Report of the Australian and New Zealand Neonatal Network 2001

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Deborah Donoghue
and the ANZNN

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The ANZNN
would like to thank our sponsors,
the level III nurseries of
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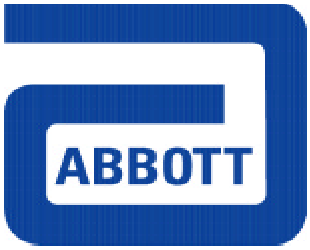

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Australian & New Zealand Neonatal Network 2001

Deborah Donoghue
and the ANZNN

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Acknowledgements

The Australian and New Zealand Neonatal Network is a truly collaborative effort, with its aims and objectives only achieved through the cooperation, perseverance and hard work of many people. Those people are primarily located in the participating units and form the backbone of the network. We wish to formally acknowledge their support and effort by listing them below.

There are many other people in nearly three hundred hospitals across Australia and New Zealand who give us their time and effort. We would like to thank those people here.

We also thank the members of our Advisory Committee whose conceptual, intellectual and financial contributions have helped make this network a respected and recognised organisation.

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

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Timaru Hospital:
Philip Morrison (Director) & Sheliah O'Sullivan.

Wairau Hospital:
Graham Cross & Ken Dawson (Director)

Wanganui Hospital:
John Goldsmith (Director) & Neil Mackenzie.

Whakatane Hospital:
Chris Moyes (Director), Marlon Radcliffe & Dharm Ramadas.

Whangarei Area Hospital:
Lynne Clarke, Toni Fergus, Mark Goodman & Peter Jankowitz (Director).

1. Organisation of the ANZNN

1.1 History

In July 1993, the Directors of the Australian level III Neonatal Intensive Care Units (NICUs) 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'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 Structure

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

The Advisory Committee is made up from the Directors (or their nominee) of each participating unit and the academic neonatologists 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 formally once a year, in association with the Perinatal Society of Australia and New Zealand's annual congress. These meetings were held in Canberra in the Australian Capital Territory in 2001, Christchurch New Zealand in 2002, and at Hobart in Tasmania in March 2003.

The Executive Committee represents various areas of the network and is concerned with the general running and decision making.

The Executive includes Kaye Bawden from Monash Medical Centre who brings her expertise as an audit officer and follow-up coordinator. David Cartwright is the Director of Neonatology at Royal Women's Hospital in Brisbane, and has a special interest in databases. Brian Darlow is Professor of Paediatrics at Christchurch School of Medicine and a neonatologist at Christchurch Women's Hospital, New Zealand. A/ Professor Paul Lancaster at the Department of Paediatrics, University of New South Wales is a perinatal epidemiologist. David Henderson-Smart 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. John Doran was elected to the Executive in 2003 to represent level II units and is the Director of the nursery at Taranaki Hospital in New Plymouth, New Zealand. Penny Waterson, then chairperson of SANDS Australia and a member of Maternity Alliance was our consumer representative until March 2001.

Staff members of the network include Deborah Donoghue who has been the coordinator / researcher since the network's inception. Anne Cust ably filled the Project Officer's position from August 99 until the end of 2001, when Rachel Jones took on the role. The Project Officer is primarily responsible for the level II nurseries and the day to day running of the audit.

1.3 Funding

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

Funding also comes from the annual contribution of each level III unit, in return for their membership of the network and the annual individual unit feedback. This was a voluntary and unanimous decision by the tertiary centres.

2. Data set

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 old; or
- received major surgery.

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

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

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

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

2.2 Data set variables

The variables and their definitions for the 2001 audit are listed in Appendix 1. There were several changes to the variables collected this year.

Those added to the data set include:
- Indigenous status
- Retinopathy of prematurity threshold disease present

Variables that replace previous versions are:
- Baby meets local criteria for eye examination replaces the item retinopathy of prematurity examination.
- Hours of intermittent positive pressure ventilation replaces the previous item days of intermittent positive pressure ventilation.
- Hours of continuous positive airways pressure replaces days of continuous positive airways pressure.

As reported in previous years most units collected the complete data set and we continue to use the data available for the audit as long as it meets the agreed definitions. Data which are expressed as percentages exclude missing and unknown data.

2.3 Data collection

Data are collected in the participating units by either filling out the specific ANZNN forms or by incorporating the ANZNN data items into the local audit. Data are then transferred to the ANZNN database either electronically or on paper forms. Confidentiality guidelines (Appendix 5.3) are followed. Identifying information is removed and replaced by codes at the individual units.

2.4 Data verification

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

3 Results - babies registered to level III nurseries

3.1 In general

In 2001, 6805 babies were born who met the criteria for the Australian and New Zealand Neonatal Network's (ANZNN) high-risk audit and were admitted to one of the 28 level III neonatal intensive care units (NICUs) throughout Australia and New Zealand. Of these, 3250 babies were born at less than 32 completed weeks gestation (Figure 1 page 11; Table 1 page 26) and 2791 were born weighing less than 1500 grams (Table 2). Assisted ventilation (intermittent positive pressure ventilation (IPPV) and/or continuous positive airways pressure (CPAP) was given to a total of 5877 babies. There were 858 babies who received major surgery.

Live births for both countries totalled 302193 in 2001 (Australian Bureau of Statistics, 2002; Statistics New Zealand, 2003). This is a decrease from the 313981 babies born in 1995. The ANZNN level III cohort now represents 2.25% of all live births in the two countries. This rate has steadied in the past few years (2.25% in 1999 and 2.23% in 2000), but did demonstrate a significant increase from 1.8% in 1995, 1.96% in 1996, 2.0% in 1997 and 2.08% in 1998. This appears to be due to both the increasing numbers of mildly preterm babies receiving assisted ventilation, and the increasing number of very preterm babies born alive (Figures 1 and 2, Nassar and Sullivan, 2001).

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

In this report, babies are referred to as 'very preterm' if they are born at less than 32 completed weeks gestation, 'preterm' if they are born at less than 37 completed weeks' gestation, and 'term' if born at 37 weeks' gestation or more.

Data in the tables are by birthweight group and gestational age group (adapted from WHO groups and NSW Health's role delineation guidelines). Data in figures are given by gestational age divisions. In our region, gestation is well documented, and it is gestation that is known prior to the birth not the weight.

3.1.1 Babies born in Australia

In 2001, 246394 babies were registered in Australia (Australian Bureau of Statistics, 2002). Of these, the ANZNN high-risk criteria were fulfilled by 5241 (2.13%) babies cared for in the 22 Australian level III units. There were 2619 babies in the category of those born at less than 32 weeks gestation (1.06% of the live births in Australia for the year). There were 2232 babies who weighed less than 1500 grams at birth (0.91% of live born babies that year). Of the 4432 babies (1.80% of all live births) who received assisted ventilation, 1260 (28.4%) had CPAP as their only form of assisted ventilation. Seven hundred and thirty-one babies had major surgery.

3.1.2 Babies born in New Zealand

In New Zealand there were 55799 babies born alive in 2001 (Statistics New Zealand, 2003). Of these, 1564 (2.80% of live born) babies were cared for in one of the six New Zealand level III units and met our registration criteria.

Six hundred and thirty-one babies were born at less than 32 weeks gestation and received level III care (1.13% of live births) as were 559 (1.00%) babies born weighing less than 1500 grams. Major surgery was received by 127 babies. Assisted ventilation was given to 1450 babies (2.60% of live births), with more than half (n: 899, 62.0%) receiving CPAP only.

In 2001, an additional 363 babies met our criteria for the audit and were registered to a participating level II unit. These babies are discussed in Section 4 (page 22). Currently, the 14 level II nurseries in New Zealand and the level II nursery in Tasmania are members of the ANZNN.

3.1.3 Registrants per unit

During 2001, the number of babies who met the criteria for this audit ranged from approximately 70 to 550 babies per unit (Figure 3). These numbers reflect the size of the unit, the case mix of their patients and the geography and population distributions in both countries.

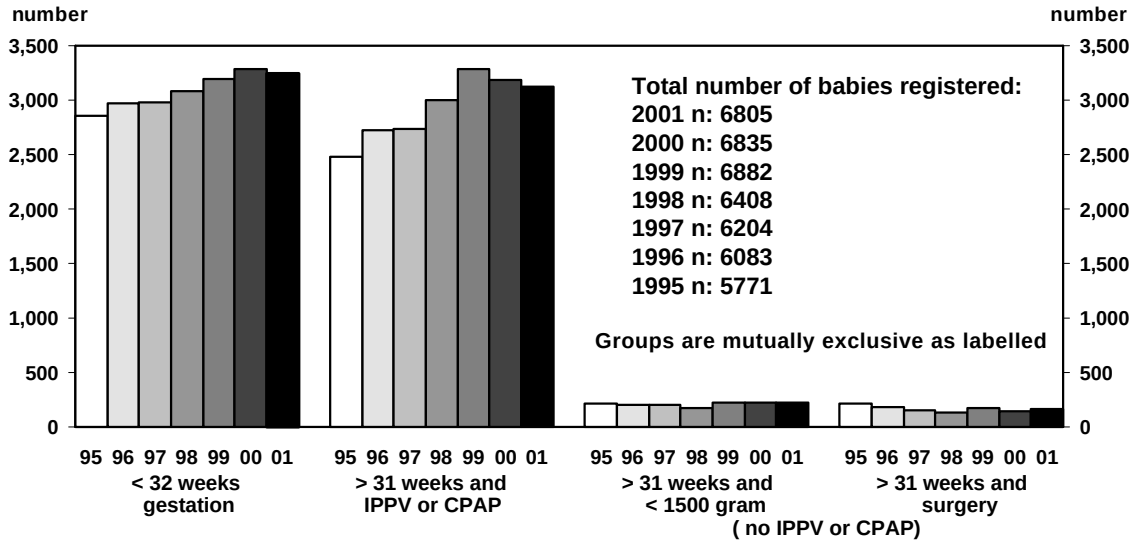

Figure 1: Number of babies in the ANZNN cohort by registration criteria, 1995-2001

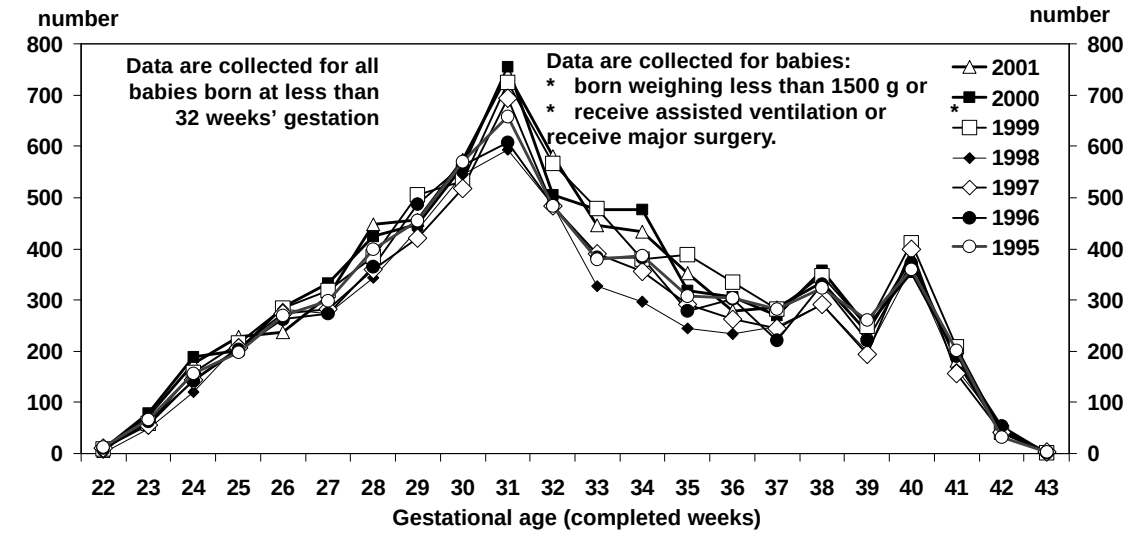

Figure 2: Number of babies in the ANZNN cohort by gestational age, 1995-2001

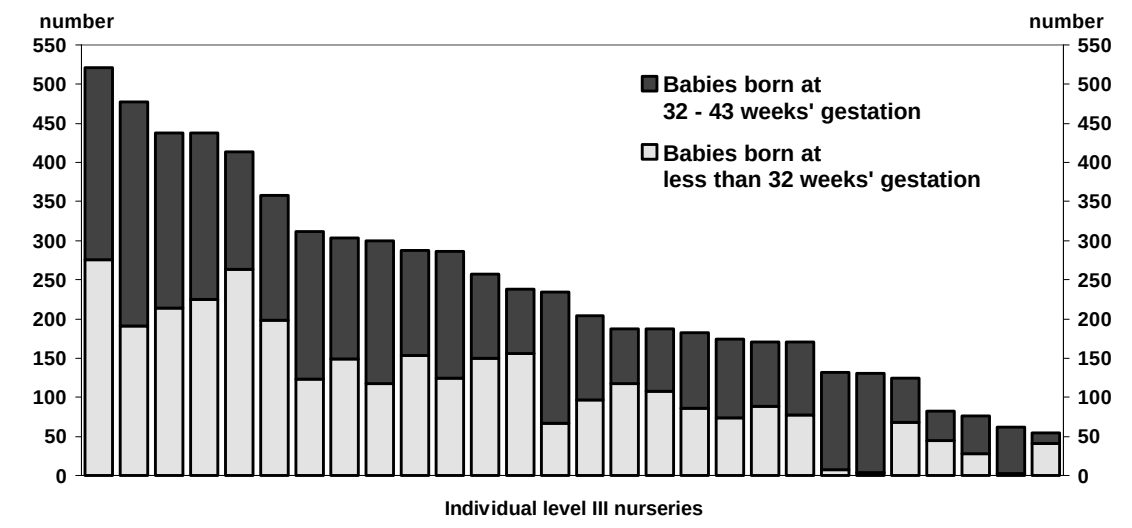

Figure 3: Number of babies in the ANZNN cohort by registration NICU, 2001

3.1.4 Levels of neonatal care

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.

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

Level III or intensive care refers to the care of newborn infants who require more specialised care and treatment. It includes most babies born at less than 32 weeks gestation or less than 1500 grams birthweight, and others who may require intravenous feeding, and/or surgery, and/or cardio-respiratory monitoring for management of apnoea or seizures, and/or require assisted ventilation (IPPV or CPAP), and/or supplemental oxygen over 40% or long-term oxygen.

Hospitals with a level III NICU 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 2001 (after amalgamation of the two units in Western Australia). 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 the high-risk babies, but factors known to affect the risk of preterm birth are noted. Data are collected per baby, not by confinement or pregnancy. For example, if the mother's age is either lower or higher than average, this can be associated with poor outcome. For ANZNN babies born at less than 32 weeks gestation, there were significantly more babies born to teenage mothers (6.82% (95% Confidence Interval (CI): 5.97 - 7.75%) compared to 5.1% in Australia in 1999) and to mothers over 34 years ((20.2% CI: 18.8-21.6%) compared to 16.4% for Australia in 1999; Nassar & Sullivan, 2001, Stats New Zealand, Figure 5).

Ethnicity as identified by the mother is reported for 99.4% of babies registered in New Zealand. Mothers identified themselves as Maori for 21.7% of the babies, as Pacific Islander for 11.8%, as Caucasian for 59.9% of babies and asian and other for the remaining 6.6%. These figures are similar to those reported for the New Zealand population (Demographic Trends 2002).

Ethnicity continues to be poorly documented for babies registered to Australian units however, compliance has improved from 75.6% in 2000 to 86.8%. Of those mothers with reported ethnicity, 84.7% were Caucasian. Mothers were identified as Aboriginal or Torres Strait Islander for 6.22% of babies, a rate higher than that seen in the Australian population (3.4%, Australian Bureau of Statistics 2001).

3.3 Antenatal events

3.3.1 Antenatal corticosteroids

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

This therapy was given to the mothers of 2618 (87.2%) babies born at less than 32 weeks gestation. (Tables 3 and 4, Figure 6; treatment is considered to be 'complete' when two or more doses of steroids are given with at least one dose 24 hours prior to the birth. 'Incomplete' is when steroids are given less than 24 hours or more than a week before the birth; data were available for 93.4% of babies). Recent questions about the number of courses that should be given are evident in the pattern of data (Figure 6) and a trial is currently underway.

The range between units of the use of any antenatal corticosteroids for inborn babies of less than 32 weeks gestation had a median of 91.6% and an interquartile range of 88.6% to 94.8%.

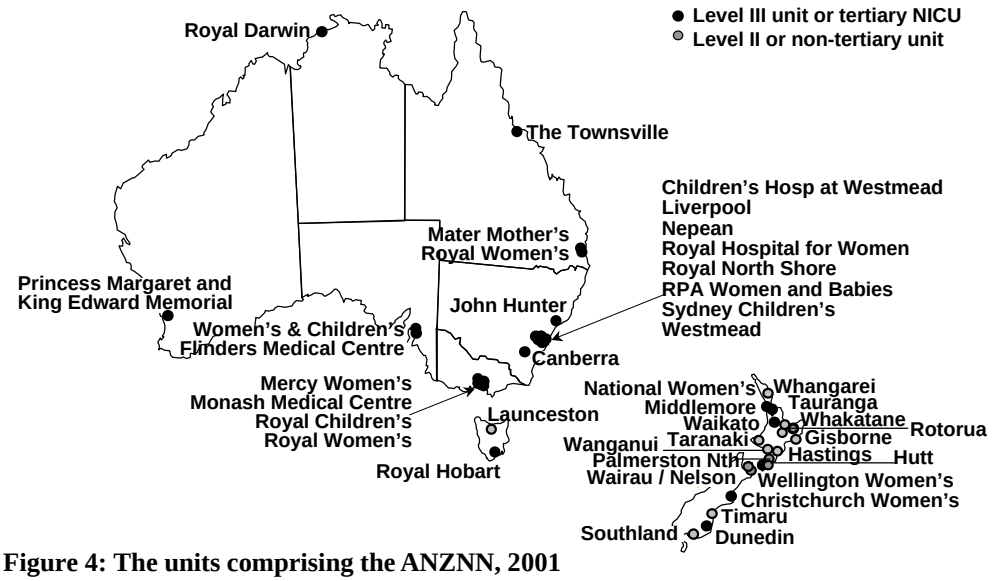

Figure 4: The units comprising the ANZNN, 2001

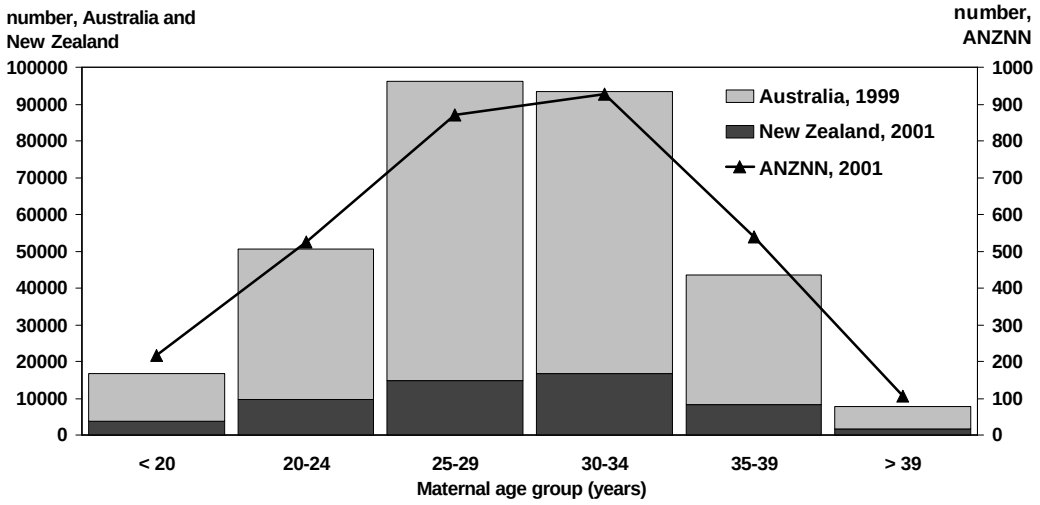

Figure 5: Maternal age for Australian (1999) and New Zealand (2001) confinements, and for ANZNN babies born at less than 32 weeks gestation, 2001

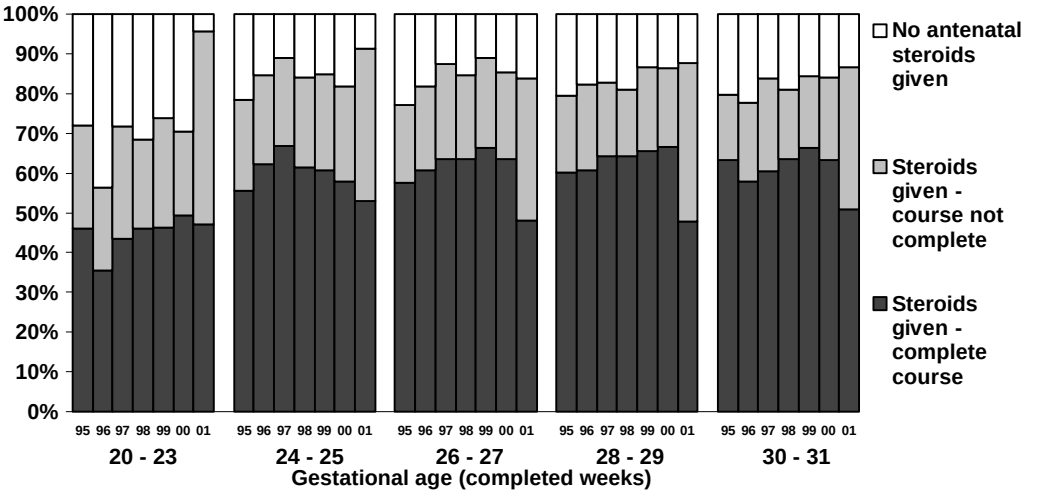

Figure 6: Antenatal corticosteroids, babies born at less than 32 weeks gestation, 1995-2001

3.3.2 Antenatal problems

Data were collected on the obstetric or antenatal problem that led to the mother's most recent stay in hospital, thus leading to the baby's birth and subsequent admission to NICU. Preterm labour was the predominant (n: 1295, 40.1%) presenting problem for babies born at less than 32 weeks gestation (Figure 7). The less mature the baby, the more likely preterm labour was to be the precipitating factor for birth (from 70.0% at less than 24 weeks to 33.9% at 34 to 36 weeks). Pre-labour, preterm, rupture of the membranes (PPROM) accounted for another 22.5% (n: 727) of babies. Data are presented for the number of babies (not the number of confinements) and were recorded for 99.3% of cases.

In the mildly preterm group (born at 32 to 36 weeks gestation), the main presenting problem remained preterm labour (n: 685, 33.4%). However, other complications also lead to the baby's birth. PPROM (n: 344, 16.8%) and pregnancy induced hypertension (n: 307, 15.0%) accounted for another third of the problems.

For half (n: 631, 49.8%) of the babies born at term, no antenatal problem that could be identified on admission to hospital or the labour ward. However, in this selected group of high-risk babies, 266 (18.9%) babies were noted to have 'fetal distress' and 160 (11.0%) had 'antenatal detection of a fetal malformation'.

3.4 The baby

3.4.1 Multiple births

Babies from multiple births have an increased risk of being preterm and of having other morbidities independent of their prematurity (NHMRC, 1997)

A total of 1492 (21.9%) babies in our cohort were from a multiple birth with 162 (2.4%) babies born from triplet pregnancies and three babies (0.04%) were from quadruplet pregnancies (Tables 5, 6).

Nearly a third (29.3%) of babies born at less than 32 weeks were from a multiple birth. Two-thirds of the triplets (69.8%) and all of the quadruplets were very preterm. A quarter (24.1%) of mildly preterm babies, born at 32 to 36 weeks gestation, were from multiple births. However, term babies had a similar rate of multiple pregnancies (2.60%) as the general population of Australia (2.8%, Australian Bureau of Statistics 1997) and New Zealand (3.17%, Stats NZ, 2003).

3.4.2 Gender

Each year, slightly more male babies are born than female babies, with boys accounting for 51.3% of all live births in Australia in 2001 (Australian Bureau of Statistics, 2002).

The proportion of males in our cohort was 57.6% (n: 3920) compared to 42.4% females (n: 2883). For babies born at less than 32 weeks gestation, 54.3% (n: 1766) were male. This proportion rose to 62.4% for babies born at term. Gender was not able to be determined for two babies.

3.5 Birth

3.5.1 Place of birth

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

The majority of babies of less than 33 weeks gestation in our cohort were born in a perinatal centre (n: 3377; 88.2%). Of those, about half (52.7%, n: 1778) had mothers who had booked into that tertiary unit. As expected, at term the proportion of babies born in a tertiary centre decreased to 52.8% (n: 773). Overall, 76.6% of the babies in our cohort were born in a perinatal centre (Tables 7 and 8).

3.5.2 Method of birth

The method of birth varied with gestational age (Tables 11 and 12). However more than half (57.1%) were born by caesarean section, and of these half (58.4%) occurred before the onset of labour (also known as an 'elective' caesarean). This proportion was similar for all age groups. Data were available for 99.8% of babies.

The caesarean section rate for all confinements in Australia in 1999 was 21.9%. Notably, this rate rose to 48.7% for twin pregnancies and to 56.4% for singleton babies born at 500 to 1500 grams. Pregnancies where the baby presented in the breech position at term were mostly delivered by caesarean (82.4%, Nassar and Sullivan, 2001).

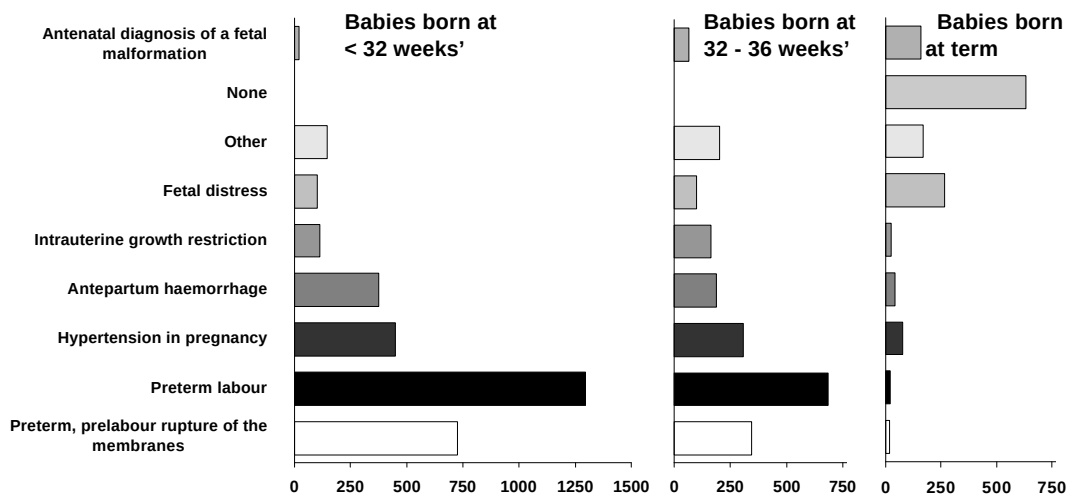

Figure 7: Presenting antenatal problem by gestational age group, 2001

At term, babies are usually born with their head presenting first in the vagina (cephalic, 94.9% of all confinements in Australia, Nassar and Sullivan, 2001). For the term babies in our cohort, 93.4% were cephalic and 5.4% were breech (data available for 96.1% of cases). For the babies born at less than 32 weeks gestation, presentation was 64.2% cephalic and 30.2% breech.

3.5.3 Condition at birth

The Apgar score is a clinical indicator used to note a baby's condition at birth and is scored from 0 to 10. A low score (less than 4 at one minute) indicates that a baby that needs assistance with their adaptation to extrauterine life in the form of specialised resuscitation. The rate for this happening to Australian babies is 2.3% each year (Nassar and Sullivan, 2001). In the ANZNN cohort, 22.3% (n: 324) term babies had a low Apgar score as did 558 (17.3%) babies born at less than 32 weeks. This suggests that a need for assistance at birth can occur at any gestation, and that all staff attending a birth should be skilled in resuscitation. Data available for 99.3% of babies.

NHMRC's clinical practice guidelines for care around preterm birth (1997) recommends that ideally, very preterm births should be attended by NICU staff, and those less than 34 weeks should be attended by someone with up-to-date skills in endotracheal intubation (passing a tube into the windpipe). Overall, 1921 babies in our cohort were intubated in labour ward to aid resuscitation at birth, including 371 (42.2%) babies of less than 32 weeks (99.9% data available)

3.5.4 Transfer after birth

The reason for a baby's transfer after birth may include a precipitous preterm birth in a hospital without a NICU; or no that bed was available in the hospital of birth. The reason could also be that this is a pre-planned birth in a hospital with a NICU to ensure a managed transfer to a specialised children's unit; or the unexpected need for intensive care treatment in a term baby, such as ventilation for meconium aspiration syndrome.

After birth, a total of 1377 babies were transferred to a level III NICU by a specialist retrieval team who have training for the care of the sick newborn and specialised equipment ("retrieved", Tables 9 and 10). Nearly half (45.6%, n: 628) of those retrieved babies were born at term. Most of the retrieved babies (n: 1261, 91.6%) were born in a non-tertiary centre, but 87 (6.32%) were transferred from another hospital with a NICU. Of the babies retrieved from a tertiary centre, 65 (74.7%) were term or mildly preterm and received surgery.

For the extremely preterm babies (born at less than 28 weeks gestation), 95 were retrieved after birth and another 20 were brought to the tertiary centre by other means.

A total of 262 (16.0% of all those babies who were transferred) babies were transferred by a non-specialist team such as an ambulance or the flying doctor service. More than half of these babies were born either mildly preterm or at term were and transferred from a non-tertiary hospital (n: 151, 57.6%).

3.6 Morbidity

There is a high rate of morbidity amongst babies who are admitted to a level III neonatal intensive care unit. These are principally associated with preterm birth or complications arising in babies born at term such as the need for respiratory assistance or major surgery.

The registration criteria for this audit has selected those newborn babies most at-risk of morbidity. The outcomes reported are those identifiable while the baby is in hospital, and relate to the objectives of the ANZNN or to clinical indicators being developed by the ANZNN. Many of these outcomes have also been shown to be predictors of later morbidity.

3.6.1 Respiratory distress

The adaptation to life outside the uterus can cause problems for both preterm and term babies. Respiratory distress is a major cause of morbidity and accounts for a large proportion of the use of resources in these high-risk babies. As receiving respiratory assistance for four or more hours is an eligibility criterion for this audit, only 586 (8.61%) babies did not have respiratory support.

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

Of the babies admitted to a level III NICU in 2001, assisted ventilation was given to 5882 (Tables 13 and 14). The most common form of ventilation was a combination of IPPV and CPAP (n: 2247). 'CPAP only' was given to 2159 babies, an increase on last year and a continuing trend observed since 1995 (Figure 6). 'IPPV only' was given to 1476 babies.

In 2001 the duration of ventilation was collected in 'hours' rather than the previous 'days' (a 'day' was defined as 4 or more hour in any one 24 hour period). IPPV was given to babies in our cohort for a total of 637 642 hours (26568 days). CPAP was delivered for 916 245 hours (38179 days, Tables 13 and 14; Appendix 1).

The treatment and aetiology of respiratory distress changes with maturity (Figure 7), thus gestational age groups are discussed separately.

3.6.1.1 Babies born at less than 32 weeks gestation

All babies admitted for care at less than 32 weeks gestation are part of this audit. Hence 297 babies (9.1%) received no respiratory support of any kind, including supplemental oxygen. Another 2757 (84.8%) babies had mechanical assistance with breathing (IPPV and/or CPAP). Of these, a quarter (24.4%, n: 792) had CPAP as their only form of ventilation (Figures 8 and 10).

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 481666 hours. Duration of CPAP was 817558 hours (87.0% of total CPAP hours). HMD was the predominant respiratory diagnosis for babies born at less than 32 weeks gestation (n: 3181, 68.3%, Figure 9).

High-frequency oscillation is a specialised form of mechanical ventilation given at 8-15 cycles per second, in contrast to conventional IPPV which is given at about one breath per second. Of the 1965 very preterm babies given IPPV, 328 (16.7%) had high-frequency oscillation.

Nitric oxide is a gas inhaled in very tiny amounts to dilate the pulmonary blood vessels and is used primarily to treat pulmonary hypertension (Barrington & Finer 2003; Finer & Barrington 2003). Nitric oxide was given to 75 babies (3.82% of those receiving IPPV).

A pulmonary airleak requiring any drainage was reported in 163 babies (8.30% of those ventilated, an increase from last year's 5.2%).

Oxygen therapy continues to be measured in "days" as before. This therapy was given to most of the babies (88.1%) in this group, for a total for 94298 oxygen 'days'. Supplemental oxygen was given to 283 babies (9.78% of survivors) after they went home from hospital. Most of these babies (n: 205, 72.4%) were born at less than 28 weeks gestation (Table 15).

Chronic lung disease is defined as babies born at less than 32 weeks gestation who require respiratory support (supplemental oxygen and/ or assisted ventilation) at 36 weeks post menstrual age (PMA, gestational age plus age after birth, measured in weeks). There were 740 babies who met this definition (25.3% of survivors, Tables 15 and 16). In some areas, the definition for chronic lung disease is a supplemental oxygen requirement at 36 weeks PMA; 738 babies met this definition.

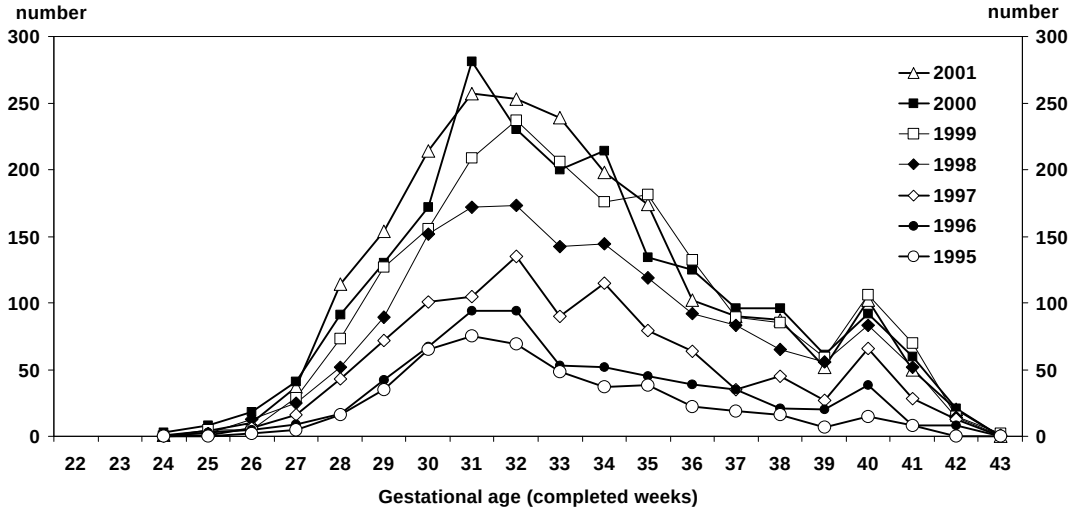

Figure 8: Number of babies with CPAP as their only form of assisted ventilation, by gestational age, 1995-2001

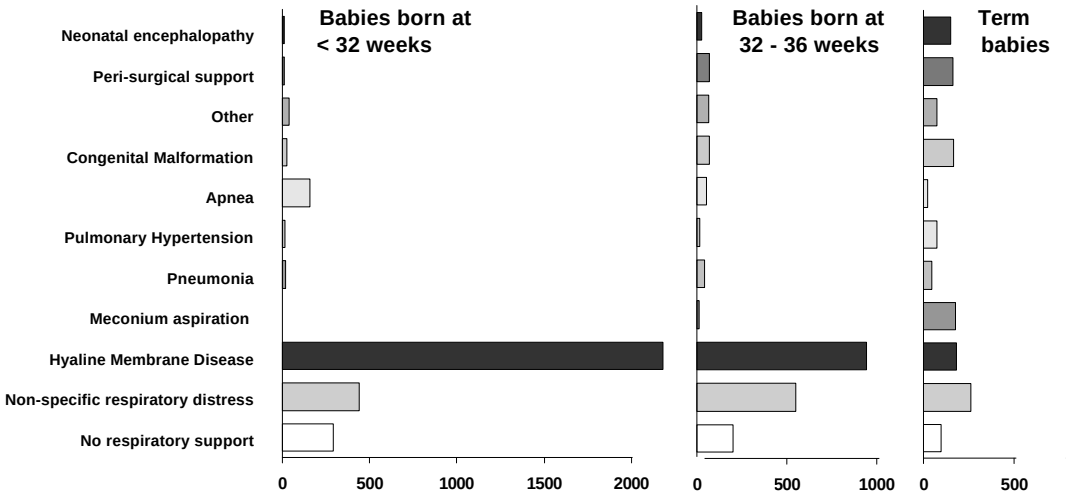

Figure 9: Respiratory diagnosis by gestational age group, 2001

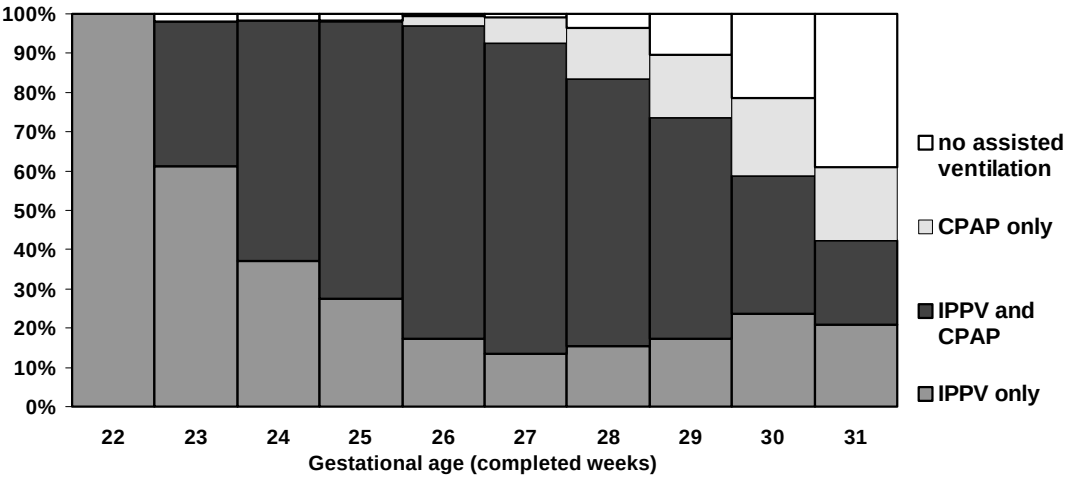

Figure 10: Type of ventilation by gestational age, 2001

3.6.1.2 Babies born at 32 to 36 weeks gestation

The audit criteria primarily involves ventilatory assistance in this gestational age group. Only 190 (9.0%) of these mildly preterm babies did not have any respiratory support at all, while 1805 (86.3%) babies received IPPV and/or CPAP. CPAP alone was given to 966 babies, more than half (53.5%) of those ventilated, and another rise 2000 (Figure 6). The predominant respiratory disease was HMD (n: 940, 46.0%, Figure 7) however, for those babies receiving CPAP only, 452 (47.5%) had non-specific disease.

High frequency ventilation was given to 50 babies (5.96% of those receiving IPPV) and 27 received nitric oxide (Table 13). Pulmonary airleak was seen in only 69 babies (3.8% of those ventilated) and 20 babies required oxygen after discharge home (Tables 15 and 16).

3.6.1.3 Babies born at term

The main indication for respiratory support in term babies is now non-specific respiratory disease (n: 263, 20.1%), with HMD, meconium aspiration syndrome, congenital malformation, surgery and newborn encephalopathy accounting for between 12 and 14% of babies each. A total of 1320 term babies received some form of assisted ventilation, with 401 receiving CPAP alone (30.4% of those ventilated). There was a reduction in the use of high frequency ventilation (n: 65) in 2001. However, the use of nitric oxide (n: 212), extracorporeal membrane oxygenation (n: 4) and the number of pulmonary airleaks requiring drainage (n: 71) were similar to 2000.

3.6.1.4 Exogenous surfactant

Exogenous surfactant is a treatment primarily for respiratory distress (HMD) and is given soon after birth via the endotracheal tube. Its efficacy was confirmed by a systematic review (Soll, 2003) and this treatment is recommended (NHMRC, 1997). There were 2411 babies who received IPPV for HMD in 2001. Surfactant was given to 2098 (87.3%, data unavailable for 7) babies. The range of use between units had a median of 87.8% and interquartile range from 80.8 to 91.4%. Another 35 babies received surfactant for HMD but were not intubated for more than an hour (i.e. not IPPV). Additionally 282 babies were treated with surfactant for other respiratory diagnoses, including meconium aspiration syndrome (n: 55), non-specific respiratory distress (n: 51) and congenital malformation (n: 44).

3.6.2 Cerebral ultrasound

Ultrasound imaging of the head of very preterm babies is performed 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. These IVHs are graded according to an internationally recognised method (Papile et al. 1978). More severe grades are when the ventricle is dilated with blood (grade III) or there is blood in the body of the brain (grade IV), and these are markers of possible later disability.

Of the babies born at less than 32 weeks gestation, 2419 (74.4% of all babies; 80.3% of those examined) did not have an IVH detected on ultrasound (or at post mortem, Figure 8, Tables 19 and 20). Another 236 (7.26%) babies did not have an early ultrasound report. Two thirds (n: 155 65.7%) of these were in the 30 to 31 week gestation group, indicating that some units are not screening this group. Another 65 (27%) babies died before the third day of life.

A significant haemorrhage (grade III or IV) was detected in 154 (5.11%) babies, half (n: 72, 46.8%) of whom died. The proportion of babies with significant haemorrhage increases as gestation decreases (Table 19, Figure 8) , but the absolute number of babies decreases (Figure 9). The incidence of significant haemorrhage has decreased from 8.0% in 1995, to 7.0% in 1996, 5.9% in 1997, 6.5% in 1998, 6.1% in 1999 and 6.3% in 2000. The median rate of significant haemorrhage in the individual units is 4.96% (with an interquartile range of 3.74% to 7.41%).

Later ultrasound examinations detect cystic lesions (e.g.porencephalic cysts, periventricular leukomalacia or encephaloclastic porencephaly) and post-haemorrhagic hydrocephalus. These are strong predictors of later abnormality. There were 2959 very preterm babies who survived to day 27 and did not have congenital hydrocephalus. Of these, only 1820 (61.5%) had an ultrasound dated at least 3 weeks after birth. Of those babies, 1667 (91.6%) had a normal report.

Hydrocephalus was reported for 28 babies (1.54% of those with later ultrasounds recorded), 28 (1.54%) had porencephalic cysts and 63 (3.46%) had peri-ventricular leukomalacia. Some babies had multiple lesions detected, hence only 109 (5.99%) babies had a major abnormality detected on their late head ultrasound. No encephaloclastic porencephaly was reported during 2001.

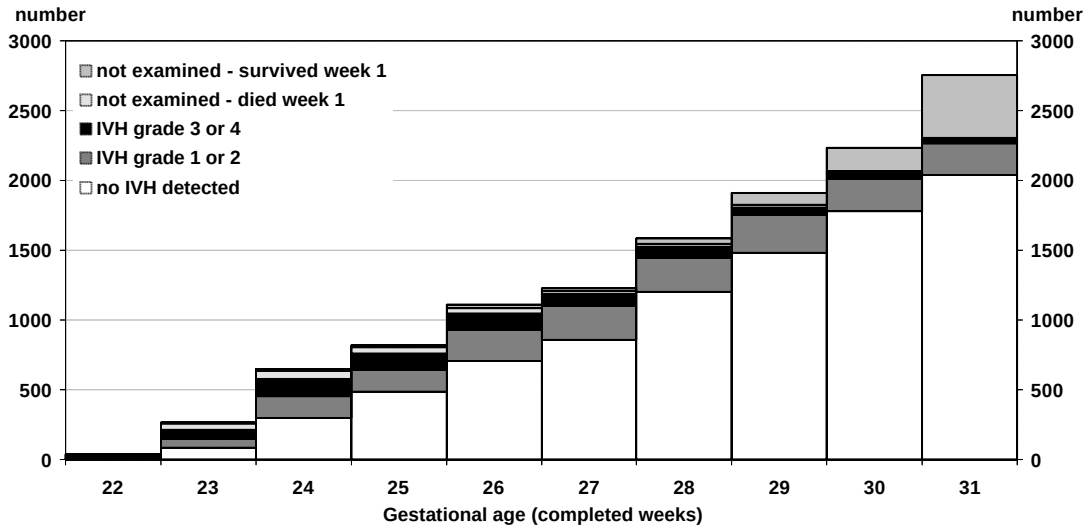

Figure 11: Early untrasound scan results, 1995-2001

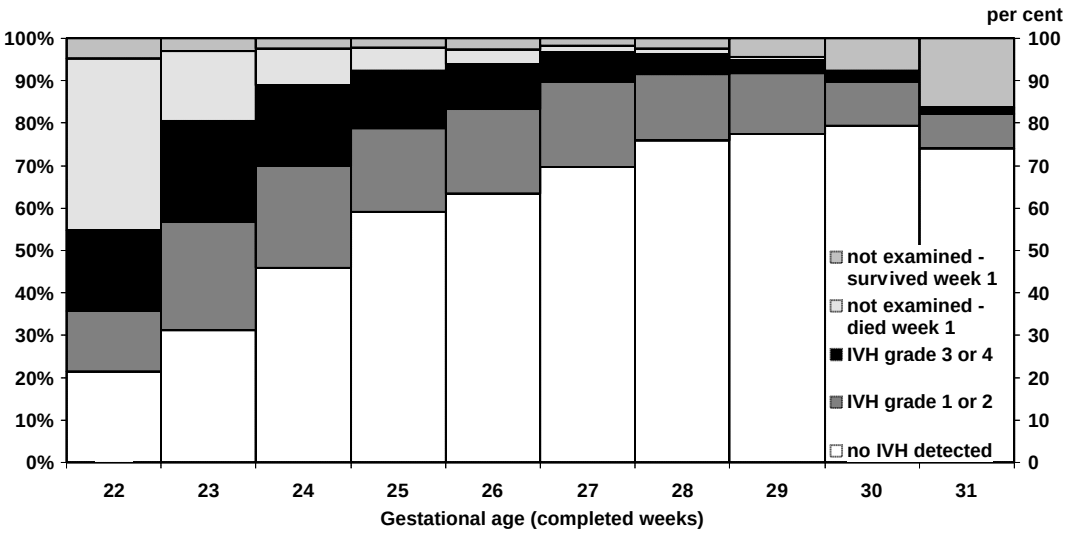

Figure 12: Intraventricular haemorrhage by gestational age, 1995-2001

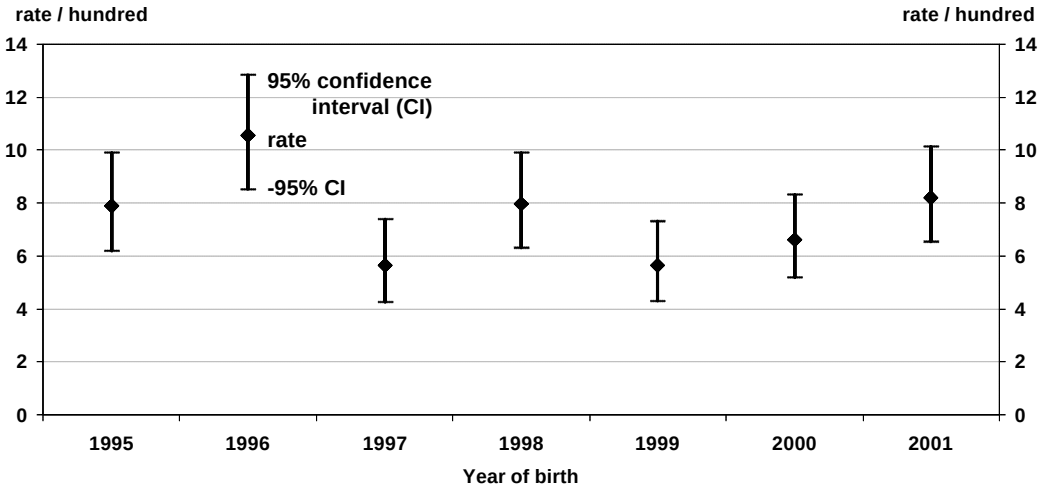

Figure 13: Necrotising enterocolitis by year of birth, 1995-2001

3.6.3 Eye examinations

Eyes of very preterm babies are examined to monitor vascularisation which, if disrupted, can result in retinopathy of prematurity (ROP). The staging criteria for ROP were set by the International committee for the classification of retinopathy of prematurity (1984). If a baby's eye reaches threshold disease Stage III plus or Stage IV, treatment with laser or cryotherapy may be necessary to preserve vision.

The criteria most commonly used for ROP screening in our region are birth at less than 31 weeks gestation or a birthweight of less than 1250 grams. There were 2371 babies who met these criteria and survived to 36 weeks post menstrual age (i.e. when the eye is fully vascularised); 1486 (62.7%) of these babies were examined and did not have ROP (Tables 21, 22).

The results of the examination were not available, or the baby fell outside the local criteria, or an examination was not performed for another 398 babies (16.8%). Other babies may have their eyes examined, but this is at the discretion of the neonatologist, and they are not reported here.

Significant eye disease (Stages III or IV) was reported for 122 babies (6.2% of those with results noted). ANZNN definitions require that the worst stage of ROP is recorded, even if the retinopathy resolves with the subsequent development of the eye.

Babies with ROP threshold disease have been shown to benefit from treatment (The cryotherapy for retinopathy of prematurity co-operative group, 1990). We commenced reporting 'threshold' in 2001 and this was identified in 61 babies, however this item was not well reported. Treatment for ROP was given to 82 babies.

3.6.4 Necrotising enterocolitis

Necrotising enterocolitis (NEC) is a disease of the gut which usually affects the large intestine (colon). While rare, it has a high rate of morbidity and mortality in preterm infants and occasionally in term infants. The cause of NEC is unknown, but it has been associated with factors such as very low gestational age and hypoxic events (Beeby & Jeffery, 1992).

During 2001, there were 135 babies proven to have NEC. Half (n: 78, 57.8%) of these babies were less than 28 weeks' gestation, and two-thirds (n: 111, 82.2%) were less than 32 weeks.

More than a third (n: 51, 37.8%) of all babies with NEC died with NEC being implicated in the cause of death in 37 (72.6%) of the 50 cases where the details were reported. Thus the death rate attributable to NEC in our cohort was 27.4 percent of babies diagnosed with the disease. Forty-one of those who died were born at less than 28 weeks gestation and NEC was implicated in a similar proportion of babies (n: 30, 73.2%).

The reported occurrence of this disease varies greatly (Figure 13). There is a statistically significant difference in the rate of NEC seen in those babies born at less than 28 weeks gestation in 1996 compared to 1997 (Figure 13). The prevalence of NEC seen in all babies in our cohorts are 2.02 per hundred (95% Confidence Intervals: 1.7, 2.4) in 2001, 1.86 in 2000, 1.64 in 1999, 2.36 in 1998, 2.02 in 1997, 2.46 in 1996 and 2.55 in 1995.

3.6.5 Neonatal infection

Systemic infection is potentially a severe morbidity for babies with an attributable mortality rate of around 10% (Isaacs et al. 1995). In this cohort, infection is recorded as the number of separate episodes of proven systemic infection at any time and from any site. This includes infection of the blood (septicaemia), the cerebrospinal fluid (meningitis), urine (urinary tract infection) and / or lung (pneumonia, Isaacs et al. 1995). The infection may occur early (during the first 48 hours of life) or later (after 48 hours).

At least one proven systemic infection was reported for 960 (14.1%) babies in our cohort. This proportion rose to 22.2% (n: 721) for babies of less than 32 weeks gestation and to nearly half (41.8%) of babies born at less than 28 weeks gestation. The number of separate infective episodes in these babies ranged from one to ten. Data are known for 99.9% of babies in the cohort.

Of the babies in our cohort with proven infection, 143 or 14.9% died. Sixty (42.0%) of those who died had infection implicated in their demise, making an attributable mortality rate of 6.25 percent. For babies born at less than 28 weeks, 101 (23.4%) died and 46 (45.5%) had systemic infection noted in their cause of death. In contrast, 94 (9.16%) babies born at term had a systemic infection. Thirteen of these babies died (13.8%) but only 4 had infection implicated in their cause of death (30.8% of babies who died but 4.26% of those with an infection). Data on cause of death are known for all but one baby.

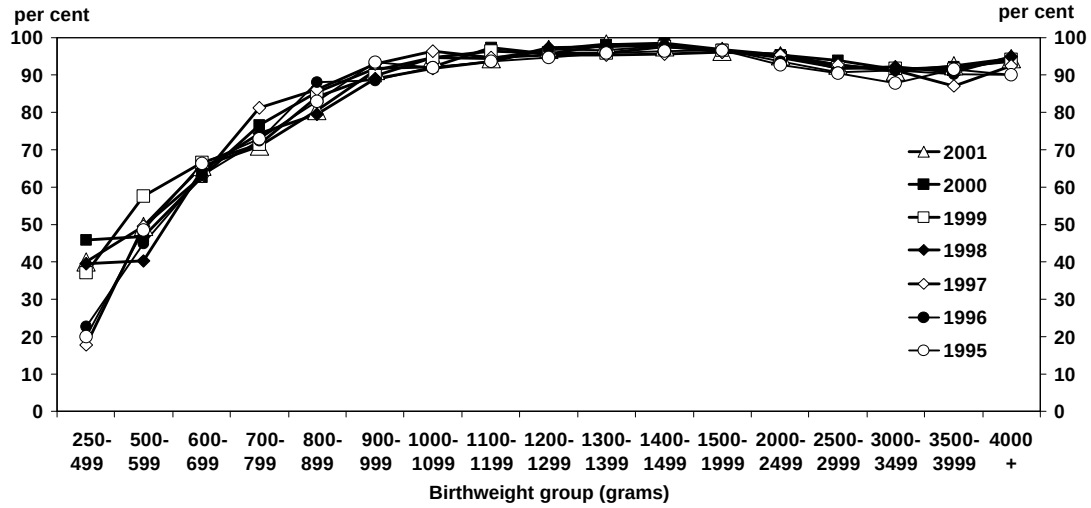

Figure 14: Survival to discharge home by birthweight group, 1995-2001

3.6.6 Neonatal surgery

Surgery in the newborn is a specialised field, conducted in only a limited number of centres such as children's hospitals, or perinatal centres in general hospitals with substantial paediatric departments. These babies need specialist care to stabilise their condition both before, during and after an operation. Some less complex procedures (eg cryo treatment for ROP (section 3.6.3)) are conducted at perinatal centres.

This cohort only includes babies admitted to a NICU as part of their first time in hospital. Many other babies undergo surgery during their first weeks of life but they either go home first, or to paediatric units, such as for cardiac surgery. In 2001, 858 in our cohort had major surgery.

Half (n: 413, 48.1%) of the babies in our cohort who had major surgery were born at term. Half of these term babies (n: 228, 55.2%) were born in a perinatal centre and two-thirds of those babies (n: 145, 63.6%) had a congenital malformation diagnosed before birth, allowing the birth to be planned to be close to expert care. Major malformations were detected in most (n: 384, 93.0%) of the term babies having surgery. Twenty-two (5.3%) of the term babies who had major surgery died, and their death could be directly attributed to a congenital malformation in 14 (63.6%) cases. While 4 of these term babies died in the first week of life, 9 died after day 28. This pattern was also evident in the other gestational age groups with 11 (57.9%) dying after day 28 in the 32-36 week group and 21 (45.7%) in the less than 32 weeks group.

For the babies born at 32 to 36 weeks gestation, 196 had major surgery. Nineteen (9.69%) of these babies died and their death was attributed to a congenital malformation in 13 (68.4%) cases. Two-thirds (n: 130, 66.3%) of these babies were born in a perinatal centre and half (n: 72, 55.4%) had the malformation diagnosed antenatally.

The very preterm babies who had major surgery were a far more heterogenous group, with reasons for their surgery ranging from treatment for necrotising enterocolitis to correction of a congenital malformation. Of the 249 (7.66%) babies who had surgery, 46 died (18.5%) but only 7 (15.2%) had a lethal congenital malformation.

3.7 Outcome

3.7.1 Survival

Overall, the majority of babies in this highly selective, high-risk cohort survived to go home (91.6%). Survival is dependent on many factors, including gestational age and birthweight. Data are presented as survival to discharge home by week of gestational age and by birthweight group (Figures 14 and 15, Tables 23 and 24). These data include babies who are back-transferred to level II or level I nurseries, and those who are transferred to other tertiary centres. These data differ from those usually reported for State or National populations as they represent only those high-risk babies who were admitted to a level III NICU. They do not include babies who were stillborn, died in labour ward or who died in hospitals without a NICU.

To provide a comprehensive picture, these data are reported as survival to 7 days, to 28 days (neonatal death) and to discharge to home. Data are available for 97.3% of all infants with outcome unknown only for 184 babies at the time of printing.

The presence of a major congenital malformation that is known to have contributed to the death of the baby (a lethal congenital malformation) is noted. In 2001, the death of 129 babies (22.7% of those who died) could be directly attributed to a major malformation. Half (n: 65, 50.4%) of these babies died before a week of age.

Five hundred and sixty-nine babies died in our cohort in 2001. When death occurred, it was during the first day of life for 76 (13.4%) babies and within the first week for more than half (n: 298, 52.4%) of the babies who died. At 28 days, 467 (82.1%) babies had died (neonatal death). Another 102 infants died after this time while still in hospital.

Of the babies who died, 75 (15.2%) were transferred to another hospital. Five went to another hospital with a level III nursery. Another 55 (77.3%) babies went to a children's hospital, and of those, 24 (40.0%) had a lethal congenital malformation. The remaining 15 babies went to a non-tertiary centre.

Better than 95% survival is seen for babies born from 29 to 34 weeks gestation (Figure 15). The survival of the more mature babies is around 90%, indicating the high-risk criteria that we have applied to the cohort. The lower survival rate at term is also due to the inclusion of the 49 babies with a lethal congenital malformation. If these babies are excluded from the data, overall survival for term babies increases from 91.2% to 94.4%. In fact, the overall survival for the whole cohort rises from 91.6% to 93.4% when babies with lethal congenital malformation are excluded.

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

3.7.2 Discharge from registration NICU

After their stay in newborn intensive care, babies go to a level II nursery in either the same hospital or another centre. In 2001, of the 6237 babies who survived to go home, half (n: 3083; 49.4%) went home from their original hospital of registration. This rate was higher for term babies (n: 908, 68.0%) than for babies born mildly preterm (n: 1010, 50.3%) and those born at less than 32 weeks gestation (n: 1165, 40.2%).

The majority (n: 2682, 80.1%) of babies who were transferred went to a level I or level II nursery before going home. The remaining babies were transferred to a hospital with a level III nursery (n: 201) or a children's hospital (n: 270).

Discharge data have been received from over 300 hospitals across Australia and New Zealand to provide outcome information for the babies covered in this audit. Babies who were transferred to a participating level II nursery before going home are discussed in Section 4.6.

Data given in Tables 25 and 26 pertain to all babies, not just those who survived.

3.7.3 Going home

The total amount of time spent in hospital is related to many factors (especially maturity at birth) and there is wide variation in the length of stay between individuals (Figure 16, Tables 27 and 28). However, surviving extremely preterm babies are usually discharged home around their due date (term equivalent age or 40 weeks post menstrual age, Figure 17) and preterm babies usually go home a few weeks before they are due.

Term babies who receive intensive care for respiratory support or surgery tend to stay in hospital for one to three weeks. In contrast, data for all babies born in Australia during 1999 who survived to go home, shows them going home from their hospital of birth before 7 days (88.1%, Nassar and Sullivan, 2001).

Over the period 1995 to 2001, there has been little change in the median length of stay of ANZNN babies when considering time in hospital against gestational age at birth (Figure 17). These data are for all survivors and include time spent in all hospitals, including peripheral hospitals, until the baby goes home. These discharge data are now available for 97.4% of all babies in the cohort.

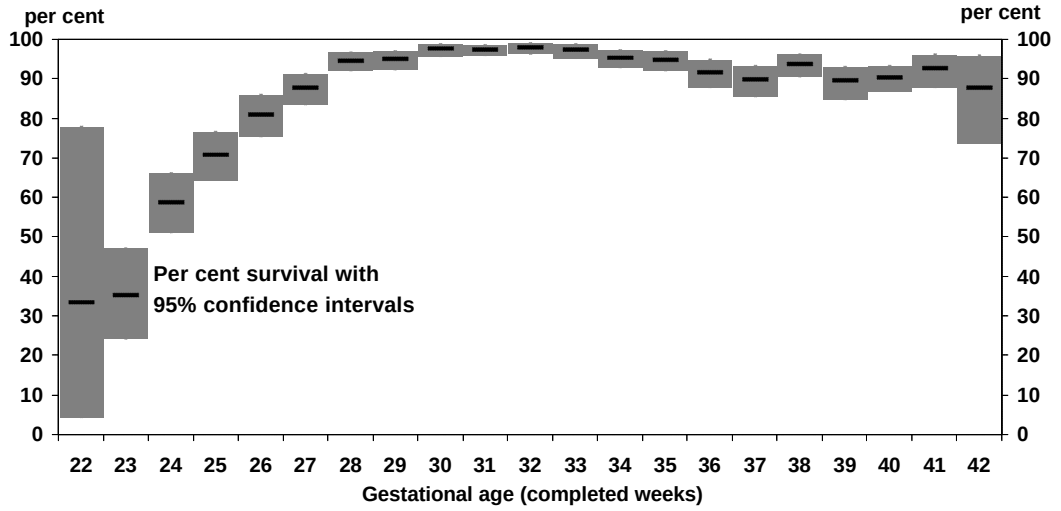

Figure 15: Survival to discharge home by gestational age, 2001

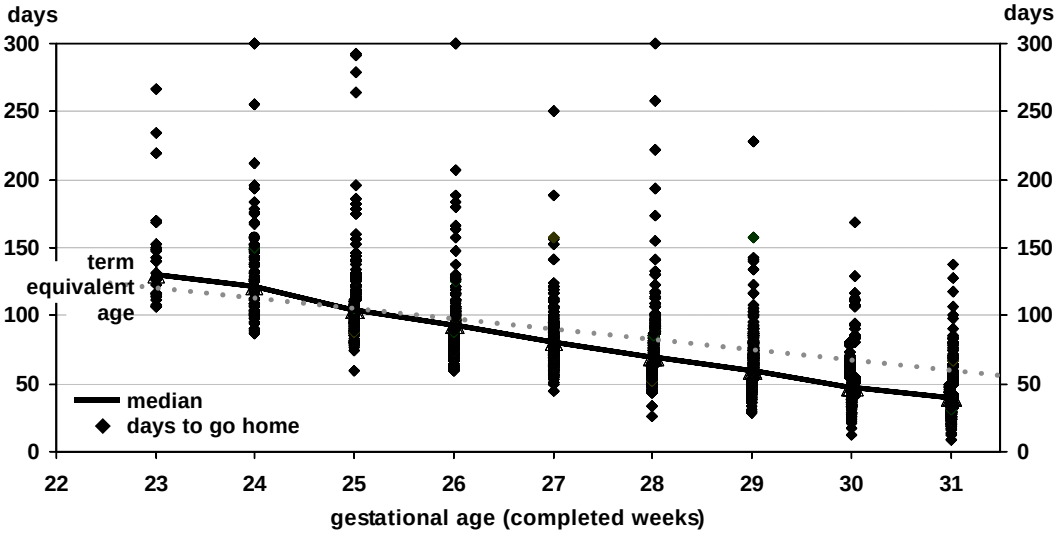

Figure 16: Days to go home, surviving babies of less than 32 weeks gestation, 2001

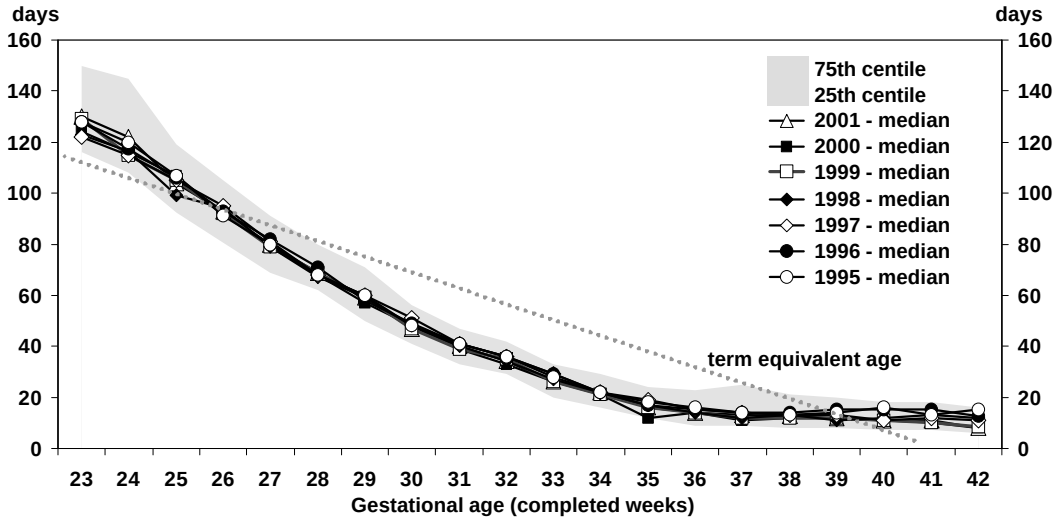

Figure 17: Median days to go home for survivors, by gestational age, 1995-2001

4 Results - babies registered to level II nurseries

4.1 In general

Level II nurseries have special care facilities to manage mildly or moderately ill babies, with varying levels of resources for neonatal intensive care (Section 3.1.4). Since 1998, every hospital in New Zealand with a level II nursery has been a member of the ANZNN. Collaborating with the network includes contributing to the audit of high-risk infants admitted to their nursery. The actual number of level II units in New Zealand has varied over this period, but care is taken to involve all units who care for such babies. The Tasmanian hospital with a level II nursery joined the ANZNN in 1999.

The registration criteria for level II nurseries are the same as for level III nurseries (Section 2.1) allowing an audit of the full cohort of live-born babies admitted to a nursery in New Zealand and in Tasmania who are born at less than 32 weeks gestation, or less than 1500 grams birthweight, or who received assisted ventilation for four or more hours. Infants receiving surgery were also included, although those who went directly to a paediatric or cardiac unit without a neonatal unit are not included.

Babies who were transferred to a level III NICU within 28 days of birth were registered to that level III nursery, and are reported in Section 3 of this report. Therefore, babies were registered to a level II nursery if their hospital stay was entirely within non-tertiary hospitals, or 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 2001, 363 babies fulfilled the ANZNN criteria and were registered to one of the 15 level II nurseries (Figures 18 and 19, Tables 29 and 30). This number continues to increase from 156 in 1998 (when only New Zealand units contributed to the audit), to 301 in 1998 and 319 in 2000. In the current cohort, 58 (16.0%) were born at less than 32 weeks gestation, 48 (13.2%) weighed less than 1500 grams at birth, 320 (88.2%) received assisted ventilation and 7 (1.93%) babies had major surgery. There were no babies eligible for the audit this year in 3 nurseries while the maximum number was 71 (Figure 20).

4.2 Antenatal

Antenatal corticosteroids were administered to the mothers of 36 of the 58 (62.1%) babies born at less than 32 weeks gestation, with 55.6% receiving a complete course.

As with babies registered to level III units, the most common obstetric complications leading to the baby's birth for very preterm babies were preterm labour (41.4%) and rupture of the membranes prior to labour beginning (17.2%). There was a similar pattern for the babies born at 32-36 weeks gestation, but for term babies, half (48.4%) had no identifiable problem. Most babies (91.1%) were booked at the hospital of their birth, and registration.

4.3 Baby and birth

As expected, there were more male babies (n: 220, 60.6%) than females (n: 143, 39.4%), and the number of babies born from a multiple pregnancy was higher than usual (n: 36, 9.92%). The majority of babies were born vaginally (n: 167, 46.1%), but another third (n: 121, 33.2%) were born by caesarian section after labour began.

A low Apgar score (less than 4 at 1 minute) was recorded for 38 babies (10.5%) and 32 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 (IPPV and/or CPAP and/or supplemental oxygen) was given to all but 26 (7.67%) babies. The most common diagnoses for the 337 babies with support were non-specific respiratory distress (n: 153, 45.4%) and hyaline membrane disease (n: 117, 34.7%). Meconium aspiration syndrome was seen in 29 (24.6% of term babies).

Supplemental oxygen was given to 328 babies (90.4% of the cohort) for a total of 1529 'days' (Table 31). Three babies received supplemental oxygen after going home.

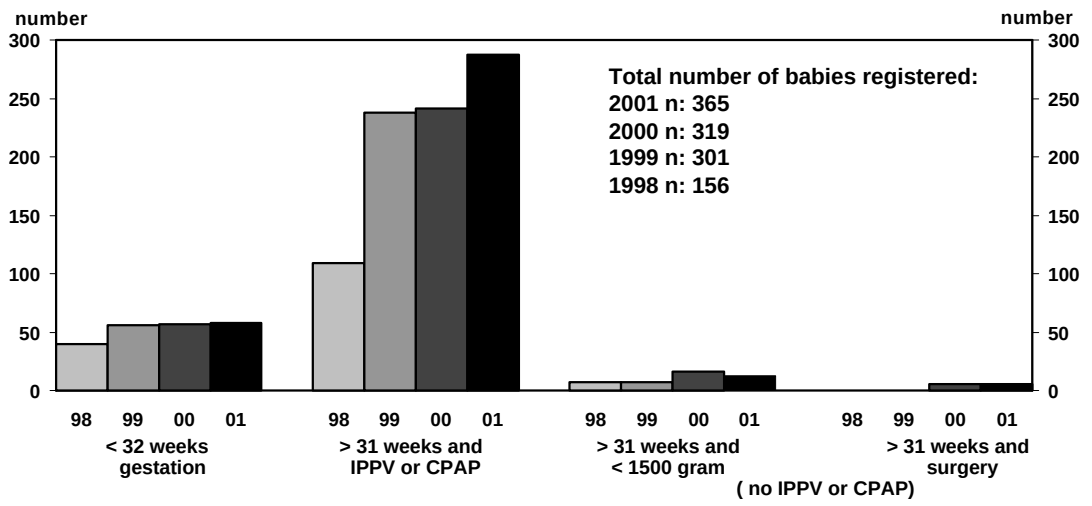

Figure 18: Number of babies registered to level II units by registration criteria, 1998-2001

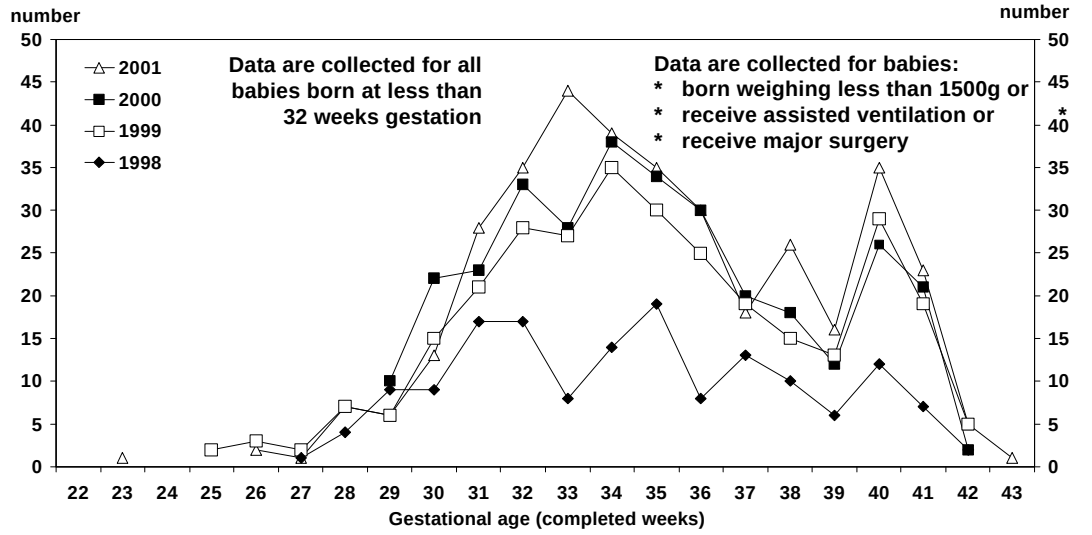

Figure 19: Number of babies registered to level II units by gestational age, 1998-2001

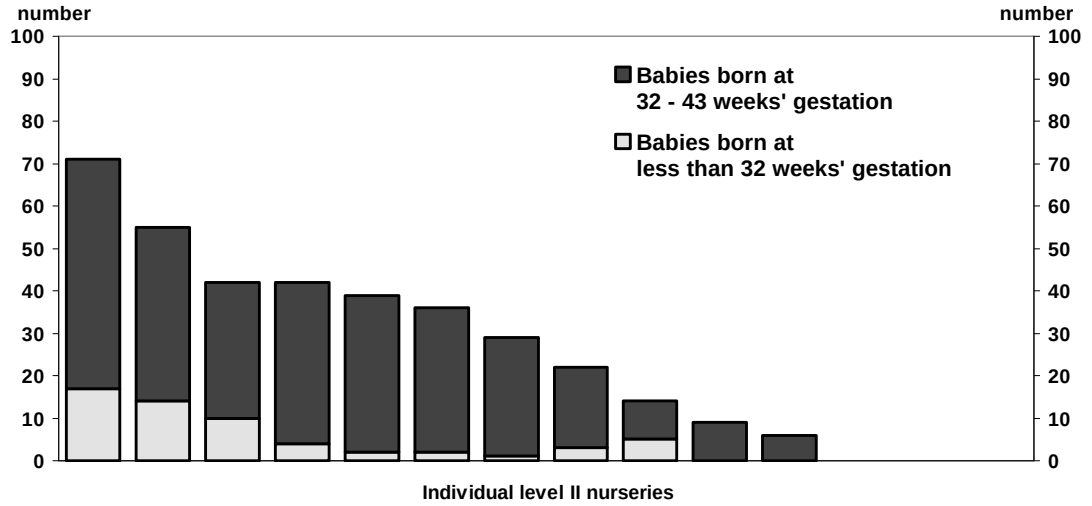

Figure 20: Number of babies registered to level II units by registration nursery, 2001

Assisted ventilation was given to 320 babies, with 286 (89.4%) receiving CPAP only. The median and total duration of assisted ventilation was comparatively short (Table 31), with a total of 1965 hours of IPPV and 13771 hours of CPAP '.

Exogenous surfactant was given to 20 of the 23 babies (86.7%) receiving four or more hours of IPPV for hyaline membrane disease. Pulmonary airleak requiring drainage was seen in 4 babies.

Nitric oxide and high frequency oscillation ventilation are not used in a level II nursery..

4.4.2 Cerebral ultrasound

The head ultrasound done in the first week of life showed no intraventricular haemorrhage (IVH) for 40 (90.1%, Table 32) babies born at less than 32 weeks gestation. One (2.3%) baby had a significant IVH (grade III or IV). However, of the 57 babies eligible for an ultrasound examination, only 44 were reported (77.2%; one baby died on day one). Half (n: 27, 47.4%) of the eligible babies had a late head ultrasound, all of which were reported to be normal.

4.4.3 Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 27 (79.4%) of the 34 babies eligible to have their eyes examined for ROP (i.e. born at less than 31 weeks or less than 1250 grams). One baby had significant ROP (Stage 3 or 4) requiring treatment.

4.4.4 Other morbidities

Proven systemic infection was seen in 25 babies with a rate of 13.7% for those born at less than 32 weeks gestation to 10.9% at term.

Necrotising enterocolitis was proven for three babies, one of whom received surgery. Six other babies received surgery, five of whom were term and had cardiac malformations.

4.5 Outcome

In 2001, 358 of the 363 babies registered to a level II unit survived to go home (98.6%, Table 33). This high survival rate reflects the more mature gestations and the overall lower risk of these babies compared to those babies requiring intensive care (Section 3).

The five deaths all occurred within the first two weeks of life, with three babies having a congenital malformation considered to be implicated in their death. At the time of publication, discharge data were available for 362 of the 363 babies (99.7%).

Only 27 (7.44%) babies were transferred to another hospital prior to going home. Of these, 8 went to a hospital with a level III nursery after day 28, and three babies were transferred to a hospital with facilities for cardiac surgery.

Babies born at term who survived to go home tended to stay in hospital for a week (median days: 7; interquartile range: 5-10 days). For mildly preterm babies the median stay was two weeks (babies born at 34 to 36 weeks' gestation, median: 14 days; interquartile range: 10.5 - 20 days) and babies born at 32 to 33 weeks tended to be in hospital for a month (median: 28 days inter-quartile range: 19.5 - 36 days).

Very preterm babies (born at 30-31 weeks) were in hospital for a median stay of 42 days (inter-quartile range 34 - 47 days). This equates to these babies going home at 36 to 37 weeks post menstrual age. The babies who were born at less than 30 weeks and remained in a level II nursery are few (n: 16) and they tended to go home around the time that they were due (term equivalent age).

4.6 Level III to level II transfers

Of the 6805 babies registered to an ANZNN level III nursery, 255 were transferred to one of the level II hospitals described in this section. Most transferred babies (n: 167, 65.5%) were born at less than 32 weeks gestation, and they tended to be transferred to a level II unit at three weeks of age (median age: 23 days, interquartile range 12-41.5). The more mature babies (born at more than 31 weeks) stayed in the level III unit for a median of 9 days (interquartile range 6-17 days). Ten (3.9%) babies were transferred back to a tertiary centre for care prior to going home. This may have been for a new illness, or to have surgical repair of an inguinal hernia.

Many babies continued their respiratory support after back-transfer. Twenty babies received at least one day of continuous positive airways pressure ventilation after transfer and 58 babies received supplemental oxygen (28.3% of those who received oxygen).

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6 Tables

6.1 Babies registered to level III nurseries

Table 1: Number of babies at each gestational age, 2001

Gestational age (completed weeks)	Number	Cumulative per cent
21	—	—
22	6	0.09
23	74	1.28
24	177	3.78
25	229	7.14
26	237	10.6
27	308	15.2
28	448	21.7
29	457	28.5
30	573	36.9
31	741	47.8
(All babies <32 weeks)	*3250*	
32	580	56.3
33	446	62.8
34	434	69.2
35	352	74.4
36	279	78.5
37	286	82.7
38	334	87.6
39	237	91.1
40	382	96.7
41	181	99.4
42	41	99.9
43	3	100
44	—	100
All babies	**6805**	

Table 2: Number of babies at each birthweight group, 2001

Birthweight group (grams)	Number	Cumulative per cent
250-499	45	0.66
500-599	103	2.17
600-699	198	5.08
700-799	200	8.02
800-899	236	11.5
900-999	261	15.3
1000-1099	294	19.7
1100-1199	340	24.6
1200-1299	366	30.0
1300-1399	343	35.1
1400-1499	405	41.0
(All babies less than 1500g)	*2971*	
1500-1999	1268	59.7
2000-2499	847	72.1
2500-2999	663	81.8
3000-3499	609	90.8
3500-3999	416	96.9
4000 and over	211	100
All babies	**6805**	

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

Table 3: Antenatal corticosteroid use by gestational age group, babies less than 34 weeks gestation, 2001

Antenatal steroid use	20-23	24-25	26-27	28-29	30-31	32-33	Babies < 34 weeks
				Number			
None	3	33	83	103	162	252	636
Incomplete course	32	103	131	194	280	204	944
Course completed	32	199	248	399	615	342	1835
Course completed >7 day	1	40	54	140	150	130	515
Unknown	12	31	29	69	107	98	346
All babies	**80**	**406**	**545**	**905**	**1314**	**1026**	**4276**
				Per cent			
None	4.4	8.8	16.1	12.3	13.4	27.1	16.2
Incomplete course	47.1	27.5	25.4	23.2	23.2	22.0	24.0
Course completed	47.1	53.0	48.0	47.7	51.0	36.9	46.7
Course completed >7 day	1.4	10.7	10.5	16.8	12.4	14.0	13.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

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

Table 4: Antenatal corticosteroid use by birthweight group, babies less than 2500 g birthweight, 2001

Antenatal steroid use	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	Babies < 2500 g
					Number			
None	—	26	76	112	158	286	424	1082
Incomplete course	9	106	138	180	164	252	111	960
Course completed	24	206	273	355	397	479	146	1880
Course completed >7 day	6	38	66	101	124	148	84	567
Unknown	6	33	36	71	86	103	82	417
All babies	45	409	589	819	929	1268	847	4906
					Per cent			
None	—	6.9	13.7	15.0	18.7	24.6	55.4	24.1
Incomplete course	23.1	28.2	25.0	24.1	19.5	21.6	14.5	21.4
Course completed	61.5	54.8	49.4	47.4	47.1	41.1	19.1	41.9
Course completed >7 day	15.4	10.1	11.9	13.5	14.7	12.7	11.0	12.6
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

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

Table 5: Plurality by gestational age group, all babies, 2001

Plurality	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Singleton	47	725	1528	718	869	1426	5313
Twins	30	211	593	272	183	38	1327
Triplets	3	15	95	36	13	—	162
Quadruplets	—	—	3	—	—	—	3
Unknown	—	—	—	—	—	—	—
All babies	**80**	**951**	**2219**	**1026**	**1065**	**1464**	**6805**
				Per cent			
Singleton	58.8	76.2	68.9	70.0	81.6	97.4	78.0
Twins	37.5	22.2	26.7	26.5	17.2	2.6	19.5
Triplets	3.7	1.6	4.3	3.5	1.2	—	2.4
Quadruplets	—	—	0.1	—	—	—	0.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 6: Plurality by birthweight group, all babies, 2001

Plurality	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
						Number						
Singleton	26	297	447	576	602	870	668	605	596	415	211	5313
Twins	17	100	129	206	264	369	170	58	13	1	—	1327
Triplets	2	12	13	36	61	29	9	—	—	—	—	162
Quadruplets	—	—	—	1	2	—	—	—	—	—	—	3
Unknown	—	—	—	—	—	—	—	—	—	—	—	—
All babies	**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**	**6805**
						Per cent						
Singleton	57.8	72.6	75.9	70.3	64.8	68.6	78.9	91.3	97.9	99.8	100.0	78.0
Twins	37.8	24.5	21.9	25.2	28.4	29.1	20.1	8.7	2.1	0.2	—	19.5
Triplets	4.4	2.9	2.2	4.4	6.6	2.3	1.0	—	—	—	—	2.4
Quadruplets	—	—	—	0.1	0.2	—	—	—	—	—	—	0.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 7: Level of hospital of birth by gestational age group, all babies, 2001

Level of hospital	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Not born in a hospital	—	7	14	10	11	20	62
Hospital, no level III NICU	6	106	243	170	333	670	1528
Hospital with level III NICU	74	838	1962	846	720	773	5213
Unknown	—	—	—	—	1	1	2
All babies	80	951	2219	1026	1065	1464	6805
				Per cent			
Not born in a hospital	—	0.8	0.6	1.0	1.0	1.4	0.9
Hospital, no level III NICU	7.5	11.1	11.0	16.6	31.3	45.8	22.5
Hospital with Level III NICU	92.5	88.1	88.4	82.4	67.7	52.8	76.6
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 8: Level of hospital of birth by birthweight group, all babies, 2001

Level of hospital	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
							Number					
Not born in a hospital	—	—	8	7	5	11	10	5	5	6	5	62
Hospital, no level III NICU	—	29	65	87	102	198	231	249	275	205	87	1528
Hospital with level III NICU	45	380	516	725	822	1059	605	408	329	205	119	5213
Unknown	—	—	—	—	—	—	1	1	—	—	—	2
All babies	**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**	**6805**
							Per cent					
Not born in a hospital	—	—	1.4	0.9	0.5	0.9	1.2	0.8	0.8	1.4	2.4	0.9
Hospital, no level III NICU	—	7.1	11.0	10.6	11.0	15.6	27.3	37.6	45.2	49.3	41.2	22.5
Hospital with level III NICU	100	92.9	87.6	88.5	88.5	83.5	71.5	61.6	54.0	49.3	56.4	76.6
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 9: Transport type by gestational age group for babies transferred immediately after birth to registration hospital, 2001

Transportation method	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Non-specialised transport[(a)]	5	90	200	152	302	628	262
Specialist transport team[(b)]	1	19	49	25	52	116	1377
All babies	**6**	**109**	**249**	**177**	**354**	**744**	**1639**
				Per cent			
Non-specialised transport[(a)]	16.7	17.4	19.7	14.1	14.7	15.6	16.0
Specialist transport team[(b)]	83.3	82.6	80.3	85.9	85.3	84.4	84.0
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

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

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

Table 10: Transport type by birthweight group, for babies transferred immediately after birth to registration hospital, 2001

Transportation method	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
						Number						
Non-specialised transport[(a)]	—	5	11	19	17	33	33	39	45	45	15	262
Specialist transport team[(b)]	—	22	60	74	88	173	211	237	257	177	78	1377
All babies	**—**	**27**	**71**	**93**	**105**	**206**	**244**	**276**	**302**	**222**	**93**	**1639**
						Per cent						
Non-specialised transport[(a)]	—	18.5	15.5	20.4	16.2	16.0	13.5	14.1	14.9	20.3	16.1	16.0
Specialist transport team[(b)]	—	81.5	84.5	79.6	83.8	84.0	86.5	85.9	85.1	79.7	83.9	84.0
All babies	**—**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(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 11: Method of birth by gestational age group, all babies, 2001

Mode of birth	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Vaginal	68	390	747	296	395	705	2601
Vaginal with instruments	3	14	66	35	49	141	308
Caesarean section – emergency (labour)	7	293	540	258	240	279	1617
Caesarean section - elective (no labour)	2	253	863	433	379	336	2266
Unknown	—	1	3	4	2	3	13
All babies	**80**	**951**	**2219**	**1026**	**1065**	**1464**	**6805**
				Per cent			
Vaginal	85.0	41.1	33.7	29.0	37.2	48.2	38.3
Vaginal with instruments	3.7	1.5	3.0	3.4	4.6	9.7	4.5
C. section with labour	8.8	30.8	24.4	25.2	22.6	19.1	23.8
C. section without labour	2.5	26.6	38.9	42.4	35.6	23.0	33.4
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 12: Method of birth by birthweight group, all babies, 2001

Mode of birth	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
						Number						
Vaginal	13	194	180	253	302	463	321	291	281	199	104	2601
Vaginal with instruments	—	7	10	8	33	52	43	38	52	49	16	308
Caesarean section – emergency (labour)	3	84	172	231	230	305	215	137	124	69	47	1617
Caesarean section – elective (no labour)	29	123	227	326	361	445	266	196	152	98	43	2266
Unknown	—	1	—	1	3	3	2	1	—	1	1	13
All babies	**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**	**6805**
						Per cent						
Vaginal	28.9	47.6	30.6	30.9	32.6	36.6	38.0	44.0	46.1	48.0	49.5	38.3
Vaginal with instruments	—	1.7	1.7	1.0	3.6	4.1	5.1	5.7	8.5	11.8	7.6	4.5
C. section with labour	6.7	20.6	29.2	28.2	24.8	24.1	25.4	20.7	20.4	16.6	22.4	23.8
C. section without labour	64.4	30.1	38.5	39.9	39.0	35.2	31.5	29.6	25.0	23.6	20.5	33.4
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 13: Respiratory support by gestational age group, all babies, 2001

Type of respiratory support		20-23	24-27	28-31	32-33	34-36	37-44	All babies
IPPV	n	79	895	1051	368	498	947	3838
	median (hours)	192	192	42	37.5	50	48	
	interquartile range (hours)	33–681.5	51–552.5	21–94.5	18.75 –72	24–91.75	24–10.5	
	no IPPV (n)	1	56	1168	658	567	517	2967
	data not available	—	—	—	—	—	—	—
ECMO	n	—	—	—	—	—	4	4
Nitric oxide	n	8	48	19	12	15	121	223
High freq ventilation	n	35	221	72	16	34	65	443
Air leak (with drainage)	n	11	79	73	34	35	71	303
CPAP	n	33	793	1616	751	721	701	4615
	median (hours)	792	586	72	27	56	24	
	interquartile range (hours)	616 – 1032	282 – 902	24 – 192	14 – 62	13 – 55	9 – 48	
	no CPAP (n)	47	158	603	275	344	763	2190
	data not available	—	—	—	—	—	—	—
Oxygen	n	79	924	1649	746	831	1140	4445
	median (days)	10	59	5	3	5	4	
	interquartile range (days)	2 – 112.5	18 – 94	2 – 30	2 – 6	2 – 7	2 – 8	
	no oxygen (n)	—	21	540	264	222	293	2360
	data not available	1	6	30	16	12	31	96
All babies		**80**	**951**	**2219**	**1026**	**1065**	**1464**	**6805**

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

Table 14: Respiratory support by birthweight group, all babies, 2001

Type of respiratory support		250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
IPPV	n	45	397	486	496	364	505	404	377	388	258	125
	median (hours)	275	319	120	51	37	42	39	47	48	55.5	42
	interquartile range	57–991	81–774	42–370	24–138	19–85	19–74	20–72	24–96	27–103	32–107	21–79
	no IPPV (n)	—	12	103	323	565	763	443	286	221	158	86
	data not available	—	—	—	—	—	—	—	—	—	—	—
CPAP	n	22	289	504	648	574	917	624	411	301	215	115
	median (hours)	637	669	504	168	57	33	24	24	24	24	24
	interquartile range	501–1006	312–1032	168–816	48–452	23–139	16 – 74	13 – 58	12 – 54	11 – 48	9 – 48	12–48
	no CPAP (n)	23	120	85	171	355	351	223	252	308	201	96
	data not available	—	—	—	—	—	—	—	—	—	—	—
Oxygen	n	45	401	537	667	599	926	674	529	501	325	173
	median (days)	15	76	46	22	5	4	4	4	4	4	3
	interquartile range	2 – 128	10–108	9 – 81	3 – 54	2 – 26	2 – 7	2 – 7	2 – 7	2 – 8	2 – 8	2–7
	no Oxygen (n)	—	4	47	148	309	328	163	246	99	84	35
	data not available	—	4	5	7	21	14	10	8	9	7	3
All babies		**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**

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

Table 15: Supplemental oxygen dependency by gestational age group, all babies, 2001

Oxygen dependency	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Oxygen therapy at day 28	31	648	433	41	38	61	1252
Per cent survivors with oxygen therapy on day 28	93.9	83.6	20.1	4.1	3.7	4.5	19.8
Chronic lung disease[(a)]	25	449	266	—	—	—	740
Per cent of survivors with chronic lung disease [(b)]	89.3	59.9	12.4	—	—	—	25.3
Oxygen therapy after discharge to home	15	185	81	9	9	16	315
Data not available	—	1	—	—	1	—	2
All babies	**80**	**951**	**2219**	**1026**	**1065**	**1464**	**6805**

(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, gestational age plus chronological age) for babies born at less than 32 weeks gestation.

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

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

2. Data not available here is different to that for Table 13 as it may be known that the baby received oxygen, but the total duration may not be available eg if the baby is transferred to another nursery

Table 16: Supplemental oxygen dependency by birthweight group, all babies, 2001

Oxygen dependency	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
Oxygen therapy at day 28	20	261	343	305	137	85	31	31	23	12	4	1252
Per cent survivors with oxygen therapy on day 28	90.1	93.2	66.0	38.9	15.1	6.9	3.8	5.0	4.1	3.1	2.0	19.8
Chronic lung disease [(a)]	17	219	223	176	66	34	3	2	—	—	—	740
Per cent of survivors with chronic lung disease [(b)]	89.5	83.0	44.5	24.9	10.0	4.8	4.8	33.3	—	—	—	25.3
Oxygen therapy after discharge to home	11	100	91	48	21	18	3	10	5	7	1	315
Data not available	—	—	—	1	—	—	1	—	—	—	—	2
All babies	**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**	**6805**

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

Table 17: Exogenous surfactant use by gestational age group, all babies, 2001

Surfactant use	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
None	5	176	1375	746	776	1253	4331
Survanta	74	769	821	261	279	203	2407
Exosurf, other or both	—	4	1	1	2	—	8
Unknown	1	2	22	18	8	8	59
All babies	**80**	**951**	**2219**	**1026**	**1065**	**1464**	**6805**
				Per cent			
None	6.3	18.6	62.6	74.0	73.4	86.1	64.2
Survanta	93.7	81.0	37.4	25.9	26.4	13.9	35.7
Exosurf, other or both	—	0.4	—	0.1	0.2	—	0.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 18: Exogenous surfactant use by birthweight group, all babies, 2001

Surfactant use	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
						Number						
None	3	52	186	415	632	908	608	510	484	344	189	4331
Survanta	42	353	396	397	279	347	234	149	119	70	21	2407
Exosurf, other or both	—	3	2	—	—	—	1	—	2	—	—	8
Unknown	—	1	5	7	18	13	4	4	4	2	1	59
All babies	**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**	**6805**
						Per cent						
None	6.7	12.8	31.9	51.1	69.4	72.4	72.1	77.4	80.0	83.1	90.0	64.2
Survanta	93.3	86.5	67.8	48.9	30.6	27.6	27.8	22.6	19.7	16.9	10.0	35.7
Exosurf, other or both	—	0.7	0.3	—	—	—	0.1	—	0.3	—	—	0.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 19: Intraventricular haemorrhage by gestational age group, babies less than 32 weeks gestation, 2001

Head ultrasound result	20-23	24-25	26-27	28-29	30-31	Babies < 32 weeks
			Number			
None	35	240	371	741	1032	2419
Grade I	9	48	64	95	91	307
Grade II	8	34	49	23	20	134
Grade III	9	25	17	10	7	68
Grade IV	9	30	28	13	6	86
Not examined	10	29	16	23	158	236
All babies	80	406	545	905	1314	3250
			Per cent			
None	50.0	63.7	70.1	84.0	89.3	80.3
Grade I	12.9	12.7	12.1	10.8	7.9	10.2
Grade II	11.4	9.0	9.3	2.6	1.7	4.4
Grade III	12.8	6.6	3.2	1.1	0.6	2.3
Grade IV	12.9	8.0	5.3	1.5	0.5	2.8
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 20: Intraventricular haemorrhage by birthweight group, babies less than 1500g birthweight, 2001

Head ultrasound result	250-499	500-749	750-999	1000-1249	1250-1499	Babies <1500
			Number			
None	28	239	430	644	731	2072
Grade I	6	52	55	79	71	263
Grade II	2	31	43	31	15	122
Grade III	—	26	18	10	8	62
Grade IV	2	33	23	19	5	82
Not examined	7	28	20	36	99	190
All babies	**45**	**409**	**589**	**819**	**929**	**2791**
			Per cent			
None	73.7	62.7	75.6	82.2	88.1	79.7
Grade I	15.8	13.7	9.7	10.1	8.5	10.1
Grade II	5.3	8.1	7.6	4.0	1.8	4.7
Grade III	—	6.8	3.2	1.3	1.0	2.4
Grade IV	5.2	8.7	4.0	2.4	0.6	3.1
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Table 21: Results of eye examination for ROP by gestational age group, babies less than 31 weeks gestation or less than 1250g birthweight, 2001

Eye examination result	20-23	24-25	26-27	28-29	30-31	32-44	Eligible babies
				Number			
No ROP	9	89	295	665	382	48	1488
Stage I	2	53	65	47	13	2	182
Stage II	4	68	60	40	9	—	181
Stage III	11	61	32	9	2	—	115
Stage IV	—	6	1	—	—	—	7
Threshold disease	4	37	15	4	1	—	61
Received therapy	7	49	19	4	2	—	81
Not examined	2	2	18	102	239	35	398
Babies eligible for exam.	**28**	**279**	**471**	**863**	**645**	**85**	**2371**
				Per cent			
No ROP	34.6	32.1	65.1	87.4	94.1	96.0	75.4
Stage I	7.7	19.1	14.3	6.2	3.2	4.0	9.2
Stage II	15.4	24.6	13.3	5.3	2.2	—	9.2
Stage III	42.3	22.0	7.1	1.2	0.5	—	5.8
Stage IV	—	2.2	0.2	—	—	—	0.4
Eligible babies examined	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes 1. Indicates worst stage of ROP reported.

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

3. 'Babies eligible for exam.' includes all babies born at less than 31 weeks gestation or less than 1250 grams who were alive at 36 weeks postmenstrual age (when the eye should be 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: Results of eye examination for ROP by birthweight group, babies less than 31 weeks gestation or less than 1250 g birthweight, 2001

Eye examination result	250-499	500-749	750-999	1000-1249	1250-1499	1500-2999	Eligible babies
				Number			
No ROP	5	98	288	599	347	149	1486
Stage I	2	41	74	42	15	8	182
Stage II	2	63	72	37	6	1	181
Stage III	8	53	44	6	3	1	115
Stage IV	1	4	2	0	0	0	7
Received therapy	8	40	26	4	2	1	81
Not examined	1	5	28	102	135	127	398
Babies eligible for exam.	**19**	**264**	**508**	**786**	**506**	**286**	**2369**
				Per cent			
No ROP	27.8	37.8	60.0	87.6	93.5	93.7	75.4
Stage I	11.1	15.8	15.4	6.1	4.0	5.0	9.2
Stage II	11.1	24.3	15.0	5.4	1.6	0.6	9.2
Stage III	44.4	20.5	9.2	0.9	0.8	0.6	5.8
Stage IV	5.6	1.5	0.4	—	—	—	0.4
Eligible babies examined	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 23: Survival to discharge by gestational age, all babies, 2001

Gestational age (weeks)	All babies admitted	No. with discharge data	No. with lethal cong malform.	No. alive at 7 days	No. alive at 28 days	No. alive at discharge	Per cent survival at discharge
21	—	—	—	—	—	—	—
22	6	6	—	2	2	2	33.3
23	74	74	—	48	31	26	35.1
24	177	172	1	142	120	104	58.8
25	229	222	1	199	174	162	70.7
26	237	233	3	212	201	192	81.0
27	308	300	2	295	280	270	87.7
28	448	437	7	431	427	424	94.6
29	457	434	4	443	438	434	95.0
30	573	556	2	565	562	559	97.6
31	741	714	9	736	728	722	97.4
32	580	559	8	574	569	568	97.9
33	446	429	8	440	436	434	97.3
34	434	426	11	427	420	414	95.4
35	352	343	13	344	339	334	94.9
36	279	275	11	263	261	256	91.8
37	286	280	13	270	262	257	89.9
38	334	329	10	323	316	313	93.7
39	237	235	12	223	216	212	89.5
40	382	376	8	357	348	345	90.3
41	181	177	3	173	169	169	93.4
42	41	41	3	37	36	36	87.8
43	3	3	—	3	3	3	100
44	—	—	—	—	—	—	—
All babies	**6805**	**6621**	**129**	**6507**	**6338**	**6236**	**91.6**

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 24: Survival to discharge by birthweight group, all babies, 2001

Birthweight group (grams)	All babies admitted	No. with discharge data	No. with lethal cong malform.	No. alive at 7 days	No. alive at 28 days	No. alive at discharge	Per cent survival at discharge
250-499	45	44	—	28	22	18	40.0
500-599	103	102	1	77	59	51	49.5
600-699	198	192	—	168	144	130	65.7
700-799	200	194	3	175	153	142	71.0
800-899	236	230	6	215	201	190	80.5
900-999	261	254	3	248	243	238	91.2
1000-1099	294	288	6	285	282	278	94.6
1100-1199	340	328	4	328	323	321	94.4
1200-1299	366	354	1	358	355	354	96.7
1300-1399	343	326	4	339	337	337	98.3
1400-1499	405	390	—	401	398	395	97.5
1500-1999	1268	1228	24	1245	1232	1222	96.4
2000-2499	847	821	21	829	816	806	95.2
2500-2999	663	654	23	636	623	615	92.8
3000-3499	609	601	22	575	562	554	91.0
3500-3999	416	406	11	397	389	386	92.8
4000 +	211	209	—	203	199	199	94.3
All babies	**6805**	**6621**	**129**	**6507**	**6338**	**6236**	**91.6**

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.

2 Data are divided into 100 grams group from 500 grams to 1500 grams, then 500 grams groups.

Table 25: Transfer status and level of hospital if transferred, by gestational age group, all babies, 2001

Hospital level	20-23	24-27	28-31	32-33	34-36	37-44	All babies
				Number			
Not transferred	65	556	862	467	608	1019	3577
Hospital with level I/II nursery	10	283	1201	501	390	312	2697
Hospital with level III NICU	2	57	98	25	9	15	206
NICU in children's hospital	3	55	58	33	58	118	325
Data not available	—	—	—	—	—	—	—
All babies	**80**	**951**	**2219**	**1026**	**1065**	**1464**	**6805**
				Per cent			
Not transferred	81.3	58.4	38.9	45.5	57.1	69.6	52.6
Hospital with level I/II nursery	12.5	29.8	54.1	48.8	36.6	21.3	39.6
Hospital with level III NICU	2.5	6.0	4.4	2.5	0.8	1.0	3.0
NICU in children's hospital	3.7	5.8	2.6	3.2	5.5	8.1	4.8
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes 1. Where a baby was transferred many times, the level of hospital was recorded for the stay of most significance, or as the level 1 or 2 transfer if this was not apparent. This was to allow computation of stay in level 3 NICUs compared to step-down or level 1 or 2 stay.

2. 'Not transferred' refers to babies who went home from or died in their hospital of registration.

3 'Not available' data are excluded from per cent calculations.

Table 26: Transfer status and level of hospital if transferred, by gestational age group, all babies, 2001

Hospital level	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All babies
							Number					
Not transferred	37	281	314	350	336	548	432	428	403	295	153	3577
Hosp. with level I/II nursery	6	87	203	399	533	640	351	192	155	89	42	2697
Hospital with Level III NICU	1	16	41	45	35	37	18	3	2	4	4	206
NICU in children's hospital	1	25	31	25	25	43	46	40	49	28	12	325
Data not available	—	—	—	—	—	—	—	—	—	—	—	—
All babies	**45**	**409**	**589**	**819**	**929**	**1268**	**847**	**663**	**609**	**416**	**211**	**6805**
							Per cent					
Not transferred	82.2	68.7	53.3	42.7	36.1	43.2	51.0	64.6	66.2	70.9	72.5	52.6
Hosp. with level I/II nursery	13.4	21.3	34.5	48.7	57.4	50.5	41.5	29.0	25.4	21.4	19.9	39.6
Hospital with level III NICU	2.2	3.9	7.0	5.5	3.8	2.9	2.1	0.4	0.3	1.0	1.9	3.0
NICU in children's hospital	2.2	6.1	5.2	3.1	2.7	3.5	5.4	6.0	8.1	6.7	5.7	4.8
All babies	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Notes 1. Where a baby was transferred many times, the level of hospital was recorded for the stay of most significance, or as the level 1 or 2 transfer if this was not apparent. This was to allow computation of stay in level 3 NICUs compared to step-down or level 1 or 2 stay.

2. 'Not transferred' refers to babies who went home from or died in their hospital of registration.

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

Table 27: Total days until discharge home from hospital by gestational age group, 2001

Days to discharge	20-23	24-27	28-31	32-33	34-36	37-44
Median (days)	130	93	51	31	19	12
Interquartile range	116 – 149.3	79 – 111	41 – 65	24 – 39	13 – 27	7 – 20
Survivors with discharge data	**28**	**704**	**2061**	**964**	**983**	**1312**

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

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

Table 28: Total days until discharge home from hospital by birthweight group, 2001

Days to discharge	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-4000+
Median (days)	137	111	85	64	47	37	22	15	12	11
Interquartile range	127–156	96–130	71–100	52–77	38–58	30–45	17–29	10–23	8–19	7–19
Survivors with discharge data	**17**	**241**	**484**	**756**	**867**	**1182**	**780**	**606**	**546**	**573**

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

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

6.2 Babies registered to level II nurseries

Table 29: Number of babies at each gestational age, 2001

Gestational age (completed weeks)	Number	Cumulative per cent
Less than 28	4	1.10
28-29	13	4.67
30-31	41	16.0
All babies less than 32 weeks	*58*	
32-33	78	37.8
34-36	103	65.8
More than 37	124	100
All babies	**363**	

Table 30: Number of babies at each birthweight group, 2001

Birthweight group (grams)	Number	Cumulative per cent
< 1000	5	1.38
1000-1249	16	5.79
1250-1499	26	12.95
All babies less than 1500 grams	*47*	
1500-1999	71	32.0
2000-2499	67	50.4
2500-2999	68	69.1
3000-3499	51	83.2
3500-3999	35	93.1
4000-7000	25	100
All babies	**363**	

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

Table 31: Respiratory support by gestational age group, 2001

Type of respiratory support		less than 28	28-31	32-33	34-36	37-44	All babies
IPPV	n	3	12	4	6	11	34
	median (hours)	1	2	0.5	1	1	
	no IPPV (n)	1	42	74	97	113	331
	data not available	—	—	—	—	—	—
Air leak (with drainage)	n	—	1	—	2	1	4
CPAP	n	3	40	68	89	110	310
	median (hours)	24	2.5	1.25	1	0.6	
	interquartile range (hours)		1 – 4	0.5 – 2.5	0.5 – 2.5	0.4 – 1.4	
	no CPAP (n)	1	14	10	14	14	55
	data not available	—	—	—	—	—	—
Oxygen	n	4	43	67	91	101	306
	Median (days)	66	4	3	3	2	
	Interquartile range (hours)		2 – 10	1 – 5	2 – 4	1 – 4	
	no oxygen (n)	—	11	11	12	23	59
	data not available	—	—	—	—	—	—
Oxygen therapy after discharge to home		—	—	1	—	2	3
All babies		**4**	**54**	**78**	**103**	**124**	**363**

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

Table 32: Intraventricular haemorrhage by gestational age group, babies less than 32 weeks gestation, 2001

Head ultrasound result	20-29	30-31	Babies less than 32 weeks
		Number	
None	12	28	40
Grade I	1	—	1
Grade II	2	—	2
Grade III	—	1	1
Grade IV	—	—	—
Not examined	2	12	14
All babies	**17**	**41**	**58**
		Per cent	
None	80.0	96.6	90.9
Grade I	6.7	—	2.3
Grade II	13.3	—	4.5
Grade III	—	3.4	2.3
Grade IV	—	—	—
All babies	**100.0**	**100.0**	**100.0**

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

Table 33: Survival to discharge by gestational age group, 2001

Gestational age group (weeks)	All babies admitted	No. with discharge data	No. with lethal cong malform.	No. alive at 7 days	No. alive at 28 days	No. alive at discharge	Per cent survival at discharge
Less than 28	4	4	—	3	3	3	75.0
28-29	13	13	—	13	13	13	100.0
30-31	41	41	—	41	41	41	100.0
32-33	78	78	—	79	79	79	100.0
34-36	103	103	1	102	102	102	99.0
More than 37	124	123	2	122	121	121	97.5
All babies	**363**	**362**	**3**	**359**	**358**	**358**	**98.6**

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, the 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 (n: 1, 0.28% of all babies) these babies have been assumed to have survived to go home.

Appendix 1
Definitions of the data items for audit in 2001

The definitions for the audit are authorised by the Advisory Committee of the Australian and New Zealand Neonatal Network prior to being introduced into the dataset. The sources of these definitions include those that exist in the National Health Data Dictionary (of Australia); from Australasian collaborative groups; from multi-centre randomised controlled trials in which ANZNN units had participated; 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. For a more detailed view of the definitions currently in use, please see our website at:

http://www.usyd.edu.au/cphsr/anznn/defn.html

The items changed for the 2001 audit relate to the measurement of assisted ventilation (now in hours) and to the examination of the eyes for retinopathy of prematurity. Please see section 2.1 for registration criteria for the audit.

1.1 Minimum dataset variables

Registration hospital

Definition: 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 4 or more hours .

Coding: numeric code representing registration hospital

Guide for use: Babies who were transferred were considered to be admitted to the hospital to which they were transferred from the time the transport team arrived to collect them. If a baby dies within 4 hrs, they are registered to unit where they die.

Maternal age

Definition: Age in completed years of the woman giving birth on the date of her baby's birth.

Coding: 2-digit number representing maternal age in completed years.

Previous preterm birth

Definition: This mother has had a previous birth that was at less than 37 weeks gestation and more than 20 completed weeks, regardless of outcome.

Coding: 99: unknown

0: no previous preterm birth

1: yes, there was a previous preterm birth

Previous perinatal death

Definition: This mother has had a previous perinatal loss.

Coding: 99: unknown

0: no previous perinatal death

1: yes, has had a previous perinatal death

Guide for use: A perinatal loss is when an baby with a birth weight of more than 400 grams or a gestational age of more than 20 completed weeks died during the first 28 days of life.

Assisted conception in this pregnancy

Definition: The type of infertility treatment used during the conception or used to conceive this pregnancy.

Coding: 0: unknown - information not available

1: none - used for this pregnancy.

2: hyperovulation - any hormone therapy used to stimulate ovulation.

3: IVF / GIFT etc. - any method of in vitro fertilisation. Incl. in-vitro fertilisation gamete intra-fallopian transfer, zygote intra-fallopian transfer, and IC sperm injection.

4: other - infertility treatment used, that is not mentioned above, incl. artificial insemination.

Guide for use: Disregard any treatment for any previous pregnancies.

Ethnicity of mother

Definition: Ethnic origin of the mother of baby, as identified by the mother.

Coding: 0: unknown - information not available

1: Aboriginal or Torres Strait Islander (TI) - of Aboriginal or TI descent who identifies as an Aboriginal or TI and is accepted as such by the community with which she is associated

2: Asian - from countries of Asia, South East Asia & Indian subcontinent. Incl. say Fijian Indian.

3: Caucasian - of Caucasoid heritage, includes Arabic, European, Russian & Middle Eastern.

4: other - includes African Negroes, Inuit, American Blacks and Indians, Melanesian.

5: Pacific Islander - Pacific Islander background

6: Maori - maternal self-identification

Source of referral

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

Presenting antenatal problem

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

Other antenatal complications

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

Prolonged rupture of membranes (ROM)

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

Preterm labour

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

Hypertension in pregnancy

Definition: A systolic blood pressure (BP) > 140 mmHg and/or a diastolic BP > 90 mmHg, or a rise in systolic BP > 25 mmHg &/or a rise in diastolic BP > 15 mmHg from a reading before conception or in 1st trimester and 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 intra-uterine growth restriction present
1: yes, intrauterine growth restriction suspected

Fetal distress

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

Antenatal diagnosis of fetal malformation

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

Other antenatal complication

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

Antenatal corticosteroids

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

Coding: 0: unknown - information not available
1: none - steroids not given to enhance fetal lung maturation.
2: less than 24 hours - first dose given less than 24 hours prior to this baby's birth.
3: complete - more than one dose of steroids given, and first dose at more than 24 hours and less than 8 days before the 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 information of the time of doses given is not available, but two doses are known to have been given appropriately, also use 'complete'.

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: A single digit numeric field representing birth order
0: singleton.
1: first of a multiple birth
2: second of a multiple birth
3: third of a multiple birth. etc.
8: other.

Date of birth

Definition: Date of birth of the patient.

Coding: DD / MM / YYYY

Admission date

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

Coding: DD / MM / YYYY

Sex

Definition: The sex of the patient.

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

Infant weight

Definition: The first weight of baby after birth.

Coding: 4 digit numbered field representing birthweight in grams

Guide for use: The weight is usually measured to the nearest five g and obtained within 1 hr 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 clinical assessment.

Coding: 2 digit numbered field representing the number of completed weeks.

Guide for use: Derived from clinical assessment when accurate information on the date of the last menstrual period is not available.

Place of birth

Definition: Place of baby's birth

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

Presentation at birth

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

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

Mode of birth

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

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

Apgar score (1 minute)

Definition: Numerical score to evaluate the baby's condition at 1 minute after birth.
Coding: 2 digit numeric field representing the 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 numeric field representing the Apgar score

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 NICU after resuscitation is complete.

Congenital malformations

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

Specified congenital malformations

Definition: Structural abnormalities (including deformations) present at birth and diagnosed prior to discharge
Coding: ICD-10

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: 3-digit numbered field representing temperature measured in degrees Celsius.
Guide for use: 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 retrieval team arrive at the baby's bedside. If the baby is > 12 hours old at admission to the registration unit or when the specialist neonatal team arrives (whichever is earlier), or if an admission temperature is not recorded, use '0' to denote missing.

Highest appropriate inspired oxygen

Definition: Highest appropriate inspired oxygen (FiO_2), between admission to NICU and 12 hours after birth. Appropriate range is when arterial P_aO_2 or $TcPO_2$ is 50-80 mmHg,
or if FiO_2 is >25%, SaO_2 is 88-95%,
or if FiO_2 is < 25%, SaO_2 is >88%.
Coding: 3 digit numbered field representing FiO_2 recorded as a percentage.
Guide for use: as for *temperature on admission*; use '0' to denote missing.

Lowest appropriate inspired oxygen

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

Worst base excess

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

Main respiratory diagnosis

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

8: apnoea - recurrent pauses in breathing for >20 sec, or for <20 sec associated with bradycardia or any desaturation requiring intervention.
9: congenital malformation - congenital malf. is the primary reason for RD, e.g. diaphragmatic hernia (list malformation is appropriate field).
10: other - unspecified other RD.
11: peri surgical - respiratory support given for surgical intervention.
12: newborn encephalopathy - a syndrome of disturbed neurological function in an infant with difficulties initiating or maintaining respiration, depression of tone reflexes or consciousness and often with seizures[12a]

Guide for use: For a diagnosis other than 'normal' the baby must receive respiratory support (O_2 and/ or assisted ventilation for > 4 consecutive hours, or died prior to 4 hours of age). If more than one diagnosis is possible, use the most serious condition e.g., severe hyaline membrane disease (HMD) requiring exogenous surfactant therapy and mechanical ventilation plus later apnoea requiring CPAP would be coded as '3'. However, for diaphragmatic hernia and mild HMD, 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: other - other artificial surfactant given
5: both - Exosurf and Survanta were both used
Guide for use: Incl. incomplete administration.

Air leak requiring drainage

Definition: Any form of air leak requiring drainage (either transient or continuous drainage). Pulmonary airleaks include pneumo-thorax, pulmonary interstitial emphysema, pneumo-mediastinum, pneumopericardium, pneumo-peritoneum, 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 numbered field representing IPPV hrs
Guide for use: The hours of all forms of assisted ventilation via an endotracheal tube are summed. The usual rounding applies, e.g. 1 hr 20 mins is recorded as 1 hr, 1 hr 30 mins as 2 hours. Where there is prolonged use of this therapy, i.e. > 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 numbered field representing CPAP hours
Guide for use: as for hours of IPPV

High frequency ventilation

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

Nitric oxide

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

Extracorporeal membrane oxygenation

Definition: An extracorporeal circuit, established to divert baby's blood to a membrane lung for oxygenation, was initiated for the baby.
Coding: 99: unknown
0: no, extracorporeal membrane oxygenation (ECMO) never initiated
1: yes, ECMO initiated

Date of final added oxygen therapy

Definition: Date supplemental oxygen (O_2) ceased (appropriately).
Coding: DD / MM / YYYY
Guide for use: 4 consecutive hours in any 24 hr period constitutes a 'day'. Any route for O_2 is included. If O_2 is ceased, and then required again for the same illness, use the final date of O_2 use. Do not include days of O_2 for subsequent illnesses e.g. RSV or surgery. If no O_2 given, leave blank. This date is used to calculate O_2 use.

Chronic lung disease

Definition: The baby received respiratory support (supplemental O_2 or any form of assisted ventilation) for a chronic pulmonary disorder at 36 weeks post menstrual age (PMA).
Coding: 99: unknown
0: no chronic lung disease.
1: yes, chronic lung disease.
Guide for use: 4 consecutive hours in any one 24 hr period constitutes respiratory support on that day. To calculate PMA add gestational age (in completed weeks) to chronological age (in days). E.g. 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 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, and date of final added oxygen therapy must be date of discharge to home.

Neonatal surgery

Definition: Did this baby have 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:
1. Has at least 4 of the following symptoms:
at least one systemic sign: temperature instability apnoea, bradycardia or lethargy; and
one intestinal sign: residual of more than 25% of previous feed on two consecutive occasions, abdominal distension, vomiting or faecal blood;
2. 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.
3. Plus the baby warranted treatment for NEC, which included nil by mouth and antibiotics[2].

Number of episodes of proven infection

Definition: The total number of separate episodes of proven bacteria, fungal or viral systemic infections.
Coding: 2 digit number representing the number of episodes of proven infection.
Guide for use: Systemic sepsis is a clinical picture consistent with sepsis, plus a positive bacterial or fungal culture of blood and/ or cerebrospinal fluid, or positive urine culture by sterile collection Infections with coagulase-negative staphylococci and other potential contaminants, or group B streptococcal antigen detected in urine are included only if the baby is considered clinically septic and there is supporting evidence. Viral infections are proven by culture and / or haematological results consistent with infection[10]

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 examination

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 (as in above date). 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 - VI <= 97thcentile.
2: dilatation - 97thcentile< VI >=97thcentile+4mm
3: hydrocephalus - VI > 97thcentile+4mm, or hydrocephalus present requiring a shunt or any form of drainage (permanent or transient).
Guide for use: If 2 or 3, record ventricular index

Ventricular Index (VI)

Definition: VI is measured as the furthest lateral extent of each ventricle from the midline measured at the level of Foramen of Monro[12].
Coding: 2 digit number representing VI in mm.
Guide for use: Record if ventricular dilatation.

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 the periventricular white matter in the boundary zones supplied by terminal branches of the both the 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 retinopathy of prematurity exam

Definition: The baby meets the criteria for eye examination for retinopathy of prematurity at registration hospital.
Coding: 99: unknown
0: no
1: yes, did meet local criteria.

Retinopathy of prematurity

Definition: Worst stage of retinopathy of prematurity 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

Retinopathy of prematurity threshold disease present

Definition: Eye examination for retinopathy of prematurity revealed threshold disease.
Threshold disease is defined as:
. for Zone II: presence of posterior pole dilation/ tortuosity in at least two posterior pole quadrants (plus disease), and stage III retinopathy of prematurity for at least five contiguous clock hours or eight composite clock hours.
. for Zone I: retinopathy of prematurity (any stage) with the presence of posterior pole dilation/ tortuosity in at least two posterior pole quadrants (plus disease), or stage III retinopathy of prematurity, with or without plus disease.
. Stage IV or Stage V retinopathy of prematurity, or massive vitreal haemorrhage obscuring the view of the fundus is beyond threshold disease, but considered as threshold present16.
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

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 field
Guide for use: Cause of death is to be described in morbid anatomical terms.

Death due to congenital malformation

Definition: The death of the infant may be directly attributed to the congenital malformation.
Coding: 99: unknown
0: no
1: yes, death is attributable to a congenital malf.
Guide for use: Must be coded as “yes” for major congenital malformation and “yes” for died.

Transferred to another hospital

Definition: The baby was transferred to another hospital nursery before going home.
Coding: 99: unknown
0: no, never transferred
1: yes, transferred

Date of transfer

Definition: Date on which a newborn baby completes an episode of care after birth in the hospital of registration. Formal separation is the administr-ative process by which a hospital records the completion of treatment and / or care and accommodation of a patient.
Coding: DD / MM / YYYY
Guide for use: Use the most significant date.

Discharge date

Definition: Date on which an admitted patient completes an episode of care.
Coding: DD / MM / YYYY
Comment: All data collection ceases when the baby is discharged to home.

1.2 Minor congenital malformations

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

Skull
bachycephaly, dolichephaly, plagiocephaly
craniotabes
large, small or absent fontanelles
macrocephaly
head asymmetry

Face
Facial palsy
facial asymmetry micrognathia
flat or wide nasal bridge, upturned nose, or other minor nose malf.
Deviation of 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

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

Mouth, tongue & 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

Cardiovascular system
patent ductus arteriosis or foramen ovale *(gestational age <37 weeks or birth-weight <2500g)*
mild, trivial or physiological valvular regurgitation
cardiomegaly
dextroposition of heart
heart block
persistent fetal circulation
single umbilical artery

Gastrointestinal system
hepatomegaly
splenomegaly
Merkel's diverticulum
anal tags
anal or rectal fissures
inguinal hernia in boys
inguinal hernia in girls *(birthweight < 2500 g)*
umbilical hernia (*skin covered*)

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 *(gestational age <37 weeks, birth-weight <2500g)*
small penis
chordee
patent urachus or urachal cyst
ectopic kidney.

Limbs
skin tags on hands and 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 of subluxation of knee
hallux valgus
hallux varus
talipes calcaneovalgus or equinovarus
cervical rib, other extra ribs
rocker-bottom feet
simian or Sydney lines, abnormal palmar creases
hip subluxation, clicky hips

Respiratory system
hypoplastic lungs *(gestational age < 37 weeks)*
laryngeal stridor
laryngomalacia

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

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1.4 Abbreviations

Please refer to the definitions section for any abbreviations that may appear in the report that are not outlined below.

ANZNN: Australian and New Zealand Neonatal Network
BW: Birthweight (in grams)
DOB: Date of birth
GA: Gestational age (in completed weeks)
Level II: a nursery for babies who require intermediate care, see section 3.2
Level III: a nursery for babies who require intensive care, see section 3.2
n: Number
NHMRC: National Health and Medical Research Council of Australia
NICU: Neonatal Intensive Care Unit
WHO: World Health Organisation

Appendix 2
Participating units in the ANZNN in 2001

2.1 Hospitals with level III nurseries

	births	beds*
New South Wales		
Children's Hospital at Westmead	–	20
John Hunter Hospital	3316	29
Liverpool Health Service	3030	23
Nepean Hospital	3274	27
Royal Hospital for Women	3726	34
Royal North Shore Hospital	1449	26
RPA Women and Babies	3629	32
Sydney Children's Hospital	–	20
Westmead Hospital	3842	39
Victoria		
Mercy Hospital for Women	5048	54
Monash Medical Centre	n/a	48
Royal Children's Hospital	1	22
Royal Women's Hospital	n/a	58
Queensland		
Mater Mother's Hospital	6656	60
Royal Women's Hospital	4133	66
The Townsville Hospital	n/a	28
South Australia		
Flinders Medical Centre	n/a	35
Women's and Children's Hospital	n/a	44
Western Australia		
King Edward Memorial and Princess Margaret Hospitals	4197	80
Tasmania		
Royal Hobart Hospital	n/a	16
Australian Capital Territory		
Canberra Hospital	1960	24
Northern Territory		
Royal Darwin Hospital	1698	18
New Zealand		
Christchurch Women's Hospital	4325	37
Dunedin Hospital	1626	16
Middlemore Hospital	6513	26
National Women's Hospital	7651	59
Waikato Hospital	3083	29
Wellington Women's Hospital	3342	35

2.2 Hospitals with level II nurseries

	births	beds*
Tasmania		
Launceston General Hospital	1640	15
New Zealand		
Gisborne Hospital	725	6
Hastings Hospital	1817	12
Hutt Hospital	n/a	8
Nelson Hospital	875	6
Palmerston North Hospital	1811	17
Rotorua Hospital	1348	10
Southland Hospital	n/a	6
Taranaki Base Hospital	1348	8
Tauranga Hospital	1769	10
Timaru Hospital	611	4
Wairau Hospital	442	4
Wanganui Hospital	660	4
Whakatane Hospital	676	5
Whangarei Area Hospital	n/a	8

*

'births' refers to the number of live births in that hospital in 2001

'beds' refers to the number of beds for newborn infants associated with that nursery.

n/a is not available

Appendix 3
2001 publications by staff of participating units

3.1 Journal articles

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Yu VYH. *Surfactant replacement therapy: benefits and risks.* J Neon. 15:33-45.

3.2 Chapters

Colditz PB, Dunster KR & Joy GJ. *Allergy and dermatology: anetoderma of prematurity in association with electrocardiographic electrodes* 2001 Year Book of Pediatrics, James A Stockman III (ed) 115-116.

Evans N & Archer N. *Perinatal cardiology (editorial)* Semin Neonatol. 6:1.

Kluckow M & Evans N. *Low systemic blood flow in the preterm infant.* Semin Neonatol 6:75-84.

Knight DB. *The treatment of patent ductus arteriosus in preterm infants. A review and overview of randomized trials.* Semin Neonatol 6:63-73.

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Yu VYH. *Perinatal health in Asia and Oceania: neonatal aspects.* In: *The perinatal medicine of the new millennium.* Monduzzi (ed) Bologna 5-10

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Yu VYH. *Training and subspecialisation in neonatology.* In*: The perinatal medicine of the new millennium.* Monduzzi (ed) Bologna, 1093-1098

3.3 Cochrane Library reviews

The Cochrane Library is a database of systematic reviews for the Cochrane Collaboration. These reviews follow a strict set of criterion that allow the amalgamation or 'meta-analysis' of multiple randomised controlled trials. This methodology is regarded as producing the highest level of evidence on which to base treatment and care.

All Australians have free access to the Cochrane Library through a Commonwealth Government website at this address:

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

The Cochrane Library is updated regularly as well as having new reviews added during the year. The author of each review undertakes to update their review biannually if new data has appeared (a substantive update). Currently, there are 66 Cochrane reviewers in the Neonatal Review Group from Australia and New Zealand.

The reviews below are listed only if they were first published in 2001 or had a substantive update during that year. To cite these publications use: In: *The Cochrane Library*, Issue 1, 2003. Oxford: Update Software. For example:

Alcock GS & Liley H. *Immunoglobulin infusion for isoimmune haemolytic jaundice neonates* (Cochrane Review). In: *The Cochrane Library*, Issue 1, 2003. Oxford: Update Software.

Askie LM &Henderson-Smart DJ. *Early versus late discontinuation of oxygen in preterm or low birth weight infants* (Cochrane Review).

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Askie LM & Henderson-Smart DJ. *Restricted versus liberal oxygen exposure for preventing morbidity and mortality in preterm or low birth weight infants* (Cochrane Review).

Crowther CA, Hiller JE & Doyle LW. *Magnesium sulphate for preventing preterm birth in threatened preterm labour* (Cochrane Review).

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Davies MW & Davis PG. *Nebulized racemic epinephrine for extubation of newborn infants* (Cochrane Review).

Davies MW, Kimble RM & Woodgate PG. *Ward reduction without general anaesthesia versus reduction and repair under general anaesthesia for gastroschisis in newborn infants* (Cochrane Review).

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Davis PG & Henderson-Smart DJ. *Intravenous dexamethasone for extubation of newborn infants* (Cochrane Review).

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Flendy VJ & Gray PH. *Chest physiotherapy for preventing morbidity in babies being extubated from mechanical ventilation* (Cochrane Review).

Flenady V & King J. *Antibiotics for prelabour rupture of membranes at or near term* (Cochrane Review).

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Foster J & Cole M. *Oral immunoglobulin for preventing necrotizing enterocolitis in preterm and low birthweight neonates* (Cochrane Review)

Fowlie PW & Davis PG. *Prophylactic intravenous indomethacin for preventing mortality and morbidity in preterm infants* (Cochrane Review).

Henderson-Smart DJ, Bhuta T, Cools F & Offringa M. *Elective high frequency oscillatory ventilation versus conventional ventilation for acute pulmonary dysfunction in preterm infants* (Cochrane Review).

Henderson-Smart DJ & Osborn DA. *Kinesthetic stimulation for preventing apnea in preterm infants* (Cochrane Review).

Henderson-Smart DJ, Subramaniam P & Davis PG. *Continuous positive airway pressure versus theophylline for apnea in preterm infants* (Cochrane Review).

Henderson-Smart DJ & Steer PA. *Doxapram treatment for apnea in preterm infants* (Cochrane Review).

Henderson-Smart DJ & Steer P. *Methylxanthine treatment for apnea in preterm infants* (Cochrane Review).

Henderson-Smart DJ & Steer P. *Prophylactic caffeine to prevent postoperative apnea following general anesthesia in preterm infants* (Cochrane Review).

Henderson-Smart DJ, Wilkinson A & Raynes-Greenow CH. *Mechanical ventilation for newborn infants with respiratory failure due to pulmonary disease* (Cochrane Review).

Ho JJ, Henderson-Smart DJ & Davis PG. *Early versus delayed initiation of continuous distending pressure for respiratory distress syndrome in preterm infants* (Cochrane Review).

Ho JJ, Subramaniam P, Henderson-Smart DJ & Davis PG. *Continuous distending pressure for respiratory distress syndrome in preterm infants* (Cochrane Review).

Hunt R & Osborn D. *Dopamine for prevention of morbidity and mortality in term newborn infants with suspected perinatal asphyxia* (Cochrane Review).

Kecskes ZB & Davies MW. *Rapid correction of early metabolic acidaemia in comparison with placebo, no intervention or slow correction in LBW infants* (Cochrane Review).

King J & Flenady V. *Prophylactic antibiotics for inhibiting preterm labour with intact membranes* (Cochrane Review).

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Kuschel CA & Harding JE. *Calcium and phosphorus supplementation of human milk for preterm infants* (Cochrane Review).

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Mills JF & Tudehope D. *Fibreoptic phototherapy for neonatal jaundice* (Cochrane Review).

Osborn DA. *Thyroid hormones for preventing neurodevelopmental impairment in preterm infants* (Cochrane Review).

Osborn DA, Cole MJ & Jeffery HE. *Opiate treatment for opiate withdrawal in newborn infants* (Cochrane Review).

Osborn DA & Evans N. *Early volume expansion for prevention of morbidity and mortality in very preterm infants* (Cochrane Review).

Osborn DA & Evans N. *Early volume expansion versus inotrope for prevention of morbidity and mortality in very preterm infants* (Cochrane Review).

Osborn DA, Jeffery HE & Cole MJ. *Sedatives for opiate withdrawal in newborn infants* (Cochrane Review).

Simmer K. *Longchain polyunsaturated fatty acid supplementation in infants born at term* (Cochrane Review).

Soll RF & Morley CJ. *Prophylactic versus selective use of surfactant in preventing morbidity and mortality in preterm infants* (Cochrane Review).

Woodgate PG & Davies MW. *Permissive hypercapnia for the prevention of morbidity and mortality in mechanically ventilated newborn infants* (Cochrane Review).

Woodgate PG & Flenady V. *Tracheal suctioning without disconnection in intubated ventilated neonates* (Cochrane Review).

3.4 All ANZNN publications

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Heuchan AM, Evans N, Henderson Smart DJ & Simpson JM. *Perinatal risk factors for major intraventricular haemorrhage in the Australian and New Zealand Neonatal Network 1995-1997.* Arch Dis Child Fetal Neonat Ed 2002;86:F86-90

Hacking D, Watkins A, Fraser S, Wolfe R, Carlin J & Nolan T. *Respiratory distress syndrome and antenatal corticosteroid treatment in premature twins.*Arch Dis Child Fetal Neonat Ed. 2001; 85:F75.

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Donoghue, DA *Report of the Australian & New Zealand Neonatal Network, 2000*. Sydney: ANZNN 2001.

Donoghue, DA & Cust AE *Report of the Australian & New Zealand Neonatal Network, 1999.* Sydney: ANZNN 2000.

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Jordens CF, Hawe P, Irwig LM, Henderson-Smart DJ, Ryan M, Donoghue DA, Gabb R & Fraser IS. *Use of systematic reviews of randomised trials by Australian neonatologists and obstetricians.* MJA 1998;168:267-270.

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Appendix 4
ANZNN Documentation

4.1 Aim

The aim of the Australian and New Zealand Neonatal Network is '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 Australian & New Zealand Neonatal Network Advisory Committee Meeting, Auckland, NZ, 2nd April 1995.

4.2 Objectives

The objectives of the Australian & New Zealand Neonatal Network 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 Australian & New Zealand Neonatal Network Advisory Committee Meeting, Auckland, NZ, 2nd April 1995.

4.3 Confidentiality guidelines

Confidentiality guidelines were devised and agreed to by the Advisory Committee to provide an unambiguous framework for the handing of data that met the strict criteria of governing bodies. These guidelines are set out in full below.

Confidentiality guidelines for the collection, processing, and analysis of data from the national minimum data set of the Australian & New Zealand Neonatal Network.

As revised at the Australian & New Zealand Neonatal Network 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 Australian & New Zealand Neonatal Network (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:

- as de-identified summary tables not provided in the annual report, but available upon request;
- as de-identified unit record data for analytical purposes as approved by the ANZNN; and
- 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 the data retrospectively from 1st January 1994.

A Principles of ownership and maintenance of data

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

B Conditions for data collection

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

C Conditions for use and release of data

1. Use of the data would entail agreement by the Advisory Committee (Directors, or their nominee, of each contributing NICU) and the Executive.
2. Data will not be published or supplied with any patient identifying information.
3. Data will not be published or supplied with any NICU or State/Territory/nation identifying information without the written approval of all the NICU Directors of the State/Territory or nation concerned.
4. External requests for a hard copy of patient de-identified data will be made in writing to the data custodians. Any requests for data that could potentially identify a unit or State/ Territory/nation will be referred to the Advisory Committee.

   External requests for patient de-identified data on computer disk will be made in writing to the data custodians, and then referred to the Advisory Committee.

   Requests in writing must be in the form of a one page research proposal. A confidentiality agreement must be signed by the person(s) requesting data prior to the release of the data.

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

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

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

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

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

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

   Data will also be released to each Director in electronic form with their own unit data identified, and the rest of the data completely de-identified.

D Conditions for data security

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

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