hospital.

Coding: 99: unknown

0: no supplemental oxygen used at home

-1: yes, home oxygen therapy

Guide for use: Must have required supplemental oxygen in hospital. The date of final added oxygen therapy must be the date of discharge to home.

Neonatal surgery

Definition: Did this baby have major surgery that involved opening a body cavity?

Coding: 99: unknown

0: no

-1: yes

Proven necrotising enterocolitis

Definition: Diagnosis of necrotising enterocolitis (NEC) is definite.

Coding: 99: unknown

0: no necrotising enterocolitis proven

-1: yes, NEC proven

Guide for use: Baby meets the following criteria:

• Has at least four of the following symptoms:
at least one systemic sign: temperature instability, apnoea, bradycardia or lethargy; and
one intestinal sign: a residual of more than 25% of the previous feed on 2 consecutive occasions, abdominal distension, vomiting or faecal blood;

• Has profile consistent with definite NEC including at least one of the following:
abdominal wall cellulitis and palpable abdominal mass, or pneumatosis intestinalis, or portal vein gas, or a persistent dilated loop on serial x-rays, or a surgical or post mortem diagnosis.

• Plus the baby warranted treatment for NEC, which included nil by mouth and antibiotics[2].

Early infection

Definition: An episode of systemic sepsis with initial symptoms occurring before 48 hours after birth.

Coding: 99: Unknown

0: No early infection noted.

-1: Yes, early infection noted.

Guide for use: These conditions must apply:

- isolation of an organism from at least one blood culture and,
- after consideration of the clinical and laboratory evidence, a decision is made to give antibiotics with therapeutic intent against this organism.

The following must not apply:

- mixed coagulase negative staphylococci or other skin flora - contaminant.

Episodes of late-onset sepsis

Definition: At least one episode of systemic sepsis with initial symptoms from 48 hours after birth.

Coding: 2-digit field representing total episodes of late onset septicaemia.

Guide for use: For each episode of septicaemia the following must apply:

- isolation of organism from 1 blood culture and,
- after considering clinical / laboratory evidence, decision made to give antibiotics with therapeutic intent against this organism.

The following must not apply:

- mixed CNS or other skin flora.- contaminant
- Same blood organism isolated from blood during previous 14 days – repeat isolate.

Maximum grade of intraventricular haemorrhage

Definition: Worst level of intraventricular haemorrhage (IVH) seen on either side by either ultrasound or post mortem examination.

Coding: 0: none - no IVH.

1: grade 1 - subependymal germinal matrix IVH.

2: grade 2 - IVH with no ventricular distension.

3: grade 3 - IVH plus the ventricle is distended with blood.

4: grade 4 - intraparenchymal haemorrhage[13].

5: not examined - no ultrasound or post mortem

Date of late head ultrasound

Definition: Date of the cerebral ultrasound scan nearest to six weeks of age.

Coding: DD / MM / YYYY

Ventricle size

Definition: Size of ventricle at the ultrasound closest to 6 weeks of age (date above). Ventricular index (VI) is measured as the furthest lateral extent of each ventricle from the midline measured at the level of Foramen of Monro[12] .

Coding: 0: unknown - not available, includes not scanned.

1: no dilatation - Ventricular index < 97th centile.

2: dilatation - 97thcentile < ventricular index > 97thcentile + 4mm

3: hydrocephalus - VI > 97th centile + 4mm or hydrocephalus present requiring a shunt or any form of drainage (permanent or transient).

Guide for use: If 2 or 3, record VI in next field

Ventricular Index (VI)

Definition: Size of ventricle at the ultrasound closest to 6 weeks of age (date above)[12].

Coding: 4-digit number representing VI in mm correct to 1 decimal place.

Guide for use: Record if ventricular dilatation is present ie, 'dilatation' or 'hydrocephalus'.

Cerebral cystic formations

Definition: Changes in brain parenchyma seen at the scan closest to six weeks of age

Coding: 0: unknown - not available, not scanned
1: no cysts - none seen on ultrasound
2: porencephalic cyst(s) - parenchymal lesions corresponding to grade IV IVH.
3: periventricular leukomalacia - ischaemic brain injury affecting periventricular white matter in the boundary zones supplied by terminal branches of both centripetal and centrifugal arteries[8].
4: encephaloclastic porencephaly - relatively late development on cerebral scan of extensive dense, cystic lesions involving the periphery of the brain[4].

Baby meets local criteria for ROP exam

Definition: The baby meets the criteria for eye examination for ROP at registration hospital.

Coding: 99: unknown
0: no
-1: yes, did meet local criteria.

Retinopathy of prematurity (ROP)

Definition: Worst stage of ROP in either eye prior to going home.

Coding:
0: none seen - no changes seen
1: stage I - demarcation line.
2: stage II - ridge.
3: stage III - ridge with extraretinal fibro-vascular proliferation.
4: stage IV - retinal detachment[9].
5: not examined - no eye examination

ROP threshold disease present

Definition: Eye examination for ROP revealed threshold disease, defined as: [16].

• for Zone II: presence of posterior pole dilation/ tortuosity in at least 2 posterior pole quadrants (plus disease), and stage III ROP for at least 5 contiguous clock hours or 8 composite clock hrs.
• for Zone I: ROP (any stage) with plus disease, or stage III ROP, with or without plus disease.
• Stage IV or Stage V ROP, or massive vitreal haemorrhage obscuring the view of the fundus is beyond threshold, but consider as threshold present

Coding: 99: unknown
0: no, threshold disease not detected.
-1: yes, threshold disease detected.

Therapy for retinopathy of prematurity

Definition: Any therapy used to treat retinopathy of prematurity (ROP) i.e. laser or cryotherapy.

Coding: 99: unknown
0: no therapy for ROP received
-1: yes, therapy given for ROP.

Died

Definition: The death of this baby occurred prior to discharge from hospital

Coding: 99: unknown
0: no, survived to discharge to home.
-1: yes, died

Date of death

Definition: Date of death of baby (at any time).

Coding: DD / MM / YYYY

Guide for use: If baby is known to have died after discharge, record date here and 'no' to died.

Post Mortem

Definition: Post mortem examination performed.

Coding: 99: unknown
0: no post mortem performed
-1: yes, a post mortem was performed

Immediate cause of death

Definition: The cause of death .

Coding: unspecified free text field

Guide for use: To be described in morbid anatomical terms.

Death due to congenital malformation

Definition: The death of the infant may be directly attributed to the congenital malformation.

Coding: 99: unknown
0: no
-1: yes, death is attributable to a congenital malf.

Guide for use: Must be coded as "yes" for major congenital malformation and "yes" for died.

Transferred to another hospital

Definition: The baby was transferred to another hospital nursery before going home

Coding: 99: unknown
0: no, never transferred
-1: yes, transferred

Date of transfer

Definition: Date on which a baby completes an episode of care after birth in the hospital of registration. Formal separation is administrative process where a hospital records the completion of treatment/ care/ accommodation of a patient.

Coding: DD / MM / YYYY

Guide for use: Use the most significant date.

Discharge date

Definition: Date on which a patient completes an episode of care.

Coding: DD / MM / YYYY

Comment: All data collection ceases on this date.

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1.3 Minor congenital malformations

Skin

skin cysts; naevus flammeu; non calvernous, single, small haemangioma; birth mark; benign skin neoplasms; mongolian spots; cutis marmorata; cafe au lait spots; scalp defects, cutis aplasia; lanugo excessive or persistent; accessory nipple; pilonidal or sacral dimple.

Skull

brachycephaly, dolichocephaly, plagiocephaly; craniotabes; large, small or absent fontanelles; macrocephaly; head asymmetry

Eyes

Esotropia, exotrophia strabismus; nystagmus; blue sclera; brushfield spots; epicanthal folds; eye slant (up or downward); narrow palpebral fissures; nasolacrimal duct obstruction or dacryostenosis

Face

Facial palsy; facial asymmetry micrognathia; flat or wide nasal bridge, upturned nose, or other minor nose malf; deviation of the nasal septum.

Ears
ear tags; bat, cauliflower, elfin, lop, pointed, posteriorly rotated, or low-set ears; Darwin's tubercle; pre-auricular sinus, cyst or pit; macrotia

Mouth, tongue and palate
tongue-tie; tongue cyst; ranula; cleft gum; macroglossia; microglossia; natal teeth; big, wide or small lips; high-arched palate; bifid uvula

Neck
Branchial cleft or sinus; redundant neck skin folds webbing of neck; short neck

Gastrointestinal system
Merkel's diverticulum; anal tags; anal or rectal fissure; hepatomegaly; splenomegaly; inguinal hernia-boys; inguinal hernia-girls (GA < 37 weeks or BW < 2500g); umbilical hernia (skin covered)

Cardiovascular system
Patent ductus arteriosis or foramen ovale (GA <37 weeks/BW < 2500g); mild, trivial or physiological valvular regurgitation; cardiomegaly; dextro-position of heart; heart block; persistent fetal circulation; single umbilical artery.

Genitourinary system
imperforate hymen; prominent clitoris; fusion of vulva; vaginal or hymenal tags; cyst of vagina, vulva, canal of Nuck or ovary; hydrocele; undescended testis (GA < 37 wks, BW <2500g); small penis; chordee; patent urachus or urachal cyst; ectopic kidney.

Respiratory system
hypoplastic lungs (GA <37 weeks); laryngeal stridor; laryngomalacia

Limbs
skin tags on hands or feet; partial syndactyly of toes, webbing of toes; brachydactyly, unspecified clinodactyly; camptodactyly; flexion deformity of digits; long fingers and toes; nail hypoplasia; enlarged or hypertrophic nails; widely spaced first and second toes; overlapping toes; tibial torsion or bowing; genu valgum, varum or recurvatum; dislocation or subluxation of knee; hallux valgus; hallux varus; talipes equinovarus or talipes calcaneovalgus; cervical rib, other extra ribs; rockerbottom feet; simian or Sydney lines, abnormal palmar creases; hip subluxation, clicky hips

Other conditions
balanced autosomal translocations; birth injuries cephalohaematoma; cystic fibrosis; enzyme deficiencies; hydrops fetalis; meconium ileus; metabolic disorders; pyloric stenosis; sterno-mastoid tumor; toricollis; volvulus

1.4 Abbreviations

The definitions section has abbreviations that may appear in the report that are not outlined below.

ANZNN	Australian and New Zealand Neonatal Network
BW	birthweight of the baby (in grams)
CPAP	continuous positive airways pressure - a form of assisted ventilation
FiO_2	fractional inspired oxygen - measures the amount of supplemental oxygen
GA	gestational age (in completed weeks)
HMD	hyaline membrane disease - a disorder of the respiratory system
ICD 10-AM	International Classification of Diseases no 10-Australian Modification - codes congenital malformations, diseases and procedures.
IPPV	intermittent positive pressure ventilation - a mechanical support for breathing.
IVH	intraventricular haemorrhage - a disorder of the immature brain with bleeding into the ventricles in the head.
Level II	a nursery for babies who require intermediate care, see section 3.2
Level III	a nursery for babies who require intensive care, see section 3.2
n	number
NEC	necrotising enterocolitis - a disorder of the gut.
NHMRC	National Health and Medical Research Council of Australia - peak health body
NICU	neonatal or newborn intensive care unit
O_2	oxygen - normal air is 21% oxygen.
PMA	post menstrual age (completed weeks). Gestational age plus postnatal age - eg when a baby born at 25 weeks GA is 15 weeks old, they are 40 weeks PMA (also known as term equivalent age).
ROP	retinopathy of prematurity - disorder of the developing eye
sepsis	overwheming infection of the blood stream by toxin-producing bacteria - also known as septicaemia.
NZ	New Zealand - capital city - Wellington

States and Territories of Australia - capital city

ACT	Australian Capital Territory - Canberra
NSW	New South Wales - Sydney
NT	Northern Territory - Darwin
Qld	Queensland - Brisbane
SA	South Australia - Adelaide
Tas	Tasmania - Hobart
Vic	Victoria - Melbourne
WA	Western Australia - Perth

Appendix 2: Publications by the staff of ANZNN units, 2002

3.1 Journal articles

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http: //www.nicsl.com.au/cochrane/index.asp

The Cochrane Library is updated regularly as well as gaining new reviews each year. The reviews below are listed only if they were first published, or had a 'substantive update' during 2002. To cite these publications use: In: *The Cochrane Library*, Issue 2, 2004. Chichester, UK: John Wiley & Sons, Ltd. For example:

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Appendix 4: ANZNN documentation

4.1 Aim

Australian and New Zealand Neonatal Network (ANZNN) aims 'to improve the care of high-risk newborn infants and their families in Australia and New Zealand through collaborative audit and research'.
As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2nd April 1995.

4.2 Objectives

The objectives of the ANZNN are:

1. To provide a core data set that will:
   - i Identify trends and variations in morbidity or mortality warranting further study.
   - ii Enhance the ability to carry out multicentre studies and randomised controlled trials.
   - iii Provide information on neonatal outcomes adjusted for case mix and disease severity to participating neonatal units to assist with quality improvement.
2. Monitor the use of new technologies eg surfactant usage by patient type and outcome.
3. Develop and evaluate a clinical risk score for babies in Australian and New Zealand neonatal units (mortality and morbidity).
4. Develop and assess clinical indicators for perinatal care through neonatal outcomes.

As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2nd April 1995.

4.3 Confidentiality guidelines

Confidentiality guidelines were devised and agreed to by the Advisory Committee to provide an unambiguous framework for the handing of data that met the strict criteria of governing bodies. These guidelines are set out in full below. Confidentiality guidelines for the collection, processing, and analysis of data from the national minimum data set of the ANZNN.
As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2nd April 1995.

The purpose of these guidelines is to set out the principles under which the National Minimum Data set (NMD) for Neonatal Intensive Care Units (NICUs) is formulated and the conditions that apply to the use of these data and release to parties internal and external to the ANZNN.

The essential purpose of the NMD is to provide national unit record data on babies meeting specified criteria who have been admitted to NICUs, or affiliated nurseries, in Australia and New Zealand. In general, this will be achieved through distribution of an annual report containing summary tables without identifying characteristics, either of a personal, institutional or State / Territory / national nature. In certain other instances, data may be provided internally in the following manner:

1. as de-identified summary tables not provided in the annual report, but available upon request;
2. as de-identified unit record data for analytical purposes as approved by the ANZNN; and
3. as identifiable summary and / or unit record data for clinical audit purposes by the respective NICU providing the data.

These guidelines will cover the collection and provision of data retrospectively from 1st Jan 1994.

A Principles of ownership and maintenance of data

1. The ANZNN will be responsible for collection and maintenance of the data set and decision-making with respect to its use.
2. The Custodians of the data will be the ANZNN Executive. All queries related to the NMD should be referred to a Custodian, who will address them personally or refer them to the appropriate source person.

B Conditions for data collection

It is expected that all participating NICUs will collect an agreed-upon minimum set of data in a standardised format. Data entry on to hard-copy data forms or into an electronic data form will be performed at the respective NICU.

C Conditions for use and release of data

1. Use of the data would entail agreement by the Advisory Committee (Directors, or their nominee, of each contributing NICU) and the Executive.
2. Data will not be published or supplied with any patient identifying information.
3. Data will not be published or supplied with any NICU or State/Territory/nation identifying information without the written approval of all the NICU Directors of the State/Territory or nation concerned.
4. External requests for a hard copy of patient de-identified data will be made in writing to the data custodians. Any requests for data that could potentially identify a unit or State/Territory/nation will be referred to the Advisory Committee. External requests for patient de-identified data on computer disk will be made in writing to the data custodians, and then referred to the Advisory Committee. Requests in writing must be in the form of a one page research proposal. A confidentiality agreement must be signed by the person(s) requesting data prior to the release of the data.

4a. Requests for data involving unit identifying data analysis - if a Director had not responded within six (6) weeks (having received a reminder at three (3) weeks), then it was to be assumed that the Director did not object to the project and consent is given.

4b. Requests for individual patient data that did not identify unit or region – the Coordinators (or the new expanded Coordinator panel) could approve the request in principle and notify the members of the Advisory Committee in writing, seeking replies only if there are objections. If no objections are received within 4 weeks then the data is released. When there are any objections then written approval of all members should be obtained as in 4a.

4c. Data requests tabled at the annual meeting do not have to go to attendees for approval only to those who did not attend. Responses as in 4b.

5. Publication of data in any form must be endorsed in writing by seventy-five percent (75%) of the Advisory Committee prior to the material being submitted for publication. The mechanism for this will be by prior notification and then endorsement at an Advisory Committee meeting, or by faxing each committee member.

   All published data must acknowledge the ANZNN Advisory Committee and Executive.

6. Data will be released annually in a report provided free to each participating Director. This report will summarise the pooled, de-identified data. This report will be distributed widely after the majority of the Advisory Committee agree on content and form. Data will also be released to each Director in electronic form with their own unit data identified, and the rest of the data completely de-identified.

D Conditions for data security

Patient-identifiable data should not leave the site of the ANZNN. The electronic version of this data will be maintained on a single central computer protected by password. All hard copy patient identifiable data and electronic backup files will be kept in locked cabinets. Master lists of code material will be kept in a separate locked area.

All rooms and offices used by ANZNN are locked when not in use. Filing cabinets containing data are locked when not in use. Computerised data are protected by passwords known only to each person who has access to computerised data. Security disposal of data is available through use of designated bags or a shredding machine.


Women's Hospital • Royal Darwin Hospital • Nelson Hospital
Women's Hospital, Brisbane • Royal Women • Rotorua Hospital
Taranaki Base Hospitales • Royal North Shore Hospital • Royal Hobart
Townsville Hospital • Tauranga Hospital • Women's Hospital • Royal
Wanganui Hospital • Timaru Hospital • Sydney Children's Hospital, Melbourne • RPA
Whakatane Hospital • Wellington Women • Waikato Hospital • The Canberra Hospital
Hospital • Children's Hospital • Whangarei Area Hospital • Wairau Hospital • Th
Hawkes Bay Hospital • Dunedin Hospital at Westmead Hospital • Westmead Hospital
Princess Margaret Hospitals • John Hunter Hospital • Women's and Children
Health Service • Lower Hutt Hospital • Launceston General Hospital • Gisborne
Hospital • Mercy Hospital for Women • Mater Misericordiae • King Edward Memorial
Medical Centre • National Women's Hospital • Middlemore Hospital • Liverpool
Hospital • North Shore Hospital • Palmerston North Hospital • Nepean
Royal Hobart Hospital • Royal Children's Hospital, Melbourne • Royal Hospital • Monas
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Princess Margaret Hospitals • John Hunter Hospital • Women's and Children
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