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The journal is the official publication of Australian and New Zealand professional nursing groups caring for babies, children and their families. The three organisations represent a diversity in nursing, ranging from intensive care nursing to the community-based nursing services, found in cities and remote areas throughout Australia and New Zealand.

The journal will endeavour to reflect this diversity by its content. Neonatal, paediatric and child health nursing have many different aspects that may be relevant to more than one sector of the membership. In addition to clinically oriented material, including research, the journal also provides a forum for articles on professional aspects of nursing that apply to all nurses and in particular to nurses working with babies, children and families.

This journal has a Band 2 JET Ranking from the Australian Council of Deans.

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A new Editor for Neonatal, Paediatric and Child Health Nursing

Linda Shields  PhD, FRCNA  
Editor

Neonatal, Paediatric and Child Health Nursing has, over its history, gone from strength to strength. When I took over as editor in 2008, being mooted were changes that would see the journal become predominantly electronic in form, changes in the submission and peer-review systems, changes to advertising in the journal, changes in our relationship with our publishers, and changes in the website. The Journal Management Board has had a fine hand on the tiller and has supported us in implementing these changes. In 2008, with three editions per year, the bank of papers awaiting peer review and publication was small. In March 2011, we have 28 papers waiting for publication and we are having to consider increasing the number of editions. In addition, the papers are now coming in from many countries. Amongst those 28 are papers from, of course, New Zealand and Australia, along with some from Israel, The Netherlands, Pakistan, Sweden and the UK. In other words, we are beginning to be recognised internationally.

Being the editor of NPCHN has not always been an easy job. The changes have meant the need for adaptation and strong teamwork. This I have had in bulk from our associate editors, Ally Hutton and Denise Harrison, and latterly Annette Dickinson, who have been the key to the success of the changes and the refocusing of NPCHN. They have worked tirelessly, with revision of the editorial processes and making the systems run smoothly. Our publishers, Cambridge Media, in Perth, Western Australia, have been helpful in trying to understand what we have wanted and needed and have worked hard to put the new processes in place. In fact, it has been a learning experience for us all, as Cambridge Media have used us as ‘guinea pigs’ (with our blessing) to help them set up electronic processes for their stable of journals. Pam Nicol, until recently honorary treasurer of the Journal Management Board, has worked assiduously in liaising with Cambridge Media to sort out the financial and contractual implications of the changes and development of the journal. The publishing staff have all been as helpful as they can and nothing has been too much trouble.

So we now have to welcome our new editor, Professor Linda Johnston, from Queen’s University in Belfast, Northern Ireland. Linda will bring a whole new perspective to NPCHN and will bring a deal of historical knowledge, too, as she was part of the editorial team when it first began. As well, her international position will enhance the outreach of NPCHN and provide many opportunities for recruiting authors and peer reviewers.

There are some challenges ahead. The financial sustainability of NPCHN has to be addressed. As a membership journal, with only a small handful of independent subscribers, we have to find ways of increasing sponsorship and revenue. We have to reach out across the world to make it accessible internationally and continue to recruit authors from around the world, while providing an important vehicle for authors from Australia and New Zealand in which to publish their work.

As I step down as editor, I have one last job, and that is to thank the associate editors, Dr Alison Hutton, Dr Annette Dickinson and Professor Denise Harrison, for their support, drive and professionalism. Ms Jenny Hall has been very helpful with any bibliographic issues that have arisen and members of the Journal Management Board have always been there for me when I needed them. Pam Nicol, as I mentioned above, has my gratitude for her ability to deal with difficulties, and Melissah Burnett, who manages and writes our website, has always been extremely helpful whenever we have needed changes and revisions. Most importantly, I thank you, the readers, without whose interest the journal would not exist.

As I step down, I see the pile of other work on my very untidy desk and know I have done the right thing. As someone who finds it hard to say no, it has been a tough decision to go, but I know that Linda and her team will now move NPCHN forward in ways I could only have dreamt about.

Thank you all,
Linda Shields, PhD, FRCNA.
Neonatal nurses: A call to action

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In October 2010 the 7th International Conference for Neonatal Nurses was held in Durban, South Africa. The joint convenors of the conference were the National Association of Neonatal Nurses of South Africa (NNASA) and the Council of International Neonatal Nurses (COINNN). This was the first time the conference had been held in Africa and we were challenged to see how we were meeting the Millennium Developmental Goals (MDG) 4 and 5: to reduce infant mortality by half and reduce by three-quarters the maternal mortality ratio.

COINNN has member organisations from 12 countries and regional representatives from 58 countries. One of the challenges facing us is to integrate best practice in both developed and developing countries. The conference bought together nurses from both ends of the spectrum and we learnt from each other through presentations and networking.

The sobering facts are that 3.6 million babies die each year and 41% occur in the first six days of life and another three million stillbirths occur globally. Newborn deaths account for 40% of all deaths among children under five years. The major causes of newborn death include infection (36%), prematurity (27%), and birth asphyxia (23%).

As neonatal nurses we were challenged by Dr Joy Lawn from Save the Children – Saving Newborn Lives programme to take action in gaining attention for neonatal nurses to make a difference. Over three-quarters of these deaths occur in sub-Saharan Africa and South Asia. If all mothers and babies were reached with essential care, then over three million babies could be saved.

One of the biggest challenges is to be able to provide health care by neonatal nurses; however, we do not know how many there are and what training is available. We were challenged to start counting the global numbers – neonatal nurses are often grouped with midwives or paediatric nurses, yet their roles are very different. The clear message is that neonatal nursing needs to remain a strong specialty to enable us to influence workforce issues as well as training programmes in all countries. We heard that the neonatal programmes in India have ceased and we need to support our colleagues in their action to reinstate the courses. So the big challenge is to get neonatal nurses listed on human resource lists, both in all developed countries and across all developing countries.

So how can neonatal nurses in the developed world such as Australia and New Zealand help? We hear of stories and contributions by individual nurses. The case study in this issue by Nicole Lloyd-Nyunja highlights the role of a volunteer nurse in Kenya and the challenges faced. It takes a certain type of nurse to take on this challenge and I believe Nicole has illustrated the situation and contributing factors very well. A presentation in Durban by Jenny Liley from Christchurch outlined how the NZANN has been working with Samoa to provide an education programme to this developing nation. It was a good example of how our colleges can work with our neighbouring communities in remote Australia, South Asia and the Pacific to help bring essential care and resources to the developing communities.

At this conference the International Neonatal Nursing Excellence Awards were announced. Nominations were received from many countries and the winners were Regina Obeng from Ghana and Rekha Samant from India. These women had remarkable stories and the awards demonstrate that individual nurses can make a difference.

A strong message was to know the data and talk about it within your workplace and also your social network. Most people are unaware of the statistics. Be aware of the different numbers and be confident in your sources. Join the Healthy Newborn Network (HNN) which will provide up-to-date information and also enables you to share resources.

The Helping Babies Breathe (HBB) programme has been developed by George Little and launched by the American Academy of Pediatrics in the USA. This is a simple, basic resuscitation programme for under-resourced communities and focuses on teaching birth attendants early recognition of a distressed infant. It demonstrated how a simple programme using flip-charts and an inexpensive manikin can be used to train nurses to train others. Further educational focus is on kangaroo mother care, thermal care, breastfeeding and weight gain. Simple basic care that we all aim to provide in our NICUs and communities and which is so important in saving newborn lives.

I would like to reiterate the priorities I heard from the conference and the enlightened and motivated presenters.

• Know your data and use it.
• Know your numbers and audit data from your organisation and country.
• Add ‘N’ to Maternal, Neonatal and Child Health.
• Priority interventions must consider evidence, costs, and feasibility.
• Neonatal nurses can control quality care and need to take the initiative.

We need to change the perception of neonatal nurses from one of high value which is given low value to neonatal nurses being seen as high value who are also given high value for their contributions.

References
Healthy Newborn Network: www.healthynewbornnetwork.org
Saving Newborn Lives: www.savethechildren.org/savenewborns
Council of International Neonatal Nurses: www.coinnurse.org
Paediatric extended emergency care (PEEC): Establishing and evaluating a paediatric short-stay ward: a pilot study

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Abstract
Paediatric ‘short-stay wards’ are in existence in many paediatric centres around the country and appear to be a growing phenomenon. The purpose of this paper is to describe the journey of establishing, and subsequently evaluating, a short-stay unit on a paediatric unit. This paediatric unit is located in a general hospital, which has a separate paediatric emergency department unit. To improve patient care, a paediatric extended emergency care (PEEC) unit was established to provide a positive outcome for patients and their families by reducing avoidable admissions to the paediatric unit. Other goals were to relieve and reduce cubicle block in the paediatric emergency department (PED) to provide discharge planning to families. Therefore a trial was implemented in the form of a PEEC unit.

Keywords short stay ward, emergency department, paediatrics, extended care, nursing innovation

What is known on this topic
- Paediatric ‘short-stay wards’ are in existence in many paediatric centres around the country and are a growing phenomenon.
- Paediatric admissions are generally short and 26% of paediatric hospital stay days are unjustified.
- In theory, short-stay units are seen as an effective way to manage many paediatric conditions.

What this paper adds
- The PEEC was not effective in a ward environment and would have been better suited in an emergency facility.
- High turnover of staff in emergency created confusion as to patient admission criteria into PEEC.
- Parents were happy with the nursing care provided in PEEC.

Introduction
The purpose of this paper is to describe the journey of establishing, and subsequently evaluating, a short-stay unit on a paediatric unit. This paediatric unit is located in a general hospital, which has a separate paediatric emergency department unit (PED). This PED sees a large proportion of the paediatric population within their catchment area (that is, they see an average of 400 children per week).

With a planned refurbishment of the paediatric ward, there arose an opportunity to trial a short-stay unit. The short-stay unit was designed to admit children who came requiring...
admission, but with an expectation that the child would be discharged home within four hours. It was thought that this process would save unnecessary admissions and reduce ‘bed block’ in the PED.

Paediatric ‘short-stay wards’ are in existence in many paediatric centres around the country and appear to be a growing phenomenon. Keeping this in mind, and in the knowledge that the paediatric unit was about to temporarily decrease bed numbers by 10 during refurbishment; that is, from 24 (summer bed numbers) to 14 beds, (making a 41% decrease in beds) the timeliness of this venture was assured.

This reduction of beds was scheduled to occur during 2006–07 to better enable the ward refurbishment. In 2007–08 the PED treated 13,427 patients, with 3,035 of these patients subsequently admitted to the paediatric unit (22.6%). During peak demand times in the PED, patient flow was severely impeded by ‘cubicle block’. By incorporating lean thinking principles, it was anticipated that suitable patients could be ‘pulled’ to a short-stay area, thus reducing the block and ultimately enhancing patient care. Therefore, the impetus for creating the paediatric extended emergency care (PEEC) unit was primarily to reduce bed block, but also to increase the proficiency of patient care as well as having staff trained in emergency care and discharge planning allocated to this area.

The intended outcomes for this new structure of a short-stay unit were to:

- reduce cubic block in PED
- improve patient flow in PED
- provide optimum care and a decreased length of stay to high-volume, low-complexity conditions
- provide 1:1 education to parents/caregivers, thereby initiating primary health care/health promotion strategies to reduce future presentations
- safely decrease hospital admissions of selected patients by providing rapid, standardised care.

**Background**

**Efficient use of hospital resources**

Management in the PED, including the decision of whether or not to hospitalise the patient, is the sole responsibility of the attendant emergency physician. Decisions to hospitalise are based not only on medical conditions and services available in the community, but also the physical and social circumstances of the family. Katz et al. state that health costs, and consequently efficient use of hospital resources, are essential issues in health care delivery and management. Hospital admission rates worldwide continue to rise annually, so the appropriateness of hospital admissions has both a clinical and an economic relevance. This is especially significant in light of the growing emphasis on quality assurance, good health care management, and growing pressure for increased efficiency of health services utilisation.

Cooke, Higgin and Kidd believe that reduced hospital stay decreases child and family discomfort. Their study confirmed the effectiveness of short-stay observations in avoiding inappropriate admissions, reducing the number of patients who do not require hospital assistance, while at the same time assuring quality of care. The key to achieving success in these outcomes is directly related to a better choice of candidates for short-stay units, but also a change of guidelines to the approach and treatment of certain conditions. For example, Boyd et al. found that the use of a paediatric rehydration protocol in a short-stay facility significantly reduces admission rates and total time spent in hospital for children presenting to the emergency department (ED) with symptoms of gastroenteritis. In addition, they found that the rate of representations does not alter.

As well as the rehydration protocols, short-stay wards can also be used for asthma management. Dell, Parkin and Macarthur concluded from their study that it is important to develop alternative models of health care delivery for asthmatic children, as many exacerbations have short, yet expensive hospital stays. Furthermore, Gallinas et al. found that the opening of the short-stay observation unit had been useful in assessment and treatment of common childhood diseases and also helped reduce the hospitalisation rate.

As well as altering guidelines for care in a short-stay facility Ogilvie found that acute paediatric assessment services are a safe, efficient and acceptable alternative to in-patient admission. In addition, users of these services are more often than not satisfied. Moreover, Ogilvie associated these changes in services with reductions in in-patient activity levels as well as attached hospital costs. A short-stay environment is also useful as many paediatric admissions are short; therefore, the traditional ward system is always suitable for such fast turnover. Most assessment/observation wards/units have a maximum stay of up to 24 hours. Levett et al. found that in a 12-month period, 4446 children were discharged home after eight hours following admission. Conditions most commonly seen in this study were either respiratory or gastrointestinal illnesses. Furthermore, general practitioners interviewed claimed a hospital-based, 24-hour emergency assessment unit would be extremely beneficial in a paediatric context. To give weight to the notion that most paediatric admissions are short, Aitken et al. found that of the 987 children admitted to a paediatric facility, 404 had a stay of less than 24 hours; a total of 40.9%.
Not only are paediatric admissions short, Mozes, Schiff and Modan\textsuperscript{10} found that 26% of paediatric hospital stay days were unjustified. Reasons were attributed to diagnostic evaluation, non-emergency treatment and immediate follow-ups, which were all carried out in the hospital setting, rather than on an ambulatory basis.

Cooke\textsuperscript{1} found that all types of short-stay admission wards have advantages over traditional admission to a general hospital ward. To be successful, the ward needs proactive management and organisation, senior staff involvement and access to diagnostics: dependent on a clear set of policies in terms of admission and care. Numa and Oberklaid\textsuperscript{11} believe a significant number of children require brief hospitalisation for relatively minor illness. However, unnecessary delays caused by administrative aspects of hospital admission, paired with relatively infrequent in-patient review by medical staff often lengthened the period of admission. Significant cost savings are possible with the use of a short-stay facility, with quite a large number of patients being suitable for this form of care. Crenshaw et al.\textsuperscript{12} found that selection of patients for short-stay areas was important because if these guidelines were unclear the ward would not be utilised satisfactorily; for example, poor patient selection would lead to over- and/or underuse of such a facility.

**Establishing the PEEC**

With regard to the medical team who will be looking after the child, it appears that all units have comparable basic criteria for admission and policy. The majority of the units are functional 24 hours a day, whereas PEEC under discussion operates between the hours of 1000 and 2200. There appears to be a general consensus in the literature that short-stay units for the paediatric population deliver an improved service. Short-stay paediatric units are implemented in many paediatric hospitals around Australia. When communicating with any of these numerous paediatric units, it appears that they all have similar problems.

When contacting other short-stay units in Australia, anecdotal evidence suggests a significant difference between PEEC and other short-stay units is in how the medical team is allocated for these children. While other short-stay units align with their ED and utilise emergency physicians, our unit transfers the child to the paediatric unit and the care to the paediatric team. This has been the subject of much debate. Physically there is no room available in the ED for a short-stay facility. Accordingly, all care of paediatric cases remains with the paediatric team as a safety measure within this hospital as it is a general facility. In addition, junior paediatric doctors benefit as they are able to gain more paediatric experience.

As examined in the literature and from consultation with other short-stay units, to function effectively, these areas need to have stringent criteria for admission and leadership. For whoever manages the child from admission until discharge, the PEEC will provide guidance with admission criteria and will also assist with discharge summary responsibility. The establishment of clinical guidelines for these patients, along with the nurse-initiated discharge practices, was undertaken in anticipation of ensuring successful implementation of the unit.

PEEC was designed to improve patient care and to provide a positive outcome by reducing avoidable admissions to the paediatric unit, while also relieving and reducing cubic block in the PED. This trial was implemented in the form of a PEEC unit. The PEEC area was located within the paediatric unit by allocating a four-bed bay and a staff member on both the early and late shifts for the purpose of short-stay patients. Initially four conditions were trialled in PEEC: febrile illness, gastroenteritis, asthma and croup. The criteria were later extended to include other frequently occurring paediatric presentations, such as simple head injuries, observations following sedation, accidental poisoning that required an observation period, trial of fluids and so on (Table 1).

It was decided that PEEC operating times were to be between 1000 and 2200 daily, with a four-bed capacity to accommodate the busier PED times. The patient is assessed at PED triage via the above criteria and, if deemed suitable, is ‘pulled’ to PEEC. Furthermore, the emergency medical officer assesses patients and decides whether they are suitable for PEEC. The PEEC nurse can view PED movement via the Admissions Transfer System (ATS) and can also liaise with PED staff in assessing whether a patient is appropriate for PEEC. Due to their level of experience, along with their ability to work independently, paediatric nurses with advanced paediatric knowledge and skills were recruited to staff PEEC. These staff had been involved in the PED rotation from the unit; that is, they work in the PED on a late shift within their paediatric roster.

The nurse in PEEC continued the care initiated in PED following the appropriate clinical pathway, monitoring the patient and recording the outcome of care. Care in PEEC allowed patients to have a more focused therapy for their illness, which was not always possible in PED due to staffing constraints, lack of both space and specialised nursing care. Appropriate nursing interventions, such as assessing hydration, calculating fluid replacement and ensuring correct volume of appropriate fluid (such as Hydralyte) given at the appropriate time by the caregiver can dramatically alter the outcome for the child. One of the most important aspects during a patient’s stay in PEEC is that of patient/parent education to increase chances...
of the patient’s discharge. Additionally, the PEEC nurse liaises with the paediatric RMO/registrar to discuss issues such as ongoing care and safety for discharge or admission.

Survey results

Routinely, a telephone call was made the following day to check a child’s progress, reinforce education and evaluate care experience. This was widely accepted by parents/carers as positive as the vast majority were very grateful for the follow-up. On discharge, nurses trained in OACIS (Open Architecture Clinical Information System) initiated and completed the discharge summary, which was reviewed by medical staff before being sent out to the patient’s general practitioner.

PEEC was open for a period of 27 months in total, from November 2006 to January 2009. An average of 46 patients a month were admitted to the ward, which constitutes 5% of total ward admissions for the year. A telephone survey was conducted by a registered nurse (RN) who worked in PEEC and was constructed to obtain parent/caregiver feedback of the PEEC experience. The survey consisted of a structured questionnaire. Participants were telephoned if they had used the PEEC service within a 48–76 hour period. In total 7% of PEEC users were surveyed. One hundred per cent of the surveys described PEEC as a positive experience. However, data collected does show that the experience of PEEC was beneficial to the patients and their families even though financially it was not a success.

The experience of PEEC for this family was on comfort and security. Furthermore, leaving the casualty environment was also seen as a positive with the support of the RN. Other families liked the information they gained in the PEEC setting.

\[
\text{Got good information \ldots learnt a lot in PEEC} \ldots
\]

\[
\text{Much better than sitting in ED.}
\]

Whereas another compared the PEEC experience to a previous admission.

\[
\text{Very pleased with the difference in care in the most recent episode} \ldots \text{avoided the ‘injection’ and learned about Hydralyte \ldots Glad not to have been admitted.}
\]

This parent was educated on the regime/method regarding the trial of oral fluids and was able to put it into practice on her other child when he started showing similar symptoms, thereby avoiding another presentation. These anecdotes indicate a positive experience coupled with the support of the RN and education that was of benefits to these families.

Unfortunately the survey was only distributed to less than 10% of admission; therefore, key points made cannot be generalised to other short-stay experiences.

Present issues and limitations

Even though PEEC was a success for parents whose children were admitted to this unit, there were problems encountered that were not envisaged at the onset of establishing PEEC, which unfortunately impacted on its success. For example, the rotation of staff in the ED and in the PED impacted on admission to the PEEC environment. New medical staff

Table 1. PEEC extended criteria.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Assessment criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild gastroenteritis</td>
<td>Patient with mild to moderate gastroenteritis requiring oral or nasogastric rehydration.</td>
</tr>
<tr>
<td>Febrile child no focus</td>
<td>The child has no signs of meningitis, has normal conscious state and a normal blood pressure is &gt;three months of age and has no obvious focus requiring therapy.</td>
</tr>
<tr>
<td>Mild asthma</td>
<td>Patient with mild to moderate attack and after having three rescue nebulisers it is anticipated the child will need ventolin &gt;two hourly.</td>
</tr>
<tr>
<td>Croup</td>
<td>There is soft stridor at rest and/or mild respiratory distress. The child has received their oral prednisolone/dexamethosone.</td>
</tr>
<tr>
<td>Allergic reaction (Phenergan, steroids only)</td>
<td>The child required Phenergan or steroids observations are stable.</td>
</tr>
<tr>
<td>Post-febrile seizure observation</td>
<td>The child is not a known epileptic or has had &gt;one seizure.</td>
</tr>
<tr>
<td>Stable ingestion (for example, paracetamol). Obtain ED consultant approval</td>
<td>The poison centre has been rung and recommend that all is required is a period of observation, the ED consultant has approved a PEEC admission and the child does not require/requires cardiac monitoring.</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Assessment criteria</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>The patient has a non-surgical abdomen. The patient is systematically well.</td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>Resolution of clinical features after adrenaline (no respiratory symptoms, normal conscious state, normal BP). Needs &gt;four hours observations for any of the following: Need to observe for biphasic reaction. Live far away. Need further education. Difficult time of day to discharge. Follow-up to be arranged prior to discharge including anaphylaxis plan (+/- epipen if deemed relevant).</td>
</tr>
<tr>
<td>Asthma</td>
<td>Patient has mild to moderate asthma attack. Requires ≥two/24 ventolin. Follow up – all first-time asthma presentations should be referred to their general practitioner for follow-up and given asthma management plan and education.</td>
</tr>
<tr>
<td>Bronchiolitis</td>
<td>The patient is &gt;three months old. Has no comorbid disease, for example, Down’s syndrome, cardiac disease cerebral palsy or immunodeficiency. No oxygen required to keep SaO2 &gt;92%. Only requires oral fluids.</td>
</tr>
<tr>
<td>Constipation</td>
<td>Significant constipation requiring “washout” with bowel preparation solution. Follow-up with general practitioner.</td>
</tr>
<tr>
<td>Croup</td>
<td>Mild croup where social circumstances make it necessary for a short stay. Moderate croup where there is stridor at rest and mild to moderate respiratory distress (no oxygen requirement). Child has had their dose of oral prednisolone/dexamethosone. If required adrenaline – has had one or two doses only and improved. The child is &gt;three months old.</td>
</tr>
<tr>
<td>Febrile seizures</td>
<td>The seizure was uncomplicated. The child requires observation post-seizure.</td>
</tr>
<tr>
<td>Fever</td>
<td>Child is “well” with no signs of meningitis, normal conscious state, normal BP.</td>
</tr>
<tr>
<td>Head injury</td>
<td>Stable head injury that requires period of observation only of ≥four hours.</td>
</tr>
<tr>
<td>Ingestion*</td>
<td>Initial therapy, if required, has only been charcoal. The poison centre has been called and recommend that all is required is a period of &gt;four hours to &lt;24 hours observation. The patient is asymptomatic or only mildly symptomatic. Monitoring not required. * (Paracetamol ingestions excluded).</td>
</tr>
<tr>
<td>Rehydration</td>
<td>The child is &gt;three months old. No complicating comorbidity (for example, metabolic acidosis, other concurrent significant infection – pneumonia, bronchiolitis). Other potential diagnoses are excluded. Parents understand the concept of the rapid oral or nasogastric rehydration and can participate in this treatment pathway. Intravenous rehydration if expected to be for &lt;24-hour admission.</td>
</tr>
<tr>
<td>Sedation</td>
<td>The sedation was performed in the ED at FMC. The procedure was simple (for example, sutures). The child is still sedated and likely to take &gt;four hours to be ready for discharge. Stable cardiorespiratory status. Only requires observation.</td>
</tr>
<tr>
<td>Other</td>
<td>Any other medical condition where the anticipated length of stay is &lt;24 hours (following discussion with ward consultant). Food challenges. Midazolam trials. Bee venom. Intragram infusions. Botox injections. Eczema patients education relating to wraps. Cellulitis.</td>
</tr>
</tbody>
</table>
were unaware of the admission criteria to PEEC and as a consequence did not admit children through this system.

Lack of communication during staff rotations

Although there are criteria for admission to PEEC, they have not always been adhered to for various reasons. Frequently, due to the rotation of medical staff in the PED, new short-stay admission requirement was lost in the system, usually due to lack of communication to new staff. Thus inappropriate admissions are either sent up to the ward and/or not sent up if they meet the short-stay criteria. This occurrence appears to be something of a national dilemma as the majority of short-stay units in Australia report the same phenomenon (personal communication: Starship Hospital, Princess Margaret Hospital, New Zealand).

As well as rotation of new medical staff, ED nursing staff also rotate frequently through areas of the ED; PED being one of them. This set of circumstances makes it difficult for consistency regarding admission criteria and processes for the PEEC unit. In addition, many are not familiar with paediatric nursing, and while it is still emergency nursing, paediatrics is totally unlike adult emergency nursing. For this reason education in this area has now become a primary focus.

Inefficient use of resources

Two nurses are allocated to the PEEC unit each day. This covers the unit between the hours of 0700 and 2200. An average of 1.92 children per day has been admitted to the unit since the commencement and this equates to an inefficient use of human resources. Nevertheless, the PEEC was established on the ED model of staffing and, therefore, this model needs to be revisited in a more creative manner if PEEC is to be a success.

The PEEC unit, as it was run, has been deemed to be an inefficient use of human resources. In addition to the lack of full utilisation of a short-stay unit for a larger and wider range of conditions is something of a deficit in understanding the processes and admission criteria of the short-stay unit. The intended outcomes of PEEC were not all met. For example, cubicle bed block in the PED was not reduced, according to ‘waiting time’ data. However, anecdotally parents stated their satisfaction in reduced amount of time to get to the ward, and the care given once they were admitted to PEEC. As noted above, parents were satisfied with discharge and follow-up information provided post-discharge; however, these positive outcomes were not enough to ensure the success of PEEC. There was not enough throughput in PEEC to determine if there was a decrease to hospital admissions for the selected conditions.

Future directions

While the philosophy of the unit remains passionate throughout medical and nursing staff, it is not financially viable to continue in its present form. To this end, following much angst, we have decided to establish a system whereby the patient is ‘flagged’ as a short-stay patient. With this approach we believe we are maintaining the benefits for patients and the ED by keeping the same admission criteria and objectives as outlined above (Table 2). The criteria have been expanded to include many more conditions and more sophisticated assessment criteria have been established. In addition, we do not require a staff member to be allocated specifically to an area to admit into, thus creating financial benefits. As this system has just been introduced into the unit it will need some time to adjust. We hope this will have tangible positive outcomes for the patient, the ED and the paediatric unit.

References


(Turner personal communication: 8 October 2007, Princess Margaret Hospital, Perth, Western Australia).
Exploring the barriers to palliative care practice in neonatal nursing: A focus group study

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Abstract
Palliative care for the neonatal population has become more topical in recent years given the escalation of technological and medical advances and higher neonatal survival rates. Some newborns, however, will still die in the neonatal intensive care unit, often as a result of extreme prematurity and other complex medical problems.

This paper explores previously identified barriers to palliative care practice in neonatal nursing. These barriers were inadequate staffing, unconducive physical environment, technological imperatives and parental expectations.

Using an interpretive research framework, focus groups were conducted at three tertiary neonatal intensive care units (NICU) in Australia to elicit individual views to aid in clarifying the barriers to neonatal palliative care. A purposive sampling method accessed 24 registered nurses with neonatal intensive care experience. The three barriers identified by the survey data were discussed at each of these focus groups.

The three themes discussed at the focus groups emerged as central to the successful adoption of a palliative model of care in the NICU. The recommendations identified in this research can be translated into policy, curriculum development and training in the clinical environment.

Keywords: focus groups, neonatal palliative care, barriers, neonatal nurses.

What is known on this topic
- Previous research identifies fundamental barriers for adopting a palliative model of care for dying babies in the NICU.
- Barriers to a palliative model of care need to be addressed in the NICU environment.

What this paper adds
- By utilising the clinical intelligence of experienced neonatal nurses, the barriers to palliative care in neonatal nursing can now be better understood.

Declarations
Competing interests Nil.
Funding Royal College of Nursing Australia, the Queensland Nursing Council, Queensland University of Technology and the Australian Post Graduate Award scheme.
Ethical approval Queensland University of Technology Human Ethics Committee Approval number: 4074H.
Guarantor VK.
Contributorship Single author.
Acknowledgements I would like to thank my supervisors for this doctoral work, Professor Glenn Gardner and Professor Patsy Yates (QUT), and the neonatal nurses who participated in the focus group interviews.

Background
Neonatal palliative care can be defined as “holistic and extensive care for an infant who is not going to ‘get better’”. Palliative care for the neonatal population has become more topical in recent years given the escalation of technological and medical advances increasing neonatal survival in recent decades. There are more treatment options for newborn infants born at the margins of viability or with life-threatening conditions. Consequently, neonatal nurses are providing care to newborns who previously would not have been resuscitated, or were presumed to be dying. Despite these advances, increases in the margins of viability,
and highly skilled health care delivery, some newborns will still die in the neonatal intensive care unit (NICU), often as a result of extreme prematurity and other complex medical problems\(^1\). Whilst technological devices have been implemented to improve survival, the development and influence of technology has never been more apparent than in today’s health care setting. This is particularly so for the nursing and midwifery professions, resulting in a shift of emphasis whereby the role of many technological devices has altered from being one of supporting clinical practice to that of being an essential requirement in treatment delivery. Neonatal nursing is at a stage that without the use of the many available devices, procedures could not be carried out safely. This continued development, however, may be a 'double-edged sword'; in that technology may be used in arguably inappropriate situations.

Australian perinatal data indicates that the death rate was 2.8 per 1,000 births in 2008\(^2\). Data from the United States reports an overall newborn mortality rate of 6.7 per 1,000 live births in 2004\(^3\), with 20,000 newborns born each year with conditions considered incompatible with life beyond the first year, and are essentially ‘born dying’. These data suggest that neonatal palliative care should be increasingly relevant, yet palliative care principles are inconsistently applied and in the past two decades there has been growing recognition of the importance of palliative care for newborns with unviable outcomes\(^4\). Furthermore, inconsistencies in palliative care practice may evolve from the historical association of palliative care with oncology or geriatric patients – not newborns and infants.

Barriers to a palliative model of care for the neonatal population have been previously described in a sample of Australian neonatal nurses\(^5\). The aim of this study, therefore, was to explore what could be done about these barriers. This paper will report the findings of a focus group study with neonatal nurses to discuss the identified barriers and how they might be addressed.

**Method**

**Design**

A qualitative research design was utilised, using focus groups. The focus groups, comprising neonatal nurses with at least two years’ NICU experience, were conducted to address the barriers to palliative care identified in a national population survey in Australia (n=646)\(^6\). The data analysis framework utilised in this study assumes that the focus group participants would create and associate their own subjective and inter-subjective meanings of these barriers\(^7\). Given this, the study began with the barriers as the analytical framework, or ‘scaffold’ of prior knowledge\(^8\).

**Participants**

A purposive sampling approach was used to recruit participants who were able to contribute good quality data relevant to the research aim\(^9\). The eligibility criteria were full-time and part-time registered nurses and/or midwives on the permanent NICU roster with a minimum of two years’ NICU experience. Further demographic data was not collected. The participants knew each other within the group setting and were all employed at the same level. Nursing managers did not attend so that the interaction of the participants would not be affected, as suggested by Stewart et al.\(^10\).

**Data collection**

Three focus group interviews, moderated by the author, were conducted in tertiary level NICUs in three Eastern-border states of Australia with six–eight participants per group. All interviews were audiorecorded and transcribed verbatim into text data in a password-protected text file, consistent with standards for this research approach\(^11\). The focus groups were conducted in a quiet location and lasted approximately one hour or until the topic had been covered and/or no new data were obtained\(^12\).

**Ethical considerations**

Approval for the study was granted by the Human Research Ethics Committee at each site. All participants were given an invitational letter and information pack about the study. Participants signed a consent form prior to the focus group being conducted.

**Data analysis**

Following data collection from the focus groups, the interview transcripts were entered into the QSR NVivo data management program [Version 9, QSR International] and a comprehensive process of data coding and identification of themes was undertaken. This approach to coding involved recognising (seeing) an important theme and encoding it (seeing it as something) prior to a process of interpretation\(^13\). Analysis was deductive, meaning analyses worked from the more general a priori knowledge to more specific findings and generation of hypotheses\(^14\).

In this study, the survey findings from the previous phase of this research constituted the a priori knowledge. This knowledge is conceptual and provides important insights into the barriers to palliative care in the NICU. The additional step of using these findings to guide focus group interviews with experienced NICU nurses provided experiential data, providing added depth to translate these findings into policy recommendations. The data collected from these interviews were aggregated in deductive analysis against the subscales identified by the survey study findings. Meaningful textual patterns were identified\(^15\) and refined as subthemes\(^16\).\(^17\)-\(^19\).

There are several techniques to enhance rigour in qualitative research, including credibility, fittingness and auditability\(^20\). In this study, the members of the doctoral supervision team were all involved in the analysis of data, thus identifying irregularities in the analysis and ensuring consistency. In terms of addressing credibility, participants were able to clarify and confirm the preliminary findings.
Results
A total of 24 neonatal nurses participated in the study, across three tertiary hospital sites, with a mix of part-time and full-time staff. The three themes that emerged from the data analysis were coded from the barriers identified in the survey from the previous phase of this research: inadequate staffing; unconducive environment; and technological implications and parental expectations. These three themes are presented with exemplars below.

Inadequate staffing
The theme of inadequate staffing was couched in the labour-intensive and emotional aspects of caring for newborns who were not expected to survive.

Caring for these babies is very labour-intensive; of course this depends upon the family. You can get a family that is very emotional and wants to talk, so it can be very busy. At other times, the family don’t really want to speak to you. So at times, you need to be there all of the time for them.

It also depends upon who you work with and the support you get from your other colleagues. If you have to spend a lot of time with a mother, you need the help of other nurses with your workload.

Participants revealed the time-consuming nature of caring for dying babies. The needs of the family dictate the level of emotional support necessary from the neonatal nurse and this varies from family to family. There is a dependence upon colleagues to provide back-up support when the labour-intensive aspect of caring for these types of babies is not accounted for in staffing allocation. In terms of meeting staffing needs and engaging organisational support, participants described this as being pivotal on the lobbying skills of senior nursing staff.

We don’t have a mechanism that describes the acuity of the baby. Really, this comes down to how strong-minded the senior nursing staff are in lobbying the nurse managers to get staff to care for a really sick baby, or a baby that is dying and there are many family members around needing support. If the nurse in charge is strong, they will lobby pretty hard to get enough staff and usually win that battle.

There are no patient dependency tools that work in this area – it’s just up to us to decide, and then, of course, convince!

Further, the need for consistency in staffing was recommended by the focus group participants. However, although nurses may have wanted to allocate their permanent staff to consistently care for these types of newborns, patient acuity needs and an ongoing lack of staff were prohibitive issues to continuity of patient care assignments.

Continuity of care is an issue for staffing and caring for these babies. The family get close to a staff member, but the next shift, you are using agency staff or casual, more junior staff.

If a baby is dying, and we’ve sort of given up, anybody can care for them. It’s a bit like that.

Whilst acknowledging the desire to have consistent staffing, participants suggested there was a lack of recognition about the labour-intensive and highly specialised nursing care required by newborns receiving palliative care.

Unconducive environment
The theme ‘unconducive environment’ encompasses the ability of the organisation to manage and provide material resources to support a palliative model of care. Discussion of this with focus group participants suggested that the physical infrastructure to support palliative care was inadequate.

We need the simple things, such as recliner chairs for that last cuddle. I think that a comfy chair to put your feet up – but there’s no space for that in our unit, so parents balance the baby on their knee on an uncomfortable chair.

Participants revealed that there were no rooms set aside for such palliative care purposes within their organisation. When such a room was available it often had dual purposes for storage and meetings rather than for the purpose it was intended, and quarantining this space was interpreted as a ‘low priority’ by the organisation.

It depends what the grieving room is being used for – it’s a low priority to have a quiet place for a baby to die – it shouldn’t be, but it is. Often it just isn’t available for use when a baby is dying. There’s a high requirement for meeting rooms.

Participants were asked about their experiences of caring for babies receiving palliative care in the ‘traditional’ NICU setting – that is, multiple bed spaces, human traffic and machinery. This ‘traditional’ setting was described by nurses in the exemplars below:

The other point is that life goes on in the NICU – people laughing and so on, regardless of the fact that there’s a baby dying – staff chit-chat, not inappropriately laughing, and all we have are flimsy curtains around the bed-space – we call them the iron curtain, but of course they achieve nothing in terms of privacy.

Usually parents stay in the unit with the curtains drawn around when their baby is dying, but that is hard on the other parents, too. They are aware of what is going on, that a baby is dying, and it is distressing for all.

Participants depicted the NICU environment as somewhat indifferent to the needs of dying babies given the general relentless activity that is inherent to this environment going on around the dying baby and their family. When a newborn is near death, relocation to another room away from the unit may be an option, as supported by the literature, and this was discussed with participants. However, participants identified some problems with this, including that parents may feel abandoned if they leave the relative familiarity of the NICU.

I’m not so sure about having a room dedicated to palliative care. I worry that parents may feel abandoned, coming
out of the unit for their baby to die, the NICU is the only environment that they have ever known.

Participants supported the notion that parents needed to know that they would not be abandoned and would be offered the choice of either leaving the NICU, or moving to a more private location.

*I think that sometimes parents want to stay in the NICU, even if we can offer them a private room for palliative care. We offer them a choice sometimes – but they might prefer to stay in the unit, in a familiar environment.*

This suggests that offering a choice of location is preferable, because in some cases, parents may not wish to leave the NICU where they have bonded with staff and have adjusted to the noise and activity. However, some parents, participants indicated, strongly wished to leave the NICU environment when their newborn died.

*I think the biggest issue with a dying baby for the parents is that their baby never gets to leave the hospital and we need to be flexible about this, so they can at least say: "I got to take my baby outside".*

*We had one baby that died outside, in the sunshine. The parents wanted him to taste chocolate – we did all we could to make it happen.*

Participants emphasised the importance of some parents simply wanting to ensure that their baby had experienced the outside world before death and their satisfaction at fulfilling the parents’ wish for their dying baby.

**Technological imperatives and parental expectations**

The themes of technological imperatives and parental expectations were analysed together, given that both themes were underscored by the participants’ experiences of moral dilemmas in caring for dying babies. Participants struggled morally with the need to provide complex medical care for babies who were not expected to survive and the futility of this approach to care.

*We had three newborns die last year, and their lives were shockingly unpleasant due to treatment, drugs, machines, and it’s hard to daily look after a baby who is very ill, knowing that this baby is not going to go home, and you wonder if the parents have false hope because of what the doctors have said to them, so they think all of this mechanical support is necessary.*

This dilemma may be linked to the experience of moral distress. Moral distress is described as a manifestation of the prevention of translating moral choices into moral action22. Participants suggested moral distress when engaging in futile procedures:

*Well the doctors come around a couple of times a shift, and you can see that the baby is deteriorating, so you say to them that you think it’s time for that baby to come out for a cuddle, although that may not be the baby’s last gasp, you just perform more torture by doing unnecessary procedures, and that sends the wrong message to parents.*

Participants suggested that technology was often used just because it was there, describing a sense of powerlessness that technology was not used judiciously.

*If another ventilator is sitting there, or the oscillator, or whatever, it’s just so tempting for the doctors to say well let’s just try another machine just because it is there, just in case … it’s annoying, frustrating, but you need to follow orders, I guess.*

Participants revealed that parental expectations regarding the long-term outcomes of critically ill newborns may be idealistically high and so might be the expectations placed upon neonatologists and neonatal nurses. However, the health care team in general have no rights or authority to substitute their own decision for that of the parents22. The participant narrative below emphasises the point.

...We had a case and the grandparents came in the next day to say goodbye to the baby, because the consultant the previous day had decided that treatment should be withdrawn, but another consultant was on duty and had changed the plan, and didn’t withdraw treatment, because of his own beliefs. I just could not believe what he was saying, and the parents and grandparents were so confused and said, "But you said that you were going to turn the machine off, and we’ve come to say goodbye". In this instance the family knew what they wanted, but the medical decision went against these wishes.

Adding to the moral dilemmas described by participations were the expectations parents had possibly due to influences of the media reporting upon the successes of neonatal medicine whilst seldom publicising its limits. Participants made reference to a television series, Saving Babies23, which was being aired on an Australian commercial network station at the time:

*Have you seen that 'Saving Babies' show? Did you notice how nobody ever dies? I mean, they never die! What message does that send out to parents? There is a focus in the media about miracle babies that reinforces the notion that babies just don't die. Maybe I'm getting a bit intense about it, but parents will say, "I know my baby can be saved, because they saved that one on the TV!"*

Participants described the untenable position they may face due to the influence of the media. The impact of the media upon parental expectations is also apparent in popular women’s magazines. Participants discussed their concerns at how the media purposely selected cases of so-called ‘miracle babies’, conveying the notion to parents that all newborns can be saved:

*I think parents are coming around to talking about death and dying. But as to whether they take the reality of their baby’s situation on board is another matter. Parents might be thinking: 'Well I read in 'That’s Life’ that this same thing happened to these parents, and their baby survived’.*
Participants discussed the impact that the media have upon parents and families in the NICU, describing instances where magazines sensationalised babies who had survived, often at very low gestations. There were concerns expressed about the disturbing precedence this sets and the expectation that every baby, regardless of their gestation or prognosis, would survive.

**Discussion**

In this study, the three themes discussed at the focus groups emerged as central to the successful adoption of a palliative model of care in the NICU. The first theme – inadequate staffing – illustrated the barrier that Australian neonatal nurses generally reported of not being adequately staffed to provide a palliative model of care, and that meeting this need is dependent upon the lobbying ability of senior staff. This finding supports an Australian study of nursing workload,

24 demonstrating that organisational factors in the neonatal unit may have a more powerful influence on nursing workload than the acuity of the patients themselves that are assigned to individual nurses. In this study, neonatal nurses discussed their desire to use the most experienced staff to care for dying babies and provide excellence in palliative care, yet a lack of staff meant that this continuity of patient care assignment was not possible. Intensive care services provision is labour-intensive and nursing personnel costs are estimated to account for three-quarters of total expenditure. Therefore, not unexpectedly, health systems are probing new ways to contain this expense while ensuring quality and managing risk.

This research suggests that staffing levels may be inadequate to recognise the labour intensive aspects and highly specialised needs of providing a palliative model of care. Patient dependency levels are determined by senior staff and are dependent upon their lobbying ability to secure this level of staffing. These findings would recommend that patient dependency tools are developed to accurately reflect the acuity of babies who are dying, taking into account the psychosocial needs of their parents and family members. These tools need to recognise the labour-intensive aspects and specialised needs of providing care to these babies, as well as the emotional support required by parents and families.

In the second theme – unconducive environment – neonatal nurses reported that the chaos of a busy, open and non-private NICU may not be the place for palliative care to take place, and this is supported by the literature.

26,27 It is advocated that environmental support should provide for as much of a normal and nurturing environment as possible; this includes noise being kept to a minimum with telephones and pagers turned low and staff conversations kept to a minimum.

Participants described some parents feeling abandoned when vacating the NICU for a quiet place for the baby to die. Often by the time curative treatment is withdrawn, parents have formed relationships with staff and the NICU has become an environment they feel comfortable in and familiar with. These data also highlighted the importance of clinical staff being sensitive to the needs of the family if curative care is withdrawn in the NICU environment. Such families might feel isolated if moved to a private place.

1 If a transition out of the NICU is an option, this should be approached sensitively. Yam et al.

2 found that the bureaucratic rules of the organisation made the experience for the family of the dying newborn ‘dehumanising’. In part, this was due to the lack of an appropriate area – or even a ‘multipurpose room’ – so that palliative care could be administered.

These results support the recommendation that a physical environment and infrastructure is provided to support parents whose baby is receiving palliative care, depending upon where parents decide palliative care should take place. In the NICU, this may mean relocating to a larger cot space set aside for such purposes that affords some comfort and privacy. When parents request to move from the NICU environment, a room for palliative care purposes should be available. Multiple purpose use for such a room should be limited, to assure its immediate availability for palliative care. The provision of this infrastructure would demonstrate that the organisation is committed to facilitating a palliative model of care, and could feasibly be incorporated into existing NICUs, and incorporated into the design of new units.

Theme three – technological imperatives and parental expectations – described the fundamental nature of the fast-paced and highly technical environment of the NICU as one that poses constant challenges to the neonatal nurse. These challenges are frequently ethically derived, challenging the individual’s values and moral position, particularly concerning delivery of care to newborns with a poor prognosis and for whom survival is unlikely. Often the foundation of care delivery revolves around the use of technology. Due to its widespread availability in the developed world, there may be a temptation to use it even when it may prolong the life of a baby who will not survive. Furthermore, when palliative care is introduced, there may be a temptation to continue to use technological life support because there are no clinical guidelines to mandate its judicious use.

In this study, neonatal nurses reported a sense of powerlessness when technology is not used judiciously. This suggests that neonatal nurses may feel powerless to speak out against futile technological intervention whilst expressing the need to practise in a system that allows them to maintain their fidelity to the newborns in their care. Neonatal nurses need to be able to follow their conscience, yet practise in a collaborative environment that allows them to follow orders from their medical colleagues with integrity and a degree of moral comfort.

Neonatal nurses reported that the demands of parents presented them with one of the most difficult areas of providing care to these babies. The media has unmitigated access to the community in perpetuating the notion that babies don’t die and that all babies can be saved. Changing
these prevalent points of view will take considerable time, and in the interim, parents require candid and pragmatic information from a team that is unified through a process of mediated consensus. Such an approach would provide consistent, evidence-based information for parents to assist them in making decisions on behalf of their children, that take into account pain and suffering, and the likely prognosis and morbidity of the newborn.

This research has found that neonatal nurses have concerns regarding the use of technological imperatives to prolong life and possibly suffering, and the demands made by parents to do all that is possible to maintain life. It is recommended that policy be developed that clearly outlines the judicious use of medical technology when caring for marginally viable and critically ill newborns. Incorporating the parameters of judicious use into the evidence-based clinical guidelines recommended by this research will clearly delineate what interventions constitute a palliative approach, and when such interventions become inappropriate.

**Study limitations**

There are limitations to the interpretation of these results that need to be considered when attempting to generalise these analyses to broader issues of interest. The focus group interviews were conducted in three out of eight Australian states. Therefore, these findings are not representative of the entire Australian population of neonatal nurses, or representative of neonatal nurses in every state.

**Conclusion**

The findings from this research have implications for nursing policy makers and neonatal clinicians. Prior to this research, the reasons why implementing a neonatal palliative model of care had been problematic were unknown. By utilising the clinical intelligence of experienced neonatal nurses, the barriers to palliative care in neonatal nursing can be better understood.

The recommendations identified in this research need to be translated into policy, curriculum development and training in the clinical environment. Research imperatives in this respect need to be directed at engaging clinical leaders in the development of neonatal palliative care guidelines that take into account the needs of all key stakeholders.

**References**

Care of the low birthweight neonate in a developing country: a case study

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Abstract

Siaya is located in rural western Kenya, an area with the highest infant mortality rate in the country. Malaria and HIV rates in this area are high, having a huge impact on maternal and neonatal health. Research shows that maternal malaria and HIV increases incidence of preterm delivery and foetal growth restriction, resulting in low birthweight (LBW) babies. Siaya district hospital covers a population approaching one million and encounters many premature and LBW babies; however, they lack the resources to cope with this. As an Australian volunteer nurse, I spent considerable time in Siaya, developing a nursery with basic resources to cope with this demand. Basic principles of neonatal care were implemented to attempt to improve the outcomes for this neonatal population. Staff education played a large role in changing the care that was provided. There was a focus on effective neonatal resuscitation, thermoregulation, infection control and fluid management. Teaching and practices implemented were designed to be sustainable once I had left. LBW has implications for neonatal health; however, the application of basic neonatal nursing principles can contribute to better outcome.

Keywords: low birthweight, neonate, developing country, nursing care.

Introduction

High neonatal mortality is a major challenge the world is faced with today, with an estimated four million newborn deaths yearly worldwide. Most of these (about 98%) occur in developing countries, where lack of resources and properly trained staff is a common issue. An estimated 0.8 million newborn deaths occur in sub-Saharan Africa yearly. It is thought that every minute eight mothers are losing their newborn somewhere in a developing country. In developing countries an estimated two-thirds of all neonatal deaths occur in the first week of life.1

So why is neonatal mortality such a problem in developing nations? First of all, maternal health is much poorer, with diseases like malaria and HIV taking its toll. Pregnant women are often poor and malnourished and many undergo stress of excessive work. High fertility is also a factor. Obstetric complications often go undetected and thus not treated, due to lack of access to quality antenatal care. In the developing world, only 40% of deliveries occur in health facilities and just over 50% occur in the hands of a skilled birth attendant. This means that millions of women are delivering their babies at home with no appropriately trained help. If problems occur, this is often fatal for the baby and/or the mother. Even if the baby survives the delivery, birth asphyxia, and associated handicaps, is common. Infections caused by the poor hygiene of the delivery environment are also a common occurrence. Health facilities may be far away and the quality of neonatal care offered in these facilities is often poor.2

Not only do developing nations suffer from high infant mortality rates, they also have a high incidence of low birthweight (LBW) babies. This is defined as a birthweight less than 2500 grams. One of the Millennium Development Goals set by world leaders was the reduction of infant mortality rates by two-thirds before 2015. The contribution of LBW towards high infant mortality is well recognised. There are thought to be 75,000–200,000 LBW African babies born yearly due to preterm delivery and foetal growth restriction. This is due to a variety of reasons, but unique to developing countries are diseases such as malaria and HIV, which are closely associated with LBW. The LBW population has
significantly higher morbidity and mortality rates; therefore, these neonates require a good standard of medical and nursing care if outcomes are to be improved.

Background

Kenya is an East African country that suffers from mass poverty and disease, with HIV and malaria being amongst the biggest killers. Infant mortality is high and life expectancy is significantly reduced compared to a western society such as Australia. Kenya is divided into several provinces. Siaya, part of Nyanza province, has an estimated population of half a million, with approximately 65% living below the poverty line. The average doctor to patient ratio is 1:96,000 and the official HIV/AIDS prevalence is 24%. Within Kenya, Siaya holds the lowest life expectancy at 43 years and the highest infant mortality rate at 135 per 1000 births. HIV and malaria and are two of the main diseases affecting the area.

Malaria in pregnancy is associated with premature delivery and intrauterine growth retardation which results in significant risk of LBW. LBW has a huge impact on mortality and morbidity and is an important factor in growth and development and ultimate chances of survival. Chronic malarial infection is associated with decreased neonatal birthweight due to intrauterine growth restriction as a result of placental insufficiency. Acute malarial infection has been more closely associated with preterm delivery. Preterm labour can be a result of placental malarial generating an immune response which stimulates early labour. Placental function is impaired, nutrient transport to the foetus is compromised and the effect is intrauterine growth retardation. It is thought that adequate malaria control alone could prevent 3–8% of infant deaths.

Malaria in pregnancy has serious adverse health outcomes for both baby and mother. Specifically, severe maternal anaemia can lead to both maternal and foetal death. Severe anaemia in pregnancy as a result of malarial infection causes an estimated 10,000 maternal deaths each year. Prevention of malarial infection during pregnancy may reduce the risk of severe maternal anaemia by 38%, LBW by 43% and perinatal mortality by 27%.

The World Health Organization estimates that 55% of all pregnant women in developing countries are anaemic, with a haemoglobin of less than 11g/dL. This is in comparison to approximately 18% in the developed world. Major contributing factors to this increased anaemia rate include iron deficiency, malaria and malnutrition. Evidence from developing countries indicates that anaemia is associated with LBW. Also, maternal anaemia in early pregnancy is associated with increased rates of preterm delivery. Maternal anaemia can contribute to growth retardation through a reduction in oxygen transport to the foetus. There is some evidence that iron and folate supplements commenced in early pregnancy have a positive effect on both maternal and neonatal outcomes, although more research is needed.

HIV is another common disease in parts of the developing world that is thought to have an impact on the higher rates of LBW babies in these countries. Increased rates of premature delivery and LBW babies have been associated with women who are HIV-positive. Some studies report as much as double the rate of preterm delivery in these women. A Kenyan study showed a threefold increase in the risk of delivering a LBW baby if the mother was HIV-positive.

In many developing countries, where there is high prevalence of malaria as well as HIV, this causes even further health problems. HIV infection increases a pregnant woman’s susceptibility to malarial infection. Also, malarial infection increases the HIV load in a pregnant woman. HIV increases the degree to which malaria is associated with maternal severe anaemia and LBW. This is combined with the effect of HIV itself on anaemia and birthweight.

Another common factor that contributes to an increased incidence of LBW babies in Africa is malnutrition and low maternal weight. Poverty, with associated malnutrition, is unfortunately all too common in the developing world. This malnutrition in pregnant women is associated with increased risk of preterm delivery and LBW in the neonate as a result of malnutrition in the foetus. There is some evidence that a balanced protein–energy supplementation during pregnancy can improve foetal growth but more research, particularly in developing countries, is needed.

Considering all of these factors, it is easy to see why the incidence of LBW babies is high in Kenya’s region of Siaya. Poverty, thus malnutrition, is widespread and maternal malarial and HIV infection rates are high. This produces a huge challenge for under-equitied and under-resourced health facilities.

Case study of an LBW baby in Siaya – my story

My name is Nicole and I arrived in Kenya in April 2005. I was an Australian volunteer nurse with four years’ experience in neonatal nursing. I had never been to Africa and had little idea of what to expect as a volunteer nurse. I went to Kenya through a volunteer programme and was placed in a local health centre in the west of Kenya, not far from Uganda. Below is an account of one of my very first experiences in the health centre.

The baby girl was brought to the hospital by her grandmother. The child was less than two weeks old and weighed less than one kilogram. The mother of the child had died a week earlier when the child was born prematurely. The baby was all skin and bones, her face looked like that of an old woman and she appeared to not have been fed since birth. I inserted a nasogastric tube and initiated feeds. The baby was wrapped in blankets and given to the grandmother to hold in the sun for warmth. The child died about one hour later. (Nicole Lloyd-Nyunja, September 2005)

I spent a few days in the health centre but didn’t feel that my neonatal skills were being utilised and the clinic was relatively well staffed. I decided to branch away from the
volunteer organisation I came to Kenya with and work as an independent volunteer, (thus with no financial support) in the local district hospital in Siaya. Siaya Hospital agreed to have me work there, without the backing of an organisation, with an aim at developing better neonatal services. It was here that I met Vicki and Liz.

Case study
Baby Vicki was 1.1kg, had clearly suffered from intrauterine growth restriction but gestation was unknown. She was positioned with three other babies of a similar size in a broken incubator, all naked and wet and hypothermic. She had been in the ‘nursery’ for a week and her mother Liz was at her wit’s end. Liz had been expressing breast milk into a cup every three hours and feeding it to Vicki with a spoon. Vicki was too small and weak to suck at the breast. Liz had been unwell during the pregnancy with malaria but couldn’t afford proper treatment. Liz’s husband was a polygamist and Liz was his second wife. Her HIV status was unknown. Liz was 19 years old and Vicki was her first child. She had wanted to go to university but her family couldn’t afford it so she was encouraged to marry young. There were no chairs or heating in the nursery, so Liz had to sit on the floor to feed her baby. Every time she entered the nursery the staff made Liz change clothes into a hospital gown so she wouldn’t bring germs into the nursery. Liz was exhausted and worried sick that her husband would refuse to pay her hospital costs and she would be told to leave the hospital. Would Vicki survive if Liz had to take her home now?

My work in Siaya
When I arrived in Siaya I immediately knew that this was a place where I could really make a difference. The ‘nursery’ inside the maternity ward was a single room. It housed one broken incubator, a bench top and a sink (but no soap). It was a cold room, with no heating or even chairs to sit on. The mothers slept in the maternity ward (often two to a bed) and came in to feed their babies. They were made to change into a hospital gown to enter the nursery and wear slip-on shoes that were outside the nursery door. There were no chairs to sit on, so the mothers sat on the floor. The floor vinyl was lifting and always looked dirty. There were many ants on the benches and even rats in the storage cupboard at one point. Infection control seemed impossible.

There were no staff especially assigned to look after the nursery. There was usually one nurse working each shift on the maternity ward. That one nurse had to look after the antenatal and postnatal women, those birthing as well as the babies in the nursery. This appeared to be an impossible task.

The mothers performed all care for their baby in the nursery, with little support or guidance from nursing staff. Mothers also received minimal advice regarding feeding. Regular observations such as vital signs and weight were not routinely measured or recorded.

Although the hospital didn’t charge families for their babies’ stay, the mothers, however, were charged. Many couldn’t afford it so took their baby home and hoped for the best. Often their husbands pressured them to come home or they had to leave to take care of other children.

I was overwhelmed with the challenge in front of me. How do you care for these LBW babies with such limited resources?

Making change – going back to basics
My initial plan in the nursery was to go back to the basics of neonatal care. The old saying that babies should be kept ‘warm, pink and sweet’ seemed highly relevant. Unfortunately, the only funds available to me were my own savings, so whatever I implemented in the nursery needed to be cheap and sustainable by the hospital.

Thermoregulation
LBW babies in particular are highly susceptible to hypothermia. I bought two bar heaters for the nursery that were running at all times. This helped dramatically in keeping the nursery warm. The mothers were also encouraged to practise kangaroo mother care (KMC), whereby the mum and baby would have skin-to-skin contact, extremely effective in temperature regulation in the neonate. This was a practice that seemed to come naturally to these mothers and aided in the establishment of breastfeeding.

Linen such as sheets and blankets was purchased for the incubator and cots. I also bought cloth nappies, plastic nappy protectors and hats and clothing for the babies. I labelled each set of nappies and clothing with a letter. Each mum was given a pack labelled with a particular letter and they were responsible for washing these items for their baby. This worked well. Even though multiple babies still shared an incubator, they were all clean and dry and this also helped contribute to better infection control. I purchased a new incubator (the cheapest I could find!) with my own personal savings and this, combined with other measures, helped dramatically in achieving normothermia in these babies.

Axillary temperatures were measured via an electronic thermometer that I also purchased.

Infection control
I purchased plastic chairs for the mothers to sit on and educated hospital staff on appropriate cleaning of the nursery and equipment. I urged the hospital to buy soap for hand-washing and educated the mothers and staff on the importance of this. The mothers no longer had to gown to enter the nursery; the focus shifted to hand-washing. I also supplied some antiseptic hand gel. A steam steriliser was sent to me from an Australian friend that ran on electricity and was simple to use. This enabled feeding equipment to be sterilised. I ensured that if babies had to share cots or the incubator, they were dressed and kept dry to minimise body fluid exposure. If a baby had a proven or suspected infection then all attempts were made to keep them away from the other babies.
Nutrition

I introduced nasogastric feeds for the small babies who were not coping with spoon/breastfeeds. I calculated a fluid chart to guide mothers and nurses on appropriate feed volumes and mothers expressed breast milk to give to their babies. If there was insufficient breast milk or the mother had died or was sick, cow’s milk was boiled and half-diluted with boiled water as a supplement. Baby formula was available in town but was far too expensive for most of the mothers to use. Breastfeeding was encouraged as soon as possible. Kitchen scales were purchased to enable accurate measurement of babies’ weights. Each baby was weighed twice weekly or more often if indicated. Syringes for nasogastric feeds often had to be reused and these were sterilised between each use.

Resuscitation

A lot of time was spent on teaching the doctors and nurses the currently recommended neonatal resuscitation principles. One aspect was the importance of adequately drying (thu also stimulating) the baby. Basic bag-valve-mask devices were already available in the hospital; however, some education was required to ensure their correct use. Most drugs were removed from resuscitation areas and there was education on the minimal need for drugs in resuscitation. A basic flow chart was displayed in all likely resuscitation areas.

Other changes

I lobbied the hospital for better staffing to include nurses specifically responsible for the nursery. This was eventually achieved. Staff education was conducted, emphasising regular documentation such as weights, vital signs, feeds, medications and so on. I produced and implemented a policy manual to guide nursery practice and to act as an educational resource tool when I had left. Use of oxygen therapy via an oxygen concentrator was used when deemed necessary. We did not have access to oxygen saturation monitoring (or any monitoring for that matter), so the need for oxygen was based on clinical judgement.

Barriers and challenges

The barriers and challenges I faced were innumerable. The English barrier was a problem; although many staff and parents had good English and I could usually find an interpreter. Lack of quality diagnostic testing facilities and appropriately educated support people meant that my clinical assessment skills formed the basis for all clinical care. There was a lack of educational and financial resources, which was a never-ending problem. It was often difficult to motivate staff as they saw that the extension of nursing care in the nursery would create a greater workload on them. Although I encouraged families to bring their babies back for follow-up after discharge, most didn’t and, therefore, I had no idea about the effects of my care on long-term outcomes. As I had no financial support, measures that were implemented had to be sustainable by the hospital. By the time I left, the hospital agreed to provide the basic necessities that would keep the nursery functioning and provide nursing support for the nursery.

Returning to the case study

Vicki thrived following establishment of regular feed volumes of expressed breast milk and achievement of normothermia. She needed a nasogastric tube initially and Liz was very good at learning to feed via this method. Vicki put on weight steadily and Liz’s stress levels reduced dramatically once she began to feel supported in the care of her baby. After a few weeks Liz went home with Vicki, fully breastfeeding and healthy. Liz and I remained friends and I checked on Vicki’s progress at regular intervals.

Care of the LBW neonate in a developing country

As already discussed, diseases such as malaria and HIV contribute greatly to the high number of LBW babies born in a developing country such as Kenya. What care is available for these high numbers of LBW babies and how can good care be provided in a highly under-resourced environment?

Much can be done to achieve better outcomes and quality survival for newborns, even in the absence of sophisticated facilities. Often, quality education and training of staff can have a huge impact even in the face of inadequate resources. Effective neonatal resuscitation has been shown to decrease the neonatal mortality rate, decrease birth asphyxia and its long-term negative outcomes. Untrained personnel can be taught basic, effective resuscitation principles with huge positive effect on outcomes. With current research evidence on the effectiveness of resuscitation in room air, an oxygen supply is not necessarily needed for effective resuscitation⁹. Ho and Chang found in their study an increase in five-minute APGAR scores following the implementation of a neonatal resuscitation programme based on AAP guidelines¹. The use of continuous positive airway pressure (CPAP) is one strategy that would be relatively simple to implement to support neonatal respiration in the absence of a ventilator¹³.

Hypothermia in the newborn is associated with significant mortality and the risk is even higher in the LBW population. Hypothermia has been associated with increased risk of infection, acidosis, coagulation abnormalities, circulatory and respiratory problems and brain haemorrhage. Studies have shown that a high percentage of newborns are hypothermic within the first few hours of life⁸. The survival of small babies is greatly enhanced by maintenance of their neutral thermal environment. Simple measures such as drying the infant thoroughly after birth and covering the body and head with insulated materials can prevent a postnatal fall in temperature¹⁴. Other measures include warming the room, early breastfeeding, delayed bathing and appropriate swaddling and dressing⁹.

KMC has been found to save the lives of newborns in rural areas without neonatal facilities. It involves principles of skin-to-skin contact, whereby the mother acts as an incubator for her newborn¹¹. Studies in developing countries have shown that benefits of KMC in the LBW population include increased weight gain and exclusive breastfeeding rates, lower risk of nosocomial infection and illness. KMC can increase mother-
infant bonding, improve newborn thermal control, assist in earlier physiological stabilisation and shorten hospital stay⁶.

Hypoglycaemia after birth is a major cause of morbidity in the LBW population. Early feeding with breast milk is the major preventative measure. Nasogastric or cup/spoon feeding is an alternative to breastfeeding in this population. When breast milk is not available, formula, sugared water and cow’s milk have been used in some countries, but their safety in these settings is questioned⁴.

Nosocomial infections are a leading cause of neonatal death. Paying close attention to practices such as sterilisation of equipment, avoidance of overcrowding, isolation of infected babies and aseptic procedures can significantly assist in infection control management. The most important aspect of infection control is effective hand-washing and this should be emphasised to staff and parents¹⁴.

It can be difficult for practitioners in a developing country to base practice on evidence when access to scientifically validated and current information is so difficult. This has led to harmful or ineffective practices persisting. A study by Ho and Chang revealed an improvement in the survival of LBW babies following the implementation of evidence-based practices. They acknowledge the sometimes overwhelming barriers to the implementation of these practices but they did prove that it is possible in a developing country¹².

Considering a large proportion of births in developing countries occur outside health facilities, it is important to focus education programmes not only on health workers but also on the many birth attendants that assist in births within the communities. Many studies have shown decreased neonatal mortality and improved outcomes with the training of these birth attendants⁹.

Conclusion

Neonatal mortality rates in developing countries are still unacceptably high. It seems unlikely that the Millennium Development Goal of reducing infant mortality rates by two-thirds by 2015 will be met. Diseases such as malaria and HIV still constitute a huge problem and contribute to high mortality rates and the high numbers of LBW babies in these countries. Many countries in the developing world are not equipped to deal with this population of LBW babies and, therefore, neonatal mortality and morbidity are unnecessarily high. The case study in this article demonstrates how some basic care principles can be applied to provide care for these LBW babies. It is important to keep in mind that a lot of these babies are not born in health facilities, but rather in homes out in the community. Education and improved resources will go a long way in improving the outcomes of LBW babies in terms of morbidity and mortality. It’s about time that governments committed more to the care of their mothers and babies.

References


Referencing for Neonatal, Paediatric and Child Health Nursing

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Skin care guidelines for infants aged 23–30 weeks' gestation: a review of the literature

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Abstract
The purpose of this study is to develop evidence-based skin care guidelines for premature neonates aged 23–30 weeks' gestation being cared for in the neonatal intensive care unit (NICU). This paper aims to provide an overview of the anatomy and physiology of neonatal, and specifically premature, skin. An understanding of the anatomy and physiology of premature neonates’ skin is required before the full effect of environmental factors on the premature infant can be realised. Research relating to the care of premature infants’ skin will be critically analysed and parallels and differences will be reported. Using this scientific knowledge and through critiquing the literature, guidelines for the skin care of infants aged 23–30 weeks will be developed. The guidelines will include recommendations for bathing, emollient use, the use of semi-permeable membranes in relation to trans-epidermal water loss, humidity and the use of adhesives. Areas for further research are identified and discussed.

Infants born between 23 and 30 weeks' gestation have different skin structures than infants born at full term. For this reason, their skin requires specialised care by the neonatal nurse. Evidence-based guidelines will ensure the neonatal nurse delivers the best care for the extremely premature neonates in his/her care.

The guiding question for this paper is: What is best practice for the care of the skin of infants aged 23–30 weeks' gestation?

Keywords: Neonatal, skincare, emollient, adhesives, transepidermal water loss, humidity.

What is known on this topic
- Premature infants have unique skin physiology
- National skin care guidelines for infants 23-30 weeks' gestation are not available in Australia.

What this paper adds
- Guidelines for bathing, emollient use, use of semi-permeable membranes and the use of adhesives.

Declarations

Competing Interests none
Funding self funded as written for a university paper
Ethical Approval n/a
Guarantor MA
Contributorship all work and writing by MA
Acknowledgements Thanks to Kerri Sullivan, Surginal CNC, John Hunter Children’s Hospital, for suggesting this review. Thanks to Elsevier for permission to publish the figure on p22.

Purpose: To critique published research and literature to develop evidence-based skin care guidelines for neonates aged 23–30 weeks' gestation being cared for in the neonatal intensive care unit (NICU). Areas for further research will also be discussed.

Design: Using three online databases, as well as cited references in the articles reviewed, literature was found and critiqued. From the critical analysis of the literature, skin care guidelines for the care of premature neonates in the NICU were developed.

Results: Neonatal skin has many roles and functions. Due to prematurity, the skin is not fully developed, leaving the neonate
exposed to infection, hypothermia and increased water loss. Environmental factors such as bathing and the use of emollients, adhesives, humidity and semi-permeable membranes can have a positive or negative effect on the premature neonate. Appropriate evidence-based guidelines addressing these issues are necessary to improve patient outcomes.

Implications for practice: Infants should be bathed in a pH-neutral solution and should be bathed twice weekly. Neonates weighing less than 1000g should only be bathed in water. The use of emollients is not recommended and the use of adhesives should be kept to a minimum. After the first week of life, incubator humidity should be reduced to 50%. The use of semi-permeable membranes is recommended when humidity is unavailable or impractical to reduce trans-epidermal water loss. The use of emollients, semi-permeable membranes and adhesives in premature neonates requires further research as the literature reviewed is both inconclusive and contradictory.

Table 1. Skin care practices research summary.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Participants</th>
<th>Method</th>
<th>Results</th>
<th>Limitations</th>
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<tbody>
<tr>
<td>Lund C, Osborne J, Kuller J, Lane A, Wright J, Raines D⁴.</td>
<td>51 neonatal intensive care nurseries and well baby nurseries in America. 2,820 neonates (gestational age 20–42 weeks).</td>
<td>Non-equivalent control group design (quasi-experiment) Site coordinators received training on neonatal skin care and implemented skin care guidelines (Appendix B) addressing 10 aspects of skin care. Skin condition was assessed using the Neonatal Skin Condition Score (Appendix A) before and after implementation of the guidelines. Each site included at least 30 infants in both observation periods.</td>
<td>After implementation of the guideline, skin care scores improved in both the NICU and the special care nursery. Less redness and dryness was reported post-implementation, and skin breakdown was less.</td>
<td>Reliability was compromised by the number of different sites and the large number of assessors used across the 51 sites. A major limitation of this study is that multiple guidelines were implemented at the same time, making it impossible to determine which practice resulted in the improved skin condition. It is important to note that this study was funded by skin care product manufacturer Johnson &amp; Johnson⁵.</td>
</tr>
<tr>
<td>Lund C, Kuller J, Lane A, Lott J, Raines D, Thomas K⁶.</td>
<td>51 neonatal intensive care nurseries and well baby nurseries in America. 65 site coordinators included in research.</td>
<td>Quantitative survey Data was collected from participating sites to evaluate site demographics, skin care knowledge, typical skin care practices and current products used before implementation of the skin care guidelines. A final project survey was distributed one year after implementation to evaluate if the implementation of the guidelines had caused any change in practice or knowledge.</td>
<td>Increased knowledge of skin care practices was demonstrated by the site coordinators. Product use changed, reflecting new knowledge and practices by the participating sites.</td>
<td>This study was funded by skin care product manufacturer Johnson &amp; Johnson⁴. 67% of the 51 sites involved responded to the final survey.</td>
</tr>
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</table>

Background

Premature infants have unique skin, in as much as it is not fully developed. Skin has many vital functions including thermoregulation, provision of a barrier against toxins and infections, tactile sensation, insulation and fat storage, and water and electrolyte excretion. Due to their prematurity and lack of development, premature neonates are at increased risk of sepsis, hypothermia, dehydration and electrolyte imbalance, and skin breakdown. National skin care guidelines for infants aged 23–30 weeks’ gestation have not been developed in Australia. Each individual NICU may or may not have its own guidelines on how to bathe infants and the use of humidity, adhesives, emollients and semi-permeable membranes. It is important that neonatal skin care is based on relevant and recent scientific research, so as to optimise patient outcomes. Guidelines need to be evidence-based,
not merely guided by tradition. By using evidence-based practice, it is hoped better outcomes and skin condition will be seen, specifically in those infants aged 23–30 weeks’ gestation in the NICU.

Method
A literature search was carried out using the online databases CINAHL (1982–2010), Ovid MEDLINE (1950–2010) and Journals@Ovid. Keywords included neonatal, skin, emollient, premature, adhesives, transepidermal water loss, humidity, anatomy and physiology. The search was limited to full text articles and to articles published within the last 10 years. As anatomy and physiology of the skin does not change, dates for this part of the search were not restricted and there was no date limit imposed on the anatomy and physiology search. Articles cited in recovered literature were also reviewed. Articles were chosen for their relevance to the topic and research articles were used when possible.

After an initial search, it was discovered that much of the research and literature refers to two studies conducted by Lund et al. in 2000. These studies were recovered and a further search, focusing on dates 1999 to 2010, was undertaken to determine if any new research has been conducted to support or contradict the results found by Lund et al. This search showed that the studies by Lund et al. are the most comprehensive studies to date. According to Visscher, there is a lack of published research available on the effects of topical agents on neonatal skin, particularly adequately sized randomised controlled trials. While smaller studies have been carried out, none have the size or scope of the Lund et al. research. A literature search of MEDLINE and CINAHL only identified two research papers that addressed more than one skin care practice. Hence these two papers form the basis for this literature review. The research conducted by Lund et al. is endorsed by the Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN) and the National Association of Neonatal Nurses (NANN).

Table 1 summarises the findings of these two studies.

Results
Revision of anatomy and physiology of the skin
The major layers of the skin are the epidermis, dermis and subcutaneous layer. The function of the epidermis is to act as a barrier, preventing penetrations and absorption of toxins, and retaining water, heat and electrolytes. The epidermis is the outermost layer and contains the stratum corneum (SC) and the viable epidermis. The role of the viable epidermis, or basal layer, is to constantly replenish the SC. It is located near the junction of the epidermis and dermis, and is constantly growing and dividing new keratinocytes, which mature and form the SC (Figure 1).

The SC is constructed like the bricks and mortar of a wall. The individual keratinocytes are the bricks and ligaments between the cells are the mortar, and by this design the SC is difficult to penetrate from the outside. In the mature SC, the keratinocytes are arranged in an organised pattern, interconnected with dermatomes to form a stable barrier. The body’s contents are protected from the physical and chemical environment – water is kept in and potentially harmful chemical and bacteria are kept out. The epidermis, and more specifically the SC, is the most important permeability barrier in the skin.

The epidermis is attached to the dermis by fibrils constructed of protein. The dermis contains nerves that carry sensation from the skin to the brain and blood vessels that nourish the skin. The dermis has great mechanical strength, elasticity, resilience and compressibility, while the subcutaneous layer consists of fatty connective tissue that provides insulation and the storage of calories. This tissue is not deposited until the last trimester of pregnancy.

Differences in the skin of premature infants
The full-term infant has a well-developed epidermal barrier, and transepidermal water loss is very low. The SC is fully developed in full-term infants and the integrity of the SC is directly related to gestational age. The higher the gestational age, the more mature the SC. Due to prematurity, the epidermis and SC in neonates 23–30 weeks is underdeveloped. An infant born at 23 weeks’ gestation will have virtually no SC present. By 32 weeks’ gestation, the epidermis and SC present.

In the first two weeks of life, the SC matures at an accelerated rate for premature neonates; however, this development is not as rapid for premature babies <27 weeks’ gestation. This accelerated maturation resembles the epidermal healing experienced by an adult after superficial burns or epidermal burns.

Figure 1. Structural components of the epidermis, dermis and subcutaneous tissue. This diagram was published in Maternal, Fetal & Neonatal Physiology, Blackburn, p525, © Elsevier 2007.
### Table 2. Petrolatum-based emollient research summary.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Participants</th>
<th>Method</th>
<th>Results</th>
<th>Limitation</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane A, Drost S (1993)24.</td>
<td>34 infants 29–34 weeks’ gestational age.</td>
<td>Randomised controlled trial</td>
<td>TEWL decreased in the experimental group, no difference was noted in positive bacterial or fungal skin cultures between the two groups.</td>
<td>Mean gestational age 32.3 weeks.</td>
<td>Emollient use recommended.</td>
</tr>
<tr>
<td>Nopper A, Horii K, Sookdoo-Drost S, Wang T, Mancini A, Lane A (1996)13.</td>
<td>60 infants less than 33 weeks’ gestational age.</td>
<td>Randomised controlled trial</td>
<td>Ointment therapy decreased TEWL and skin condition improved in the treatment group. Positive skin and blood cultures were significantly less in the treatment group.</td>
<td>Infants were transferred to incubators during the study period (humidified incubators affect skin condition), the amount of emollient used is not stated.</td>
<td>Emollient use recommended.</td>
</tr>
<tr>
<td>Campbell J, Zaccaria E, Baker C (2000)25.</td>
<td>40 infants weighing &lt;1000g</td>
<td>Case control study</td>
<td>Increase in the cases of systemic candida in extremely low birthweight infants.</td>
<td>Small sample size, method not explained very well.</td>
<td>Emollient use not recommended.</td>
</tr>
<tr>
<td>Lund C, Osborne J, Kuller J, Lane A, Wright J, Raines D (2001)4.</td>
<td>51 neonatal intensive care nurseries and well baby nurseries in America. 2,820 neonates (gestational age 20–42 weeks).</td>
<td>Non-equivalent control group design – quasi-experiment</td>
<td>Skin condition improved, with no significant difference in positive blood culture pre- and post-guideline.</td>
<td>Tested more than one intervention during the study making it impossible to determine which intervention resulted in the improved skin condition, funded by skin care company Johnson &amp; Johnson.</td>
<td>Emollient use recommended.</td>
</tr>
<tr>
<td>Edwards W, Connor J, Soll R (2004)26.</td>
<td>1191 infants weighing 501–1000g aged &lt;32 weeks’ gestation at 53 NICUs in North America.</td>
<td>Randomised clinical trial</td>
<td>Nosocomial bacterial infection determined by blood culture was significantly higher in the group receiving emollient therapy.</td>
<td>More males in the emollient group (54%) compared to the control group (47%) – males reported to have higher rates of nosocomial bacterial sepsis.</td>
<td>Emollient use not recommended.</td>
</tr>
</tbody>
</table>
stripping following adhesive removal. The physiology of this acceleration appears to result from the transition from an aqueous to a gaseous environment\textsuperscript{11,13}. The drying out of the skin following birth is also part of the natural maturation process of the skin, and any interference in this process (for example, lotions or creams) only serves to delay the development of the SC and prolong problems associated with an immature SC\textsuperscript{10}. Vernix caseosa may also assist the development of the SC\textsuperscript{10}.

Vernix caseosa is a superficial fatty film which begins to develop after 20 weeks’ gestation, and starts to thin after 36 weeks’ gestation. The foetus is covered with vernix until birth, that provides the skin with protection from amniotic fluid maceration, while also preventing fluid and electrolyte loss from the foetus to the amniotic fluid\textsuperscript{10}. It is unique to humans and has many of the same properties and functions as the SC. While the exact role of vernix is unclear\textsuperscript{14}, it is rich in lipids, and has been shown to contain anti-infective agents\textsuperscript{15}.

Due to the underdeveloped SC, premature infants are at risk for increased transepidermal water loss (TEWL)\textsuperscript{16}. TEWL refers to the water lost through the epidermis to the atmosphere. The effectiveness of the epidermis as a barrier, humidity, air speed and temperature determine the amount of water lost through TEWL\textsuperscript{11}. These losses can be 10–15 times greater in the extremely premature infant (25 weeks’ gestation) than in a full-term neonate\textsuperscript{11}. Other factors that increase TEWL in extremely premature neonates is a larger surface area to body weight ratio and increased blood supply that is closer to the skin surface\textsuperscript{15}. Morbidity secondary to dehydration, thermal instability and electrolyte imbalance are the result of the enormous fluid losses\textsuperscript{13}.

The relationship between relative humidity and TEWL follows a transverse linear curve. TEWL is high under low humidity conditions, but falls to zero as the relative humidity approaches 100%. As skin and environmental temperature increases, so does TEWL. Despite the accelerated maturation of the SC following birth, TEWL in extremely premature infants is still high even at four weeks post-birth\textsuperscript{10}. Steps must be taken to decrease TEWL in extremely premature infants\textsuperscript{11}.

The skin of premature infants is easily injured\textsuperscript{17}. The fibrils that connect the dermis to the epidermis are fewer in number and more widely spaced in premature neonates. The keratinocytes lack the organisation seen in the SC of full-term infants and there are fewer intercellular connections\textsuperscript{10}. The connection between the dermis and epidermis becomes stronger with increasing gestational age. Because of this weak structure, preterm infants are at increased risk of injury from adhesive removal. Some adhesives may have a stronger bond to the epidermis than the bond between epidermis and dermis, and removal of these adhesives can result in epidermal stripping\textsuperscript{1} and can occasionally damage the basal layer causing permanent scarring\textsuperscript{11}. There is a large increase in TEWL through the damaged area and an increased risk of bacterial penetration leading to systemic sepsis\textsuperscript{11}.

The nutritional status of the neonate also effects skin development and maturation. Premature infants may develop skin problems because of deficiencies in zinc and fat, nutrients accumulated in the third trimester of pregnancy. Essential fatty acid deficiency presents as superficial scaling, with desquamation and irritation in the neck, groin or perianal area. Platelet function can also be affected\textsuperscript{5}. Essential fatty acid deficiency can be treated by the administration of intravenous lipids\textsuperscript{5}.

Zinc is needed for a number of metabolic processes of the skin and subcutaneous tissues and is required for normal wound healing. Intrauterine zinc accumulation increases between 28 and 36 weeks’ gestation, meaning premature infants may miss out on these deposits. Zinc deficiency is manifested by scaly skin, excoriation in the neck folds, groin and perianal areas, and areas of trauma. Other symptoms include lethargy, poor growth and diarrhoea. Infants with chronic diarrhoea, short bowel syndrome or ileostomy are at increased risk of zinc deficiency. Total parental nutrition with zinc supplementation can prevent and treat zinc deficiencies\textsuperscript{5}.

At the moment of birth, skin is sterile. Within 24 hours it has been colonised by its own bacteria, and must act as a barrier against this bacteria. The skin creates an acid mantle, lowering its pH to <5 to protect from microorganisms. This environment creates a natural protection for full-term infants, children and adults\textsuperscript{18}. At birth the skin of a full-term infant has a neutral pH, and within one week the pH has fallen to 5\textsuperscript{18}. In a study of premature infants aged 24–34 weeks’ gestation, the skin pH was greater than 6 at birth, and took three weeks to drop to a pH of 5\textsuperscript{1}. During this time, the neonatal skin is vulnerable to infection\textsuperscript{18}.

**Skin care practices**

**Bathing**

The purpose of bathing newborns is to remove waste materials, potentially reduce microbial colonisation and increase aesthetics. However, in premature newborns who are sick or physiologically unstable, bathing can have detrimental effects\textsuperscript{1}. These include hypothermia, destabilisation of vital signs and absorption of harmful chemicals. Bathing can also upset the acid-base mantle\textsuperscript{20}.

Lund et al.\textsuperscript{3} recommended that pH-neutral cleansers be used for bathing, the frequency of bathing be decreased and only water be used for bathing infants weighing less than 1000g. Franck, Quinn and Zahr\textsuperscript{21} suggested bathing can be reduced to every four days without increase in skin flora colonisation.

Trotter\textsuperscript{22} advocated the use of water only as a cleanser of neonatal skin for the first month of life. Skin cleansers can damage the skin, altering the pH and removing the lipid components of the SC. Washing the baby in only water for the first month of life also decreases the incidence of skin rashes and dermatology problems associated with newborns\textsuperscript{22}.
Emollients

Emollients are used to act as a barrier for the skin and decrease TEWL. The use of emollients is controversial and the literature inconclusive. Lund et al.\(^1\) suggested that the skin is hydrated by the use of emollients and is better able to conserve water content of the SC. However, the natural maturation process of the SC is dependent on the skin drying out after birth\(^10\) and the application of emollients interferes with this process. The emollients in question are petrolatum-based. While the use of emollients may improve skin condition, some studies have shown this practice can increase the incidence of nosocomial bacterial infection and fungal infections. In a Cochrane systematic review of four randomised controlled trials, including a total of 1304 premature infants, Connor, Soll and Edwards\(^21\) concluded emollients improved skin condition, but also reported more bacterial infections than infants receiving no emollient. Table 2 summarises the findings of five research studies relating to petrolatum emollients, three of which recommend the use of emollients and two which do not. The emollient used in all five studies is petrolatum-based and water soluble.

Lanolin and sunflower seed oil have also been used as emollients in premature neonates. Kiechl-Kohlendorfer, Berger and Inzinger\(^25\) researched the effect of an olive oil/lanolin mix emollient and dexamethasone/phenoxetanol emollient on premature neonates with a mean gestational age of 30 weeks. The randomised trial involved 173 neonates, and showed less dermatitis and no significant difference in sepsis rates between the two treatment groups and the control group. Darmstadt et al.\(^26\) conducted a randomised trial in Egypt involving 103 neonates <34 weeks’ gestation. The treatment group received application of sunflower seed oil three times a day for the first 14 days, then twice-daily application until 28 days of life. The results showed better skin condition in the treatment group and reduced nosocomial infection in the treatment group. A major limitation of this study is that more than 60% of the patients died.

Semi-permeable membranes

Premature infants less than 30 weeks’ gestation can lose as much as 15 times more water through their skin than that of a full-term infant. TEWL can be reduced by as much as 50% by creating a second skin using a transparent dressing creating a semi-permeable membrane. Applying a polyurethane “second skin” also prevents hypothermia in the neonate\(^27\). The research by Lund et al.\(^3\) and a literature review by Garcia-Gonzalez & Rivera-Rueda\(^19\) recommend the use of transparent dressings for infants less than 30 weeks’ gestational age. The subsequent study by Lund et al.\(^3\) indicates no increase in the use of these dressings as a result of the implementation of the guidelines.

The application of Tegaderm\(^\circledR\) to the abdomen, chest and extremities of extremely low birthweight infants has been shown to decrease fluid and electrolyte disturbances and increase survival\(^8\). These results reflect those found by Mancini, Sookdoo-Drost, Madison, Smoller and Lane\(^9\) who studied 15 infants with a mean gestational age of 27.7 weeks. This small quantitative study found non-adhesive, semi-permeable dressings to decrease TEWL without increasing bacterial or fungal colonisation. While Tegaderm\(^\circledR\) may decrease TEWL, the study by Bhardari et al.\(^8\) involving 69 infants (BW <1000g) did not consider the trauma to the skin removal of the Tegaderm\(^\circledR\) would cause. The study done by Bhardari et al.\(^8\) is the most recent study on this topic.

Humidity

The use of humidity is widely used in NICUs across Australia and New Zealand in the management of preterm infants\(^28\). Humidified, double-walled incubators are used to decrease TEWL in premature infants. In a retrospective comparative study involving 155 infants weighing <1000g, Gaylord, Wright, Lorch & Walker\(^29\) reported lower fluid requirements, increased urine output and better electrolyte balance among infants nursed in humidified incubators compared to those who were not. While Lund et al.\(^1\) recommended humidity >70% be used, Argen, Sjors and Sedin\(^30\) found humidity >75% beyond 14 days of life may result in a slower rate of SC formation than a lower humidity of 50%. This small randomised, quantitative study included 27 infants aged 23–27 weeks’ gestation and all infants were first nursed in 85% humidity for one week before the humidity was decreased. These infants were then randomly assigned to two groups, the first who received 75% humidity, while the second group received 50% humidity. This adjustment was made over 12–24 hours. No ointments were applied to the infants’ skin before or during the study. Although both groups had the same TEWL for the first week of life, those nursed in 50% humidity had lower TEWL at four weeks of age than those nursed at 75% humidity. While TEWL values were shown to decrease as gestational age increased, the TEWL of those nursed in 50% humidity was further decreased than those nursed in 75% humidity. The practice of nursing preterm infants in high humidity and then lowering the humidity as tolerated by the neonates’ condition (for example temperature) is common\(^28\).

Adhesives

Adhesives are commonly used in the NICU to secure monitoring equipment and lifesaving devices such as endotracheal tubes. The removal of these adhesives, particularly adhesive tape, has been shown to disrupt the skin surface of neonates\(^17,19\) and can result in epidermal stripping. Gel adhesives are less traumatic, but cannot be used to secure lifesaving equipment as it lacks sufficient adherence. Solvents are not recommended in premature neonates because of the increased risk of absorption through the underdeveloped SC\(^7\). No research reported in the last 10 years could be found on the databases used.
Discussion

While humidity has been shown to decrease TEWL\textsuperscript{29}, high humidity slows the maturation process of the SC and extends the period of high TEWL\textsuperscript{30} seen in very premature neonates. The natural drying process of the skin is needed for SC formation\textsuperscript{10} and high levels of humidity interferes with this process. Prolonged exposure to water causes skin maceration, barrier breakdown, inflammation, irritation and urticaria\textsuperscript{3}. The infant must be nursed at optimal levels of humidity to decrease TEWL while allowing for normal SC development.

The largest area of conflicting research found related to the use of emollients on premature neonatal skin. The two large studies by Lund et al.\textsuperscript{3} and Edwards et al.\textsuperscript{7} found conflicting results relating to the increase of bacterial infection associated with this practice. Further research addressing this issue is needed, identifying and understanding the cause of infection. Randomised controlled trials involving large numbers of premature neonates is needed to research the effects of emollients such as olive oil, lanolin and sunflower seed oil. These emollients may provide a solution to the problem of nosocomial infection while improving skin condition. Until this time, the use of emollients in low birth weight infants will remain controversial.

The recommendations in the literature regarding bathing are similar and the research findings congruent. It is important to maintain the acid-base mantle of the neonatal skin in order to optimise the barrier to bacteria. The risks associated with bathing, such as hypothermia and destabilisation of vital signs, need to be minimised and this can be achieved with less frequent bathing. No further research is required on this topic.

Current research on the benefits of semi-permeable membranes is lacking. The research found included only small sample populations, and did not address the trauma the removal of adhesives causes the epidermis. A large randomised controlled trial is needed to address the issue of semi-permeable membrane use to reduce TEWL. Due to the universal use of humidity to control TEWL in Australian NICUs, semi-permeable membranes need only be used when humidity is unavailable, such as during resuscitation after birth and during procedures on the open care unit. In these situations, a semi-permeable membrane also serves to control heat loss and prevent hypothermia in the neonate\textsuperscript{27}.

The use of adhesives in the NICU is unavoidable due to the need to secure monitoring devices and lifesaving equipment. Thought needs to be given by the neonatal nurse to minimise the amount of tape used and minimise the area of skin in contact with the adhesive. The use of adhesives on neonatal skin also requires further research due to product development in the last decade. No research has been done in this area for 10 years and new products (solvents or adhesives) may be available which would benefit the neonatal population.

Table 3. Skin care guidelines for infants aged 23–30 weeks' gestation.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathing</td>
<td>As most of the literature refers to the major study carried out by Lund et al.\textsuperscript{3,4}, these are the guidelines being recommended\textsuperscript{12,18,20,31}. Neonates weighing &lt;1000g, or &lt;32 weeks' gestation, should only be bathed in water, and should be bathed 2–3 times per week. Infants above this age and weight can be bathed in either water or a pH-neutral detergent, but should still be bathed no more than two to three times per week.</td>
</tr>
<tr>
<td>Emollients</td>
<td>Recent research indicates the routine use of emollients is contraindicated due to the increased risk of infection. Skin care guidelines for infants 23–30 weeks' gestation caring for in the NICU should not include emollients as part of routine care. TEWL can be reduced by other means such as humidity\textsuperscript{10} and the use of semi-permeable membranes.</td>
</tr>
<tr>
<td>Semi-permeable membranes</td>
<td>The use of non-adhesive membranes in premature infants aged 23–30 weeks' gestation being cared for in the NICU is recommended where humidity is unavailable. Situations where humidity is unavailable may include procedures needing to be performed on the open care unit, or when the neonate is resuscitated after birth. Semi-permeable membranes decrease TEWL and the research does not indicate an increased risk of infection.</td>
</tr>
<tr>
<td>Humidity</td>
<td>Infants aged 23–30 weeks' gestation should be nursed in high humidity (85%) for the first week of life to manage TEWL. After this period, humidity should be weaned to 50% to encourage SC formation, thereby allowing the infant to self-regulate TEWL. Once the humidity has been lowered to 50%, the optimal duration of humidification for the preterm infant has yet to be established\textsuperscript{25,32}, hence no recommendations can be made regarding this issue.</td>
</tr>
<tr>
<td>Adhesives</td>
<td>Based on the guidelines by Lund et al.\textsuperscript{1} the use of adhesives should be minimised, and tape removal should be delayed until at least 24 hours after application. Tape should be backed with cotton wool where possible to reduce trauma upon removal, and small pieces of tape should be used. Where possible, tape should be placed on top of tape to secure extra devices to reduce adhesive contact with the skin. Solvents should not be used to aid adhesive removal. Warm water and cotton balls should be used to aid adhesive removal, and care should be taken to remove adhesives slowly\textsuperscript{1}. Lifesaving and monitoring equipment should be secured in a way that minimises the adhesive contact with the skin.</td>
</tr>
</tbody>
</table>
The knowledge gained from this literature review can be used in NICUs caring for infants aged 23–30 weeks’ gestation. The guidelines developed represent the most current research available on bathing, emollients, adhesives, humidity and semi-permeable membranes. These guidelines can be implemented with the knowledge that they are current and evidence-based. Areas for further research have been identified and contradictions in research findings noted.

Implications for practice

Based on the above review of the literature, the following guidelines (Table 3) have been developed for the care of neonates ages 23–30 weeks’ gestation being cared for in the NICU environment.

Conclusion

Skin is the largest organ of the human body and has many roles. Premature skin is not fully developed and for this reason is particularly fragile. Care of neonatal skin in the NICU needs to be evidence-based on current research. Adhesives, emollients, semi-permeable membranes, humidity and bathing are all environmental factors that have the potential to further harm the delicate skin of the premature neonate. Guidelines need to be in place in all NICUs caring for extremely low birthweight neonates to minimise the negative effects of these environmental factors. The implementation of such guidelines will improve the outcomes for this infant population.

References

Welcome to our Cochrane Nursing Care column, where each issue of the journal will feature a summary of a Cochrane Review relevant to neonatal, paediatric or child health nursing. This is an initiative of the Cochrane Nursing Care Network (CNCN), which was established to improve health outcomes through:

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Competing interests none
Funding nil
Ethical approval N/A
Guarantor CC
Contributorship CC
Acknowledgements nil

Positioning for acute respiratory distress in hospitalised infants and children

Cochrane summaries are based on new and updated systematic reviews published in The Cochrane Library. The summary must be read in conjunction with the full review when making decisions. The authors’ conclusions are summarised but have not been reinterpreted.

Clinical context

An association has been established between prone positioning and sudden infant death syndrome (SIDS) which has led to the recommendation that young infants be positioned supine. Yet, the prone position has been shown to improve the arterial oxygenation in older infants and children with respiratory distress. Due to structural and physiological immaturity, the respiratory mechanics differ between adults and children, which means that the risks and benefits of positioning in the younger age group may have more clinical significance. Given the SIDS recommendations for supine positioning in young infants and the benefits associated with prone positioning with respiratory distress, a systematic review of the literature was necessary to guide clinical practice in hospitalised infants and children.

The aim of this Cochrane Review was to compare the effects of different body positions (prone, supine, lateral, elevated and flat) on infants and children hospitalised with acute respiratory distress. The search for this review was updated in August 2008.

Inclusion criteria

Studies
Randomised or pseudo randomised controlled trials comparing two or more positions in the management of acute respiratory distress in hospitalised infants and children.

Participants
Infants and children aged 16 years or under, diagnosed with acute respiratory distress or an acute exacerbation of a chronic respiratory illness. Subgroup analyses were undertaken by respiratory condition, (for example, for hyaline membrane disease, bronchiolitis, croup and pneumothorax) age categories and ventilatory support.

Intervention
Body positioning used for infants and children with acute respiratory distress including sitting (erect and non-erect); prone; semi-prone; horizontal (flat) and head elevated; lateral/ side-lying position – horizontal (flat) and head elevated; supine – horizontal (flat) and head elevated; recumbent/ semi-recumbent; kinetic positioning (continuous postural therapy) and body tilting.
Outcomes

Blood gases (PaCO$_2$ and PaO$_2$); oxygen saturation (SaO$_2$); oxygenation indices (PaO$_2$/FiO$_2$); respiratory rate (RR); respiratory effort; heart rate (HR); %FiO$_2$; duration of supplemental oxygenation; intensive care unit (ICU) admission; length of hospital stay; mortality; episodes of apnoea; haemodynamic parameters and ventilatory parameters.

Results

Twenty-three studies with 560 infants and children were included in the review. A crossover design comparing supine, prone lateral, elevated and flat positions was used in 20 studies (19 used random and one alternative allocation) and four parallel group randomised studies compared only supine and prone positions. Seventy-four per cent of the participants were preterm neonates and most of these neonates were mechanically ventilated (71%). The remaining participants were aged from newborns to 16 years and most of these infants and children were mechanically ventilated (84%).

Risk of bias

Only three trials used adequate allocation concealment with 20 unable to be determined.

Authors’ conclusions

Implications for practice

The authors concluded that the prone position provides considerable short- and medium-term oxygenation benefits for hospitalised, ventilated preterm infants. Extrapolation of benefit beyond this group of infants is not possible due to the limited studies. Because of the association of the prone position with SIDS in young infants, the authors recommend that all hospitalised infants nursed in the prone position receive continuous cardiorespiratory monitoring.

Implications for research

There is a need for more research with larger sample sizes and a range of age groups to answer the questions regarding the effect of other positions on oxygenation.


Publication status and date: Edited (no change to conclusions), published in Issue 4, 2010. Review content assessed as up-to-date: 6 August 2008.

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