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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.

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Finally, we would like to thank Deborah Donoghue who was the coordinator / researcher since the network's inception and left ANZNN in 2004, for her efforts and hard work to develop the network to a well recognized organization. We wish her a successful future.

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: 3146; nursery beds: 29

Chris Wake (Director), Lynne Cruden

Liverpool Health Service:

Births: 3142; nursery beds: 23

Robert Guaran (Director), Ian Callendar, Catherine Medlin, Jacqui Stack, Sara Wilson.

Nepean Hospital:

Births: 3293; nursery beds: 27

Mark Tracey (Director), Mee Fong Chin.

NSW newborn & paediatric Emergency Transport Service:

Andrew Berry (Director).

Royal Hospital for Women:

Births: 3728; nursery beds: 34

Kei Lui (Director), Diane Cameron

Royal North Shore Hospital:

Births: 1681; nursery beds: 26

Tushar Bhuta (Director), Jennifer Bowen, Vicky Gallimore, Martin Kluckow.

RPA Women and Babies:

Births: 4113; nursery beds: 32

Nick Evans (Director), Philip Beeby Shelley Reid.

Sydney Children's Hospital:

Births: 0; nursery beds: 20

Barry Duffy (Director) Janelle Young

Westmead Hospital:

Births: 3960; nursery beds: 39

Marilyn Rochefort (Director), William Tarnow-Mordi (Director and Professor of Neonatal Medicine), Jane Baird, John Vandyk.

Australian Capital Territory

The Canberra Hospital:

Births: 2011; nursery beds: 24

Graham Reynolds (Director), John Edwards

Victoria

Mercy Hospital for Women:

Births: 5144; nursery beds: 54

Andrew Watkins (Director), Catherine Fleming, Simon Fraser

Monash Medical Centre:

Births: 3555; nursery beds: 48

Andrew Ramsden (Director),Kaye Bawden, Rose Li, Victor Yu (Professor of Neonatology)

Newborn Emergency Transport Service (Victoria):

Michael Stewart (Director).

Royal Children's Hospital:

Births: 0 nursery beds: 22

Peter McDougall (Director), Jo Brooks, Peter Loughnan, and Liz Perkins.

Royal Women's Hospital:

Births:4932; nursery beds: 50

Colin Morley (Professor of Neonatal Medicine and Director), Caroline Collis, Lex Doyle (Professor of Neonatology), Mei Mok, Geraldine Norman, Sheryle Rogerson, Neil Roy, Wendy Simmons.

Queensland

Mater Misericordiae Mother's Hospital:

Births: 7399; nursery beds: 60

David Tudehope (Director and Professor of Paediatrics and Child Health), Vicki Flenady, Peter Gray, Lyndon Kaye

Royal Women's Hospital:

Births: 4265; nursery beds: 66

David Cartwright (Director), Paul Colditz (Professor of Perinatal Medicine), Lyn Chapple, Kate Bobbermein, Tim Donovan, Lesley Eliason, Sue Jenkins-Manning, Kellie McGrory

The Townsville Hospital:

Births: 1656; nursery beds: 28

John Whitehall (Director)

Caroline Allen, Jenny Binney, Donna Gandini, Guan Koh, Jacinta Lee

South Australia

Flinders Medical Centre:

Births: 2153; nursery beds: 35

Peter Marshall (Director). and Cordula Blank

Women's and Children's Hospital:

Births: 3894 nursery beds: 49

Ross Haslam (Director), Elizabeth Gent, and Andy McPhee.

Western Australia

King Edward Memorial and Princess Margaret Hospitals:

Births: 4446; nursery beds: 104

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: 1633; nursery beds:

Graham Bury (Director), Karen Butterley, Peter Dargaville (Director), Heather Giannaros and Simon Parsons (Director).

Northern Territory

Royal Darwin Hospital:

Births:1487 nursery beds: 18

Charles Kilburn (Director), Alan Ruben, Gurmeet Singh (Director) and Margaret Stewart

New Zealand

Christchurch Women's Hospital:

Births: 4487; nursery beds: 37

Nicola Austin (Director), Brian Darlow (Professor of Paediatrics) and Nina Mogridge.

Dunedin Hospital:

Births:1683 nursery beds: 16

Roland Broadbent (Director).

Middlemore Hospital:

Births: 6704; nursery beds: 20

Lindsay Mildenhall (Director) and Maisie Wong

National Women's Hospital:

Births: 7729; nursery beds: 59

Carl Kuschel (Director), Jane Harding (Professor of Neonatology), David Knight, Coila Bevan,

Waikato Hospital:

Births: 2865; nursery beds: 29

David Bourchier (Director), Phil Weston, Deborah Harris

Wellington Women's Hospital*:*

Births: 3588; nursery beds: 35

Vaughan Richardson (Director), Dawn Elder, Keith Fisher, Michael Hewson, Joel Sadowsky.

Level II nurseries:

Tasmania

Launceston General Hospital:

Births: 1482; nursery beds: 12

Chris Bailey (Director), Jennifer James and Robyn Morey.

New Zealand

Gisborne Hospital:

Births: 681; nursery beds: 6

Graeme Lear (Director).

Hawkes Bay Hospital:

Births: 2103; nursery beds: 12

Lorna Asquith, Marion Bates and Jenny Corban (Director).

Lower Hutt Hospital:

Births:1779: nursery beds: 8

Deryn Hogan, Robyn Shaw (Director) and Adele Sullivan.

Nelson Hospital:

nursery beds: 10

Peter McIlroy (Director).

North Shore Hospital:

Nursery beds

Bobby Tsang (Director)

Palmerston North Hospital:

Births: 1916; nursery beds: 17

Jeff Brown (Director) and Eta Raicebe.

Rotorua Hospital:

Births: 1421; nursery beds: 10

Stephen Bradley (Director), Phillipa Clark, Gaye France and Judi Tapp.

Southland Hospital:

Births:1103; nursery beds: 6
Paul Tomlinson (Director).

Taranaki Base Hospital:

nursery beds: 8
John Doran (Director).Geoff Aiken, Jane Bocock

Tauranga Hospital:

nursery beds: 10
Hugh Lees (Director), Heather McAlley, Sue Rodda.

Timaru Hospital:

Births: 581; nursery beds: 3
Philip Morrison (Director) , Sheliah O'Sullivan.

Wairau Hospital:

nursery beds: 4
Ken Dawson (Director), Graham Cross

Wanganui Hospital:

nursery beds: 4
John Goldsmith (Director).

Whakatane Hospital:

nursery beds: 5
Chris Moyes (Director), Marlon Radcliffe, Dharm Ramadas.

Whangarei Area Hospital:

Births: 1415; nursery beds: 8
Lynne Clarke, Toni Fergus, Mark Goodman

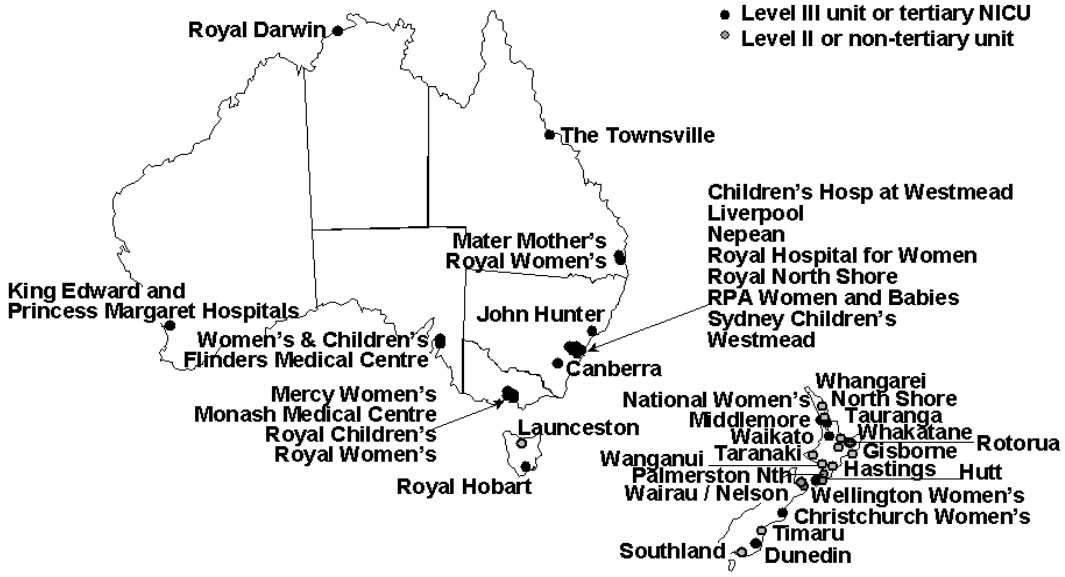


Figure 1: A map of Australia and New Zealand with Participating Hospital NICUs

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 Hobart, Tasmania in 2003, Sydney NSW in March 2004 and in Adelaide, South Australia in 2005.

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.

Staff members of the network include Samanthi Abeywardana who is the project officer and Sue Wood who joined the network recently as the data manager.

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 while 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 2003 audit are listed in Appendix 1.

During the annual general meeting 2005, members agreed to review existing variables and add few other variables to the data collection that will be very useful for further research. Accordingly, during a data review meeting held in June 2005, members agreed to add a few extra items to the data set from 2006. Some of the items include time of birth, time of rupture of membranes, parity, date and time of surfactant given, date and time of intubation, type of infection and name of the surgical procedure that the baby underwent. Members decided to discontinue collecting "Retinopathy of Prematurity Threshold disease" due to the recent changes in criteria for ROP treatment. Total number of infections also will not be collected; instead we are expecting to collect more details on infection such as name of the organism causing infection. Details of these definitions will be provided to all units as soon as they are completed.

2.3 Data collection and verification

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 (Appendix3.3) are followed. Identifying information is removed and replaced by codes at the individual units.

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

Among the babies admitted to all level III neonatal intensive care units (NICUs) throughout Australia and New Zealand there were 7178 babies who met the criteria for the Australian and New Zealand Neonatal Network's (ANZNN) high-risk audit in 2003. This represents 2.34% of the 307334 total live births in Australia and New Zealand in 2003 (Australian Bureau of Statistics, 2003; Statistics New Zealand, 2003). This rate is gradually increasing since ANZNN began reporting in 1995 (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.

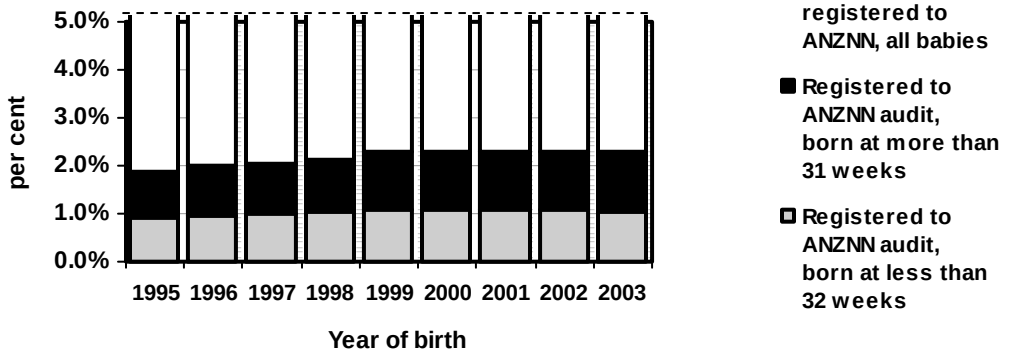
Of the babies registered to ANZNN cohort 3250 were born before 32 completed weeks of gestational age. The number of babies in ANZNN cohort who required assisted ventilation (Intermittent positive pressure ventilation and/or continuous positive airways pressure) was 6404 and 3594 of them were born at more than 31 weeks gestational age. There were 197 babies who were born after 31 weeks gestational age and had birth weight less than 1500g who did not require IPPV or CPAP. Of the babies who had major surgery, 613 were born after 31 weeks gestation (Figure 3).

In ANZNN cohort, gestation is documented as the completed weeks of gestation. 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 birth weight 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.

3.1.1Babies born in Australia

There were 5452 babies admitted to 22 level III neonatal intensive care units in Australia who met ANZNN registration criteria representing 2.1% of live births in Australia. (There were 255,099 live births in 2003, Australia's mothers and babies 2003, NPSU). Of those babies,4320 were born before 37 weeks gestation. This represents 21.3% (n:20,243) of the preterm babies born in Australia (Australia's mothers and babies 2003, NPSU). There were 2600 babies born at less than 32 weeks gestation (1% of live births) and 2193 babies weighed less than 1500 grams at birth (0.84%). The number of babies who required assisted ventilation was

Figure 2: Babies registered to the ANZNN audit in level III nursuries as a proportion of all live born babies by year of birth



4805 (1.9% of live births) and 1676 (35%) of them had CPAP as their only form of ventilation. The number of babies who had major surgery was 724. Maternal ethnicity was provided for 91% babies in 2003. Of those with a reported ethnicity, 78.1% of babies were from Caucasian mothers and 5.1% mothers identified themselves as Aboriginal or Torres Strait Islanders a rate higher than that seen in the Australian population (3.6%, Australia's Mothers and Babies2003, NPSU). There were 5.8% babies born to Asian mothers.

3.1.2 Babies born in New Zealand

In 2003, there were 56134 live births registered in New Zealand (Statistics New Zealand, 2004). Among the babies admitted to all level III NICUs in New Zealand, 1725 met ANZNN registration criteria representing 3.07% of live births. Of those babies, 648 were born at less than 32 weeks gestation (1.15% of the live births) and 546 weighed less than 1500 grams at birth (0.97% of live births). Most of these babies received assisted ventilation (n:1599, 2.84% of live births) with 65.4% of them (n:1045,) receiving CPAP only. The number of babies who had major surgery was 139.

Ethnicity of the mother was reported for 98.1% of babies registered in New Zealand. The proportion of Caucasian mothers in the cohort was 59.2% and 19% of mothers were Maori. Another 9.6% of mothers identified themselves as Pacific Islanders. Statistics New Zealand, 2004 reported similar proportions in each ethnic group among live births in 2003.

There are 14 level II special care nurseries in New Zealand who are members of the ANZNN and they had 348 babies who met ANZNN criteria for the audit in 2003.

3.1.3 Number of registrants per unit

The number of babies registered to ANZNN for audit ranged from 45 to 615 babies per unit in 2003 (Figure 4) reflecting the overall size of the unit, the case mix of their patients and the geography and population distributions in both countries. All but two perinatal units cared for more than 50 babies born at less than 32 weeks gestation and seven units had 50 to 100 very preterm babies during the year. The remaining 16 units admitted more than 100 very preterm babies in 2003. The children's hospitals were the primary registration hospital for the care of less than 25 very preterm babies.

3.1.4 Levels of neonatal care

Both Australia and New Zealand have systems of regionalised care. This involves centering 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 birth weight, and others who may require 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 of 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 2003.

Fig 3. Number of babies in ANZNN cohort by registration criteria and year of birth 1995 - 2003

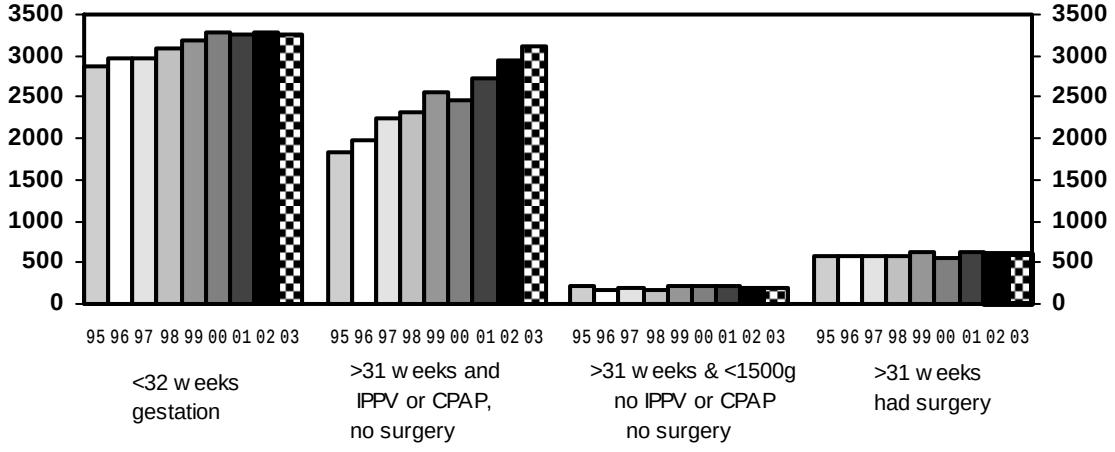


Figure 4: Number of babies in the ANZNN cohort by registration nursery, 2003

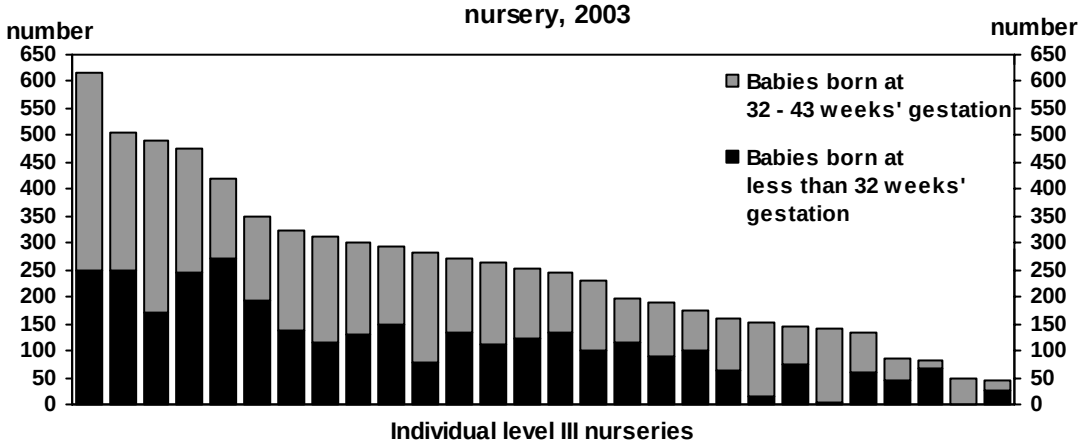
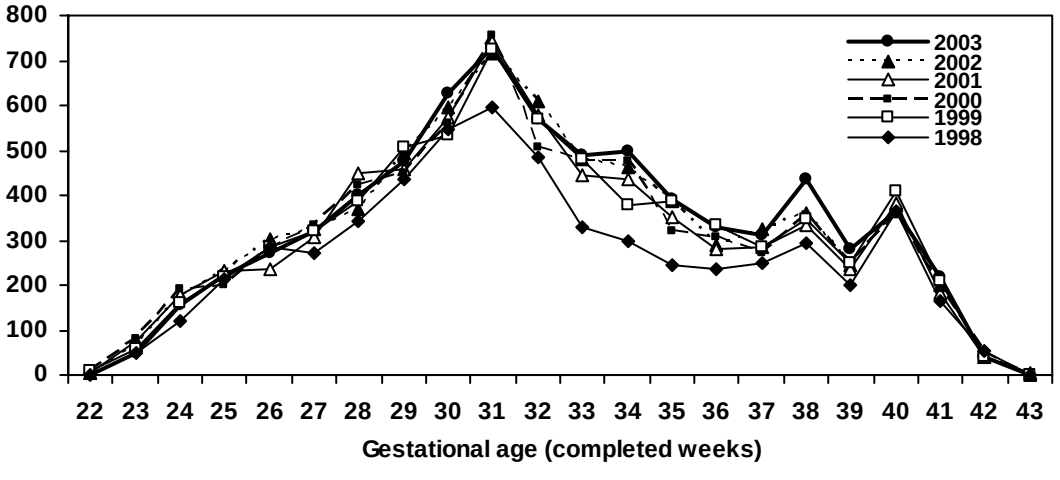


Figure 5: Number of babies in the ANZNN cohort by week of gestation and year of birth 1998 - 2003



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.

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.

In the ANZNN cohort 53% of the babies born to teenage mothers were born before 32 weeks of gestation. Mothers of other age groups had a lower rate of very preterm babies(less than 45%). The proportion of babies in ANZNN cohort who were born to teenage mothers in 2003 was 6.9% and this is a decrease from 7.2% in 2002. In Australia 4.35% of the confinements were teenage pregnancies.(Australian Bureau of statistics, 2003) This reflects that a higher proportion of babies born to teenage mothers need level III NICU care.

Of the mothers who had their babies registered to ANZNN, 817 reported that they had previous preterm deliveries (11.4% of the cohort) and 316 (4.4%) reported that they had previous perinatal loss while 199 (2.8%) had both preterm deliveries and perinatal deaths.

3.3 Antenatal events

3.3.1 Antenatal corticosteroids

Administering corticosteroids to pregnant women at risk of preterm birth to enhance the maturation of her baby's lungs is an established intervention. 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).

In our cohort, corticosteroids were given to the mothers of 2735 (86.2%) babies born before 32 weeks gestation. (Tables 3 and 4, Figure 6). The proportion of mothers given antenatal steroids gradually increased over the years for babies born at 24-31weeks gestation (77.3 in 1995 to 84.3 in 2003). Only 60.8% mothers who had given birth at 20–23 weeks gestation were given antenatal steroids in 2003. This proportion is fluctuating since 1995 and shows a lower figure in 2003. (Data were available for 99.2% of babies in 2003). The proportion of mothers given a steroid course more than a week prior to birth is also increasing over the years (Figure 7).

The median rate of giving antenatal corticosteroids to the mothers of inborn babies born at less than 32 weeks gestation, among individual NICUs was 91.2% (inter quartile range: 86.8%, 93.1%) and these figures are similar to 2002.

3.3.2 Antenatal conditions

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

The commonest presenting problem for mothers giving birth before 32 weeks in the ANZNN cohort was preterm labour (n: 1345, 41.4%) Another 21.2% (n: 689) of mothers had prelabour, preterm rupture of the membranes (PPROM) and 14.3% (n: 466) had hypertension in pregnancy (Figure 8).

The main presenting problem for mothers giving birth to babies at 32-36 weeks gestation remained preterm labour (n: 725, 31.8%). Hypertension in pregnancy (n: 362, 15.9%) and PPROM (n: 363, 15.9%) accounted for other major problems.

Of the term babies 44.5% (n: 734) did not have an antenatal problem that could be identified. However, in this group of high-risk babies, 275 (16.7%) were noted to have 'fetal distress' and 173 (10.5%) had a fetal malformation detected antenatally.

3.4 The baby

3.4.1 Multiple births

Babies from multiple pregnancies have an increased risk of being preterm and of having other morbidities independent of their

Figure 6: Antenatal corticosteroid use (any) by gestational age group

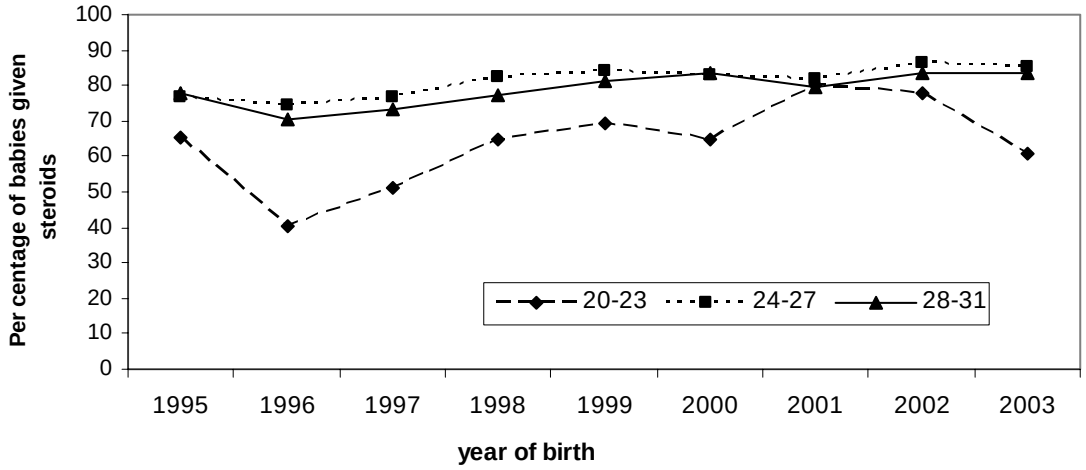


Figure 7: Use of antenatal corticosteroids and completeness of the course given

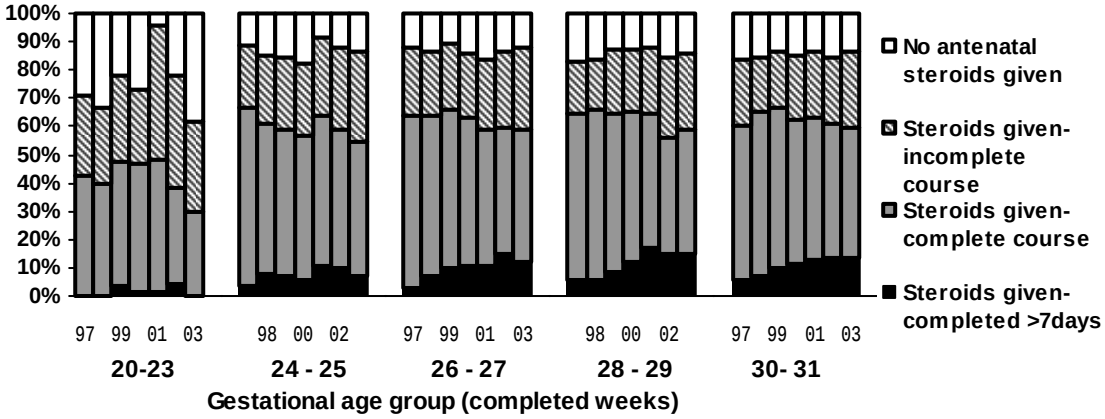
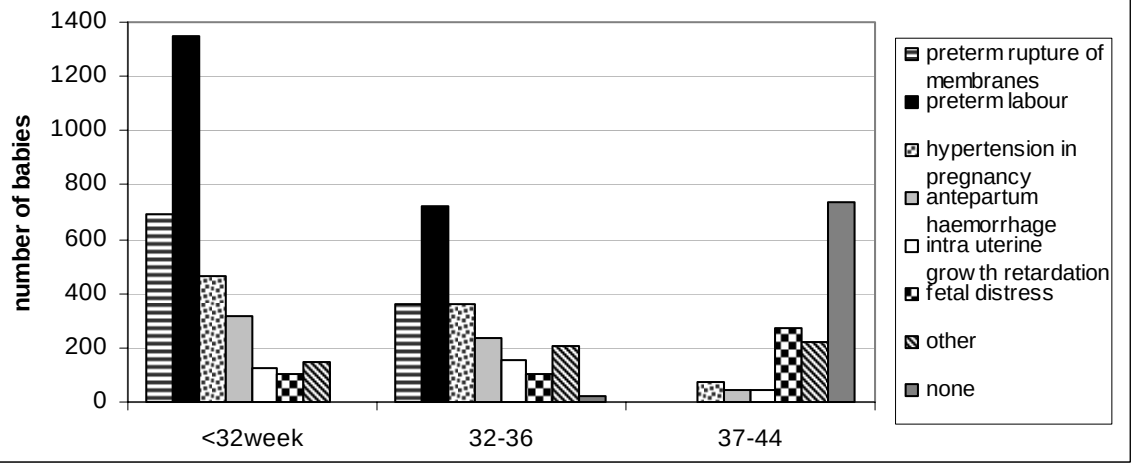


Figure 8: Presenting antenatal problem by gestational age group 2003



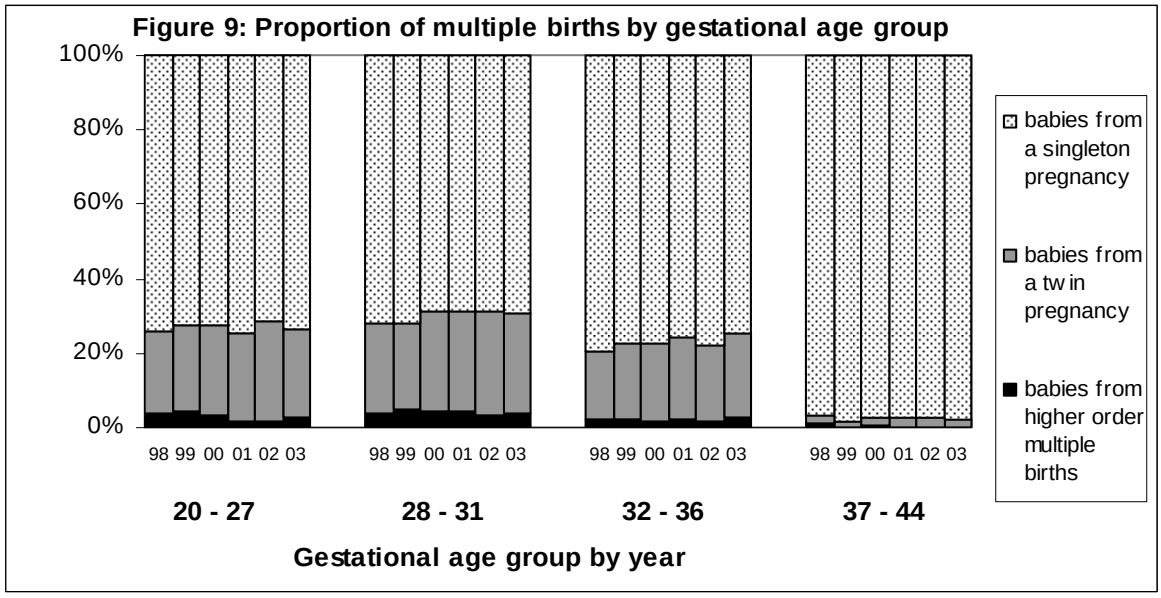


Figure 9: Proportion of multiple births by gestational age group
100%
80%
60%
40%
20%
0%
98 99 00 01 02 03
98 99 00 01 02 03
98 99 00 01 02 03
98 99 00 01 02 03
20 - 27
28 - 31
32 - 36
37 - 44
Gestational age group by year
babies from a singleton pregnancy
babies from a twin pregnancy
babies from higher order multiple births

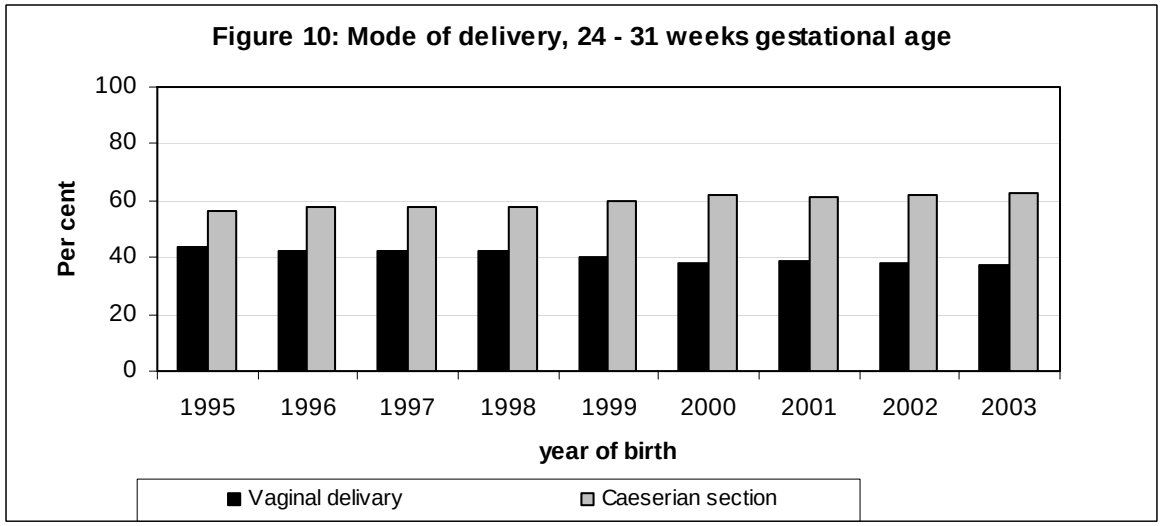


Figure 10: Mode of delivery, 24 - 31 weeks gestational age
Per cent
100
80
60
40
20
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
year of birth
Vaginal delivary
Caeserian section

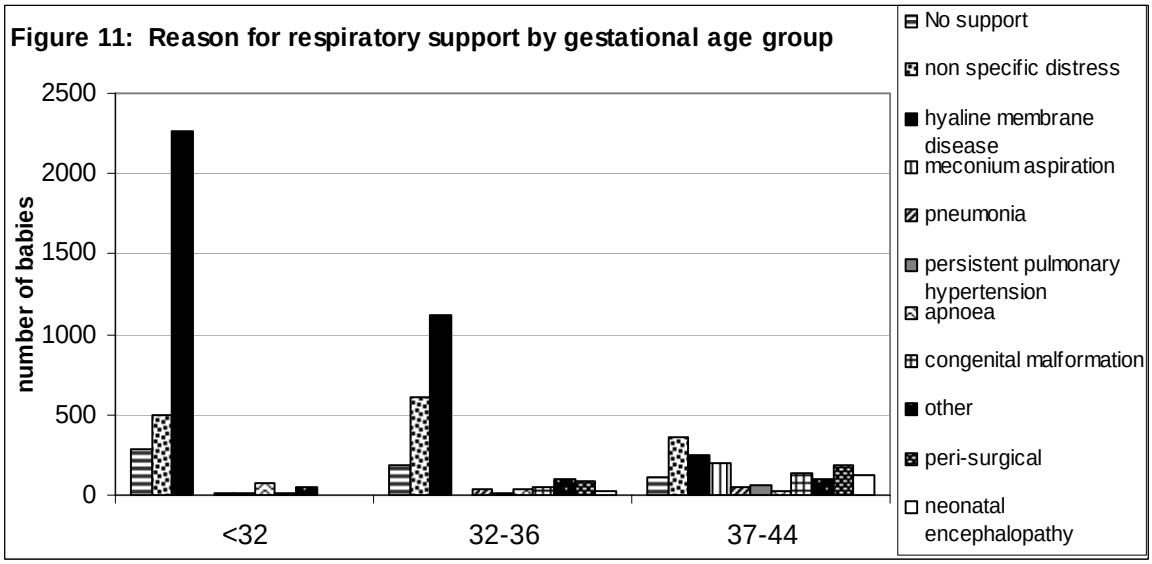


Figure 11: Reason for respiratory support by gestational age group
number of babies
2500
2000
1500
1000
500
0
<32
32-36
37-44
No support
non specific distress
hyaline membrane disease
meconium aspiration
pneumonia
persistent pulmonary hypertension
apnoea
congenital malformation
other
peri-surgical
neonatal encephalopathy

prematurity (NHMRC, 1997). There were 1572 (21.9%) babies in our cohort from multiple pregnancies and 170 (2.4%) of them were from triplet pregnancies. Only 9 babies were from quadruplet pregnancies (Tables 5 and 6, Figure 9). Of those multiple births, 97.6% were born preterm. Of the triplets, 65.3% (n:111)) and all of the quadruplets were born before 32 weeks gestation.
In the ANZNN cohort, among the babies born at less than 32 weeks gestation, 29.4% (n: 957,) were from a multiple birth. A quarter (n: 578, 25.4%) of the babies born at 32 to 36 weeks gestation were from multiple births; a higher rate compared to 22.2% in 2002.

The proportion of multiple births among term babies in ANZNN cohort was 2.2% and it was 1.7% in the general population of Australia (Australian Bureau of Statistics, 2003) and 3.3% in New Zealand (Stats NZ, 2004).

3.4.2 Gender

In the ANZNN cohort, there were 4057 males (56.5%) and 3117 females (43.4%). There was a slight increase in the number of female babies in 2003 compared with 2002. Of the babies born at less than 32 weeks gestation, 53.3% (n:1734) were male and 46.6% (n:1516) were females. Among the term babies, there were 61.9% (n:1021) males and 38% (n:627) females. Gender was not able to be determined for three babies. In Australia, there are more male babies born than female babies with boys accounting for 51.4% of live births in 2003 (Australian Bureau of Statistics, 2004).

3.5 The birth

3.5.1 Place of birth

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. When the requirement of a NICU can be anticipated, either the mother can 'book' at a hospital with tertiary care or the mother may be transferred before the birth (in-utero).

In the ANZNN cohort, most babies born at less than 33 weeks gestation were born in a hospital with a NICU (n: 3319; 86.9%) and 47.5% (n:1816) of those mothers had booked into a perinatal hospital with a NICU. In Australia, 97.2% births occurred in hospitals and 2.8% births occurred in birth centres or at home. (Australia's mothers and babies 2003,NPSU).

3.5.2 Method of birth

The method of the birth varies with gestational age, presenting part of the baby and other factors. In 2003, 58.8% of the babies registered to the ANZNN cohort were born by Caeserean section and of those, 60.3% occurred before the onset of labour. Data were available for 99.5% of babies. The rate of Caeserean section in our cohort shows an increasing trend since 1995. The Caeserean section rate for all confinements in Australia in 2003 was 28.5% (Australia's mothers and babies 2003,NPSU).
In the ANZNN cohort, the head was presenting part for 87.1% (n:1437) of the term babies. Another 6.4% (n:106) had breech presentation and 88.7% (n:94) of them were born by Caeserean section. (The head was the presenting part for 93.9% of the confinements in Australia, Australia's mothers and babies 2003,NPSU).
Of the babies born at less than 32 weeks gestation, 39.3% (951) were breech presentations and 78% (n:742) of breech babies had Caeserean sections.

3.5.3 Apgar score 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 the baby needs specialised resuscitation.
In the ANZNN cohort, 14.7% (n: 1056) babies had an Apgar score of less than 4 at 1 minute and 3.1% (n: 223) had low scores at 5 minutes. Among babies born at less than 32 weeks, 496 (15.3%) babies had a low Apgar score at 1 minute and 318 (19.3%) term babies also had low scores at 1 minute(data available for 99.4%). Among term babies, a low Apgar score (0-3) was recorded for 6.4% (n:106) at 5 minutes.
Low Apgar Scores (0-3) at 5 minutes were recorded for 0.3% of all Australian babies born

in 2003.(Australia's mothers and babies 2003, NPSU).NHMRC's clinical practice guidelines for care around preterm birth (1997) recommend 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.

There were 1860 babies in our cohort who were intubated in labour ward to aid resuscitation at birth, including 1316 (40.5%) babies of less than 32 weeks and 290 (17.6%) babies born at term (99.4% data available). The proportion of babies intubated at birth in the Australian population was 0.7% in 2003 (Australia's mothers and babies 2003,NPSU)

3.5.4 Transfer after birth

A baby may need to be transferred after birth due to a precipited 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.

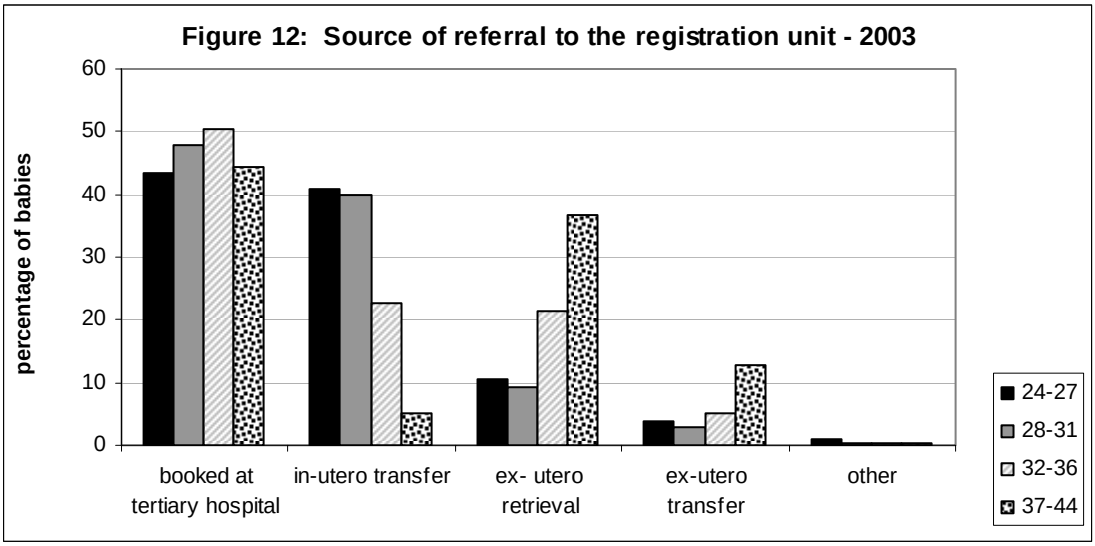
There were 1336 babies who were retrieved from a non-tertiary centre to a tertiary centre (94.8% of retrieved babies). Only 51 (3.6%) babies were retrieved between hospitals with NICUs.

Of those babies, 43.1% (n: 607) were born at term (Tables 11 and 12). Of the babies born before 28 weeks gestation, 112 (10.9%) were retrieved after birth and two of them were transfered between NICUs. There were 435 babies transferred by a nonspecialist team and 332 (76.3%) of them were transferred from a non-tertiary hospital. Among those transferred babies 331 (76.1%) babies were born after 31 weeks gestation.

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.

Figure 12: Source of referral to the registration unit - 2003



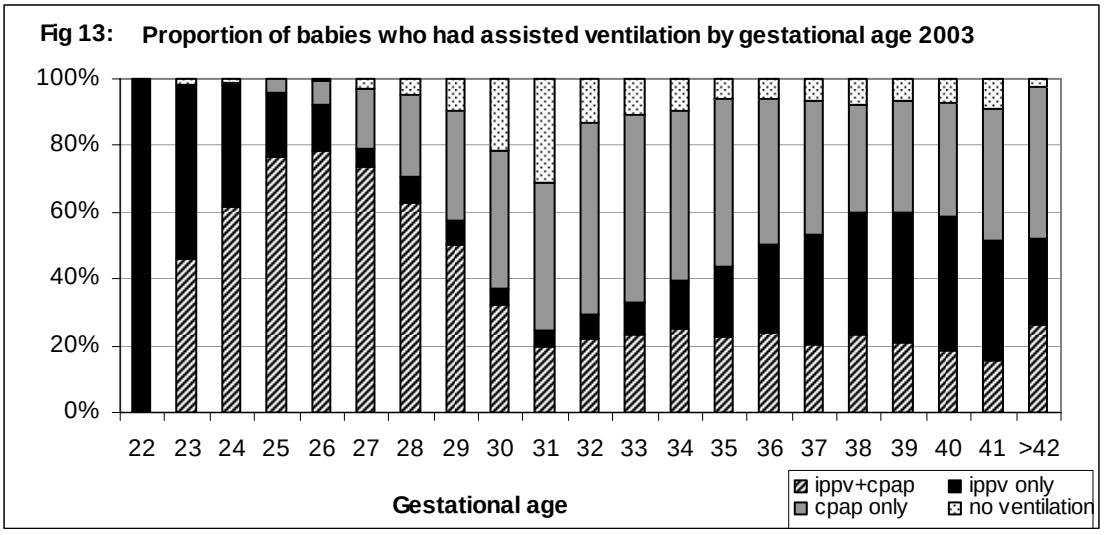


Fig 13: Proportion of babies who had assisted ventilation by gestational age 2003
100%
80%
60%
40%
20%
0%
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 >42
Gestational age
ippv+cpap
ippv only
cpap only
no ventilation

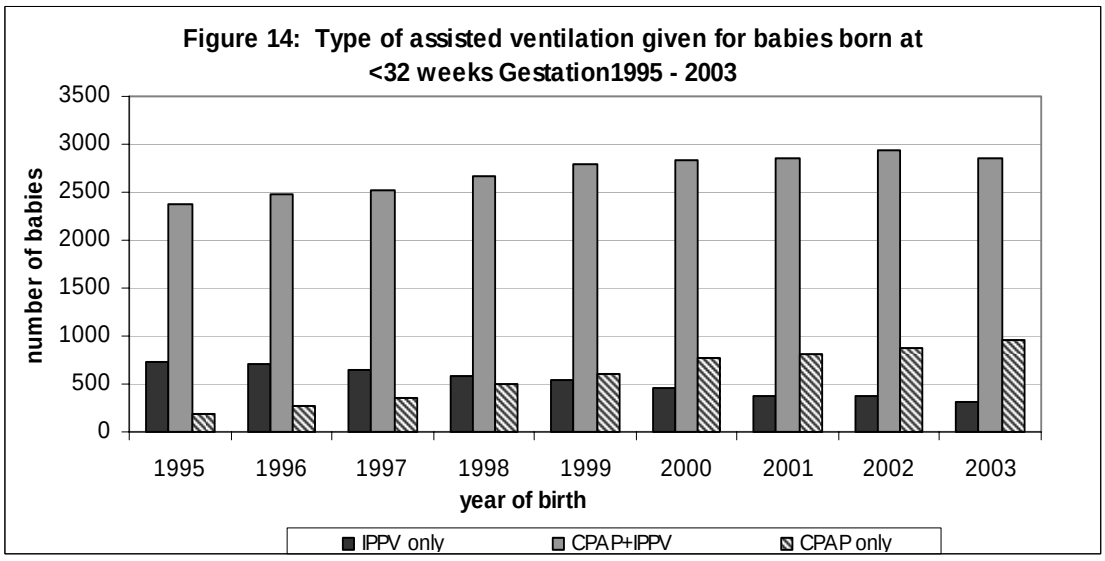


Figure 14: Type of assisted ventilation given for babies born at <32 weeks Gestation1995 - 2003
number of babies
3500
3000
2500
2000
1500
1000
500
0
1995 1996 1997 1998 1999 2000 2001 2002 2003
year of birth
IPPV only
CPAP+IPPV
CPAP only

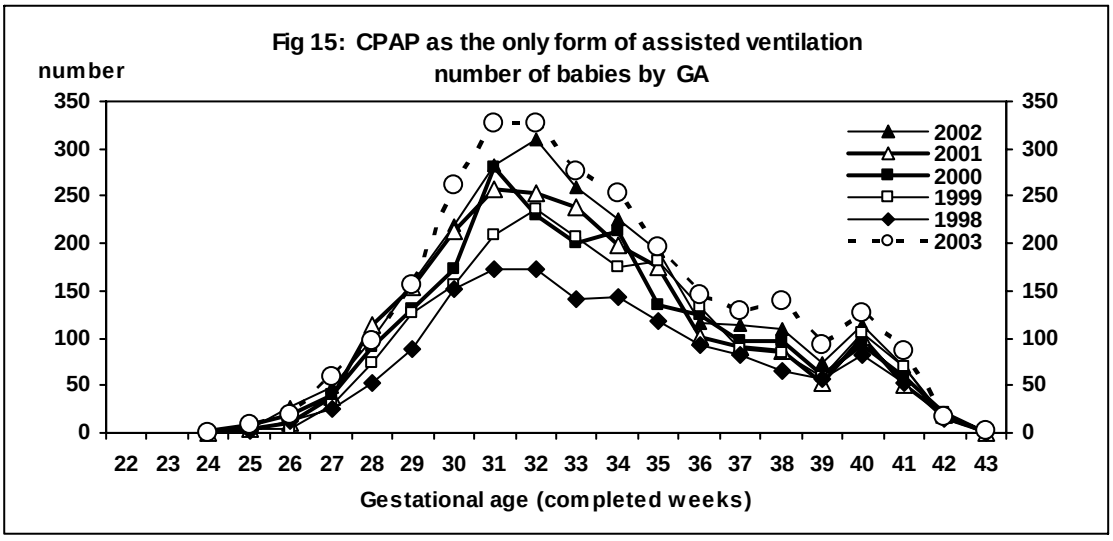


Fig 15: CPAP as the only form of assisted ventilation
number of babies by GA
number
350
300
250
200
150
100
50
0
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
Gestational age (completed weeks)
2002
2001
2000
1999
1998
2003

3.6.1 Respiratory assistance

Among the babies admitted to level III NICUs, the main indication for assisted ventilation was respiratory distress syndrome (n:3629, 50.5%) and non specific respiratory distress was the next commonest indication (n:1462, 20.4%). Only 592 (8.2%) babies admitted to level lll NICUs in 2003 did not have any form of respiratory assistance for four or more hours (including IPPV, CPAP or oxygen). The two major forms of assisted ventilation used are mechanical ventilation / intermittent positive pressure ventilation (IPPV) and continuous positive airways pressure (CPAP). Both forms require specialised nursing, medical and paramedical care and utilise a large component of the available resources. Of the babies registered to ANZNN cohort, 88.4% (n:6347) were given assisted ventilation for 4 or more hours in 2003 (Tables 13 and 14).

The most common form of ventilation was CPAP and a continuing trend of increasing use of CPAP and decreasing use of IPPV was observed since the beginning of ANZNN data collection in 1995. In 2003, "CPAP only" was given to 2721 babies. A combination of IPPV and CPAP was given to 2444 babies. (Figure 13). 'IPPV only' was given to 1238 babies.

Since 2001 the duration of ventilation has been collected in 'hours'. (From 1995 to 2000 it was collected as 'days' and a 'day' was defined as four or more hours in any one 24 hour period). In 2003, IPPV was given to babies in our cohort for a total of 595751 hours (24823 days) and CPAP was delivered for 999031 hours (41626 days, Tables 13 and 14; Appendix 1). These 1594782 hours of assisted ventilation equate to each baby receiving 9 days of assisted ventilation.

However, the indication for respiratory assistance and the treatment vary with the individual and with maturity (Figure 11). For this reason, respiratory assistance is discussed in three separate gestational age groups.

3.6.1.1 Babies born at less than 32 weeks gestation

Only 307 babies (9.4%) in this cohort did not receive any respiratory support and another 125 (4.4%) babies had only supplemental oxygen. CPAP was the only form of ventilation for 930 (28.6%) babies and 167 of them had less than four hours of supplemental oxygen or none at all. Only IPPV was given to 308 babies and 1573 babies had both IPPV and CPAP. However, "CPAP only" use shows a gradual increasing trend from 1995 to 2003 (Figure 15). 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 438781 hours (18283days) and 860116 hours (35838 days) of CPAP was administered in 2003.

Duration of use of IPPV for babies less than 28 weeks shows a significant decreasing trend from 1995 to 2003 (median 16 days with inter quartile ranges 4 to 33 in 1995 to median 7 days with inter quartile ranges 2 to 24 in 2003). The duration of use of IPPV and CPAP combination therapy for these extremely preterm babies does not show much difference from 1995 to 2003 but it has decreased from median 9 days in 1995 to median 7 days in 2003 for 28 –31 weeks gestational age group (Fig: 16 – 18).

Respiratory distress syndrome was the commonest reason for respiratory support for this group of babies (n: 2260, 69.5%,Figure 11).

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 1881 babies who were born at less than 32 weeks and received IPPV, 266 (14.1%) had high-frequency oscillation, a figure that was lower than in 2002.

Nitric oxide is used primarily to treat pulmonary hypertension (Barrington & Finer 2003) and was given to 93 babies born before 32 weeks gestation (4.9% of those receiving IPPV).

Duration of Assisted Ventilation

Fig 16: Babies given only CPAP - <28 weeks and 28-31 weeks GA

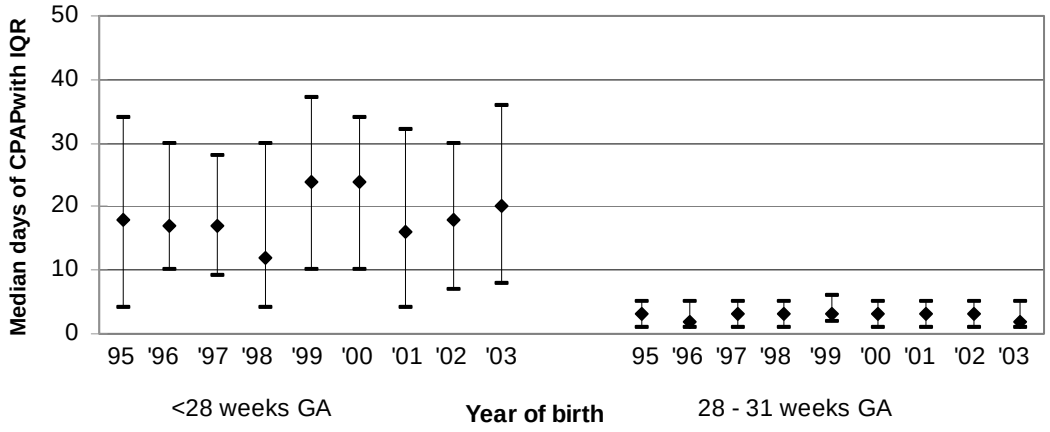


Fig 17: IPPV given with / without CPAP for babies <28weeks and 28- 31weeks GA

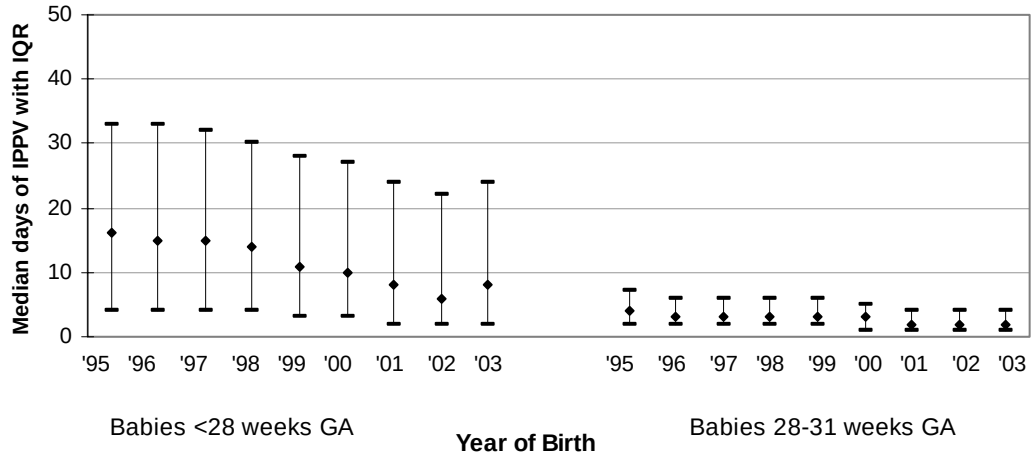
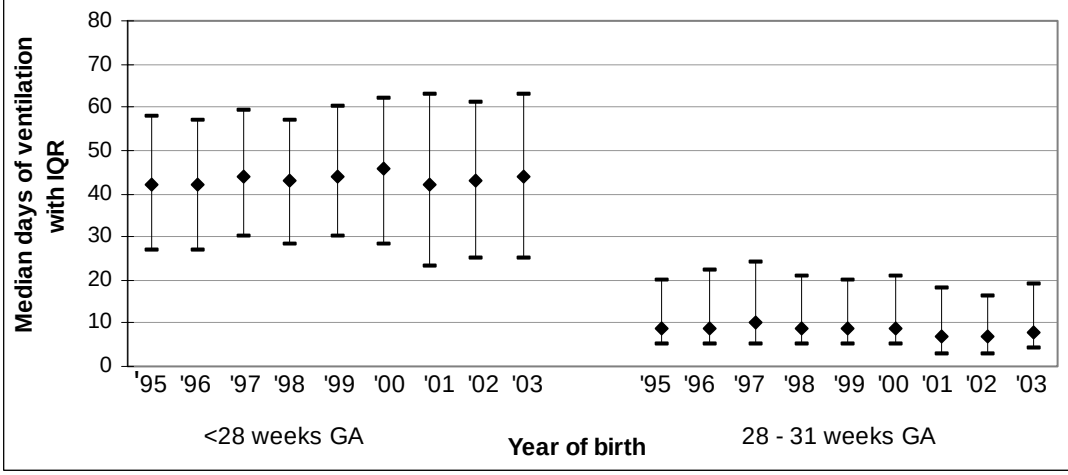
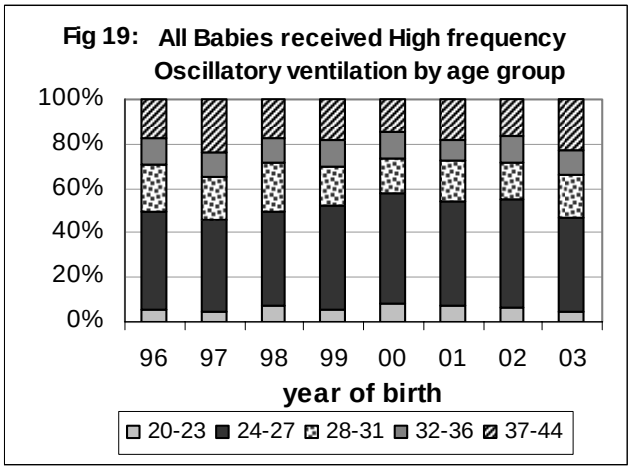
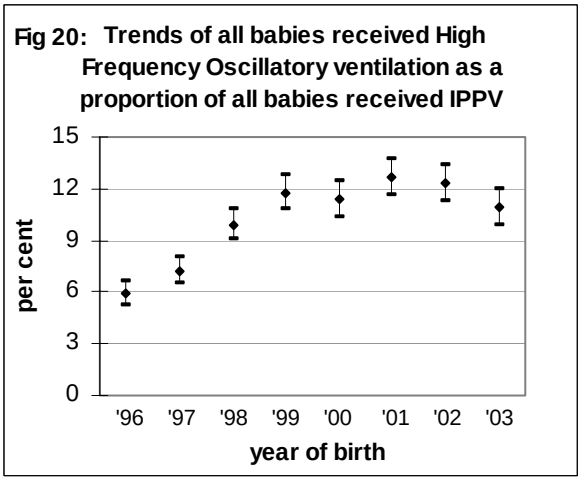
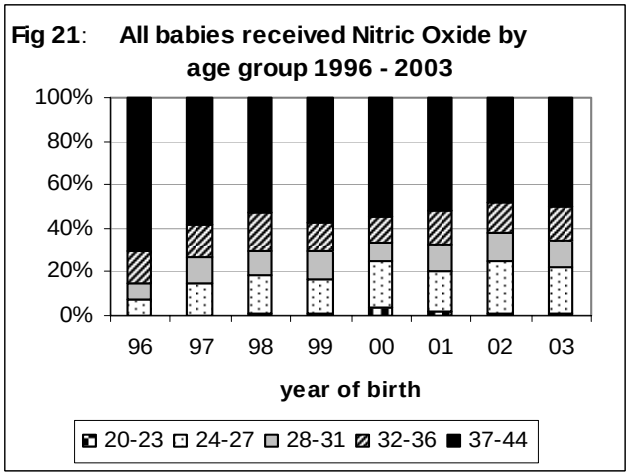


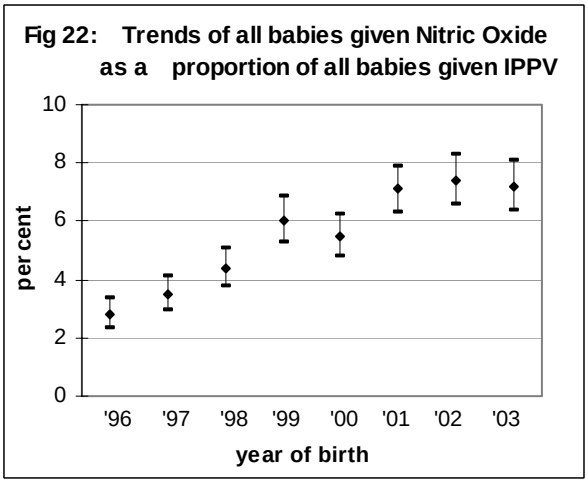
Fig 18: Babies given both IPPV & CPAP - <28weeks and 28-31weeks GA











A pulmonary air leak that required drainage was reported for 161 babies in this gestational age group (8.6% of those ventilated). Five babies who received only CPAP also had air leak that required drainage.

The proportion of babies who received oxygen therapy was 80.2% (2607) and a total of 86345 'oxygen days' was given. Of the survivors discharged to home, 8.2% (244 babies) required oxygen at home. The less mature the baby, the more likely they were to need home oxygen (50%, n:11 of survivors of less than 24 weeks and 22% n:177, of survivors born at less than 28 weeks gestation, Table 15).

Chronic lung disease (CLD) is diagnosed in babies born at less than 32 weeks, and if 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). There were 621 babies diagnosed with chronic lung disease in 2003.

This rate is higher for the babies born at the lower gestations (90.9%, n:20, for babies of less than 24 weeks and 49.9% n:408, babies born at less than 28 weeks).

The rate of CLD has decreased significantly from 22.7% in 2000 to 19% in 2003.(Mantel Haenszel chi-square for trend is 16.2 with 1 degree of freedom, P=0.0001) (figure 23)

3.6.1.2 Babies born at 32 to 36 weeks gestation

Among the babies born at this gestational age group 89.9% (n:2049) babies had assisted ventilation for 4 or more hours. Only 158 did not have any respiratory support. Of those babies 861 (37.8%) received IPPV with or without CPAP. "CPAP only" was the most common mode of ventilatory support in this age group and was given to 1199 (52.6%) babies, 182 of whom received less than 3 hours of oxygen. Again, the commonest indication for respiratory support was respiratory distress

syndrome (n: 1121, 49.2%). High frequency ventilation was given to 44 babies (5.1% of those receiving IPPV) and 42 babies received nitric oxide (Table 13). Pulmonary air leak requiring drainage was seen in 87 babies, 18 of whom received "CPAP only" and 17 babies required home oxygen (Tables 15 and 16).

3.6.1.3 Babies born at term

A total of 1533 term babies received some form of assisted ventilation and 592 of them received CPAP alone (38.6% of those ventilated). High frequency ventilation was given to 93 term babies. Nitric oxide was given to 134 babies and 67 received both therapies. There were 8 babies who received extracorporeal membrane oxygenation. Pulmonary air leak requiring drainage was detected in 87 babies and 10 of them received CPAP only.

3.6.1.4 Exogenous surfactant

The efficacy of exogenous surfactant for respiratory distress syndrome was confirmed by a systematic review (Soll, 2003) and its use was recommended by NHMRC in 1997. There were 2427 babies who received IPPV for HMD in 2003. Exogenous surfactant was given to 86.5% (2099) of these babies, a rate lower than in 2002 (Figure 24). (Data unavailable for 6 babies) The range of surfactant use between the level III units had a median of 87.5% (inter quartile range from 85% to 90.4%). Surfactant was given to 45 babies with HMD who were not given IPPV and 39 of them were given CPAP. In 2003, surfactant was given for other diagnoses such as meconium aspiration syndrome (n: 46), non specific respiratory distress (n: 50) and for babies with congenital abnormalities (25).

Fig 23: Chronic Lung Disease, Trends 1997-2003 Babies born <32 weeks GA and alive at 36 weeks

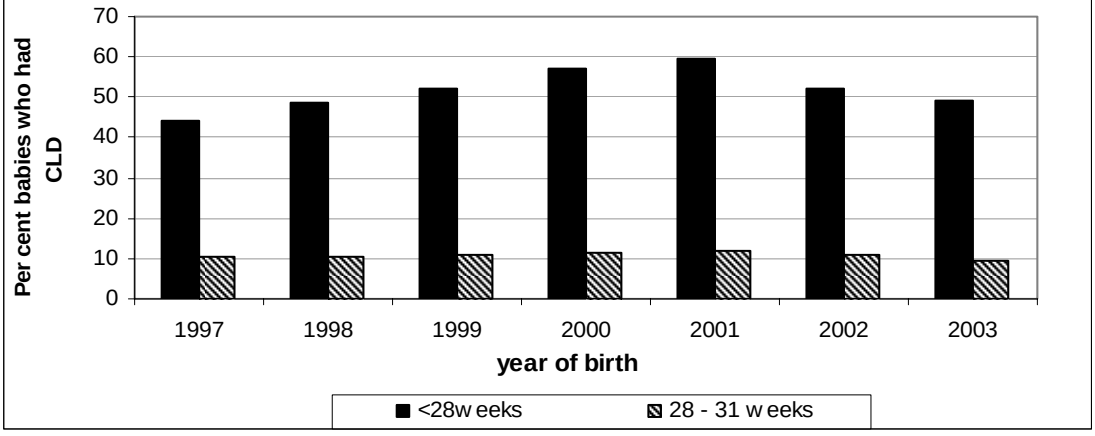
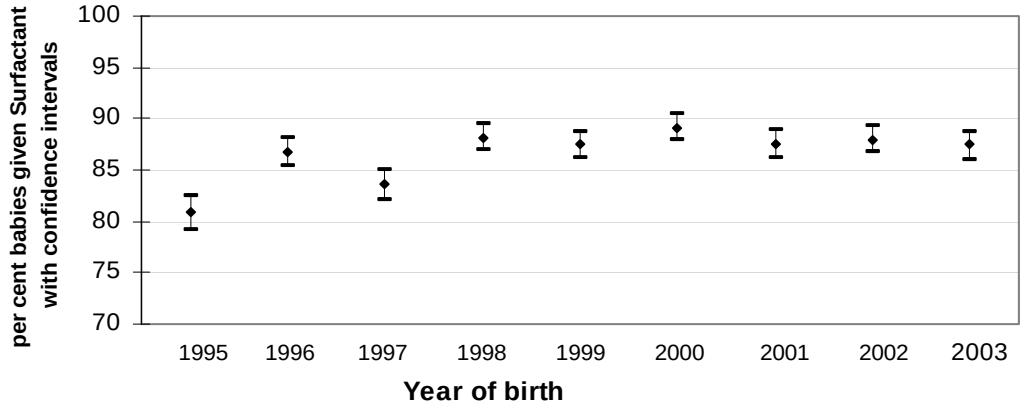


Figure 24: Babies given Surfactant - diagnosed with hyaline membrane disease and given mechanical ventilation



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.

In 2003 there were 182 (6.1%) very preterm babies who had Grade III or IV IVH and 76 (41.7%) of them died. The proportion of babies with significant haemorrhage increases as gestation decreases (Table 19, Figure 25). The median rate of significant haemorrhage in the individual units is 6.8% (with an inter quartile range of 5.4% to 10.1%).

Of the 267 (8.2%) babies who did not have an early ultrasound report, 49 (18.3%) died before day 3, and 187 (70%) were born at more than 29 weeks gestation, indicating that some units are only screening babies born at less than 30 weeks gestation.

ANZNN collect later ultrasound examination results that detect post-haemorrhagic hydrocephalus, cystic lesions that include porencephalic cysts, periventricular leukomalacia or encephaloclastic porencephaly, all strong predictors of later neurological developmental problems.

There were 1952 (64.9%) babies born at less than 32 weeks gestation who had an ultrasound dated at least 3 weeks after birth, and 96.9% (n: 1891) of these had a normal report. Another 433 babies had late head ultrasound reported as normal but date of the ultrasound was not given.

Abnormal late head ultrasounds were reported for 103 (5.3%) babies who had ultrasound reported 3 weeks after birth. Hydrocephalus was reported for 42 babies (2.1% of those with later ultrasounds recorded), porencephalic cysts for 21 (1.1%) and 56 (2.9%) had periventricular leukomalacia. Encephaloclastic porencephaly was not reported during 2003.

Another 204 babies had an ultrasound reported between day 14 and day 21 that included 10 additional babies with abnormal scans. This group had 4 more babies with hydrocephalus and 6 babies with cysts.

Figure 25: Intra Ventricular Haemorrhage, Babies born at <32 weeks GA and survived to day 3 - 2003

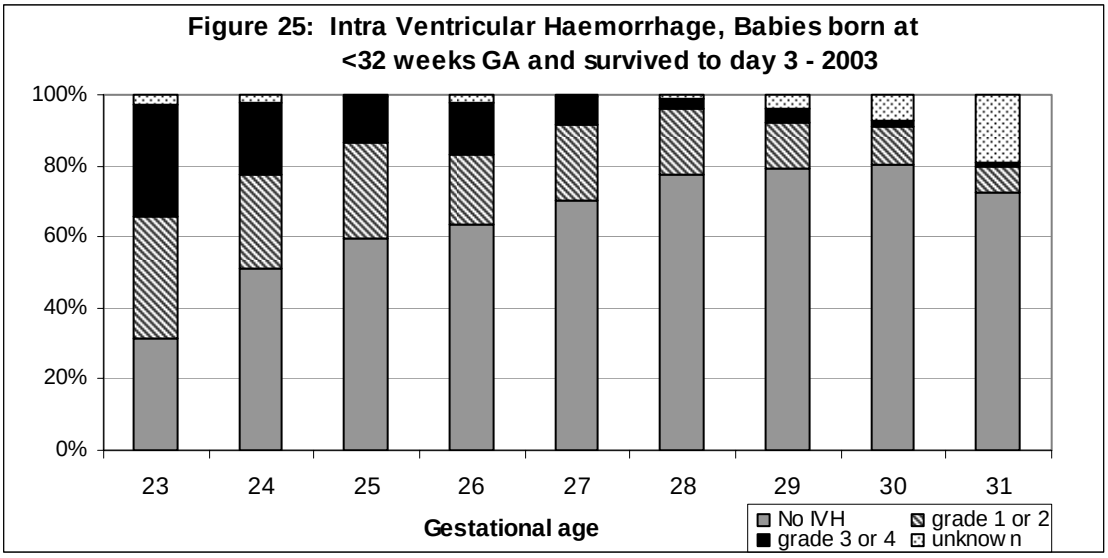


Figure 26: Intra Ventricular Haemorrhage, Trends from 1995 - 2003
Babies <30 wks GA or birth weight <1250g and survived to day 3

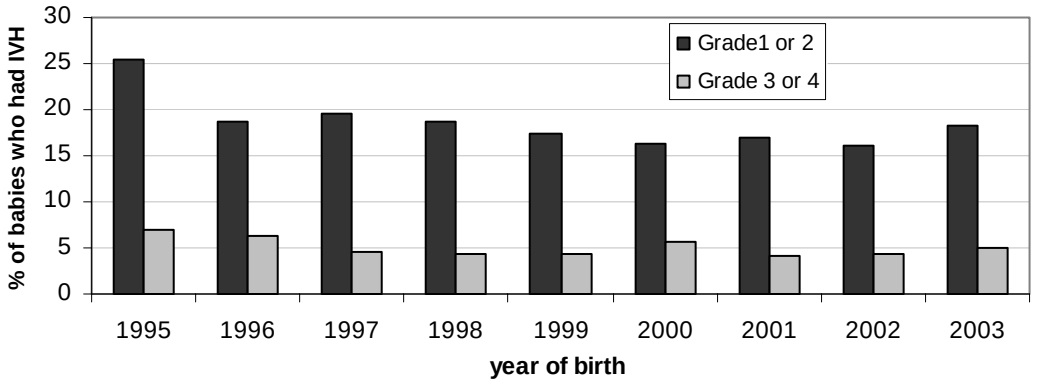
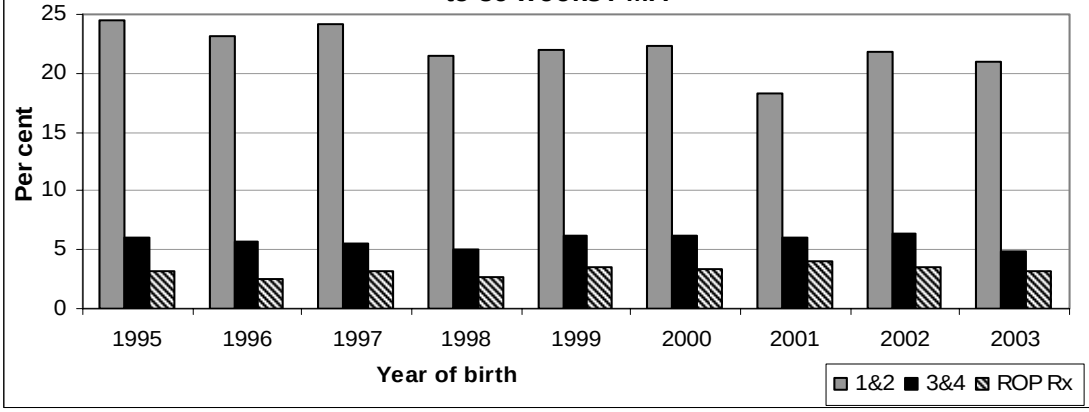


Figure 27: Retinopathy Of Prematurity, babies born at <32 weeks GA and survived to 36 weeks PMA, 2003

Figure 28: Trends of Retinopathy of Prematurity stages and treatment, babies <31 weeks GA or <1250g birth weight & survived to 36 weeks PMA



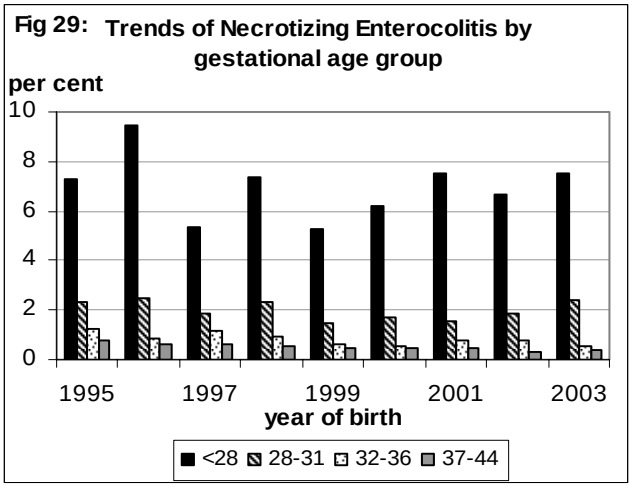
3.6.3 Eye examinations

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 cohort are birth at less than 31 weeks gestation or weighing less than 1250 grams. There were 2063 (85.4%)babies who had the results of their eye examination recorded. Among the babies not examined 261 (74%) were born 30 weeks or above gestational age. (Tables 21 and 22). Of the examined babies, 100 (4.8%) had severe eye disease (Stages III or IV) and 53 of them were treated.

3.6.4 Necrotising enterocolitis

Necrotising enterocolitis (NEC) is a rare disease, more common in preterm infants and has a high rate of morbidity and mortality.



The prevalence of this disease varies widely, but there were 153 babies proven to have NEC in 2003.(see Appendix 1 for definition). Half of these babies (n: 77, 50.3%) were born at less than 28 weeks gestation, while most of the babies with NEC (n: 132, 86.3%) were of less than 32 weeks. The incidence of NEC in the whole ANZNN cohort was 2.1% and incidence in less than 32 weeks gestation group was 4.1%. Half (n: 70, 45.7%) of the babies with proven NEC required surgery. Of the babies who had NEC 36 (23.5%) died and the disease was implicated in the death of 23 (63.9%) babies. Among those who died 23 were born at less than 28 weeks gestation and NEC was implicated in 69.6% (n:16) of those deaths.

3.6.5 Neonatal surgery

The ANZNN cohort includes only babies admitted to a NICU as part of their first admission in hospital. In 2003, half (n:432, 50.1%) of the babies who had surgery were born at term. Two-thirds of the babies who had surgery (n:565 65.5%) were born at a tertiary hospital and a similar proportion (66%, n:570) had congenital abnormalities of which 249 (43.7%) were antenatally diagnosed allowing the birth to be planned, to be close to expert care. Babies who had congenital abnormalities include 376 term babies and 22 of them had lethal congenital abnormalities. There were 85 (9.7%) babies who died after surgery and 47 (54.8%) of them had congenital abnormalities. A congenital malformation directly contributed to the death of 37 babies (a potentially lethal congenital malformation). The average length of stay in hospital for the term babies requiring surgery was nearly a month (29.5 days).

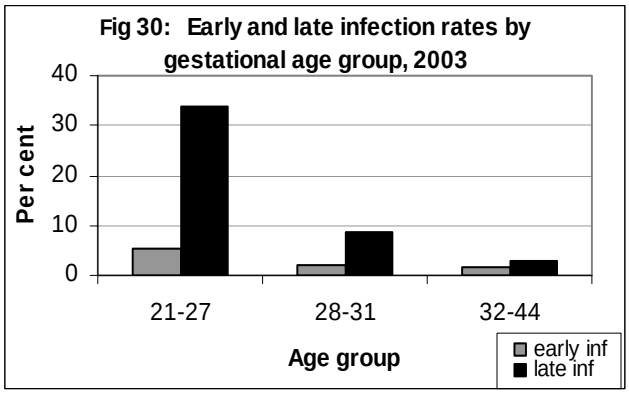
Only 266 (2.27%) babies had surgery as their entry criterion for the audit and 244 of them were born after 31 weeks of gestation (this includes ventilated babies with "peri-surgical" as their indication for respiratory support). The number of babies more than 31 weeks gestation and more than 1500g birth weight who had mechanical ventilation for congenital malformation / perisurgical reasons for respiratory assistance were 362 and they received a total of 55,588 hours of IPPV (average of 6.4 days each).

Among the babies born at 32 to 36 weeks gestation, a congenital malformation was correctly diagnosed antenatally in half (56.6%, n: 86) of the 152 (84%) babies with a malformation. Twenty one (11.6%) babies died and their death was attributed to a congenital malformation in 13 (61.9%) cases.

Of the babies born at less than 32 weeks gestation or less than 1500g birth weight 258 babies had surgery, 40 of them died but only 5 had a lethal congenital malformation.

3.6.6 Neonatal infection

In 2003, 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.



In 2003, there were 749 (10.4%) babies, who had symptomatic, blood culture positive septicaemia and 166 (22.2%) of whom were known to have symptoms before 48 hours of life. Late-onset septicaemia was diagnosed in 628 babies and 91 of them had more than one episode of infections. Of the 963 babies born at less than 28 weeks gestation who survived beyond day 2, a third (n: 326, 33.8%) had an episode of late-onset sepsis. This proportion rose to 62.8% (n:22) for those born at less than 24 weeks and 43.9% 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, 97 (12.9%) died and 18 of these babies had infection implicated in their demise (2.4% of those with sepsis, 4.4% of all babies who died). Early onset sepsis was noted in 27 of the babies who died and implicated in 11 of those deaths.

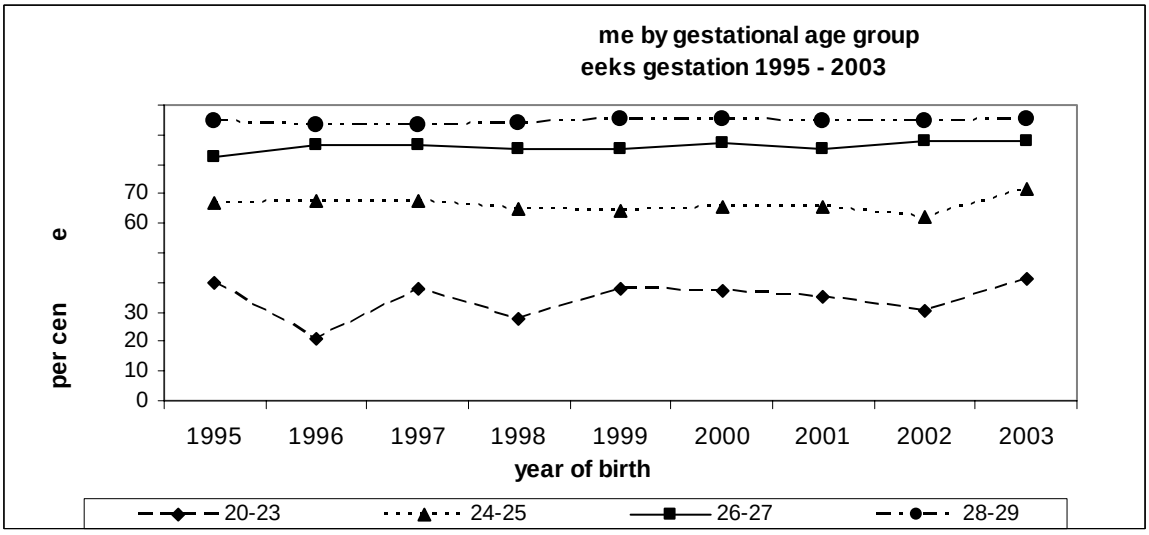
3.7 Outcome

3.7.1 Survival

The proportion of babies surviving to go home in 2003 (93.5%) was slightly higher than the proportion in 2002. Survival is dependent on many factors, including maturity and weight at birth. Data are available for all but 190 babies (2.6%). 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.

There were 463 babies from our cohort who died while in hospital. During the first day of life, 47 (10.1%) babies died and 252 (54.4%) died within the first week. Most (n: 402, 86.8%) babies died before 28 days of life. The neonatal death rate in the ANZNN cohort was 5.6%, a higher rate than the Australian figure reflecting the high risk criteria of babies admitted to the cohort. (The Australian neonatal death rate was 2.9% in 2003. The neonatal death rate for singleton babies was 2.4% and it increased to 18% for twins. It further increased to 43.5% for higher order multiple births, Australia's mothers and babies 2003, NPSU).

A lethal congenital malformation was noted in 104 babies who died and nearly half (n: 49, 47.1%) of those babies died before one week of age. There were 65 term babies who died and 47 (72.3%) of them had lethal congenital abnormalities. Better than 95% survival is seen for babies born from 28 to 35 weeks gestation (Figure 16). The survival of the more mature babies was around 90-95%, indicating the high-risk criteria that we have applied to the cohort. The survival rate for the whole cohort rises from 93.5% to 97.1% when all babies with a lethal congenital malformation are excluded from the cohort. About 200 deaths were due to extreme prematurity.


me by gestational age group
eeks gestation 1995 - 2003
e
per cen
70
60
30
20
10
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
year of birth
20-23
24-25
26-27
28-29

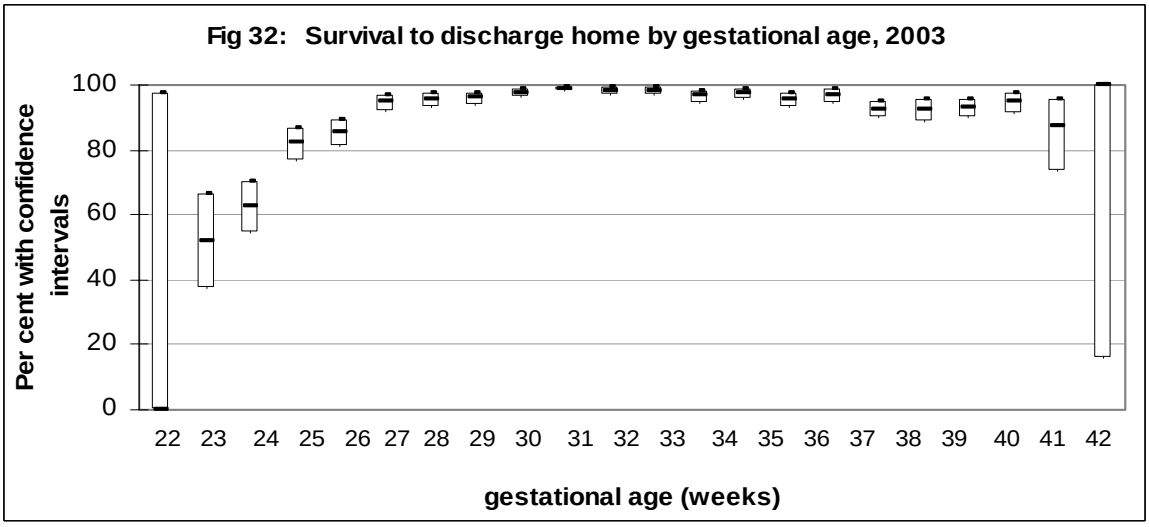


Fig 32: Survival to discharge home by gestational age, 2003
Per cent with confidence intervals
100
80
60
40
20
0
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
gestational age (weeks)

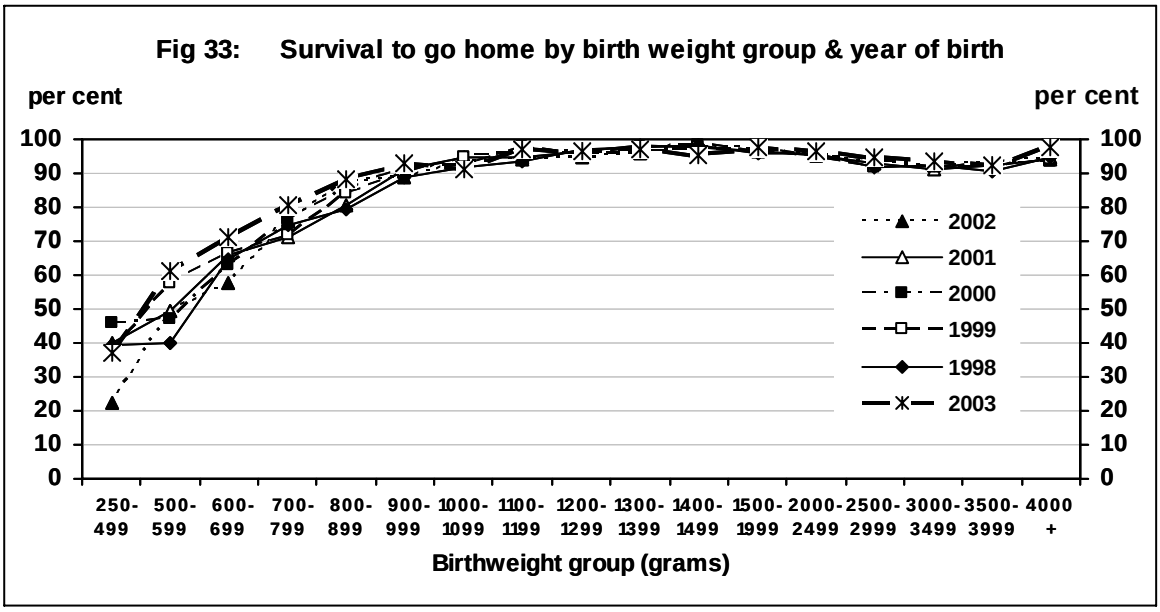


Fig 33: Survival to go home by birth weight group & year of birth
per cent
per cent
100
90
80
70
60
50
40
30
20
10
0
2002
2001
2000
1999
1998
2003
250-499
500-599
600-699
700-799
800-899
900-999
1000-1099
1100-1199
1200-1299
1300-1399
1400-1499
1500-1999
2000-2499
2500-2999
3000-3499
3500-3999
4000+
Birthweight group (grams)

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 2003, 47.6% (n: 3194) of the babies who survived went home from their registration hospital. This rate was higher for term babies (n: 982, 64%) than for babies who were born mildly preterm (n: 1023, 46.4%) and those who were very preterm (n: 1189, 40%). More than half of survivors 3515(52.4%) were transferred to another hospital. Most babies (n: 2963, 84.3%) were transferred 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 78% (n:314) of term babies had transferred to another unit by day 14, while only 26% of the very preterm babies had done so. The remainder of the babies were transferred to either a children's hospital (n: 250) or another hospital with a NICU (n: 302). Of these babies 17.2% (n:95) were transferred on the day they were born and half (n: 300, 54.3%) 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.

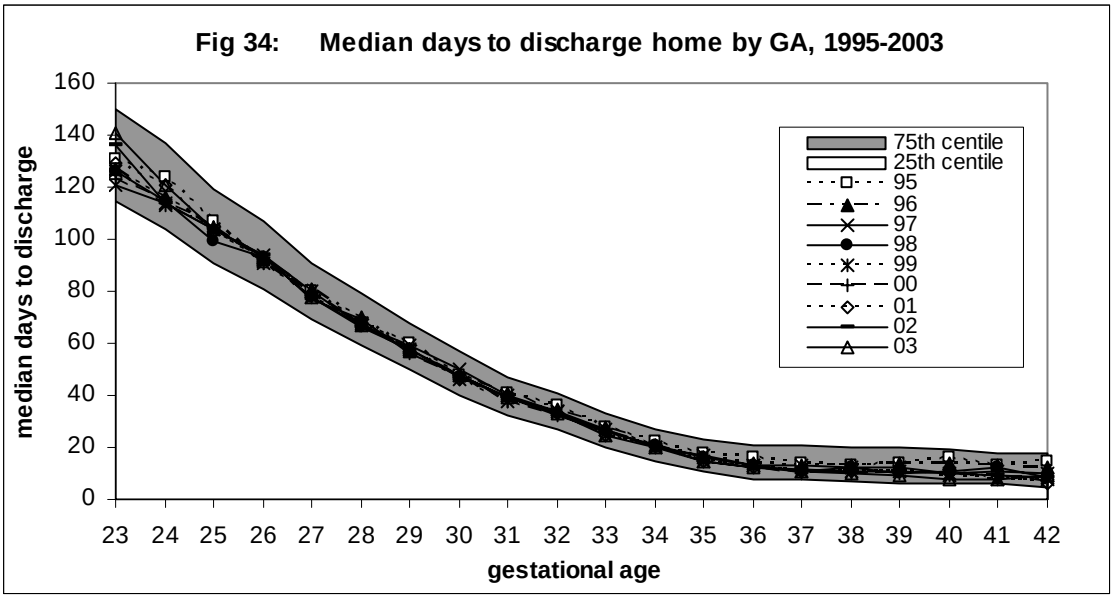
3.7.3 Going home

Due to the tremendous effort from our collaborating units, the date of discharge is available for 97.3% (n: 6988) of babies. Over the period 1995 to 2003, 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 33). However, there is a very wide range here with an inter quartile 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: 11days, inter quartile range 7-20 days, Table 28). Data for Australian babies born in 2002 shows that most (85.5%) go home before 6 days and nearly all have been discharged by 14 days (98.7%, Australia's mothers and babies 2002).

Fig 34: Median days to discharge home by GA, 1995-2003



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 birth weight, 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 2003, 348 babies fulfilled the ANZNN criteria and were registered to one of the fifteen level II nurseries (Figures 33 and 34, 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, 53 (15.2%) babies were born at less than 32 weeks gestation, 42 (12.1%) weighed less than 1500 grams at birth, 328 (94.2%) received assisted ventilation and none had major surgery. For three units, no babies were eligible for the audit this year while the maximum number registered to a unit was 71 babies (Figure 20).

4.2 Antenatal

Antenatal corticosteroids were administered to the mothers of 26 of the 53 (49%) babies born at less than 32 weeks gestation. Another 42 mothers whose babies were eligible for ANZNN admission and delivered babies at 32 to 34 weeks gestation also were given steroids. Most mothers of the babies (n:322, 92.5%) were booked into a non tertiary hospital for the baby's birth, and thus the registration hospital. The most common obstetric complication leading to a preterm birth was preterm labour (47.2% for babies of less than 32 weeks and 38.2% for those at 32-36 weeks). At term, two thirds (n: 91, 66%) of the mothers who had babies admitted to level II nurseries did not have an identifiable antenatal problem, but 15 babies had obstetric intervention for signs of distress in the foetus.

4.3 The baby and the birth

As expected from the level III data, there were more male babies (n: 192, 55.2%) and more babies born from a multiple pregnancy (n: 37, 10.6%) than in the usual population. The Caesarean section rate was high (45.7%) with 71 (44.7%) receiving a section after labour began. A low Apgar score (less than 4 at 1 minute) was recorded for 43 babies (12.3%) and 15 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 10 babies. Of the 305 babies who received such support, 183(60%) had a diagnosis of non specific respiratory distress and 90 (29.5%) had hyaline membrane disease. Term infants again

had a high proportion of meconium aspiration syndrome (n: 23, 16.7%). Supplemental oxygen was given to 198 babies (56.9% of the cohort) for a total of 848 'days'(Table 34). Two babies had chronic lung disease and one went home on oxygen therapy.

Assisted ventilation was given to 328 babies of whom 301 (91.8%) 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 1702 hours of IPPV and 11449 hours of CPAP.

Exogenous surfactant was given to 19 of the 22 babies (86.4%) receiving of IPPV for hyaline membrane disease. Six babies had a pulmonary air leak needing drainage and one of them had IPPV. Neither nitric oxide nor high frequency oscillation ventilation is used in a level II nursery.

4.4.2 Cerebral ultrasound

Out of 51 eligible babies 41 (80.4%) had head ultrasound and none of them showed an abnormality. Ten babies who didn't have an early head ultrasound report were born at 30 or 31 weeks gestation. A late head ultrasound was reported for 24 babies and all of them were normal.

4.4.3 Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 86.3% of the eligible babies. Three babies had Stage I ROP and one had stage II. Other babies had no abnormality.

4.4.4 Other morbidities

Septicaemia was proven in 31 (8.9%) babies, of whom 28 had symptoms before day two. Six of them had both early and late infections. None of the babies died as a result of infection. There were no cases of necrotising enterocolitis. There were 5 babies with major congenital malformations and none of them had surgery before discharge to home.

4.5 Outcome

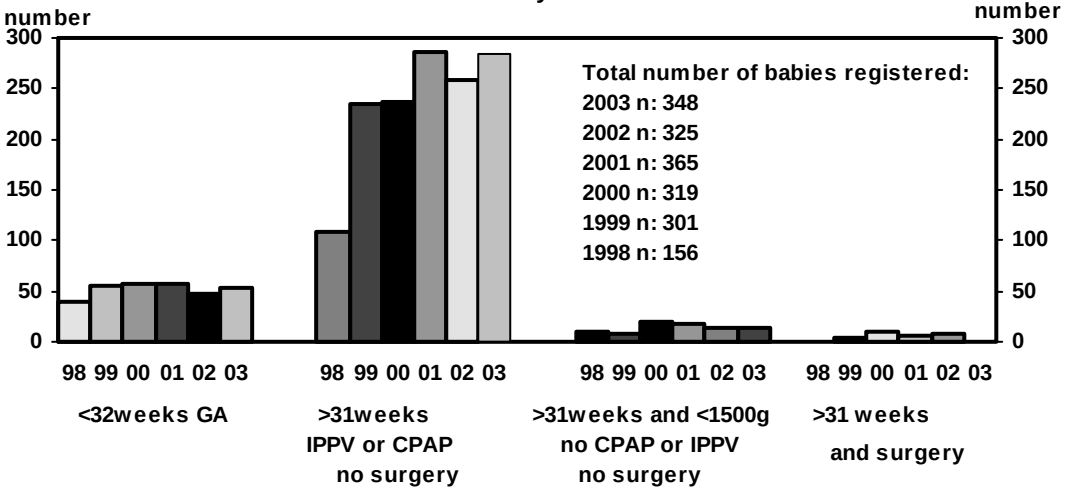
In 2003, 344 of the 348 babies registered to a level II unit survived to go home (98.8%, Table 31). Survival status was not known for 2 babies. This high survival rate reflects the more mature gestations and lower-risk nature of the pregnancy or babies, compared to those babies requiring intensive care (Section 3). One baby died on the first day of life and another one died on the second day. One baby had a congenital malformation that was implicated in the death and the other baby died of extreme prematurity.

Only 19 (8.31%) babies were transferred to another hospital prior to going home. Of these, 4 went to a hospital with a level III nursery and 3 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: 6; interquartile range (IQR): 5-9 days). For babies born at 34 to 36 weeks gestation, the median stay was two weeks (median: 15 days; IQR: 10 – 21 days) and babies born at 32 to 33 weeks tended to be in hospital for a month (median: 29 days IQR range: 24 - 39 days). Babies born at less than 32 weeks gestation were in hospital for a median stay of 52 days (IQR: 42 - 59days).

4.6 Level III to level II transfers

Of the 7178 babies registered to an ANZNN level III nursery, 277 were transferred to one of the level II hospitals described in this section. For 81 (29.2%) babies this was their hospital of birth. About 20 babies continued their respiratory support after back-transfer and 55 babies received supplemental oxygen and 43 continued to have O2 for more than one day. Babies born at less than 32 weeks gestation tended to be transferred to a level II unit at around four weeks of age (median: 27 days; IQR: 11-45; n:168). The more mature babies (born at more than 31 weeks) stayed in the level III unit for a median of 8 days (IQR: 5-14 days). A few (n: 15, 5.4%) 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.

Figure 35: Number of babies registered to level II units by registration criteria and year of birth



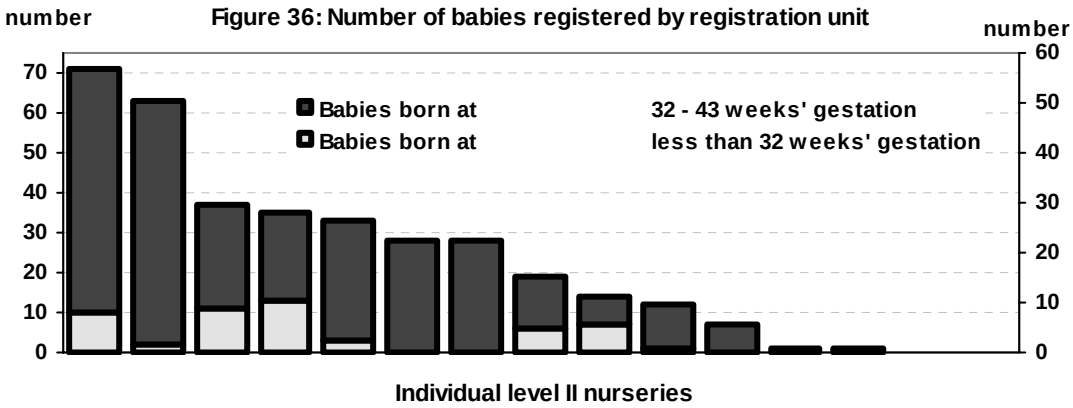
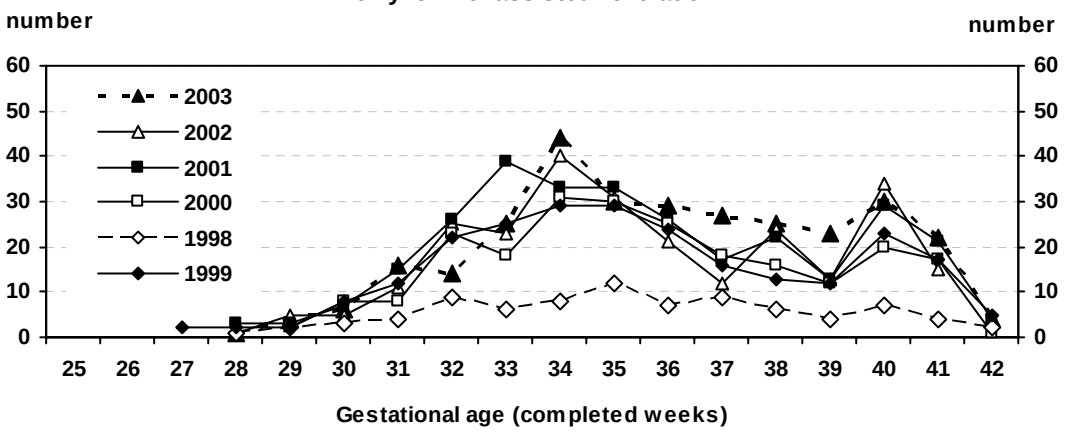


Figure 37: Number of babies registered to level II units with CPAP as their only form of assisted ventilation



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6 Tables

6.1 Babies registered to level III nurseries

Table 1: Number of babies at each week of gestation 2003

Gestational age (completed weeks)	Number of babies	cumulative per cent
21	2	0.03
22	1	0.04
23	48	0.7
24	157	2.9
25	224	6.0
26	270	9.8
27	320	14.2
28	398	19.8
29	475	26.4
30	627	35.1
31	728	45.3
All babies <32 wks	3250	
32	571	53.2
33	490	60.1
34	498	67.0
35	389	72.4
36	331	77.0
37	313	81.4
38	435	87.4
39	278	91.3
40	363	96.4
41	218	99.4
42	40	99.9
43	2	100.0
Total number of babies	**7178**	

Table 2: Number of babies at each, birth weight group 2003

Birth weight group (grams)	Number of babies	Cumulative per cent
<500	35	0.5
500-599	96	1.8
600-699	182	4.4
700-799	211	7.3
800-899	234	10.6
900-999	291	14.6
1000-1099	300	18.8
1100-1199	316	23.2
1200-1299	332	27.8
1300-1399	371	33.0
1400-1499	373	38.2
All babies <1500g	2741	
1500-1999	1369	57.3
2000-2499	891	69.7
2500-2999	762	80.3
3000-3499	709	90.2
3500-3999	477	96.8
4000 +	229	100.0
Total number of babies	**7178**	

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 gestational age or birth weight 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, 2003

Antenatal Steroid use	20-23	24-25	26-27	28-29	30-31	32-33	All Babies
none	19	51	70	119	176	224	659
Incomplete course	16	119	167	230	353	284	1169
Course completed	15	177	272	375	610	356	1805
Completed >7days	0	26	70	128	178	154	556
unknown	1	8	11	21	38	43	119
All babies	**51**	**381**	**590**	**873**	**1355**	**1061**	**4311**
none	38	13.7	12.1	14.0	13.4	22.0	15.7
Incomplete course	32	31.9	28.8	27.0	26.8	27.9	27.9
Course completed	30	47.5	47.0	44.0	46.3	35.0	43.1
Completed >7days	0	7.0	12.1	15.0	13.5	15.1	13.3
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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 birth weight group, babies of less than 2500g birth weight, 2003

Antenatal Steroid use	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	All babies
none	7	56	80	114	158	277	451	1143
Incomplete course	8	109	175	181	211	374	125	1183
Course completed	15	193	279	363	368	496	159	1873
Completed >7days	5	26	80	107	132	176	85	611
unknown	0	9	7	28	30	46	71	191
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**5001**
Percent								
none	20.0	14.6	13.0	14.9	18.2	20.9	55.0	23.8
Incomplete course	22.9	28.4	28.5	23.7	24.3	28.3	15.2	24.6
Course completed	42.9	50.3	45.4	47.5	42.3	37.5	19.4	38.9
Completed >7days	14.3	6.8	13.0	14.0	15.2	13.3	10.4	12.7
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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, 2003

Plurality	20-23	24-27	28-31	32-33	34-36	37-44	All babies
singleton	39	712	1542	710	991	1612	5606
Twins	10	233	598	305	210	37	1393
Triplets	2	26	83	42	17	0	170
Quadruplets	0	0	5	4	0	0	9
All babies	**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**
Percent							
singleton	76.5	73.3	69.2	66.9	81.4	97.8	78.1
Twins	19.6	24.0	26.8	28.7	17.2	2.2	19.4
Triplets	3.9	2.7	3.7	4.0	1.4	0	2.4
Quadruplets	0	0	0.2	0.4	0	0	0.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 6: Plurality by birth weight group, all babies, 2003

Plurality	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
singleton	24	291	446	561	614	912	678	687	693	472	228	5606
Twins	11	87	144	204	254	405	194	73	15	5	1	1393
Triplets	0	15	31	27	25	50	19	2	1	0	0	170
Quadruplets	0	0	0	1	6	2	0	0	0	0	0	9
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**762**	**709**	**477**	**229**	**7178**
Per cent												
singleton	68.6	74.0	71.8	70.7	68.3	66.6	76.1	90.2	97.7	99.0	99.6	78.1
Twins	31.4	22.1	23.2	25.7	28.3	29.6	21.8	9.6	2.1	1.0	0.4	19.4
Triplets	0	3.8	5.0	3.4	2.8	3.7	2.1	0.3	0.1	0	0	2.4
Quadruplets	0	0	0	0.1	0.7	0.1	0	0	0	0	0	0.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 7: Level of hospital of birth by gestational age group, all babies 2003

Level of birth hospital	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Born in non tertiary hospital	8	137	257	156	403	731	1692
Born in a tertiary hospital	41	822	1953	896	813	906	5431
Not born in a hospital	2	12	17	9	2	11	53
unknown	0	0	1	0	0	1	2
All babies	**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**
Per cent							
Born in non tertiary hospital	15.7	14.1	11.5	14.7	33.1	44.4	23.6
Born in a tertiary hospital	80.4	84.7	87.7	84.5	66.7	55.0	75.7
Not born in a hospital	3.9	1.2	0.8	0.8	0.2	0.6	0.7
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

Table 8: Level of hospital of birth by birth weight group, all babies, 2003

Place of birth	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
Born in non tertiary hospital	1	41	82	109	98	191	230	291	332	221	97	1692
Born in a tertiary hospital	34	346	532	677	791	1168	658	468	372	255	130	5431
Not born in a hospital	0	6	7	7	10	9	3	2	5	1	2	53
unknown	0	0	0	0	0	1	0	1	0	0	0	2
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**762**	**709**	**477**	**229**	**7178**
percent												
Born in non tertiary hospital	2.9	10.4	13.2	13.7	10.9	14.0	25.8	38.2	46.8	46.3	42.4	23.6
Born in a tertiary hospital	97.1	88.0	85.7	85.4	88.0	85.4	73.8	61.5	52.5	53.5	56.8	75.7
Not born in a hospital	0	1.5	1.1	0.9	1.1	0.7	0.3	0.3	0.7	0.2	0.9	0.7
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

Table 9: Method of birth by gestational age group, all babies, 2003

Mode of birth	20-23	24-27	28-31	32-33	34-36	37-44	All babies
vaginal	39	374	684	292	399	707	2495
vaginal with instruments	7	42	100	47	73	159	428
Caesarean section in labour	2	294	559	235	262	324	1676
Caesarean section- no labour	3	260	881	485	479	436	2544
Unknown	0	1	4	2	5	23	35
All babies	**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**
Percent							
vaginal	76.5	38.6	30.8	27.6	32.9	43.5	34.9
vaginal with instruments	13.7	4.3	4.5	4.4	6.0	9.8	6.0
Caesarean section in labour	3.9	30.3	25.1	22.2	21.6	19.9	23.5
Caesarean section- no labour	5.9	26.8	39.6	45.8	39.5	26.8	35.6
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

Table 10: Method of birth by birth weight group, all babies, 2003

Mode of birth	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
vaginal	7	143	182	216	252	480	320	299	283	210	103	2495
vaginal with instruments	3	23	23	17	45	80	52	59	51	50	25	428
Caesarean section in labour	4	75	167	218	216	338	223	149	133	99	54	1676
Caesarean section- no labour	21	152	249	339	384	469	291	252	230	111	46	2544
unknown	0	0	0	3	2	2	5	3	12	7	1	35
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**762**	**709**	**477**	**229**	**7178**
Per cent												
vaginal	20.0	36.4	29.3	27.3	28.1	35.1	36.1	39.4	40.6	44.7	45.2	34.9
vaginal with instruments	8.6	5.9	3.7	2.2	5.0	5.9	5.9	7.8	7.3	10.6	11.0	6.0
Caesarean section in labour	11.4	19.1	26.9	27.6	24.1	24.7	25.2	19.6	19.1	21.1	23.7	23.5
Caesarean section- no labour	60.0	38.7	40.1	42.9	42.8	34.3	32.8	33.2	33.0	23.6	20.2	35.6
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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, 2003

Transportation method	20-23	24-27	28-31	32-33	34-36	37-44	Grand Total
Non specialised transport [(a)]	2	40	62	39	80	212	435
Specialist transport team[(b)]	8	102	207	126	357	607	1407
All babies	**10**	**142**	**269**	**165**	**437**	**819**	**1842**
Per cent							
Non specialised transport [(a)]	20	28.2	23.0	23.6	18.3	25.9	23.6
Specialist transport team[(b)]	80	71.8	77.0	76.4	81.7	74.1	76.4
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

(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 birth weight group, babies transferred soon after birth, 2003

Transportation method	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	Allbabies
Non specialised transport[(a)]	0	12	21	30	32	41	57	64	89	62	25	435
Specialist transport team[(b)]	1	33	63	84	74	162	194	259	277	183	79	1407
All babies	1	45	84	114	106	203	251	323	366	245	104	1842
Per cent												
Non specialised transport[(a)]	0	26.7	25.0	26.3	30.2	20.2	22.7	19.8	24.3	25.3	24.0	23.6
Specialist transport team[(b)]	100	73.3	75.0	73.7	69.8	79.8	77.3	80.2	75.7	74.7	76.0	76.4
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

(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, 2003

Type of respiratory support		20-23	24-27	28-31	32-33	34-36	37-44	All babies
IPPV	number	49	870	962	330	531	940	3682
	median (hours)	384	176	47	33	46	49	
	IQR (hours)	37-890	51-561	22-104	17-70	22-85	97-22	
ECMO			1				8	9
NO		3	57	33	7	35	134	269
HFOV		19	171	78	16	28	93	405
Air leak		4	86	76	31	56	87	340
CPAP	number	22	803	1677	844	888	930	5164
	median (hours)	890	973	69	24	24	17	
	IQR (hours)	482-1155	657-1309	24-183	12 - 61	11 - 54	8 - 37	
Oxygen	number	49	918	1644	736	941	1237	5525
	median (days)	34	54	4	3	4	2	
	IQR	2-123	15-94	2 - 21	1 - 6	6 - 2	4 - 1	
All babies		**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**

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

Table 14: Respiratory support by birth weight group, all babies, 2003

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
IPPV											
number	33	370	484	465	308	473	363	402	393	274	117
Median (hours)	291	384	115	64	38	36	42	45	46	54	62
IQR	50-597	102-785	41-376	25-140	16-83	19-77	22-81	21-80	23-90	25-9	22-104
no IPPV (n)	2	23	137	328	591	896	528	360	316	203	112
CPAP											
number	16	277	542	645	579	1036	704	532	418	279	136
Median (hours)	814	825	526	158	54	32	24	21	18	16	17
IQR	347-1156	482-1104	210-833	48-448	20-138	14-76	12- 59	10- 50	8 - 44	8-41	8 -31
no CPAP (n)	19	116	79	148	320	333	187	230	291	198	93
Oxygen											
number	35	372	556	624	573	977	685	618	540	365	180
Median (days)	16	73	47	14	4	3	3	2	2	3	3
IQR	3-116	14-114	12-81	3- 43	1-11	1- 6	1 - 6	1 - 4	1- 4	2 - 7	2 - 6
no Oxygen (n)	0	21	65	169	326	392	206	144	169	112	49
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**762**	**709**	**477**	**229**

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

Table 15: Supplemental oxygen therapy by gestational age group, all babies, 2003

Oxygen therapy	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Oxygen therapy at day 28, n:	25	616	348	35	25	57	1106
survivors who had oxygen therapy on day 28, %	100	78.2	16.1	3.4	2.1	3.7	16.5
Chronic lung disease, n:	20	389	212	-	-	-	621
survivors who had chronic lung disease, %	90.9	48.9	9.7	-	-	0	20.8
Oxygen therapy after discharge to home, n:	11	166	67	10	7	25	286
All babies	**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**

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

Table 16: Supplemental oxygen therapy by birth weight group, all babies, 2003

	<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, n:	15	254	352	242	80	71	29	20	27	11	5	1106
survivors who had oxygen therapy on day 28, %	100	93.4	62.4	32.3	9.2	5.3	3.4	2.8	4.1	2.5	2.2	16.5
Chronic lung disease, n:	14	199	220	121	35	30	2	-	-	-	-	621
survivors who had chronic lung disease, %	93.3	71.8	39.7	17.5	5.6	3.9	3.2	-	-	-	-	20.8
Oxygen therapy after discharge to home, n:	8	88	84	39	7	16	2	-	-	-	-	244
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**762**	**709**	**477**	**229**	**7178**

(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.

Table 17: Exogenous surfactant use by gestational age group, all babies, 2003

Surfactant use	20-23	24-27	28-31	32-33	34-36	37-44	All babies
none	12	195	1428	826	894	1429	4784
survanta	39	773	795	232	316	210	2365
exosurf or both	0	0	0	1	1	1	3
unknown	0	3	5	2	7	9	26
All babies	**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**
Per cent							
none	23.5	20.1	64.2	78.0	73.8	87.1	66.9
survanta	76.5	79.9	35.8	21.9	26.1	12.8	33.1
exosurf or both	0	0	0	0.1	0.1	0.1	0
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

Table 18: Exogenous surfactant use by birth weight group, all babies, 2003

Surfactant use	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
none	5	68	199	404	661	1018	675	575	580	394	205	4784
survanta	30	324	421	386	237	346	212	182	122	81	24	2365
exosurf or both	0	0	0	0	0	1	0	0	1	1	0	3
unknown	0	1	1	3	1	4	4	5	6	1	0	26
All babies	35	393	621	793	899	1369	891	762	709	477	229	7178
Per cent												
none	14.3	17.3	32.1	51.1	73.6	74.6	76.1	76	82.5	82.8	89.5	66.9
survanta	85.7	82.7	67.9	48.9	26.4	25.3	23.9	24	17.4	17	10.5	33.1
exosurf or both	0	0	0	0	0	0.1	0	0	0.1	0.2	0	0.04
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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, 2003

Early head ultrasound results	20-23	24-25	26-27	28-29	30-31	Grand Total
None	12	208	390	678	1024	2312
Grade1	9	59	82	105	106	361
Grade 11	4	37	36	29	18	124
Grade 111	3	18	26	18	8	73
Grade 1V	12	42	38	11	6	109
not examined	11	17	18	32	193	267
All babies	**51**	**381**	**590**	**873**	**1355**	**3250**
Per cent						
None	30.0	57.1	68.2	80.6	88.1	77.6
Grade 1	22.5	16.2	14.3	12.5	9.1	12.1
Grade 11	10.0	10.2	6.3	3.4	1.5	4.2
Grade 111	7.5	4.9	4.5	2.1	0.7	2.5
Grade 1V	30.0	11.5	6.6	1.3	0.5	3.7
All babies	**100**	**100**	**100**	**100**	**100**	**100**

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 Birth weight, 2003

Grade of IVH	<499	500-749	750-999	1000-1249	1250-1499	Babies <1500
None	15	222	449	595	661	1942
Grade1	7	58	70	91	82	308
Grade 11	2	30	37	33	13	115
Grade 111	1	21	17	18	10	67
Grade 1V	4	36	35	24	6	105
not examined	6	26	13	32	127	201
All babies	**35**	**393**	**621**	**793**	**899**	**2741**
Per cent						
None	51.7	60.5	73.8	78.2	85.6	76.5
Grade1	24.1	15.8	11.5	12.0	10.6	12.1
Grade 11	6.9	8.2	6.1	4.3	1.7	4.5
Grade 111	3.4	5.7	2.8	2.4	1.3	2.6
Grade 1V	13.8	9.8	5.8	3.2	0.8	4.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**

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 birth weight, 2003

ROP	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-39	Grand Total
No ROP	4	94	317	650	419	37	7		1528
Stage1	5	52	89	71	27	2		1	247
Stage11	6	66	74	36	5				187
Stage111	6	50	30	6	5				97
Stage1V		3							3
ROP Rx	2	47	19	7	2				77
Not examined	1	8	12	70	231	24	6		352
Eligible	22	273	522	833	687	63	13	1	2414
Per cent									
No ROP	19.0	35.5	62.2	85.1	91.9	94.9	100	0	74.2
Stage1	23.8	19.6	17.5	9.4	5.9	5.1	0	100	12.0
Stage11	28.6	24.9	14.5	4.7	1.1	0	0	0	9.1
Stage111	28.6	18.9	5.9	0.8	1.1	0	0	0	4.7
Stage1V	0	1.1	0	0	0	0	0	0	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 birth weight group, babies of less than 31 weeks gestation or less than 1250g birth weight, 2003

Eye examination result	250-499	500-749	750-999	1000-1249	1250-1499	1500-2999	Eligible babies
No ROP	5	101	349	541	330	202	1529
Stage1		50	95	74	25	3	248
Stage11	5	67	68	40	6	1	187
Stage111	5	51	34	6	1		97
Stage1V		2	1				3
ROP Rx	4	39	28	6			77
Not examined		7	19	87	104	135	353
Eligibility	**15**	**278**	**566**	**748**	**466**	**341**	**2414**
Per cent							
No ROP	33.3	37.3	63.8	81.8	90.9	98.1	74.1
Stage1	0.0	18.5	17.4	11.2	7.1	1.5	12.0
Stage11	33.3	24.7	12.4	6.1	1.6	0.5	9.1
Stage111	33.3	18.8	6.2	0.9	0.3	0	4.7
Stage1V	0.0	0.7	0.2	0	0	0	0.1

Table 23: Septicaemia timing by gestational age group, all babies, 2003

Infection status	20-23	24-25	26-27	28-29	30-31	32-36	37-44	All babies
No infection noted	20	195	389	729	1237	2177	1536	6283
Sepsis, onset at <48 hours	3	27	21	28	21	30	36	166
Sepsis, onset at >48 hours	22	148	156	102	91	63	46	628
Sepsis, early and late onset **	0	2	11	7	8	6	11	45
Babies survived >2days	35	352	577	860	1346	2260	1616	7046
all babies	**51**	**381**	**590**	**873**	**1355**	**2279**	**1649**	**7178**
Per cent								
No infection noted *	39.2	51.2	65.9	83.5	91.3	95.5	93.1	87.5
Sepsis, onset at <48 hours *	5.9	7.1	3.6	3.2	1.5	1.3	2.2	2.3
Sepsis, onset at >48 hours +	65.7	42.6	27.4	11.7	6.8	2.9	3.0	9.1
Sepsis, early and late onset *	0.0	0.6	1.9	0.8	0.6	0.3	0.7	0.6

* Denominator for these calculations are all babies, n: 7178

\+ Denominator for this calculation is babies surviving beyond day 2, n: 7046

** These babies who had both early and late sepsis are not included in "sepsis at <48 hours" or "sepsis at >48 hours" groups

Table 24: Septicaemia timing by birth weight group, all babies, 2003

Infection status	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000+	All babies
No infection noted	25	209	433	656	813	1290	2906	6332
Sepsis, onset at <48 hours	2	19	25	23	17	23	57	166
Sepsis, onset at >48 hours	9	162	151	108	64	60	85	639
Sepsis, early and late onset**	2	9	7	6	6	3	57	90
Babies survived >2days	29	354	611	780	892	1358	3022	7046
all babies	**35**	**393**	**621**	**793**	**899**	**1369**	**3068**	**7178**
Per cent								
No infection noted*	71.4	53.2	69.7	82.7	90.4	94.2	94.7	88.2
Sepsis, onset at <48 hours*	5.7	4.8	4.0	2.9	1.9	1.7	1.9	2.3
Sepsis, onset at >48 hours+	31.0	45.8	24.7	13.8	7.2	4.4	2.8	9.1
Sepsis, early and late onset	5.7	2.3	1.1	0.8	0.7	0.2	1.9	1.3

***** Denominator for these calculations are all babies, n: 7178

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

** These babies who had both early and late sepsis are not included in "sepsis at <48 hours" or "sepsis at >48 hours" groups

Table 25: Transfer status and level of hospital if transferred, by gestational age group, all babies, 2003

Transfer hospital level	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Not transferred	36	500	897	435	646	1062	3576
Transferred to level 1 or 2	10	324	1198	559	489	405	2985
Transferred to level 3		62	78	36	45	103	324
NICU in Children's hospital	5	85	55	31	38	79	293
All babies	**51**	**971**	**2228**	**1061**	**1218**	**1649**	**7178**
Per cent							
Not transferred	70.6	51.5	40.3	41.0	53.0	64.4	49.8
Transferred to level 1 or 2	19.6	33.4	53.8	52.7	40.1	24.6	41.6
Transferred to level 3	0	6.4	3.5	3.4	3.7	6.2	4.5
NICU in Children's hospital	9.8	8.8	2.5	2.9	3.1	4.8	4.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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.

Table 26: Transfer status and level of hospital if transferred, by birth weight group, all babies, 2003

Transfer hospital level	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
Not transferred	28	217	281	336	387	536	452	442	420	304	173	3576
Transferred to level 1or 2	3	117	250	394	466	741	373	261	217	122	41	2985
Transferred to level 3	2	19	47	34	21	53	33	34	41	29	11	324
NICU in Children's hospital	2	40	43	29	25	39	33	25	31	22	4	293
All babies	**35**	**393**	**621**	**793**	**899**	**1369**	**891**	**762**	**709**	**477**	**229**	**7178**
Per cent												
Not transferred	80.0	55.2	45.2	42.4	43.0	39.2	50.7	58.0	59.2	63.7	75.5	49.8
Transferred to level 1 or 2	8.6	29.8	40.3	49.7	51.8	54.1	41.9	34.3	30.6	25.6	17.9	41.6
Transferred to level 3	5.7	4.8	7.6	4.3	2.3	3.9	3.7	4.5	5.8	6.1	4.8	4.5
NICU in Children's hospital	5.7	10.2	6.9	3.7	2.8	2.8	3.7	3.3	4.4	4.6	1.7	4.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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.

Table 27: Survival to discharge home at each week of gestation, all babies, 2003

gestational age (weeks)	All babies admitted	No. with discharge home date	Number with lethal congenital malformation	Number alive at day 7	Number alive at day 28	Number alive at discharge	Per cent survival at discharge
21	2	2	0	0	0	0	0
22	1	1	0	0	0	0	0
23	48	47	0	32	25	21	43.8
24	157	152	0	124	98	93	59.2
25	224	219	0	200	184	178	79.5
26	270	265	3	248	231	223	82.6
27	320	310	1	310	303	294	91.9
28	398	386	5	385	381	380	95.5
29	475	466	6	465	456	453	95.4
30	627	599	6	618	613	611	97.4
31	728	697	2	723	720	719	98.8
32	571	554	5	565	561	558	97.7
33	490	473	4	484	481	478	97.6
34	498	484	15	490	481	477	95.8
35	389	379	7	383	379	377	96.9
36	331	325	10	320	317	313	94.6
37	313	306	4	309	304	303	96.8
38	435	428	19	417	403	400	92.0
39	278	277	12	262	257	254	91.4
40	363	360	14	345	338	335	92.3
41	218	216	2	208	207	205	94.0
42	40	40	1	36	35	35	87.5
43	2	2	0	2	2	2	100.0
All babies	**7178**	**6988**	**116**	**6926**	**6776**	**6709**	**93.5**

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: Median length of stay in the hospital by gestational age group, 2003

Days to discharge	20-23	24-27	28-31	32-33	34-36	37-44
Median (days)	142	94	51	30	18	11
Interquartile range	120 – 150	79 – 115	40 – 65	24 – 39	12 – 25	7 – 20
Survivors with discharge data	**20**	**764**	**2084**	**1003**	**1137**	**1515**

Notes 1. Discharge data are available for 6523 of the 6709 (97.2%) surviving babies.

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

Table 29: Survival to discharge home by birth weight group, all babies, 2003

Birth weight group (grams)	All babies admitted	No. with discharge home date	Number with lethal congenital malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
<499	35	35	1	22	15	13	37.1
500-749	393	383	4	331	291	272	69.2
750-999	621	603	2	593	570	564	90.8
1000-1249	793	769	11	770	755	749	94.5
1250-1499	899	874	8	885	876	870	96.8
1500-1999	1369	1316	14	1351	1341	1333	97.4
2000-2499	891	865	19	877	864	858	96.3
2500-2999	762	747	17	740	728	724	95.0
3000-3499	709	699	26	679	668	662	93.4
3500-3999	477	474	13	454	444	441	92.5
4000-7000	229	223	1	224	224	223	97.4
All babies	**7178**	**6988**	**116**	**6926**	**6776**	**6709**	**93.5**

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 30: Days until discharge from hospital by birth weight group, 2003

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)	126	113	85	66	48	36	22	14	12	11	9
Interquartile range	108–134	97–134	71–102	53–77	37–59	29–45	16-30	9–22	7–19	7–19	6–15
Survivors with discharge data	**13**	**263**	**546**	**725**	**845**	**1282**	**832**	**709**	**653**	**438**	**217**

Notes 1. Discharge data are available for 6523 of the 6709 (97.2%) 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 by gestational age group, babies registered to level II units, 2003

Gestational age (completed weeks)	Number	Cumulative per cent
Less than 28	5	1.4
28-29	15	5.7
30-31	33	15.2
Babies less than 32 weeks	**53**	
32-33	48	29.0
34-36	109	60.3
37-39	77	82.5
More than 39	61	100
all babies	**348**	

Table 32: Number of babies by birth weight group babies registered to level II units2003

Birth weight group (grams)	Number	Cumulative per cent
500-749	1	0.3
750-999	2	0.9
1000-1249	12	4.3
1250-1499	27	12.1
Babies less than 1500g	**42**	
1500-1999	52	27.0
2000-2499	66	46.0
2500-2999	64	64.4
3000-3499	53	79.6
3500-3999	58	96.3
4000-7000	13	100
All babies	**348**	

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

Table 33: Survival to discharge by gestational age group, babies registered to level II units, 2003

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	5	5	-	3	3	3	60
28-29	15	14	-	15	15	15	100
30-31	33	32	-	33	33	33	100
32-33	48	46	-	48	48	48	100
34-36	109	104	-	109	109	109	100
37-39	77	76	-	76	76	76	98.7
More than 39	61	59	-	60	60	60	98.4
all babies	**348**	**336**	**-**	**344**	**344**	**344**	**98.9**

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 by gestational age group, level II units, 2003

Type of respiratory support	less than 28 weeks	28-31	32-33	34-36	37-44	All babies
IPPV n	5	15	3	3	5	31
median (hours)	23	28	32	36	10	
no IPPV (n)	0	33	45	106	133	317
data not available	—	—	—	—	—	—
Air leak (with drainage)- n	1	0	1	1	3	6
CPAP n:	3	41	42	106	137	328
median (hours)	309	42	26	18.5	14	
interquartile range (hours)	—	20-80	13-59	13-43	9-26.5	
no CPAP (n)	2	7	6	3	2	20
data not available	—	—	—	—	—	—
Oxygen n:	3	23	30	62	80	198
Median (days)	41	3	2	2	2	
Interquartile range (hours)		2-9	1-5	1-4	1-5	
no oxygen (n)	2	25	18	46	56	147
data not available	—	—	—	—	—	—
Oxygen therapy after discharge to home	—	2	—	—	—	1
All babies	5	48	48	109	138	348

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 11 units

Early head ultrasound results	<30	30-31	All babies
None	17	24	41
Grade 1 or 11	-	-	-
Grade 111 or 1V	-	-	-
Not examined	3	9	12
All babies	**20**	**33**	**53**

Table 36: Retinopathy of prematurity by gestational age group, babies of less than 32 weeks gestation registered to level 11 units

ROP	<30	30-31	All babies
none	13	27	40
stage 1 or 2	3	1	4
stage 3 or 4			
not examined	4	5	9
All babies	**20**	**33**	**53**

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 multicentre 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. 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. Including 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[1]

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

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 birth weight 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.

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.
4: 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

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: e*xclusion 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 (FiO2), between admission to NICU and 12 hours after birth. Appropriate range is when: arterial PaO2 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 FiO2 recorded as a percentage.
Guide for use: as for temperature on admission; use '0' to denote missing.

Lowest appropriate inspired oxygen

Definition: Lowest appropriate FiO2, between admission to NICU and 12 hours after birth - as for Highest appropriate inspired oxygen.
Coding: 3-digit number representing FiO2 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 mmol/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 (O2) 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 - echocardiac (shunting or clinical evidence - O2 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 (O2 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 interstitialemphysema, pneumomediastinum, pneumopericardium, 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 baby7.
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 (O2) ceased appropriately.
Coding: DD / MM / YYYY
Guide for use: Four consecutive hours in any 24 hour period constitutes a 'day'. Any route for O2 administration is included. If O2 is ceased and then required again for the same illness, use the final date of O2. Do not include

O2 days for subsequent illnesses eg RSV or surgery. Date is used to calculate O2 use.

Chronic lung disease

Definition: The baby received respiratory support (supplemental O2 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 malformation.
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 flammeus; non cavernous, 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 malformation; 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

Mekel'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 arteriosus or foramen ovale (GA <37 weeks/BW < 2500g); mild, trivial or physiological valvular regurgitation;

cardiomegaly; dextroposition 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, cephalhaematoma; cystic fibrosis; enzyme deficiencies; hydrops fetalis; meconium ileus; metabolic disorders; pyloric stenosis; sternomastoid tumour; torticollis; volvulus

1.4 Abbreviations

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

1. 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)
2. CI – confidence intervals
3. HMD- hyaline membrane disease - a disorder of the respiratory system
4. ICD 10-AM -International Classification of Diseases number 10 -Australian modification codes congenital mal-formations, diseases and procedures.
5. IPPV - intermittent positive pressure ventilation - a mechanical support for breathing.
6. IVH intraventricular haemorrhage - a disorder of the immature brain with bleeding into the ventricles in the head.
7. IQR – Inter quartile range
8. Level II a nursery for babies who require intermediate care, see section 3.2
9. Level III a nursery for babies who require intensive care, see section 3.2
10. n - number
11. NEC necrotising enterocolitis - a disorder of the gut.
12. NHMRC - National Health and Medical Research Council of Australia - peak health body
13. NICU neonatal or newborn intensive care unit
14. O_2 - oxygen - normal air is 21% oxygen.
15. 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).
16. ROP - retinopathy of prematurity - disorder of the developing eye sepsis overwhelming infection of the blood stream by toxin-producing bacteria - also known as septicaemia.
17. NZ - New Zealand - capital city - Wellington
18. States and Territories of Australia - capital city
19. ACT - Australian Capital Territory - Canberra
20. NSW - New South Wales - Sydney
21. NT - Northern Territory - Darwin
22. Qld - Queensland - Brisbane
23. SA - South Australia - Adelaide
24. Tas - Tasmania - Hobart
25. Vic - Victoria - Melbourne
26. WA - Western Australia - Perth

Appendix 2:

Publications by the staff of ANZNN units, 2003

2.1: Journal Articles

Askie, L.M., Henderson-Smart, D.J. L. Irwig, and J.M. Simpson, Oxygen-saturation targets and outcomes in extremely preterm infants. *New Engl J Med*, 2003. 349(10): p. 959-967.

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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 3: ANZNN documentation

3.1 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.

3.2 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.

3.3 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.

Principles of ownership and maintenance of data

1. The ANZNN will be responsible for collection and maintenance of the data set and decisionmaking 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.

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.

3.4: 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, deidentified 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.

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.