Review Article

The Australian and New Zealand Neonatal Network: past achievements and future directions

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Abstract: The care of high-risk newborns in Australia and New Zealand has continued to develop considerably over the last 50 years. The Australian and New Zealand Neonatal Network (ANZNN) was established in 1994. The Network has contributed considerably to the advancement of neonatal care through data collection, collaborative audits, benchmarking, knowledge translation and research. There has been growth from the initial minimum dataset to a sophisticated web-based data capture system facilitating electronic submission, timely data validation and tracking. Collated data are analysed to produce an annual network report covering survival, morbidity and long-term neurodevelopmental outcomes. Automated individual unit feedback is also provided to the centres contributing data. In addition to reporting and benchmarking a range of outcomes, ANZNN strives to improve clinical practice through a range of other shared activities. One important undertaking is through the annual Clinical Practice Improvement (CPI) conference, which includes sessions on improvement methodology, breakout discussion covering key areas of care plus opportunities to share the experience and outcomes from quality improvement projects. The ANZNN CPI committee has organised overseas site visits to learn from other high performing networks; facilitated widespread participation in the Evidence-based Practice for Improving Quality (EPIQ) courses; and partnered with the Royal Australasian College of Physicians (RACP) to participate in the Evolve project to identify a list of the top 5 low-value practices in neonatal care. The CPI functions are further reinforced by ANZNN support for formulating consensus-based Total Parental Nutrition and establishing the Australasian Neonatal Medicine Formulary. Moreover, ANZNN supports the expansion of research capability by providing aggregated outcome data to assist clinical trial design, facilitates surveys including those covering trends and variation in the use of newer technologies, and more recently has undertaken research such as registry-embedded trials. Supporting the data collections of the Australian and New Zealand Neonatal Surgical Network and neonatal retrieval services will add additional dimensions to the ANZNN function. In summary, ANZNN celebrated a 25-year anniversary in 2019 and is still growing and developing geographically and in activities. The strength, longevity and growth of ANZNN are based on active member engagement and sound governance structure.

Keywords: Neonatal network; Clinical Practice Improvement (CPI); benchmarking; clinical quality registry

Introduction

The care of high-risk newborn infants has developed considerably over the last 50 years, but there remains an ongoing need to review results and to continue to strive for optimal outcomes. In the early 1990s in Australia, the National Health and Medical Research Council's (NHMRC) 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". Initiatives proposed to alleviate perinatal mortality and morbidity included defining and monitoring adverse neonatal outcomes, establishing perinatal morbidity meetings, and creating minimum data sets for birth and congenital anomaly registries.

Historically, the first example of using a neonatal network was the randomised trial sponsored by the National Institutes of Health (NIH) of restricted provision of supplemental oxygen to very-low-birthweight (VLBW) infants. This multicentre study enrolled 800 infants at 18 medical centres in the USA, beginning in July 1953, and this group formally became a neonatal network in 1986 (1,2). The British Births Survey began population-based cohort studies in 1958. In Australia, state-based Victorian follow-up of cohorts of very low-birth weight infants began in 1979 (3), and the Western Australian Cerebral Palsy Register commenced in 1980. The New South Wales Newborn Intensive Care Units Study began an ongoing audit of high-risk babies in 1988. In New Zealand, all nurseries began auditing very low-birth weight infants in 1986 (4) and joined with Australian counterparts in 1994 to found the Australian and New Zealand Neonatal Network (ANZNN).

In contrast to cohort studies or clinical trials, a neonatal network is a group of units working together to collect data using standard definitions and improve patient care (1). In particular, networks encompassing geographical areas can help report population outcomes. Regular feedback to member units of a network compares performance and allows clinicians to assess their outcomes and data integrity (5,6). Furthermore, a range of highly successful network promoted quality improvement initiatives have been demonstrated (7,8).

A historical perspective of ANZNN

The ANZNN was founded on ongoing collaboration among all neonatal intensive care units led by the late founding chairman Professor David Henderson-Smart. Established in 1994 under the above recommendation of the NHMRC Expert Panel on Perinatal Morbidity, a prospective audit across all neonatal intensive care units (NICUs) (Level III) in Australia and New Zealand, leading to the contribution of data for all very premature infants born before 32 weeks gestation or birth weight less than 1,500 g from 1 January 1995 (9). Data collection was based on voluntary participation from member units submitting minimal datasets of agreed clinical data to the Network office as electronic data spreadsheets or in paper forms. This minimal data collection enabled the collective evaluation, and annual benchmarking of important clinical outcomes of the high-risk infants admitted to any of the intensive care nurseries of the two countries.

The ANZNN was initially based at the Centre for Perinatal Health Services Research at the University of Sydney. The Network grew in strength from 2005, encompassing an expanding group of 29 Level III neonatal intensive care units (NICUs) across Australia and New Zealand and all New Zealand Level II units and some in Australia.

In 2008, the Network moved to the University of New South Wales and hosted within the National Perinatal Epidemiology and Statistics Unit (NPESU). At this time, the ANZNN Data Collection & Operation Committee led by Professor Kei Lui was formed to oversee the development of an expanded dataset and definition standardisation. The data collection extended to include long term neurodevelopmental outcomes of extremely preterm infants from 2009 birth cohort. The development of the web-based data capture system in 2011 allowed electronic submission via a web portal and facilitated timely data validation, submission, and tracking. Automation of individual unit outcome feedback reporting was developed in 2015. In 2015, the ANZNN undertook a significant initiative to establish the Clinical Practice Improvement Committee for active facilitation and promotion of collaborative learning and knowledge translation to improve clinical outcomes. Since 2016, an annual ANZNN Clinical Practice Improvement Conference has been held.

Over the last decade, ANZNN has grown with the increasing inclusion of large Level II units across Australia giving a total of 35 ANZNN Level II units (19 in Australia and 16 in New Zealand). The extension to international membership saw 2 large NICUs, one of each, from Singapore and Hong Kong joined the Network in 2015 and
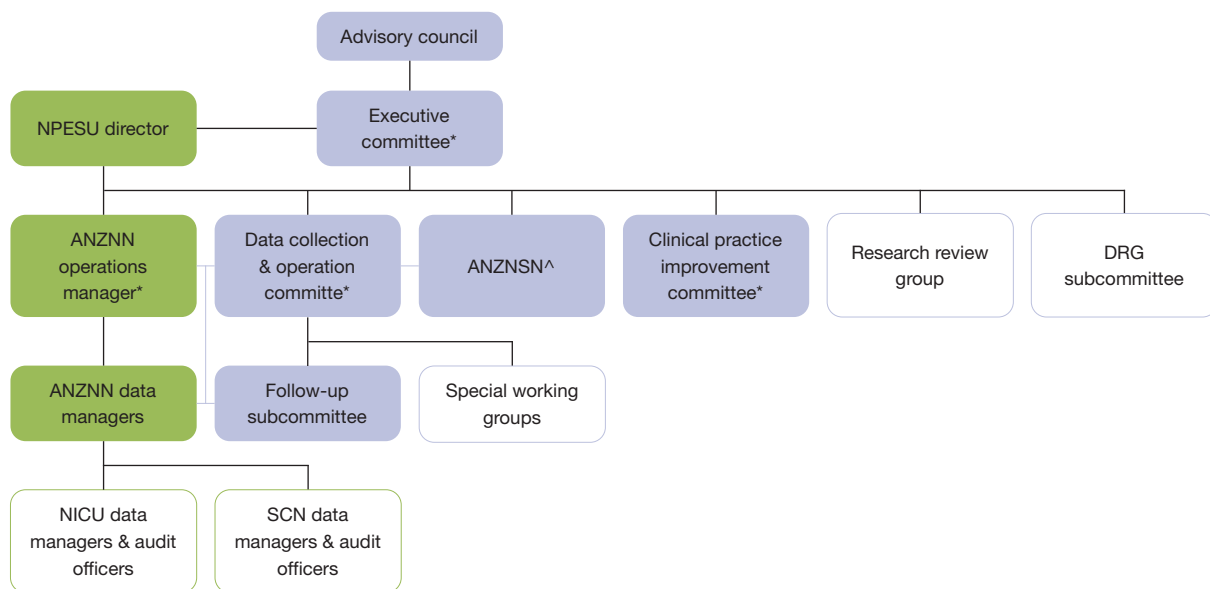
Figure 1 Governance structure of ANZNN (image adapted with NICU permission from Prof. Kei Lui). *, ANZNN Management Group is comprised of the Chairs of these operation committees and the ANZNN Operations Manager; ^, Australian and New Zealand Neonatal Surgical Network. Source: Australian and New Zealand Neonatal Network: https://anznn.net/about/structure. NPESU, National Perinatal Epidemiology Statistics Unit; ANZNN, Australian and New Zealand Neonatal Network; DRG, diagnosis related grouping; NICU, neonatal intensive care unit; SCN, special care nursery.

2017 respectively.

Goals and governance

The Network strives to improve the care of high-risk newborns and their families achieved through collaborative audits, benchmarking, knowledge translation and research (10-13). Achieving consistency in national data collection enables monitoring clinical indicators (14,15) for perinatal care, using newer technologies, and implementing evidence-based practices (16,17). The benchmarking of neonatal outcomes, in turn, would help to participate neonatal units with quality improvement to address areas needing attention. It identifies trends and variations in mortality, severe morbidities and long-term neurodevelopmental outcomes. Core datasets play a vital role in determining priority areas for research and enhancing the ability to carry out multicentre studies. The ANZNN provides aggregated outcome data to assist clinical trial designs and promote randomised controlled trials through collaboration.

The governance structure of the ANZNN consists of the Advisory Council, Executive Committee, and the two main operation committees of the Data Collection & Operation Committee and the Clinical Practice

Improvement Committee, displayed in *Figure 1* (https://anznn.net/about/structure). The Advisory Council, being the governing body of ANZNN, includes the director of NPESU, director of each participating NICU, nominated academic neonatologists, and the Australian and New Zealand regional representatives of special care nurseries and neonatal nurses, as well as three parent/consumer representatives. The Council of 45 current members, meets twice a year, oversees the Network's progress on current issues, receives financial reports, approving new variables for inclusion in the minimum data set, annual report, benchmarking and approval of data use for research on behalf of all data contributing members.

Initially, the Executive Committee of three core founding members expanded to comprise elected representatives from unit directors, data managers and neonatal nurses, and a consumer representative. The Committee, meets quarterly, has a steering role in the general functioning of the Network, finance, and decision-making, as reported by the ANZNN Chair, committee chairpersons, and the Operations Manager. The Operations Manager is the point of contact for the ANZNN, who liaises with the ANZNN committees, NPESU, data managers and audit officers.

The Data Collection & Operation Committee reports

Table 1 Current registration criteria

Registration criteria
1. Born at less than 32 weeks of gestation
2. Weigh less than 1,500 g at birth
3. Receive assisted ventilation (mechanical ventilation), including IPPV or CPAP or high flow nasal cannula for four or more consecutive hours
4. Die while receiving mechanical ventilation before four hours of age
5. Undergo a major surgery (surgery that involved opening a body cavity)
6. Receive therapeutic hypothermia

IPPV, intermittent positive pressure ventilation; CPAP, continuous positive airways pressure.

through the Executive Committee to the Advisory Council. Established in 2008, it coordinates operations of Network data collection, monitors the workload and progress of the annual report. The Operations Manager manages routine businesses of the Network and reports to the Executive Committee and Data Collection & Operation Committee. The responsibility of collecting and submitting data to the ANZNN lies with the unit data managers and audit officers.

The Clinical Practice Improvement Committee oversees the Network initiatives in advancing knowledge translation of agreed evidence-based practice, quality improvement methodology and sharing of success and outcomes of quality improvement projects. Much of this work is achieved through the annual Clinical Practice Improvement Conference, where collaborative learning is encouraged among the member units.

The Australian and New Zealand Neonatal Surgical Network (ANZNSN) found its roots among member units of children's hospitals and large perinatal centres with surgical facilities. Established in 2019, the ANZNSN works with Data Collection & Operation and Clinical Practice Improvement committees to enable benchmarking and initiatives to improve surgical neonates' outcomes. There has been increasing utilisation of the data collection for trending outcomes, such as demonstrating a decreasing trend of major intraventricular haemorrhage and surveying the current or changes in clinical practice (16,18-20). The Research Review Group was thus formed in 2019 to standardise data requests and enhance surveys as a research tool in clinical practice. Research project proposals are reviewed before being recommended to the Advisory Council for approval for data extraction or survey participation. The Diagnosis Related Grouping (DRG) Subcommittee originates from a group of senior ANZNN neonatologists who were initially consulted to assist in developing the Australian Neonatal

DRG classification. The subcommittee liaises with the federal DRG agencies and reports to the ANZNN Executive and Advisory Council.

Consumer representation has been considered of paramount importance that parents nominated through the Miracle Babies Foundation are included in major ANZNN committees, namely the Executive Committee, Clinical Practice Improvement Committee and the Follow-up Subcommittee.

Data collection and benchmarking—the role of data collection & operation committee

The ANZNN audit data are anonymous and de-identified. Babies admitted to a neonatal unit are eligible for registration if they satisfy one or more of the following criteria displayed in *Table 1*. Babies discharged home and re-admitted to a NICU during their neonatal period are not eligible for registration in the ANZNN audit. The registration hospital is assigned to the first Level III NICU in which the baby, aged less than 28 days, stayed for four or more hours. Babies who receive their entire care in a Level II nursery or who are not transferred to a Level III NICU during the first 28 days are registered to the first Level II centre that they remained in for four or more hours. Detailed definitions for each audit item are agreed upon, with a data dictionary being established to record this detail. Clinical data collected are owned by the NICU, with the directors as internal data custodians. The registration criteria and data definitions are reviewed and may be modified by the Data Collection & Operation Committee periodically. Changes made are to be approved by the Advisory Council.

To date, parents or guardians are informed of the audit by posters or information sheets as approved by an
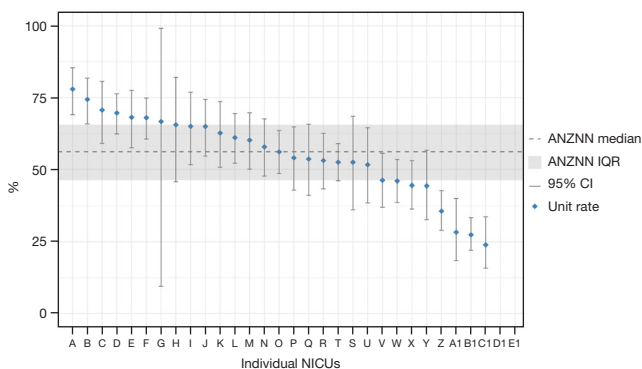
Figure 2 Percentage of admission temperature within 36.5–37.5 degrees Celsius for babies born before 32 weeks who were inborn and did not receive therapeutic hypothermia. ANZNN, Australian and New Zealand Neonatal Network; IQR, interquartile range; CI, confidence interval; NICUs, neonatal intensive care units.

institutional or regional ethics committee, and the clinical data are collected based on opt-out consent. Ethics approval covers the transfer of de-identified data to the ANZNN data capture system. Additional ethics permission is sought when data are requested to be used for a project or study.

Currently, ANZNN collects annually data from around 11,000 infants under the current agreed criteria of registration which includes over 3,000 less than 32 weeks or less than 1,500 g NICU infants. Each registrant record contains 180 baseline characteristic and outcome data items. Multiple episodes of events or interventions, such as sepsis or respiratory support data are additionally collected if occurred. In essence, the data collection represents all high risk newborn NICU admissions, as private hospitals in ANZ were not licensed to provide neonatal intensive care. In addition, almost all high dependency Level II units providing respiratory support have joined ANZNN in providing data. Those qualified for ANZNN registration of less than 32-week gestation, 1,500 g birth weight or other criteria, not retrieved to NICU, are reported and benchmarked separately. However, ANZNN did not collect data of delivery room deaths. With peri-viable gestation considered by most as 22 to 23 weeks in ANZ, ANZNN collects around 90% livebirths born less than 32 weeks gestation or less than 1,500 g.

Annual Report and collective benchmarking

The ANZNN aims for continuous scrutiny for evidence of best practices to improve high-risk babies' long-term

outcomes. The ANZNN annual reports released online and via hard copies to member units consist of the collective descriptive analyses of baseline clinical characteristics and the outcomes of the entire 12-month cohort of registrants for each birth year. The distribution of neonatal characteristics and outcomes are summarised as counts and percentages for categorical variables or using the mean or median with 95% confidence limits for continuous variables. Yearly trends are computed for selected variables and outcomes. In contrast to many neonatal networks, the ANZNN annual outcomes and collective performance are open to public online access (https://anznn.net/annualreports). All annual reports from 1995 onwards are available online.

Individual unit feedback and benchmarking

Benchmarking and comparisons of outcomes among units are confidentially fed back to individual units. Outcomes are primarily benchmarked against ANZNN mean or median and the range defined by the 95% confidence intervals. Initial crude rates and associated 95% confidence intervals are calculated and graphically displayed using 'caterpillar plots' from the lowest to the highest to identify differences visually. In addition to adverse outcomes analyses, several clinical performance indexes are included for benchmarking. An example of very preterm infants born within the perinatal centres with admission temperature of at least 36.5 ℃ and below 37.5 ℃ is shown in *Figure 2*.

Risk-adjusted benchmarking and quarterly trending of performance

There is an inherent variation with clusters of extremely premature babies being admitted and cared for during any particular year or period. Such fluctuation can result in a misleading impression of good or poor performance, particularly for a large number of small to medium-sized NICUs in the ANZNN. To adjust for multiple baseline characteristics in benchmarking and comparisons of outcomes among units of varying sizes and populations, standardised mortality/morbidity ratios (SMRs) are computed using the 'indirect standardisation' approach. We can overcome this by the use of expected outcomes.

With the wide difference between the sizes of member units, a 5-year cohort is used to improve the confidence for this benchmarking. Each unit's observed rate of the last 5 years is compared with the expected rate based on the total sample of this group of high-risk infants, based on
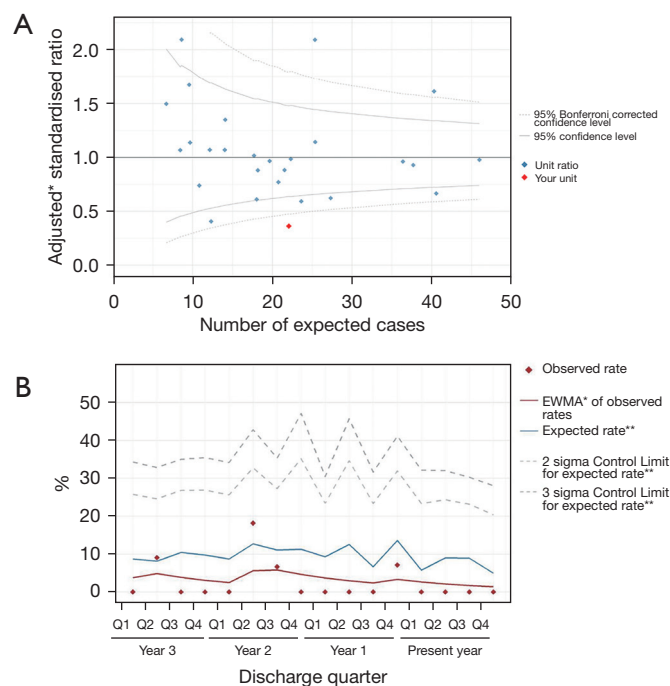
Figure 3 Complementing risk-adjusted benchmarking with Timely (quarterly) risk-adjusted performance trend (all NICU ID removed from original report with minor figure alteration, image adapted with NICU permission from Prof. Kei Lui). Example with permission of a NICU with (A) a consistently low Adjusted Rate of Severe IVH (Grade III/VI) over 5 years in babies born at 23 to 28 weeks who survived to day 3 and were tested for IVH (*, adjusted for gestational age, sex, inborn status and antenatal steroids), and (B) a continuing trend of good performance demonstrated in Quarterly Feedbacks (see text for explanation). Severe IVH for babies born before 29 weeks who survived to day 3 and were tested for IVH (*, exponentially weighted moving average; **, adjusted for gestational age in weeks, standardised to rates in Australian and NZ NICUs 2015–2019). NICU, neonatal intensive care unit; IVH, intraventricular haemorrhage.

the 5-year ANZNN performance. The expected number of events is computed as the predicted probabilities from a multivariable model adjusted for confounders for each outcome. Individual unit standardised rates SMR are graphically displayed using 'funnel' plots with 95% and 95% Bonferroni corrected prediction intervals (*Figure 3A*). The top-performing units are commonly identified within the network as internal information to all units for knowledge. This aims to encourage member units to promote clinical practice improvement (CPI) initiatives and share experience in implementation at the clinical front.

The Network explored near real-time benchmarking of selected outcomes across member units to further build on CPI initiatives. To overcome the limitation of waiting for discharge of cohort-based on birth dates, timely feedback cohorts are based on those infants discharged over the previous 3 months. Almost all the critical neonatal outcomes are known at the time of back transfer or discharge. Data of discharged infants over the last quarter are submitted "as is"

for trending analysis. Secondly, there are inherent variations with clusters of extremely premature babies admitted and cared for during any particular quarter. Such fluctuation can result in a misleading impression of good, poor or fluctuating performance, particularly for small to medium-sized NICUs. We can overcome this by comparing observed to expected outcomes. Expected outcomes are the rate predicted for this group of high-risk infants based on the previous 5 years of ANZNN performance (*Figure 3B*). This is particularly useful when used together with the 5-year risk-adjusted funnel plot benchmarking. An example of a consistently well-performing unit with low rates of intraventricular haemorrhage is shown in *Figure 3*.

Quarterly feedback benchmarking of clinical outcomes is also beneficial for identifying performance trends. While there is an apparent fluctuation of crude rates, the exponentially weighted moving average (EWMA) trend line confirms a steady improvement in a trend of fewer late-onset sepsis (LOS) as benchmarked to the ANZNN performance.
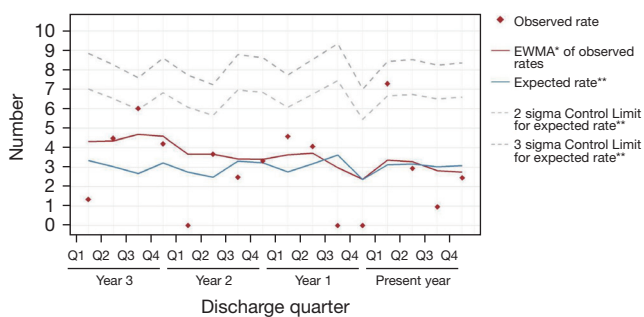
Figure 4 Trend of improving performance of late-onset sepsis rate^ for babies born before 32 weeks gestation who survived to day 2^^ (with NICU permission from Prof. Kei Lui). *, exponentially weighted moving average; **, adjusted for gestational age in weeks, standardised to rates in Australian and NZ NICUs over the last 5 years. ^, episodes per 1,000 patient days occurring during the period to first transfer or discharge to home, truncated to first 35 days of life; ^^, babies with unknown exposure time (missing date of transfer, death or discharge to home) are assumed to stay at least 35 days. NICU, neonatal intensive care unit; IVH, intraventricular haemorrhage; NZ, New Zealand.

Improving quarterly trend for LOS rate (adopted from a medium size unit) is shown in *Figure 4*. Since implementation in 2019, the survey of members has demonstrated an overwhelmingly positive response to this approach.

Neurodevelopmental outcomes—audits and benchmarking

The ANZNN database, comprising data of high-risk newborns, including the 2–3 year follow-up information (since 2009), is a rich resource for research, audits, and quality improvement. Individual Unit Feedback Reports for both follow-up rates and 2–3-year follow-up outcomes of neurodevelopmental impairment, including blindness, deafness, cerebral palsy and cognitive impairments, are produced annually. The ANZNN feedback benchmarks each unit against other units and the ANZNN for significant long-term morbidities and outcomes (21).

The Follow-up subcommittee consists of members with neurodevelopmental follow-up expertise. The subcommittee has the additional responsibility to classify incomplete assessment results to determine the level of functional impairment according to agreed definitions. The database has recently been expanded to receive 5-year follow-up data. However, not all NICUs have the capacity and resources to follow-up beyond 2 to 3 years of age. While each NICU follow-up program has own follow-up criteria, the current agreed cohort consists of infants born less than 29-week gestation or less than 1,000 g and to be followed up to 2 to 3 years of age. Follow-up rates is currently at 78% among an annual cohort around 920 infants. Follow-up rates are higher in the extreme low gestation infants of less than 25-week gestation compared with higher gestation.

CPI in the ANZNN

CPI is a vital activity of the ANZNN. From its inception in 2015, the CPI committee chaired by Professor Lui acknowledged the excellent work of the Canadian Neonatal Network (CNN) (22,23), with several members attending their annual meetings. Indeed, the first ANZNN CPI conference program was based on the same format as the Canadian Neonatal Network Evidence-based Practice for Improving Quality (EPIQ) meetings. As one of the early functions of this conference was to build capacity for CPI activity in Australia and New Zealand, the meetings have included plenary sessions by invited experts. Experts from the Neonatal Research Network Japan, EPIQ Canada, the Children's Hospital Neonatal Consortium USA and the Swedish Neonatal Quality Register have all presented. A second essential function has been to provide a forum for presenting local projects involving CPI. As the meeting evolved, it attracted many abstracts for presentation at a mix of platform and poster sessions. These sessions encourage participation in CPI, peer review and discussion, as well as disseminating CPI results. Furthermore, awards incentivise participation as prizes are a substantial discount on future conference attendance.

The third key function is to enable discussion in breakout groups interested in different aspects of care. These sessions are facilitated by members of the CPI committee and are informed by benchmark data as in *Figure 2*. Participants are allocated to the Breakout Groups, and the facilitators introduced the day before. Typically, the sessions start with a short presentation from one of the high performing centres (top quartile units) for that morbidity, which outlines relevant aspects of their approach and philosophy. A discussion builds around potential strategies to reduce specified morbidity and the evidence base for any proposed changes. The top performers in each group are notified beforehand and asked to prepare one slide on their practice. There is an opportunity to "brainstorm" potential practice changes, including discussions of evaluation, planning and implementation. There is time for feedback and exploration of local or more widespread barriers and facilitators. An

essential aspect of this session is reporting back to the main conference. Some discussions progress to a subsequent online forum, and the results of other ongoing projects may be reviewed at the meeting the following year. These breakout groups may address one of the recognised significant morbidities such as bronchopulmonary dysplasia, nosocomial infection and necrotising enterocolitis or focus on a particular aspect of care such as surgical conditions or haemodynamics. Indeed, one popular group examining the approach to care for extremely low gestational age neonates became the "Golden Hour", reflecting the importance of this period of care. Some groups have a more comprehensive brief and address nutrition and growth or family-integrated care. An excellent example of a beneficial outcome from these groups is the total parenteral nutrition (TPN) consensus formulations from the Growth and Nutrition group. The conference's interdisciplinary focus is maintained by subsidised nursing and allied health attendance funded from sponsorship.

Following each conference, feedback forms indicate that satisfaction was high. Delegates particularly value an opportunity to network and interact with colleagues about the CPI process. The collaboration between units and the interdisciplinary nature of the work and learning from others' experience and the opportunity for breakout group discussion are all rated highly.

Overseas site visits

Site visits were organised to three countries selected based on their published outcomes or well-recognised good practice. These visits include Japan in 2015, Sweden in 2016 and Canada in 2018. Each of these countries offered the opportunity to learn from the hosts' experience and philosophy.

In Japan, the itinerary included presentations of local data from the hosts plus tours of four clinical facilities. Time was set aside for a detailed discussion of available data plus differences in culture and practice. There was an emphasis on the strong positive attitude in providing intensive care to the extremely premature infant. The meticulous nature, work ethic and dedication were evident in both medical staff and nurses. Finally, the practice was protocol driven with good communication of practices between units. The trip to Sweden visited three centres and included talks on several topics, including an introduction to the local health care system, the Swedish Neonatal Quality register plus outcome data, QI in nutrition, perinatal consultation

practice, national guidelines, skin to skin at extreme prematurity and family centred care. Finally, a CPI working group of 18 delegates from Australia and New Zealand travelled to Canada in 2018 to learn first-hand about their national quality improvement program, the Evidence-based Practice for Improving Quality (EPIQ).

ANZNN EPIQ

The EPIQ program (22,23), derived from the Promoting Action on Research Implementation in Health Services (PARiHS) framework (24), is now used by the ANZNN to teach quality improvement. The ANZNN supported an EPIQ 'roadshow' across Australia and New Zealand with multiple EPIQ workshops in 2019. Since then, several EPIQ workshops across Australia and New Zealand have been held, both face-to-face and virtual platforms, with hundreds of healthcare professionals working in neonatal care trained. At present, the ANZNN is centralising co-ordination of EPIQ workshops in collaboration with the University of Alberta and the CNN to allow for greater oversight and support for quality improvement training across neonatal care in Australia and New Zealand.

ANZNN supported CPI activities

EVOLVE project

As part of a global movement, Evolve is an initiative led by physicians and the Royal Australasian College of Physicians (RACP) to drive high-value, high-quality care in Australia and New Zealand (25). The ANZNN has partnered with the RACP to develop a list of the top 5 low-value practices in neonatal care. This list is under final review, and it is anticipated to be released later in 2021.

Parenteral nutrition consensus guidelines

The 2017 parenteral nutrition formulations and guidelines developed by the 2017 Neonatal Parenteral Nutrition Consensus Group offer concise and practical instructions for clinicians to implement current and up-to-date evidence-based parenteral nutrition to the NICU population (26,27).

Australasian neonatal medicine formulary

It is a free resource to support neonatal health professionals with evidence-based consensus driven documents produced

after thorough review of the literature relevant to the use of each drug in the neonate. The information can be accessed on www.anmfonline.org.

Research

The ANZNN has a longstanding tradition of supporting clinical trials and promoting evidence-based practice through meta-analysis of trial outcomes. For clinical trials, the Network has been active in providing outcome data and event rates to inform trial design and sample size and power calculations for research grant applications and promote funded multicentre trials among members. The ANZ Neonatal Cochrane Collaboration has played a significant role in examining trial outcomes and promoting evidence-based clinical practice through the Network.

With the expansion of analysis using the ANZNN data for epidemiological projects and the increased clinical practice surveys (19,20,28-31) in recent times, the procedure for research data request and survey distribution has been formalised through the establishment of the Research Review Group/Committee. Project proposals are reviewed and feedback provided to requesting researchers before final recommendations for approval to Network members. Procedures are clarified and available online https://anznn.net/research/researchrequest. International collaboration in utilising de-identified network data collected, particularly with the Canadian Neonatal Network since 2010 (32,33), has generated substantial interest in exploring variations in clinical practice and outcomes. These lead to the participation of ANZNN as a founding member of the iNEO collaboration (International Network for Evaluation of Outcomes in very premature infants) of reporting outcomes from national or regional networks (34,35) and recently evaluating longitudinal outcome trends and variations at unit level of 11 high income countries (36,37).

The ANZNN has recently taken a more active role in providing routinely collected Network clinical data as trial data. ANZNN has taken a primary role as a trial coordinating centre for the first ANZ neonatal registry embedded trial for the WHEAT-Australia trial (WithHolding Enteral feeding Around blood Transfusion ACTRN12619000711112p), which the NHMRC Medical Research Future Fund funded in 2019. ANZNN has also taken a supporting role in providing routinely collected network data as trial data for the COST-2 cluster randomised trial (ACTRN12620001332910p, funded by

Thrasher Foundation Research Grant).

Funding support and membership

Since inception, the Network has been hosted and supported at university premises, each NICU member contributes a cost recovery membership fee according to a workload scale that provides the main operating budget for the Network staff salaries. State governments in Australia fund health services within hospital settings. Support from state governments varied, with some states providing substantial local support such as funding for neonatal unit data managers or regional audit capacities, while some states would not. Funding for CPI activities has primarily been raised from commercial conference sponsorships. Neonatal nursing delegates are substantially supported with airfare and conference accommodation subsidise by the Network. National funding for quality improvement has not been forthcoming, other than a small number achieved from research grants. The recent research funding gained is the first neonatal registry embedded trial grant support from the Australian Medical Research Future Fund.

Future and conclusions

The ANZNN was initially established as a simple minimal dataset collection. Subsequently, it has built on the collaborative spirit of ANZ NICUs and Special Care Nurseries. Although the Network celebrated a 25-year anniversary in 2019, it is still growing and developing both geographically and in activities. While there is an increasing range of activities from promoting evidence-based practice for improving care standard and outcomes to advocacy involvement in federal funding models, data collection and benchmarking remain the central core business of the Network. Further opportunities exist to improve our data collection, particularly in monitoring new therapies (16) or evaluating outcome variation and clinical practice (38,39). ANZNN will also develop collaborative data linkage with other relevant ANZ data collections, such as regional neonatal retrieval networks or high-risk pregnancy and perinatal datasets.

In addition to better data collection process and analysis, ANZNN plans to provide education, leadership, and encouragement to facilitate the wide range of CPI work our members perform. Like many organisations, the CPI committee looks forward to re-establishing face to face networking but remaining agile in adjusting to online

communication such as virtual meetings to support our work. Embedding the learnings from the rapid feedback study and units to be more responsive to available data is a priority.

Expanding our research capability is another Network priority focus. The international collaboration has opened a range of opportunities for sharing knowledge, learning from each other, and epidemiological research into the variation of outcomes and clinical practices. The recent active involvement in clinical trials may well be a substantial new change in direction and opportunity.

The strength, longevity and growth of our Network are based on active member engagement and having a sound governance structure. The international members joining ANZNN has brought in new ideas and exciting contrasts in demographics and clinical practice. One could envisage the future emergence of partnership networks in sharing data collections and practice improvement initiatives with members in ANZ. The benefits would be mutual and contribute to the ongoing endeavour to optimise outcomes following high-risk neonatal care.

Acknowledgments

Footnote

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