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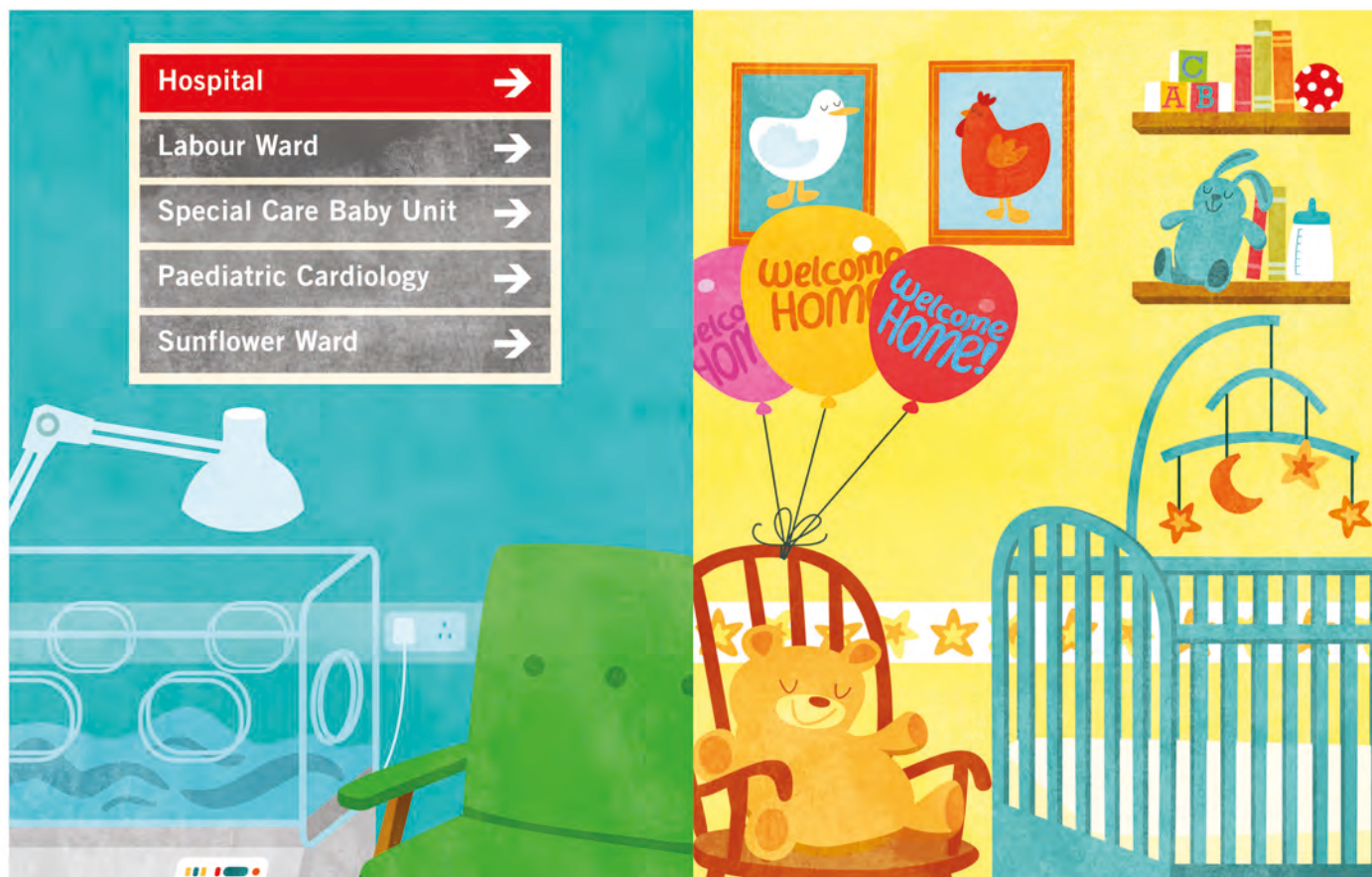
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Infant is an independent, peer-reviewed bimonthly journal for the multidisciplinary team that cares for sick or premature babies in their first year of life. The journal contains authoritative articles written by experts in their field, covering a wide range of subjects that reflects the varied roles of the professionals working in this area. Practically and clinically based, *Infant* supports neonatal and infant paediatric nursing and medical practice and develops professional education and health promotion skills. All opinions expressed in the articles published in *Infant* are those of the authors and not necessarily those of the publishers.

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Neonatal organ donation – why not?

The recent news that the NHS has experienced a 50% increase in the number of organ donations over the last five years is very encouraging¹. The success of this is due to a number of factors including an increase in the number of donations following cardiac or circulatory death (DCD – Donation after Circulatory Death). Instead of relying on donation after brainstem death has been confirmed, DCD has increased the pool of organ donors and now this route accounts for one in four kidney transplants. Data from adults show that, on average, recipients achieve an additional 56 years of life from a single donor. There is an increasing demand to consider neonates as organ donors². How many more life years could be gained if neonates were allowed to be organ donors? The neonatal and early infant mortality rates account for more deaths than any other comparable period in childhood. Why is there such inertia in establishing a process for organ donation from neonates?

Since the Academy of Medical Royal Colleges announced that brainstem death testing was not suitable for infants less than two months of age in 1991³, the possibility of neonatal organ donation ceased (at a time when it wasn't even technically possible). For infants less than 37 weeks, the lack of myelination (and delayed brain maturation) and the higher incidence of cardio-respiratory immaturity mean that brainstem death criteria cannot be justified. For infants more than 37 weeks but less than two months of age, the reason why brainstem testing was not recommended was that: "Given the current state of knowledge it is rarely possible to confidently diagnose brainstem death"⁴. Because of this mind-set the prospect of using neonates as donors has essentially frozen ever since.

However a number of neonatal organ transplants have now been successfully performed within the UK for conditions such as hypoplastic left heart. The irony is that the organs are sourced from outside the UK because of the restrictions that we have on neonatal organ donation. Several European countries, Canada, Australia and the USA accept the concept of brain death in the neonate to facilitate donation and do not rely on brainstem death testing.

There has been a successful programme of heart valve donation within the UK for a number of years, which is a testament to the many families who have wanted to help other infants affected by serious medical conditions. Although

it is a very emotive subject with complex ethical and legal issues not fully resolved, there are still a number of infants born with anencephaly each year. Some of these families choose to continue the pregnancy for personal reasons knowing that their baby will die soon after birth. It is a very humbling moment when the families ask if there is any hope that their baby's organs could be used to help others. It is a shame that at the moment, the answer is unequivocally no.

What are the other reasons why practice and research into neonatal organ donation (and transplantation) within the UK is hindered? It could be due to lack of awareness but as neonatal practitioners we should be trying to promote this issue in our everyday practice. Is it due to technical reasons? One of the significant factors in small bowel transplantation is the shortage of suitably sized organs available for infants and young children. Small bowel transplantation is usually carried out for infants older than one year of age but it is technically feasible to perform the procedure earlier. There have also been individual cases of multi-visceral transplants for neonates in North America, which shows there is technical feasibility for organ transplantation even for very small infants⁵. If transplant surgeons within the UK do not operate on younger infants because of lack of experience, the position becomes perpetually self-defeating. Revascularisation of transplanted organs is an important factor but if cardiac transplantation and coronary artery re-implantation can be performed on infants weighing less than 2.5kg, other techniques could be just as successful.

Is it because we lack facilities to harvest organs or to coordinate the process? One of the successes of the adult and paediatric transplant service is the fantastic logistical, psychological and emotional support provided, which could easily extend to the neonatal population. Is it because of a lack of supply? Each year in the UK there are more than 2100 neonatal deaths. With advances in public health, general paediatric and paediatric intensive care, death in childhood is now even less common than ever before⁶. It has been estimated that one in five or six neonates who die could be potentially suitable for organ donation^{7,8}.

The biggest barrier to overcome is to obviate the need for brainstem death testing and accept, as in adult practice, the policy of DCD or brain

death. One of the reasons why this policy has not been adopted is because of 'taboo' or fear, especially in light of the retained organ scandal, that parents would not wish to consider their babies as organ donors. However in practice, I do not think that this will be the case and a number of parents who have agreed to heart valve donation have expressed sadness that other organs could not also be used. There is an irony that, following the Alder Hey retained organs scandal, parents can now request that their own baby's organs be returned to them but they have no right to insist that they be used for transplantation.

There is a new horizon of future therapies. It is now possible to retrieve small bowel, liver and lungs and even possibly cardiac tissue after a period of confirmed circulatory death without significant warm ischaemic injury to these organs. Clearly one of the most significant clinical groups would be infants with severe hypoxic ischaemic encephalopathy (HIE) who have life-sustaining treatments withdrawn. It is precisely because of the profound and irreversible brain injury that palliative care is usually the only option. It would be possible to confirm brain death on clinical, imaging (including magnetic resonance spectroscopy) or electroencephalographic grounds in some of these cases. In others, it would also be possible to consider organ retrieval after DCD.

On the background of such personal tragedy the parents may decide that donation may offer some personal benefit and should surely be explored. The first infant heart transplantation was attempted just three days after the first adult transplantation by Barnard in 1967. Although the outcome was unfavourable, several decades passed before transplantation for hypoplastic left heart became a realistic alternative to staged

repair. Even so, infants under the age of one still have a higher transplant list mortality than any other age group, related to this very small donor pool.

Of course it would be wise to proceed in a very cautious manner – there is very little worldwide experience in this area and long-term outcome data will not be available for some considerable time. Even if a new national policy were to be established, there would continue to be active debate about the ethical and legal dimensions. There should never be any compromise on the respect for human life or disregard for any cultural or spiritual values. Nor should there be any compromise to the provision of high quality intensive care or parental support and to the transition to palliative care, where appropriate. Donation to and transplantation of older children is also still uncommon with less than 40-50 donations per year⁹. Although neonatal death is sadly still common it is unlikely that there will be a substantial donor pool and transplantation itself will be limited to only the most specialised centres.

Recent adult cases have shown how important it is to be certain that death has occurred and a minimum of five minutes should pass after the onset of permanent asystole before death is confirmed. There are a number of complicating factors that must be excluded before a diagnosis of brain death could be considered, including hypothermia, toxicity, metabolic and endocrine conditions. Therefore it would also be vital, before confirmation of brain death in a neonate, that any correctable factors or condition had been considered and reversed. If DCD is to be considered, the precise duration of the timeframe after which death is confirmed is still debateable but perhaps should be 10 minutes rather than five.

The fact that neonatal organ transplantation is permitted with organs

sourced from outside the UK while organ donation is not permitted within the UK, is an ethical paradox. The reality is that the main barrier to neonatal organ donation is not ethical or legal but procedural. Perhaps it is time for the Academy of Medical Royal Colleges to look again at this issue and deliver definitive guidance. There have been many advances in transplantation and for the benefit of neonates and their families, it is perhaps time to look to the future and not in the past.

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MBRRACE-UK and the UK-wide national Maternal, Newborn and Infant Clinical Outcome Review Programme – an update

The Maternal, Newborn and Infant Clinical Outcome Review Programme (MNI-CORP) is one of a number of programmes of quality review overseen by the Healthcare Quality Improvement Partnership (HQIP). In June 2012, HQIP appointed MBRRACE-UK (Mothers and Babies – Reducing Risk through Audits and Confidential Enquiries across the UK) to run the national MNI-CORP. The MBRRACE-UK data collection system for the UK-wide national surveillance of stillbirths, infant deaths and maternal deaths went live during April 2013.

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The Maternal, Newborn and Infant Clinical Outcome Review Programme (MNI-CORP) originated in 1993, although the formal review of maternal deaths began much earlier in 1952. Over time it has been run by different organisations, including CESDI (Confidential Enquiry into Stillbirths and Deaths in Infancy) and most recently CMACE (Centre for Maternal and Child Enquiries). The oversight of the work has been the responsibility of different sections of the Department of Health (DH) during this period. In 2010, at the end of the previous contract period, the DH commenced a new tendering process for the work. The timing of this decision coincided with the peak of the financial crisis and great change within the DH; these were probably significant factors that led to:

- A need to reduce significantly the budget allocated to this activity.
- Significant delays in choosing a new provider.

It was in June 2012 that the Healthcare Quality Improvement Partnership (HQIP) appointed MBRRACE-UK (Mothers and Babies – Reducing Risk through Audits and Confidential Enquiries across the UK) to run the national MNI-CORP. MBRRACE-UK is a collaboration comprising members from the following organisations:

- National Perinatal Epidemiology Unit (NPEU) at Oxford University
- University of Leicester
- University of Liverpool

- University of Birmingham
- University College London
- Imperial College London
- Sands, the stillbirth and neonatal death charity
- General practitioner input.

Picking up the reins

Data collection led by CMACE ended on 31 March 2011. With the appointment of the MBRRACE-UK team to lead this process, work commenced immediately to put in place a new data collection system that took advantage of modern IT opportunities and was also able to help deal with some of the challenges resulting from a much reduced budget. At present, the data collection system (described in more detail below) should be considered as a 'work in progress' as time constraints have meant that the focus has been on recommencing comprehensive good quality data collection. Once this has been achieved it will be possible to increase the sophistication of the system, not only in terms of the dataset but also in terms of data quality, as well as allowing potential interaction with individual clinicians and families.

During the provider changeover, although data continued to be requested from Trusts, completeness and quality of the data submitted showed great variation and the extent to which the data for 2010, 2011 and 2012 can be analysed and published with confidence, is unclear. This is primarily an issue for the perinatal data

Keywords

perinatal mortality; stillbirth; neonatal mortality; prematurity; congenital anomaly

Key points

Field D. MBRRACE-UK and the UK-wide national Maternal, Newborn and Infant Clinical Outcome Review Programme – an update. *Infant* 2013; 9(4): 119-21.

1. There is a new system for reporting perinatal deaths in the UK.
2. It is vital that users ensure that the data they enter are both accurate and complete.
3. There will be an annual confidential enquiry run across the UK on a topic selected from those submitted as part of an open call.

as the small number of maternal deaths means that it is feasible to ensure data completeness and quality retrospectively.

Launch of the new MBRRACE-UK surveillance data collection system

The MBRRACE-UK (www.npeu.ox.ac.uk/mbrrace-uk) data collection system for the UK-wide national surveillance of stillbirths and infant deaths was opened for external testing at the end of March 2013 and went live during April 2013. The launch was staggered so that not all hospitals tried to commence data entry on the same day.

MBRRACE-UK will be collecting information about:

- **Late fetal loss:** any baby delivered showing no signs of life between 22⁺⁰ and 23⁺⁶ weeks' gestation.
- **Termination of pregnancy:** terminations that resulted in the ending of a pregnancy in an NHS hospital after 22⁺⁰ weeks' gestation.
- **Stillbirth:** any baby delivered showing no signs of life after 24⁺⁰ weeks' gestation.
- **Neonatal death:** any death of a live born baby (at any stage of gestation) occurring before 28 completed days after birth.
- **Post-neonatal death:** any death of an infant from 28 days' old, up to the age of one year, who was never discharged from the neonatal unit before death.
- **Maternal death:** all maternal deaths occurring during pregnancy and up to one year after completion of the pregnancy.

During 2013 there will be development of systems for collection of information about all other post-neonatal deaths. This will be carried out in conjunction with Child Death Overview Panels, who already have such systems in place (see below).

Accessing and using the system

Because of the need to have a new robust system for data collection in place soon after the awarding of the contract, it was necessary to make some initial strategic decisions in terms of how the process would run. Access to the MBRRACE-UK data collection system would initially be limited to a handful of individuals in each Trust who would be responsible for data entry. Maternity services, neonatal units and children's hospitals across England, Wales and Scotland were contacted and the relevant heads of midwifery and clinical directors asked to identify those individuals who would be responsible for registering

cases from their Trust into the MBRRACE-UK data collection system. Many Trusts have focussed this activity on risk management staff, at least for the time being.

The new arrangements involve electronic data collection using a newly developed secure, web-based data entry application. The need to comply with NHS data security requirements has meant that only relatively up-to-date web browsers are compatible with the system. Details of the requirements have been sent to all those who will be involved in data entry during this first year.

In coming years, subject to contract, it is hoped that access and responsibility for data entry is widened to individual consultants. There is also exploration of the possibility for parents to 'sign off' data entered into the system about their baby, if they so wish.

Separate local arrangements are being made by NIMACH (Northern Ireland Maternal and Child Health) in Northern Ireland and in north east England for data entry during 2013 – these areas have existing centralised arrangements for collecting such data.

The data entry system was opened in April 2013 and, because user names and passwords were issued to all Trusts, it is hoped that information about deaths occurring from then on will be entered in a timely fashion. Deaths that occurred between 1 January 2013 and the launch of the new system should now be entered.

Medical notes are often removed from clinical areas once a death has occurred. For this reason, paper copies of the data collection system are being made available to assist units in gathering the relevant information about each case. These paper copies should be retained by the relevant clinical service and either destroyed or filed in the notes, once the details of the case have been entered electronically on to the MBRRACE-UK system. The paper copies must not be posted to MBRRACE-UK since they will contain personal identifiers alongside clinical information and such action would represent a serious breach of the Data Protection Act.

Advantages of the electronic data collection system

Staff in individual units will be able to see which cases have already been notified – this will save duplicate notifications and effort. Once information about an

individual case has been successfully entered into the system, a copy of the data will be able available for printing for inclusion in the medical notes. The project is working to ensure that data required by Child Death Overview Panels (CDOPs) is captured by the MBRRACE-UK system so that the completion of two separate forms becomes unnecessary. To support local audit and review, it is planned that functionality will be added to the MBRRACE-UK data collection system during 2013/14 that will allow individual units to download information about their own cases. This will help in checking that all eligible cases have been notified and will act as a central information source for units about all of their deaths.

What is different?

In terms of data collection, the switch to a web-based system has provided opportunity to review the data that is collected about each death and also to employ some more modern and sophisticated classification systems – in particular, the opportunity to classify perinatal and neonatal deaths using the CODAC and ReCoDe systems^{1,2}. The hierarchical structure of these systems is easily dealt with using multiple drop-down lists; the system also has a search facility for particular terms.

Maternal past medical history is also coded directly into ICD-10. Entered terms produce a range of options to choose from, which then code directly to ICD-10 (**FIGURE 1**). Certain 'contentious areas' have been focussed on, eg data collection on births at, or after, 22 weeks' gestation has been restored but in addition, detailed information about signs of life immediately after birth are sought.

Arrangements for confidential enquiries

In addition to national surveillance, MBRRACE-UK has also been commissioned to conduct confidential enquiries on a rolling programme of topic-specific maternal, stillbirth and infant mortality and morbidity cases. Congenital diaphragmatic hernia (CDH) has been selected as the first perinatal topic for confidential review due to the severity of the condition and the range of outcomes which result. During 2013 confidential enquiries will be carried out that will focus on the quality of care provided along the

whole of the care pathway, from diagnosis to discharge. Around 80 cases of CDH will be selected from a study conducted jointly through the UK Obstetric Surveillance System (UKOSS: www.npeu.ox.ac.uk/ukoss), the British Association of Paediatric Surgeons Congenital Anomalies Surveillance System (BAPS-CASS: www.npeu.ox.ac.uk/baps-cass) and the British Isles Network of Congenital Anomaly Registers (BINOCAR: www.binocar.org/). The cases will be identified as a stratified random sample; it will be ensured that all potential outcomes of CDH are represented in the review sample. These enquiries will be carried out as panel reviews. The process of recruiting relevant specialists to be part of the review process will begin shortly. It is envisaged that these individuals will be identified with the assistance of relevant Royal Colleges and professional associations.

Confidential enquiries of all maternal deaths from 2009 onwards, together with a rolling programme of topic-specific maternal morbidity cases, are underway. Maternal sepsis has been selected as the maternal morbidity topic for confidential enquiries during 2013, due to its prominence as the leading cause of direct maternal deaths in 2006-2008. About 30 cases of severe maternal sepsis will be identified to undergo confidential case review from the recently completed UKOSS study of sepsis. With the assistance of the relevant Royal Colleges, recruitment of case assessors for the maternal reviews has started; it is anticipated that case reviews will be underway shortly.

The retrospective identification of cases for both sets of confidential enquiries using recently completed studies, will enable rapid identification of cases for these first mortality/morbidity topics. This ability to 'hit the ground running' was important given the short timescales available for this particular round. However, in future years the choice of topics for confidential enquiry will follow the procedure that HQIP has developed for all of the Clinical Outcome Review

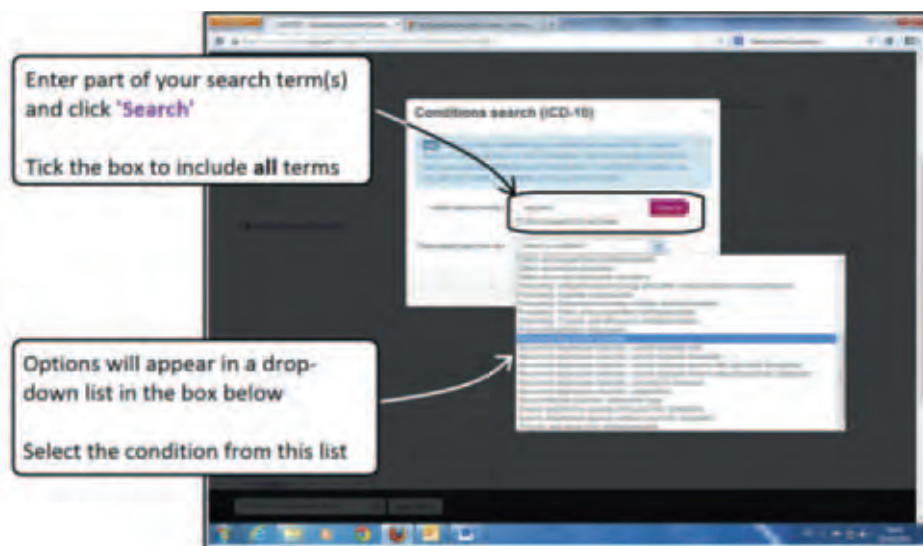


FIGURE 1 A sample screen of drop-down list options: ICD-10 categories/codes in relation to maternal health.

Programmes that it oversees. Towards the end of each year, HQIP will advertise for topic suggestions and these will then be sifted before one is chosen from a shortlist of four by an Independent Advisory Group. This process has just been completed and the topic for the perinatal confidential enquiry in 2014 is unexplained stillbirth at term.

Funding and quality accounts (England)

The MBRRACE-UK system is commissioned by HQIP and jointly funded by the DH (England); the Scottish Government Health Department; NHS Wales; The Department of Health, Social Services and Public Safety Northern Ireland; the Channel Islands; and the Isle of Man.

MBRRACE-UK collects data in England on behalf of the DH. Trusts in England are required to contribute data to MBRRACE-UK in order to fulfil their mandatory obligations both to participate in national confidential enquiries and also to report how they have implemented the recommendations to help improve the quality of patient care.

Keeping in touch

Because of the need to re-establish data

collection as soon as possible, the project focussed very heavily on getting the new data collection system in place in the period after the contract was awarded. As a result, although various means to try and communicate widely about what was taking place were used, the contact was not as regular nor wide ranging as might have been desired and MBRRACE-UK would like to take the opportunity to apologise for this. Now that the new system for data entry is working, albeit with a need for further development, it is intended that more regular communications with all clinical teams interested in the programme will be established.

Further information about the programme is available on the MBRRACE-UK website at: www.npeu.ox.ac.uk/mbrrace-uk. To contact the MBRRACE-UK team, email: mbrrace-uk@npeu.ox.ac.uk or telephone: +44 (0)1865 289715.

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Long-term health of babies born close to term

Preterm birth is defined as birth before 37 weeks of gestation and until recently, 'full term' has been used to refer to birth at or beyond 37 weeks of gestation. However, it has become clear in recent years that these definitions may require further thought and so preterm birth has been subject to reclassification and term birth to redefinition. So how and why has this challenge to established thinking come about?

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Keywords

Late preterm; moderate preterm; health; outcomes

Key points

Boyle E. M. Long-term health of babies born close to term. *Infant* 2013; 9(4): 123-27.

1. Births at 32-36 weeks of gestation represent around three quarters of all preterm births.
2. Long-term health outcomes for this group of babies are worse than for those born at full term.
3. Increased morbidity in this very large group is likely to have a substantial impact at the population level.
4. Further research is needed to identify groups at greatest risk of poor outcomes.

Historically, interest in both short- and long-term health outcomes associated with prematurity has been centred on very preterm infants, ie those born at <32 weeks of gestation. This comes as no surprise – these babies, the smallest and least mature, experience the greatest severity of illness following birth and are those most likely to have poorer long-term outcomes¹⁻⁴.

Outcomes for this group are now well documented and universally acknowledged. Much less established are outcomes for babies born beyond 32 weeks of gestation. In contrast to the highest risk babies, routine data are not collected for these babies in many countries, including the UK. Most research studies have reported data from the USA and have been retrospective in nature, although a number of recent and ongoing studies are now looking at these infants prospectively and in more detail. The majority of these reports have focused on neuro-developmental and cognitive outcomes, with fewer relating to the long-term general health of this group. To date, most studies have drawn similar conclusions namely, that both neuro-developmental and health – in particular respiratory health – outcomes for more mature preterm babies are not as good as previously believed. Full discussion of all aspects of neurodevelopment is beyond the scope of this article, therefore the aim is to summarise the currently available evidence for long-term health outcomes of babies born at, or close to, term and to describe the rationale for recent changes in terminology to describe this group.

Mortality in childhood and adulthood

Interest in babies born close to term was initially sparked by reports of increased mortality during the neonatal period in infants born at 34-36 weeks of gestation and this has been reported consistently by a number of researchers⁵⁻⁸. However, until recently there have been no published data addressing the relationship between gestational age at birth and later mortality. A national cohort study in Sweden of 674,820 singletons, born between 1973 and 1979, recently reported a gradient of increasing mortality with decreasing gestation⁹. The study included 22,590 infants born between 34 and 36 weeks of gestation. Birth at 34-36 weeks of gestation was associated with increased mortality in early childhood (one to five years) and young adulthood (18 to 36 years) compared to those born at 37-42 weeks gestation. Although congenital anomalies were often seen in this group, these did not fully explain the increased mortality. The same researchers have now also highlighted, in this cohort, an independent association between birth at 37-38 weeks of gestation and increased mortality in infancy, early childhood and young adulthood compared with those born at 39-42 weeks of gestation¹⁰. Death in early adulthood appeared to be strongly associated with congenital anomalies, diabetes and other endocrine disorders.

Respiratory morbidity

Respiratory morbidities, including

transient tachypnoea of the newborn, respiratory distress syndrome and respiratory infections are among the most common problems in neonates born at 34–36 weeks of gestation¹¹. This is thought to be related to functional immaturity of the lung structure at this stage of gestation, associated with delayed intrapulmonary fluid absorption, surfactant insufficiency, and inefficient gas exchange¹².

The relationship between birth at 34–36 weeks of gestation and risk of later respiratory morbidity has been investigated in only a very small number of studies, but from some of these there is evidence that an increased susceptibility may continue throughout infancy and childhood. Some suggest that preterm birth itself, regardless of respiratory status in the neonatal period, may have adverse effects on lung growth and development leading to a reduction in pulmonary function¹³.

In 1993, Todisco et al compared respiratory function at eight to 15 years of age in a small group of children born at 34–36 weeks, who did not have significant respiratory problems in the neonatal period, with a control group born at term¹⁴. Although asymptomatic at the time of testing, some of these children showed statistically significant abnormalities of lung function and preterm infants with impaired lung function were more likely to have mothers who smoked.

More recently, there was a follow-up study of children participating in the Avon Longitudinal Study of Parents and Children (ALSPAC; $n=14,049$). Spirometry was performed in these children at eight to nine ($n=6705$) and/or 14–17 ($n=4508$) years of age¹⁵. This study included 691 children who had been born between 33 and 36 weeks of gestation. The researchers demonstrated decreased lung function at school age in children born at 33–34 weeks of gestation. There was some improvement by the age of 14–17 years, but not all differences had resolved with time. Children born at 35–36 weeks of gestation had values similar to those of children born at ≥ 37 weeks. However, there was a very large loss to follow-up from this study, with non-attenders more likely to be from families of lower socioeconomic status and in which maternal smoking was more prevalent. This introduces the possibility that the study results might provide an under-representation of the true differences between the groups.

Asthma is a major cause of respiratory

morbidity in children but studies that have looked at the association between birth at 34–36 weeks of gestation and asthma in early childhood have produced conflicting results. A retrospective study of 71,102 children born at ≥ 32 weeks of gestation demonstrated that birth at 34–36 weeks, compared with birth at 38–40 weeks of gestation, was associated with increased risk of recurrent wheeze in the third year of life (adjusted OR 1.23; 95% CI 1.07–1.41)¹⁶. In another retrospective cohort study including 582 infants born at 34–36 weeks and 1,083 born at 37–38 weeks, it was shown that the preterm group, at 18 months of age, were more likely to have been given a diagnosis of persistent asthma, to have greater use of inhaled corticosteroids and to have had greater numbers of acute respiratory healthcare visits compared to infants born at 39–42 weeks of gestation¹⁷. In this cohort, those born at 37–38 weeks of gestation were also more likely to have a diagnosis of asthma and use inhaled corticosteroids than those infants born at 39–41 weeks. Another group studied inhaled corticosteroid use in six to 19 year olds and found an increased use of medication in those born at 35–36 weeks of gestation in comparison with those who were born at more mature gestations¹⁸ (adjusted OR 1.24; 95% CI 1.19–1.30).

The Millennium Cohort Study (MCS) is a UK nationally representative longitudinal cohort study of more than 18,000 infants born between 2000 and 2002¹⁹. Infants who were alive and living in the UK at the age of nine months were recruited. Follow-up of this large cohort involved interviews with parents at the time of recruitment to the study and again when their children were three and five years of age. In the MCS cohort, there was an increased incidence of asthma and wheeze at three and five years in children who were born at 34–36 weeks (adjusted OR 1.5; 95% CI 1.2–1.8). This finding was supported by the fact that medications for asthma were the most prominent medications used by the children at five years, with their use being more common both in those born at 34–36 weeks (adjusted OR 2.2; 95% CI 1.6–3.1) and 37–38 weeks (adjusted OR 1.4; 95% CI 1.1–1.8) of gestation²⁰. In contrast, a study in 2010 found no statistically significant association between birth at 34–36 weeks and the risk of developing asthma in childhood²¹. It is currently not known whether mechanisms of later respiratory

disease in children born at 32–36 weeks of gestation are similar or different to those of very preterm infants, nor how much of the burden of disease is correctly attributed to asthma in this group.

Hospitalisation during infancy and childhood

A number of studies have shown increased rates of hospital readmission, during the weeks following discharge from neonatal care, among preterm infants born at 34–36 weeks compared with those born at ≥ 37 weeks of gestation^{22,23}. Jaundice is the most common reason for hospital readmission in the first month of life^{22,24,25}, with infection²⁵, feeding difficulties and dehydration²⁶ also frequently seen. Breastfeeding has been associated with such problems, although it is failure to successfully establish adequate breastfeeding, rather than breastfeeding *per se* that is likely to be the important risk factor for difficulties in the early period after discharge^{24,27}.

Fewer studies have addressed the need for hospital admission beyond the neonatal period. In the USA, it was found that infants born at 34–36 weeks of gestation were more likely than more mature infants to require at least one hospital admission within the first six months of life²⁶. Costs related to health care were higher for this group of infants than term-born infants with the greater portion of this financial cost being related to hospital inpatient care episodes²⁸. Infants born at 34–36 weeks of gestation were almost twice as likely to have required inpatient hospital care during the first year of life regardless of the timing of their discharge from neonatal care. As part of the MCS, parents were asked about their children's hospital admissions, excluding those related to trauma or accidents¹⁹. As might be expected, the most immature infants (< 32 weeks) were most likely to need multiple hospital admissions. However, compared with infants born at 39–41 weeks of gestation, the odds of having three or more admissions before the age of nine months were higher for infants born at 34–36 weeks (adjusted OR 1.9; 95% CI 1.3–2.7)²⁰. Unexpectedly, infants born at 37–38 weeks of gestation were also at greater risk of requiring hospital admission than those born just two or three weeks later (adjusted OR 1.4; 95% CI 1.1–1.8). The most common reasons for hospital admission were respiratory and gastrointestinal

problems. Chest infections, wheezing, gastro-intestinal infections and gastro-oesophageal reflux (GOR) were the most common conditions reported by parents as having led to hospitalisation. The odds of being admitted to hospital three or more times between nine months and five years of age were also higher in babies born at 34–36 weeks and at 37–38 weeks (adjusted OR 1.9; 95% CI 1.3–2.7 and 1.4; 95% CI 1.1–1.8 respectively) suggesting that this risk may persist²⁰.

Long-standing illness and disability

A large longitudinal study of all births in Norway between 1967 and 1983 showed that those born at 34–36 weeks had an increased risk of major disabilities that included epilepsy and visual and hearing impairments²⁹. As adults, they were more likely to experience disability affecting their work capacity. The more recent MCS asked parents about long-standing illness, disability or infirmity, that had been diagnosed by a health professional and was of more than three months' duration²⁰. This showed that long-standing illness at three and five years of age was more common in children born at 34–36 weeks than in more mature infants and that their illness was more likely to limit their activities²⁰. Parents of the children born at 34–36 weeks and 37–38 weeks of gestation were more likely to report their child's health as being poor than those whose children had been born at 39–41 weeks. A study to determine the risk for cerebral palsy among 1,682,441 infants born between 1967 and 2001 at 37 weeks of gestation and above showed an increased risk of cerebral palsy in infants born at 37 and 38 weeks of gestation compared with those born at 40 weeks³⁰. The risk in infants born at 37–38 weeks appeared also to be increased and similar to the risk in those born post term but the mechanisms for this remain unclear.

Impact on classification of gestational age

While their morbidities are usually less severe, and their neonatal hospital stay shorter than those of their more immature counterparts, it is clear that longer-term outcomes for babies born at 34–36 weeks are worse than those for babies born after 37 or more weeks of gestation^{26,31–33}. This realisation on the part of clinicians and researchers has led to calls for a reclassification of preterm birth in

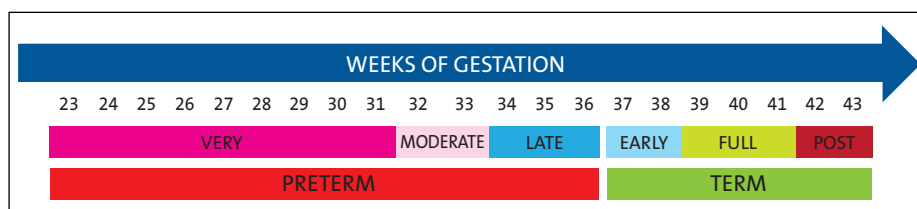


FIGURE 1 Classification of preterm and term birth.

recognition of this finding. A March of Dimes workshop in 2005 addressed issues around optimising care for babies born close to term³⁴. The conclusion of this workshop was that previously used terminology, such as 'near-term', 'marginally preterm', 'mildly preterm' and 'borderline preterm' did not adequately reflect the physiological immaturity associated with birth at 34–36 weeks of gestation, and recommended that these babies should be classed as 'late preterm'. While this term is now widely used in published literature, there has been more limited agreement with respect to birth between 32 and 33 weeks of gestation – probably the most commonly used terminology now to describe this group is 'moderate preterm'. These babies have been less well studied, but their outcomes appear to lie between those of the very preterm and late preterm groups (FIGURE 1). This evidence of a gradient of risk in the preterm population, has now led researchers to consider babies that are born at 37 or more weeks of gestation and to investigate whether such a relationship between gestation at birth and long-term outcome exists within the most mature group. In general, babies born beyond 34 weeks of gestation are rarely subject to long-term clinical follow-up. Evidence about longer-term health of infants born late preterm is strengthening, but for those born at 37 weeks or more it remains extremely limited. However, the expression 'early term' has now been adopted by many to denote birth at 37–38 weeks of gestation, with 'full term' reserved for babies born at 39–41 weeks of gestation. This reflects emerging evidence that the gradient of risk probably extends right up to the higher end of the gestational age spectrum.

What contributes to health outcome of late preterm and early term infants?

Although still limited, much of the available information about late preterm and early term gestations points to worse outcomes in these groups than in

individuals born at full term. However, we have as yet an even more limited understanding of the factors leading to birth at 34–38 weeks of gestation and those influencing long-term health in infants, children and adults. Crucial influences may be at play even before pregnancy starts, but factors relating to occurrences during pregnancy, the perinatal or neonatal period or perhaps later in childhood may also be important in determining risk. To what extent is the long-term health of these babies due to their preterm birth *per se*? There has not yet been enough detailed work in this area to allow us to answer this question. However, whereas outcomes following very preterm birth may, at least in part, be attributable simply to the effects of immaturity, it seems less likely that immaturity is the main factor influencing the health of those born close to term.

Other factors must be considered; likely to be among the most important are events that lead to the early delivery of the baby. Infants with congenital anomalies and multiple births commonly deliver following spontaneous onset of labour at late preterm or early term gestations, but a large number of births occur as a result of obstetric intervention. Concerns during pregnancy about the health of either the mother or fetus often lead to medically indicated deliveries during this period of gestation. Decisions made by obstetricians with respect to medical indications for delivery, timing of delivery and mode of delivery may therefore influence outcomes for the babies. The potential benefits associated with a longer period of gestation must be weighed against the risks of fetal demise *in utero*. Evidence to guide obstetric practice is limited for a number of the common complications of pregnancy, such as preterm premature rupture of the membranes, oligohydramnios, gestational hypertension and poor fetal growth and so the optimal timing of delivery remains unclear and requires further study³⁵.

Neonatal care may also influence outcomes. There has been little research addressing the influence of the place and

type of neonatal care, discharge policies and duration of postnatal hospitalisation, but these will vary between centres. In addition, environmental and family factors following discharge, such as type of home, parental education, socioeconomic status and family lifestyle are other factors that may potentially affect longer-term health outcomes in these infants. Many of these are inextricably linked and their relative contributions to long-term infant and child health outcomes still need further exploration.

What are the implications for provision of health care?

There has been, in recent years, a steady increase in the numbers of babies being born at late preterm gestations³⁶. However, this now seems to have reached a plateau and may even be declining. This suggests that strategies for reducing avoidable births at these gestations may be having some success. Despite this, late preterm births represent around 70% of all preterm births (approximately 30,000 births per year in the UK) and UK births at early term gestation number almost 120,000 per year³⁷. Emerging evidence about health outcomes appears to be mirroring previous data that have been reported for neuro-developmental³⁸⁻⁴³ and educational⁴⁴⁻⁴⁶ outcomes in these children although contemporary and prospective data remain limited. Poor health in large numbers of infants and children is likely to have a substantial impact on primary care, public health services and hospital services. Most preterm infants born at 34 weeks and above do not receive follow-up after discharge from neonatal care unless they have had a particularly difficult neonatal course. There is therefore no routine surveillance for their healthcare or developmental needs. Now that these children are increasingly being highlighted as a group at greater risk than has previously been appreciated, it will be important to ensure that their ongoing healthcare needs are being adequately met, though formal follow-up may not be appropriate or feasible in such a large group.

Summary

It is becoming clear that it is no longer appropriate to view term and preterm birth as a dichotomy, as there appears to be a spectrum of risk that is at its greatest in the most preterm, but that still exerts an

effect at the more mature gestations, even close to full term. While the absolute effects and differences between groups of babies may in themselves be small, it is vital to remember that the impact on healthcare services of the more mature babies will be substantial at the population level, because of the sheer number of babies that are born at late preterm or early term gestations. Further research in this area is required to identify those at greatest risk of poor health outcomes in order to allow appropriate and targeted follow-up in these children.

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Service development, NICU expansion and dune bashing in Abu Dhabi

FOCUS

BY Shirley Hargreaves, Assistant Director of Nursing, and Julian Eason, Chief of Neonatology



Consultant Dr Hisham Tawakiol preparing to scan a baby (above). Staff Nurse Tumi attending to a baby on nitric oxide (inset).

The original Corniche Hospital opened in 1977 adjacent to its current location, which opened in 1984. This was one of the first maternity hospitals to be opened in Abu Dhabi and resulted in a significant decline in the perinatal mortality rate in the Emirate of Abu Dhabi.

The United Arab Emirates (UAE) has a population of approximately 7.8 million consisting of less than 12% local Emirati with the remainder made up of ex-pat workers in a variety of industries/roles. The majority of the western ex-pat population are British, at well over 240,000 in number.

The Corniche is a stand-alone maternity hospital and is the largest maternity and neonatal facility in the UAE. It is owned by Abu Dhabi Health Services Company (SEHA), managed by Johns Hopkins Medical International and is Joint Commission International and Baby Friendly accredited. The Corniche was awarded Hospital of the Year 2012 across the five Abu Dhabi governmental hospitals.

With 235 maternity beds, three operating rooms and a 64 cot NICU, the

Corniche neonatal service is staffed by:

- seven consultant neonatologists
- 18 specialist neonatal doctors
- two fellows
- 110 nursing staff
- 13 unit attendants
- four respiratory technicians.

Additional trained personnel undertake auditory and oxygen saturation screening. In addition there is a satellite clinic – the Women's Health Centre – that provides outpatient midwifery care for low risk clients.

The current NICU, which underwent an expansion and rebuild two years ago, has:

- four intensive care rooms with a total of 27 cots
- two isolation rooms
- three special care nurseries with 35 cots.

Over 8,500 infants are delivered each year with approximately 30% by caesarean section. The routine care of extremely premature infants with equipment for cooling and nitric oxide use as well as amplitude-integrated electroencephalography (aEEG) monitoring is readily

available. Each year there are over 1,000 admissions to the NICU with two hundred neonates of less than 1500g birthweight whose care has been benchmarked through the Vermont Oxford Network database since 1998. The problems are very similar to many western NICUs with strategies to reduce bronchopulmonary dysplasia (BPD) and nosocomial infections. Extended spectrum beta lactamase (ESBL)-producing organisms are prevalent in the community and acquired gram negative sepsis is also not uncommon.

Like many stand-alone maternity and neonatal hospitals around the world, the longer-term plan is to integrate all services onto a main medical site – the Sheik Khalifa Medical City (SKMC), approximately three miles away. This is where surgical services and sub-specialty paediatric services are located. Currently specialist surgical, cardiac, ENT and ophthalmic physicians and surgeons visit the NICU to assess infants with the neonatal team. The team transport these infants to and from the main hospital and

this has led to some challenging transfers and has enabled us to develop a great deal of experience. As in the UK, many neonatal consultants are able to undertake cranial ultrasounds, echocardiography and minor surgical procedures with modern equipment available on the NICU.

This does not mean that there aren't any challenges. Having adopted an American style, insurance-based healthcare system in the UAE, the patient can choose to use government or private hospitals but all will charge. Two-thirds of deliveries occur with SEHA and the remainder in the private sector. There are multiple insurance schemes and multiple levels of cover and some individuals are self-pay. There are many local private hospitals in Abu Dhabi that will take on obstetric care, but often when complications arise, women are advised to come to the Corniche resulting in many non-booked deliveries.

All this makes for a stressful but enjoyable environment. Recent initiatives to develop 'service lines' has enabled neonatologists in Abu Dhabi to begin to collaborate, looking at cot location and provision as well as joint guideline development. The lateness of these developments does have its advantages – fetal-medicine and obstetric services can be aligned along with future NICU provision.

The Corniche Hospital has developed its services to cater for an increasingly high-risk population. There has been recent development of a fetal-medicine unit, IVF services, NICU expansion and post-graduate education, with an accredited fellowship programme in neonatology and obstetrics and gynaecology. Comprehensive women's health services have also been developed including gynaecology. This specialisation has led to an influx of UK-trained consultants and, as a result, the Corniche Hospital has become the first hospital outside the UK to earn Royal College of Obstetricians and Gynaecologists (RCOG) accreditation for advanced training skills modules (ATSMs) in maternal medicine.

No NICU can function without neonatal nursing staff and like most specialised services in the UAE the expertise has to be imported. The largest group of nurses are from the Philippines but there are many from India, Malaysia, the Middle East, Europe and elsewhere including many British nurses in senior positions. An in-house neonatal course is run at the Corniche Hospital to train nurses to



Corniche Hospital beach volleyball team won the SEHA Employees Challenge in March. Back row: Julian Eason, Ismail Hamade and Nazi El Hajj Chehade. Front row: Ali Al Ketbi and Khaled Haji Karashi.

consistent standards. The ethnic mix stimulates a whole host of diverse learning, understanding and practices – the homemade snacks after a ward round are an education unto themselves!

When it comes to community care there are some exciting developments. A follow-up clinic for high-risk infants is available from the neonatologists and there are plans to develop further community services and follow-up in the near future. The largest clinic is a jaundice clinic as G6PD (glucose-6-phosphate dehydrogenase) deficiency is prevalent. Jaundice related to dehydration can occur and there is a lactation clinic freely available. The initiation of breastfeeding is excellent at over 80% of those discharged from NICU; the challenge is to maintain this in the community.

As first cousin marriage is common locally, and in other ethnic groups in the UAE, there are many congenital neurodevelopmental problems. Unusual metabolic conditions are also often encountered requiring complex initial and longer-term care.

Leisure is, of course, important and the area is open to exploration. Desert camping and dune bashing, mountain hikes, sailing and diving are just a few of the things on offer. It is a very family friendly environment and one of the safest places in the world to live. International competitions in cricket, Formula One, tennis and golf are frequent.



A dedicated neonatal ambulance.

The thirst for knowledge is large and local and international conferences are mainly held in Abu Dhabi and Dubai; speakers come from around the world, including the UK, USA and Australia. The UAE continues to grow and the Corniche Hospital needs to grow with it. The new hospital is likely to have 100 cots and an innovative design; a family-friendly environment and an exciting place to work. At the time of writing, there are 41 ICU/HDU infants in 29 spaces and guidelines and policies for the next Joint Commission International accreditation are being frantically updated. Does that sound familiar?

Corniche Hospital is currently recruiting qualified healthcare professionals for its NICU.

Interested? Check out the job advert in this issue of *Infant*.

A case of cystic hygroma of the chest

This report describes the case of a male infant who presented with a mass on the chest wall. The mass was soft, non-tender and transilluminating. An ultrasound scan revealed a multiseptate, thin-walled cystic mass, consistent with a diagnosis of cystic hygroma.

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A baby of 37 weeks' gestation was born by normal delivery to a primigravida mother with no significant medical history. The antenatal screening had revealed no abnormalities. On delivery he was noted to have a cystic mass on the left lateral chest wall measuring 9x9x6cm (**FIGURE 1**). The mass was noted to be soft, non-tender and transilluminating (**FIGURE 2**). There was no bruit heard on auscultation. The rest of the physical examination was normal. Ultrasound showed a multiseptate, thin-walled cystic mass, consistent with a diagnosis of cystic hygroma. Chromosomal karyotyping revealed a normal 46XY appearance.

The child went on to have uncomplicated surgical removal of the mass at one year of age.

Discussion

Cystic hygromas (also known as cystic lymphangiomas) are benign, painless loculated lymphatic proliferations, which occur due to lack of development of the



FIGURE 2 Transillumination can help to differentiate cystic hygromas from other types of solid mass.

normal connections between venous and lymphatic drainage¹. The Greek word hygroma means 'moist tumour'. The majority are congenital, being evident at birth (50-65%) or within the first two years of life (90%)², however rare adult-onset cases have been described in the literature³.

The incidence of congenital cystic hygroma is said to be 1/6000 live births⁴. Hygromas diagnosed on antenatal scan have historically been associated with poorer prognosis (usually due to development of hydrops), although a recent study suggested that up to 42% of these may resolve spontaneously by birth⁵. A significant proportion of patients will have a chromosomal disorder, with up to 60% having a diagnosis of Turner syndrome⁶.

Cystic hygromas may theoretically develop at any site during embryonic lymphatic development, however the most common sites include the posterior neck (75%) and axilla (20%)⁷. Less frequently reported areas include the mediastinum, retroperitoneum, abdominal viscera, groin, bones and scrotum⁷.

Complications of cystic hygromas include bleeding into the cyst, infections (usually due to seeding from respiratory or other infections) and abscess formation. In these situations, transillumination may be lost and the hygroma will become tense

Keywords

cystic hygroma; cystic lymphangioma; dysmorphism

Key points

Lodh R., Gupta N. A case of cystic hygroma of the chest. *Infant* 2013; 9(4): 130-31.

1. Cystic hygroma is a relatively benign condition that can cause considerable anxiety to parents and professionals, especially where antenatal scans have been reported as normal.
2. Examination and ultrasound findings are characteristic and should lead to a prompt diagnosis and appropriate management.
3. Thought should be given to a possible underlying chromosomal disorder and any potential complications that may arise due to the site and size of the mass.



FIGURE 1 A cystic mass on the left lateral chest wall.

and often tender⁸. Mechanical obstruction of the airway and dysphagia may occur for those sited in the neck^{4,8}.

Surgical excision remains the mainstay of treatment for cystic hygromas. Surgery is electively conducted (with CT scan or MRI), except if life-threatening complications are present. It is not without risk as nerves, arteries, veins and pleura (depending on site) are often found in close proximity. Recurrences can occur despite presumed total excision. Alternatives to surgery include injecting sclerosing agents, such as bleomycin, directly into the mass and the use of laser therapy^{9,10}.

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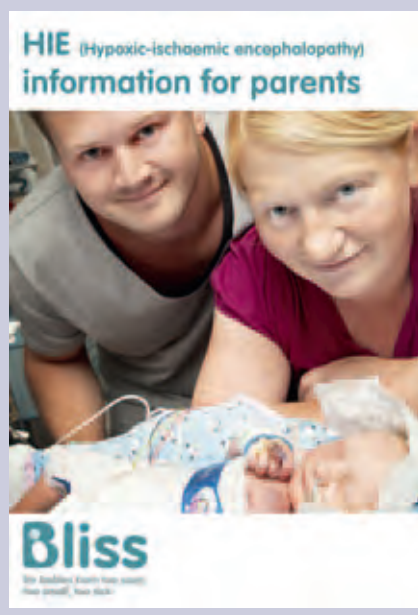


HIE information for parents

The Bliss hypoxic-ischaemic encephalopathy (HIE) booklet, co-published with the Neonatal Neuroprotection Team in the East of England, provides information for parents whose baby has been affected by HIE. The book describes the possible causes of HIE and the various treatment options, including cooling.

Parents should always be involved in decisions made about their baby's care. A book explaining why their baby is unwell and the tests and procedures that may be needed can help parents feel less alone and restore them to the centre of caring for their baby. Reading about the experiences of other parents can help many parents feel reassured.

For further information or to download a copy of the booklet, visit www.bliss.org.uk



Delegates at the Transitional Care – Cutting the Cord conference in Birmingham. From left are Leif Nelin, Tonse Raju, David Hutchon and Viktoria Nelin.

Delayed cord cutting gains further support

At an international conference organised by Dr David Hutchon and hosted by the University of Birmingham, clinicians argued that delaying cutting of the umbilical cord by at least 30 seconds is safer for a newborn baby.

At present, NHS guidelines advise that the umbilical cord should be clamped and cut as quickly as possible so that drugs (which may be harmful to the baby) can be given to the mother, and the baby can be taken away for airway clearing.

However, if the umbilical cord is left attached, the newborn baby will receive a substantial boost of blood from the placenta – as much as a 32% increase in blood volume. This may protect the baby from iron deficiency anaemia and, potentially, irreversible developmental delay. This can be especially beneficial for preterm and compromised babies.

Many medical bodies and senior doctors are moving away from immediate clamping. The National Childbirth Trust, the Royal College of Midwives, the World Health Organization and the Royal College of Obstetricians and Gynaecologists are all in favour of delayed cord-clamping. Meanwhile, the National Institute for Health and Care Excellence, which currently supports early cord-clamping, is updating its guidelines so watch this space.

MRI: a viable alternative to standard autopsy

Using magnetic resonance imaging (MRI) and blood tests to establish the cause of death in fetuses, newborn babies and infants is virtually as accurate as a standard autopsy, according to a paper published in *The Lancet*.

The study, led by Dr Sudhin Thayyil and Professor Andrew Taylor of UCL and Great Ormond Street Hospital, found that full-body MRI scans combined with non-invasive investigations were as effective as a standard autopsy in 90% of cases¹.

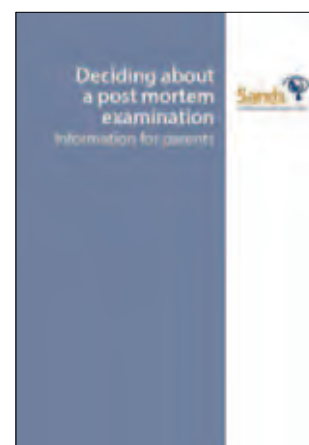
Despite evidence that post-mortem investigations provide new and useful information in the majority of cases, many parents refuse consent to a post-mortem because of the

traumatic nature of the procedure at a time of great distress.

Sands, the stillbirth and neonatal death charity, welcomed the findings of this study. Charlotte Bevan, Sands Senior Research Officer, says: “Giving parents the option to have a less invasive but equally informative investigation will not only make the decision easier for parents, but could lead to an increase in post-mortem uptake and vastly improved research into why so many babies are stillborn or die shortly after birth.”

Reference

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A handbook for parents – part of the recently launched Sands post-mortem consent package.

Bliss supports parental engagement in research

Bliss, the special care baby charity, is working collaboratively with the Medicines for Children Research Network (MCRN), researchers in the neonatal field and parents to positively promote research on the neonatal unit and ensure parents are effectively engaged.

There is often uncertainty and resistance among parents when asked if their baby might join a trial. Bliss would like to ensure that parents have a greater understanding of the value of research and its importance on the neonatal unit.

Bliss recently conducted a survey to identify the types of neonatal research taking place and how units are currently engaging with parents. From the results of the survey and the needs specified by researchers, a set of resources (including templates and guidance for research teams and other health professionals) will be produced for use on the units. Through a parents' forum, parents of



premature or sick babies will be involved to ensure health professionals are providing clear information on research trials and giving parents and families the confidence to involve their babies.

For more information, please contact Katie Nania at Bliss on 020 7378 1122 or email katien@bliss.org.uk

The winning midwifery-inspired cake.



The icing on the cake

A selection of midwifery-themed cakes, ranging from a scarlet-coloured placenta cake to a stomach-shaped cake with detachable fetus, were among the many cakes made by midwives to help raise funds for the International Confederation of Midwives.

The Royal College of Midwives (RCM) asked its members to get baking to give birth to midwifery-inspired cakes. The cakes were judged by RCM Facebook followers and the one with the most 'likes' won a ticket to the RCM Annual Conference.

The winning cake, by Alison Searle of University Hospital Coventry and Warwickshire NHS Trust, featured two marzipan figures – a woman in labour and her gas-inhaling partner.

Non-invasive test reliably detects Down's syndrome

Routine screening using a non-invasive blood test for fetal cell-free DNA (cfDNA) in a pregnant woman's blood reliably detects Down's syndrome (trisomy 21) and other genetic fetal abnormalities in the first trimester, according to two studies published in *Ultrasound in Obstetrics & Gynecology*^{1,2}.

Cell-free DNA fragments are short fragments of DNA found in the blood. During pregnancy, there are fragments from both the mother and fetus in the maternal circulation. Current screening for Down's syndrome and other trisomy conditions includes a combined test carried out between the 11th and 13th weeks of pregnancy, which involves an ultrasound screen and a hormonal analysis of the pregnant woman's blood. Only chorionic villus sampling and amniocentesis can definitely detect or rule out fetal genetic abnormalities, but these are invasive to the pregnancy and carry a risk of miscarriage.

The studies, by Kypros Nicolaides and colleagues at the Harris Birthright Research Centre for Fetal Medicine at King's College London, showed that both cfDNA and combined testing detected all trisomies, but cfDNA testing gave far fewer false-positive results than combined testing. Another major advantage of cfDNA testing is the reporting of results as very high or very low risk, which makes it easier for parents to decide about invasive testing.

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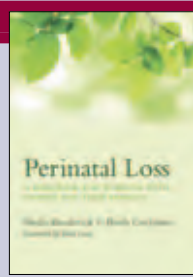
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Book review

Perinatal Loss: A Handbook for Working with Women and their Families

Sheila Broderick and Ruth Cochrane
Radcliffe Publishing, 2013
ISBN: 978-1-846199-806
£24.99, paperback



Perinatal Loss is written by a senior women's health counsellor and a consultant obstetrician and gynaecologist. The book covers both practical and emotional aspects of caring for bereaved parents and their families. Noting how staff may distance themselves from patients' pain through technical/impersonal language the authors attempt to use personal rather than clinical language throughout the book. Mostly this results in a very readable text although, as a non-medically trained person, I occasionally found myself needing to look up terms.

The introduction rightly reminds us of the collective myth that getting pregnant will nearly always result in a live healthy baby and that loss at any gestation, not just those in the third trimester, can be perceived as a devastating event. Whenever

a death occurs parents require a response appropriate to their experience and the book is full of examples of good practice. However, as the authors say, it is important to remember that 'there are no rules' and each person must be treated as an individual. As such the book highlights the importance of good communication, particularly when imparting sad or bad news, and not pre-judging the type of care that is required.

Caring for bereaved parents can be physically and emotionally draining and the authors provide a valuable chapter reminding staff about the need for self care. As an important message to managers, the chapter emphasises how the care patients receive is dependent on the quality of the support provided for staff. Just as patients want to feel that they are

individuals, and not just another number, so staff need to feel valued and supported through good information, communication and education. Related to this the final chapter provides helpful ideas for in-house training, particularly around the use of role play.

As a non-medical I found the chapters on 'Types of losses', 'Labour and delivery following a loss', and 'When something goes wrong in labour' particularly informative. Although I profoundly agree with comments about the importance of providing mementos such as certificates, and appropriate rites and rituals, I was tempted to skim through more pastorally focused chapters such as 'Initial reactions to grief' and 'Support for parents after the death'. Those with a more medical background may find the corollary.

However, any healthcare professional involved in supporting bereaved parents is likely to find something of value within the book. I therefore highly recommend its reading and its addition to reading lists and department/academic libraries.

Mark Newitt
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infant

Focus on a unit

- Is your unit currently undergoing a rebuild or refurbishment?
- Has your unit received recognition for excellent practice or is it working towards improvement?
- Is your unit overseas? Have you spent time in an overseas NICU? How does practice differ from the UK?
- Are you using or in the process of choosing cutting-edge equipment?
- Has your unit been involved in a unique fund-raising event?

Reflections on a trip to Rukungiri, Uganda

Earlier this year, I travelled to Rukungiri in western Uganda with a team of colleagues to support the local health service. The visit was a unique opportunity to see the challenges and successes of a rural health facility. The team included a paediatrician, a neonatologist, and a public health specialist. We spent time with the staff, observing their work and discussing the challenges they face. The facility is a small, one-story building with a few rooms. The staff are dedicated and hardworking, but they lack many resources. There is a shortage of staff, particularly in the neonatal unit. The equipment is outdated and in need of repair. The power supply is unreliable. Despite these challenges, the staff are doing their best to provide care for the children in their unit. We were impressed by their dedication and the care they provide. We discussed ways to support them, including providing training, equipment, and funding. The visit was a valuable experience for all of us. It highlighted the importance of supporting rural health services and the challenges they face. We will continue to work with the staff to improve the quality of care and support them in their work.

A new beginning in Norwich

Following a move from the city centre to a purpose-built building, the new Neonatal Unit in Norwich is a state-of-the-art facility. The unit is a modern, single-story building with large windows and a bright, airy atmosphere. The staff are excited about the new unit and the opportunities it offers. The unit is equipped with the latest technology, including incubators, ventilators, and monitoring equipment. The staff have received extensive training and are confident in their ability to provide the best care for the children in their unit. The new unit is a testament to the commitment of the staff and the support of the community. It is a new beginning for the unit and for the children who will be cared for there.

Is your unit special?

What makes your unit special? Is it the staff? The equipment? The location? Whatever it is, it is what makes your unit unique and special. It is what makes you proud to work there and what makes you want to provide the best care for the children in your unit. It is what makes you a team and what makes you a family. It is what makes you a unit that is truly special.

Developing a new identity at Royal Bolton

Dr. Simon Preece, Consultant, NICU, Royal Bolton NHS Foundation Trust

On 1 December 2010, after a lengthy consultation, the Joint Committee of the Royal Bolton NHS Foundation Trust and the Royal Bolton NHS Foundation Trust agreed to a new identity for the Trust. The new identity was a result of a process of consultation and engagement with the staff, patients, and the community. The new identity was a reflection of the Trust's values and its commitment to providing the best care for the children in its unit. The new identity was a new beginning for the Trust and for the children who will be cared for there.

Let our readers know what's going on in **your** unit

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Neurocritical care for hypoxic-ischaemic encephalopathy: cooling and beyond

The use of therapeutic hypothermia is now the standard of care for infants with hypoxic-ischaemic encephalopathy (HIE). Effective treatment requires early identification and safe transfer to a regional cooling centre. This article reviews some of the latest evidence from infants who have been cooled and highlights the crucial role of neurophysiology and neuroimaging in providing important diagnostic and prognostic information.

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Keywords

cooling; therapeutic hypothermia;
hypoxic-ischaemic encephalopathy;
electroencephalography; neurocritical
care

Key points

Austin T., O'Hare S.S. Neurocritical care for hypoxic-ischaemic encephalopathy: cooling and beyond. *Infant* 2013; 9(4): 135-38.

1. Initiation of cooling should not be delayed and temperature stability can be maintained during transport using servo-controlled systems.
2. aEEG remains extremely useful for continuous assessment of cerebral activity and in identifying seizures. MRI scans should be undertaken at the optimal time and interpreted by individuals with expertise.
3. Comprehensive long-term follow-up data on cooled infants is limited – follow-up programmes should extend beyond infancy.
4. A multi-disciplinary 'neurocritical care' approach to management will ensure high-quality, consistent and timely care.

Hypoxic-ischaemic encephalopathy (HIE) is a condition of altered neurological state resulting from a critical lack of blood flow and oxygen to the brain around birth. In the UK the incidence is estimated at between one and two per 1,000 live births¹; globally over one million infants die each year². Survivors are at high risk of developing life-long neurodisability, placing an enormous physical, psychological and financial burden on their families and society.

One of the major advances in neonatal care in recent years has been the introduction of therapeutic hypothermia to treat infants with HIE. This practice, endorsed by the National Institute for Health and Care Excellence (NICE) and the British Association of Perinatal Medicine (BAPM), follows decades of basic and clinical research^{3,4}. As research is translated into clinical practice there are a number of challenges to managing these infants, particularly with regard to early identification, transfer, monitoring and imaging, all of which can impact both on their outcome and how their parents are counselled.

Resuscitation and early identification: who to cool

Identification of infants who may benefit from cooling is based on evidence of fetal compromise (low Apgar score, metabolic acidosis, continued need for resuscitation) and emerging encephalopathy (abnormal conscious level, altered tone and reflexes and/or seizures). Although most experimental studies started cooling immediately after the hypoxic-ischaemic insult, for practical purposes the main clinical trials enrolled infants within six hours of birth⁵⁻⁸. The clinical trials did not

show a significant difference in neuro-developmental outcome between those cooled early (less than four hours) and those cooled late (four to six hours); there was a trend to favour those cooled earlier⁸. Experimental evidence also suggests a lack of benefit from delayed cooling⁹. It is therefore important that infants potentially eligible for cooling are identified early and cooling commenced immediately.

Both the CoolCap and TOBY trials used amplitude-integrated electroencephalography (aEEG) to assess the severity of encephalopathy before enrolling infants^{6,8}. The CoolCap study showed that at 18 months of age, the aEEG amplitude and presence of seizures were independently associated with poor outcome; in the TOBY study the outcome following cooling was not related to the severity of abnormality on the initial aEEG.

It has been reported that the early (three to six hours) predictive value of aEEG was lost with hypothermia¹⁰; a recent prospective study has also found that early aEEG (less than nine hours of age) was not predictive of neurodevelopmental outcome at 18-24 months of age in cooled infants¹¹. However, accurate grading of encephalopathy is difficult in the hours immediately following delivery and it is important that repeated and systematic neurological evaluation is carried out and documented regularly; Sarnat, Thompson and Miller scoring systems are all useful validated tools for this purpose¹²⁻¹⁴. Currently there is no evidence that infants with apparently mild encephalopathy benefit from cooling. Infants who meet the criteria initially who subsequently improve within six hours remain a challenge, as enrolment into clinical trials would have

depended on the timing of initial assessment. If a decision is made to re-warm an infant whose neurology showed significant improvement in the first hours of life, it would be advisable to continue close monitoring, ideally accompanied by continuous aEEG monitoring as these infants may still go on to develop seizures. It is unclear whether re-cooling following seizures would be beneficial; they are an important group to study and significant neurodevelopmental morbidity in these infants may make us more reticent to re-warm them in the future.

Stabilisation and transfer to the regional cooling centre

There are 20 regional transport units in the UK; most teams continue passive cooling during transfer. In the East of England, the Acute Neonatal Transfer Service (ANTS) started a 24-hour emergency service in October 2009. By May 2011 they had 106 requests for transfer of babies with HIE and moved 73 infants to one of three cooling centres in the region. Thirty-three infants were not transferred for cooling, either because they did not fit the predefined TOBY register cooling criteria, or because their neurological status was so abnormal (eg fixed dilated pupils, absent corneal reflex) that further intensive support was deemed to be futile. Between October 2009 and May 2011, the time taken to achieve target temperature had reduced significantly (regression coefficient -12.8; 95%CI 19.2 to -6.5, $p=0.0002$) (FIGURE 1). There was also a trend towards earlier referral, earlier commencement of passive cooling and earlier admission to the regional cooling cot.

The experience in the East of England is similar to that in London¹⁵ and also mirrors that of cooling during transport in other countries, which highlight the problem of overcooling^{16,17} and demonstrate the importance of continuous core-temperature (rectal temperature) monitoring. Given the challenges of maintaining stable temperatures during transport, ANTS have used a servo-controlled device since March 2011. Since its introduction there has been a significant reduction in the number of infants either overcooled or not achieving target temperature on arrival at the cooling centres. Other regions have reported their experience with active cooling, and similarly found significantly improved thermal control^{18,19}. In order to avoid overcooling, it would therefore be

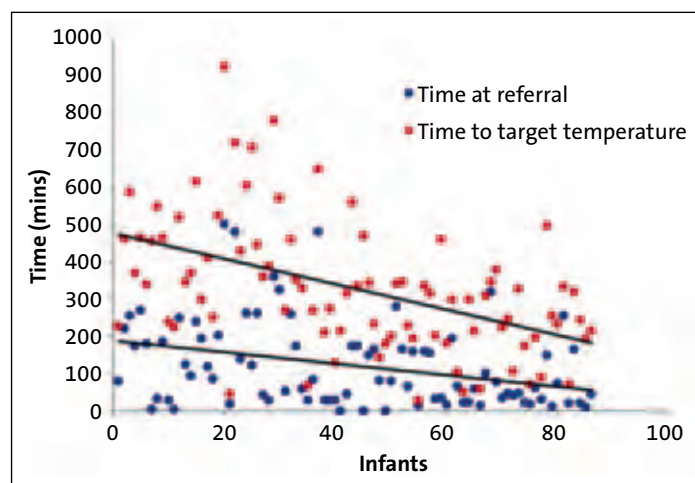


FIGURE 1 Reduction in the time at referral and time to target temperature for the first 82 infants referred to ANTS for cooling between October 2009 and September 2011.

reasonable to recommend that neonatal transport teams invest in servo-controlled equipment if moving infants any significant distance.

Continuing evaluation: the role of aEEG and EEG

The BAPM statement on therapeutic hypothermia emphasised that infants receiving cooling should be: “Supported by a multidisciplinary team experienced in intensive care, neonatal electrophysiology (both aEEG and conventional EEG) and neuro-MRI (magnetic resonance imaging). Their care should be directed by clinicians experienced in the diagnosis and prognosis of perinatal brain injury”³. The diagnosis of HIE is often not straightforward and careful neurological assessment is essential for diagnostic and prognostic purposes.

Although the early predictive value of aEEG may be more limited, electrophysiological monitoring either with aEEG or EEG remains extremely useful for continuous assessment of cerebral activity and in identifying seizure activity. Recovery time to normal background pattern remains a strong predictor of outcome; similarly, failure to develop sleep-wake cycling by 72 hours of age is a good predictor of poor outcome¹⁰.

Neonatal seizures are most commonly due to HIE; however they are frequently under-diagnosed and remain difficult to treat. Historically seizures have been shown to be strong predictors of death or disability and there is growing evidence that seizures themselves can worsen pre-existing injury²⁰. A good comparison between aEEG and EEG in seizure detection has been reported²¹, however other studies suggest that aEEG may underestimate the burden of seizures in neonates, particularly if seizures are focal

in nature, originating at sites distant from the aEEG electrodes²². Although continuous multichannel video-EEG monitoring remains the gold standard, it relies heavily on neurophysiological expertise to interpret recordings. Automated seizure detection algorithms have been developed; to date no system has sufficient sensitivity or specificity to be recommended for routine clinical use, but it is an exciting area of active research²³.

The effect of cooling on seizures has been studied – a decreased seizure burden was reported in neonates with moderate HIE who were cooled²⁴. Interestingly it has also been reported that 40% of cooled infants who had seizures had good clinical outcomes²⁵. It is possible that these observations reflect some of the therapeutic benefits of cooling.

MRI following cooling

MRI and magnetic resonance spectroscopy (MRS) are useful predictors of long-term neurodevelopmental outcome²⁶, although the optimal timing of scanning using conventional imaging is late at seven to 10 days of age. Changes in diffusion weighted imaging and MRS can be seen earlier and may aid management, particularly with regard to withdrawal of intensive support, although MRI imaging should never be used in isolation²⁷. In a sub-study of the TOBY trial, findings from 131 infants who had MRI scans were reported²⁸. Fewer cerebral lesions in cooled infants were observed and the predictive value of MRI for subsequent neurological impairment was not affected by cooling. Similar results have been reported from sub-studies of the US National Institute of Child Health and Human Development (NICHD) cooling trial and Australian Infant Cooling Evaluation (ICE) trial^{29,30}. Interestingly

more lesions on MRI have been reported in infants who received selective head cooling (SHC), compared to those with whole body cooling (WBC)³¹.

The American Academy of Pediatrics currently recommends conventional MRI in all term infants with neonatal encephalopathy, but no similar recommendation exists in the UK³².

A lack of standardisation with respect to timing, sequences and reporting of MRI scans may limit the diagnostic and predictive value of this technique. A more coordinated approach would ensure all infants with HIE receive high quality MRI scans and reports in a timely manner. Both EEG and MRI can be reported remotely and best practice may be to centralise expertise. More explicit national guidance is needed.

Follow-up and long-term prognosis

The number needed to treat with cooling to prevent one death from HIE is nine and to have one extra infant with normal neurological outcome at 18 months of age, is eight³³. Although encouraging, this means there is still a significant burden of disability after cooling. To identify problems early, it is important these children receive long-term follow-up. The NICHD cooling trial recently published follow-up of infants at six to seven years of age³⁴. Although the primary outcome of death or disability was not significantly different between the two groups ($p=0.06$), it did show a reduction in death with no increase in disability or low IQ in the cooling group. Despite a good follow-up rate the study was not powered to evaluate secondary outcomes, such as individual components of disability, cognitive and motor outcomes and overall physical and psychosocial health.

Previous long-term follow-up studies suggest that survivors of neonatal encephalopathy without major disability typically have an increased risk of subtle neurological disabilities when assessed at school age³⁵. Although BAPM recommend neurodevelopmental assessment at two years of age, it is important that these infants are followed-up throughout childhood to identify more subtle problems and attention is given during schooling to additional educational needs.

Neonatal neurocritical care: an emerging specialty

Adult neurocritical care is a growing multidisciplinary sub-specialty that

- Cooling outside current criteria:
 - preterm infants*
 - postnatal collapse
 - acute perinatal stroke
 - infants cooled after six hours of age*
 - mild to moderate encephalopathy (with base deficit less than -16)
- Possible adjuncts to cooling eg Xenon*
- Seizure detection algorithms
- Standardisation of MRI imaging and reporting

* Currently the subject of randomised controlled trials

TABLE 1 Areas of active research and ongoing development.

combines expertise in intensive care, neurology, neurosurgery and neuroradiology. Evidence suggests that specialised neurocritical care not only improves the quality of care and reduces clinical risk but also can improve long-term neurological outcome³⁶.

Several core principles from adult neurocritical care can be applied to management of these infants; careful attention to temperature control, oxygenation, blood pressure and glucose regulation can prevent secondary brain injury. In the East of England, the experience is that a coordinated, protocol-driven approach can improve identification and timely management of infants with HIE. Advances in neuromonitoring and neuroimaging provide important diagnostic and prognostic information. These developments suggest that the need for dedicated expertise in neonatal neurocritical care equals that for adults. Such a service has been described by clinicians at the University of California, San Francisco³⁷; a multidisciplinary team including neonatologists and paediatric neurologists work alongside the attending team, providing additional clinical support, guidelines and training on a broad range of neonatal neurological conditions. The aim of this approach is to provide a comprehensive and consistent approach to the care of these infants, with the ultimate aim of improving neurodevelopmental outcomes.

Conclusion

The introduction of therapeutic hypothermia into clinical practice is one of the major advances in neonatal medicine in recent years. Further research is required to identify other patient groups who may benefit from cooling, as well as therapeutic adjuncts to cooling (TABLE 1). Alongside

the continuing developments in neuromonitoring and neuroimaging, the ability to provide consistent high quality care to these vulnerable infants will stem from a coordinated and multidisciplinary 'brain orientated' approach.

Acknowledgement

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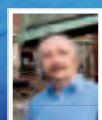
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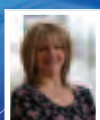
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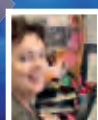


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Increasing awareness and adherence to infection control on a NICU

This article describes a prospective one-year interventional study aimed at improving infection control compliance and decreasing nosocomial infection rates across Greater Manchester tertiary NICUs. A computerised audiovisual infection control initiative (CAVICI) was installed at the entrance of the NICU to increase staff and visitor adherence to five infection control standards.

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Keywords

nosocomial infection; neonatal; NICU; infection control; hand hygiene; audiovisual display monitor

Key points

El-Kafrawy U., Taylor R.J., Francis N., Boussabaine E., Badrideen M. Increasing awareness and adherence to infection control on a NICU. *Infant* 2013; 9(4): 139-41.

1. Hand hygiene and infection control standards can be improved by increased awareness.
2. An inexpensive audiovisual display screen can highlight infection control standards and improve adherence among visitors to the NICU.
3. All ring types increase bacterial colonisation of hands.
4. Changing the long-established practices of healthcare workers is challenging.

It is recognised that infection control and, in particular, optimal hand hygiene decreases the frequency of hand contamination with potential nosocomial pathogens. Some longer term studies have also demonstrated a decrease in infection risk by sustained hand hygiene programmes^{1,2}. Preterm neonates are a high-risk patient group for acquiring nosocomial infections, with the most premature infants experiencing the highest rates of all hospitalised patients³ resulting in significant morbidity and mortality.

Education programmes and multimodal strategies to improve adherence to hand hygiene of healthcare workers include:

- Problem-based and task-orientated education
- Clustering of nursing procedures
- Reduction in total patient contact episodes
- Alcohol-based hand gel availability
- Provision of workplace reminders
- Evaluation and feedback on performance^{1,4-5}.

Studies have shown that rings increase bacterial colonisation of hands; plain bands are equivalent to rings with stones, with a stepwise increased risk of contamination with any transient organism as the number of rings worn increases⁶⁻⁸. Wrist watches have been found to increase bacterial contamination of the wrist but excess hand contamination does not occur unless the watch is manipulated⁹.

While NICU healthcare workers are a persistent source of potential pathogens, parents and visitors handling babies are also a potential source of infection that has not received much attention. Studies, including visitor hand washing practice, have mainly involved visitors with no direct or indirect patient care^{4,10}.

Concerns were raised by anecdotal observation of parents on the NICU handling their babies while not always having been seen to wash their hands thoroughly or while wearing watches, rings and jackets.

Background

In 2010-2011, the authors conducted an interventional study at Salford Royal tertiary NICU¹¹⁻¹². The aims were to ascertain how prevalent the lack of adherence and knowledge of infection control was among parents and visitors to the NICU and whether awareness and adherence to infection control could be significantly increased by the instalment of a computerised audiovisual display monitor highlighting five infection control standards, namely:

1. Thorough hand washing
2. Bare below the elbows
3. Removing jackets
4. Removing jewellery (plain bands permitted)
5. Removing watches.

The monitor displayed a continually running, correct hand washing video with the infection control standards displayed in bright colours (**FIGURE 1**). Activation of the access intercom by visitors to the NICU prompted the delivery of an audio message outlining the infection standards to be adhered to while awaiting door release. Salford NICU had nine intensive and 10 high-dependency or special care cots accessed via a single intercom. At the entrance to the NICU was a wash basin and hand gel dispenser with further hand hygiene facilities in each clinical room.

To assess visitor knowledge of infection control a pre- and post-interventional verbal questionnaire was conducted. The

post-interventional questionnaire also asked visitors to rank the effectiveness of the monitor. A further study for a one-month period before and after installation of the monitor was conducted to assess visitor hand washing and adherence to the five infection control measures. The pre-interventional questionnaire was completed six weeks prior to the onset of the pre-interventional observations and did not involve the same visitors.

Staff and parents were not made aware of the study and two members of staff carried out the observations during their working day so as not to arouse suspicion.

Data analysis used StatsDirect software (version 2.6.1, 2007) and the chi-square or Fisher's exact test.

Approval for the study was granted by Salford Royal Teaching Hospital's Audit Department.

Results of the 2010-2011 study

Adherence and knowledge of infection control of visitors to the NICU was shown to improve with the installation of a computerised, audiovisual display monitor. The monitor, electronic circuitry and instalment cost approximately £200, while the hospital's medical physics department facilitated and programmed the electronic and computer hardware.

A total of 190 patients' visitor infection control episodes were observed during two periods; 95 observations of patients' visitors to the NICU pre-installation and 95 post-monitor installation. It was found that:

- Hand washing adherence improved from 79% to 100% ($p < 0.002$)
- Watch removal increased from 67% to 90% ($p = 0.001$)
- Jewellery and ring removal (plain bands permitted) increased from 71% to 84% ($p = 0.04$)
- Jacket wearing declined from 11% to 10% (not statistically significant)
- Bare below the elbows increased from 76% to 87% (not statistically significant).

There was a 62% improvement in recall of all five infection control standards and 94% of the participants ranked the monitor as 'highly informative and effective' (score four or five out of a maximum score of five).

Limitations of the study

In order to eliminate the Hawthorne effect (in which participants alter their behaviour as a result of being part of an experiment

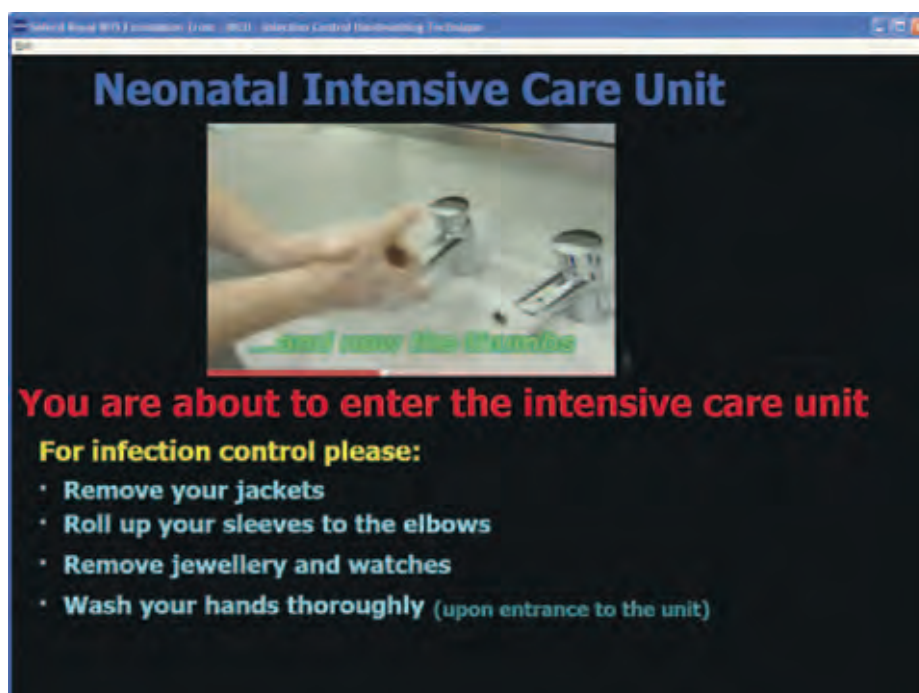


FIGURE 1 The audiovisual display monitor showing a video of correct hand washing and infection control standards.

or study), just chance observations of the visitors' infection control procedures were made; possibly resulting in some missed observations of hand washing adherence. Other studies have tried to disguise surveillance by standing adjacent to lifts¹⁰. Although the study presented here was approved by the hospital audit department, questions could be raised about the appropriateness of covert observation. Another possible limitation is that only a single, one-month period, post-installation of the monitor was looked at and therefore the longer-term was not addressed – would there be a sustained increased awareness and adherence to infection control by parents and visitors? The visitor population is a changing population and it may be expected that the results would be similar. The aims of this preliminary study did not include the ultimate goal of an assessment of whether there was a reduction in episodes of nosocomial infection, since this requires a longer-term study that was not possible due to the closure of Salford NICU.

Proposed study

During 2011-2012 neonatal and maternity services were reconfigured in Greater Manchester. Salford Royal tertiary NICU was closed with the relocation of tertiary services to two newly built units at the Royal Bolton and the Royal Oldham Hospitals, while a new unit was built on

the original site of St Mary's Hospital in central Manchester.

As prize-winners of the 2012-13 Innovating for Life Award (neonatal category) the authors are planning a study that aims to:

1. Improve awareness and adherence to infection control standards by parents and visitors to the three tertiary level NICUs in Greater Manchester by the installation of an audiovisual infection control monitor at the entrance of the NICUs, a more sophisticated CAVICI system, with the option of bi-lingual audio playback and visual display.
2. Increase adherence to infection control by neonatal healthcare workers.
3. Assess the long-term impact on nosocomial infection rates in the tertiary level NICUs in the region.

A pre- and post-interventional study looking at awareness and adherence to the five infection control standards previously identified (with the addition of use of hand gel), among parents, visitors and healthcare workers is proposed. Post-installation of the audiovisual monitors, adherence will be studied at six and 12 months and impact on neonatal infection rates at 12 months.

It has been established that healthcare workers should adhere to thorough hand hygiene and that complete adherence to hand hygiene guidelines may reduce healthcare-associated infections by 40%¹³. However, it has been shown that adherence

to infection control measures in neonatal intensive care is difficult to achieve¹⁴. For optimal hand hygiene, all rings worn by staff should be removed since there is evidence from several studies linking all ring types equally with increased bacterial hand colonisation⁶⁻⁸. Permission for staff to wear plain ring bands exists in Salford Royal and the Royal Bolton Hospitals as in other hospitals in the Greater Manchester region.

Feasibility survey for a blanket ban on ring wearing

To assess the feasibility of introducing a blanket ban on all rings worn by healthcare workers in the Royal Bolton NICU, 22 nurses and 16 medical staff present over a two-day period were observed as to whether they were wearing a ring and whether it was a plain band or stoned ring. They were then asked:

- Would they be prepared to remove the ring when at work?
- If not happy to remove, did their opinion change if made aware that the evidence showed that all rings carried an equal risk of hand bacterial colonisation?
- Were they physically able to remove their ring?

The survey showed that 10 nurses were wearing rings of which all but one were plain; one was wearing a stoned wedding ring. Four of the medical staff were wearing rings, of which one was a stoned ring. Only one of the nursing staff was physically unable to remove her plain ring. Seven of the nurses wearing rings expressed a reluctance to remove them, however all but two said that they would have been made aware of the evidence. Of the two nurses who remained reluctant, one said that she was not physically able to

remove it and the other said that she had bought her wedding ring in accordance with hospital infection control policy in 2011 and would have preferred a stoned wedding ring. The four medical staff that wore rings were prepared to remove them, however, one expressed a reluctance to do so, expressing concern that it may be lost; a concern shared with two of the nurses. Some of the nurses that expressed a reluctance to remove their wedding rings, asked whether they could continue to wear them under gloves after standard hand hygiene. Evidence from surgical medical and nursing staff performing surgical scrubs is conflicting regarding the wearing of plain rings under gloves, with some studies showing no increased risk of hand bacterial load¹⁵⁻¹⁶ and others suggesting there may be an increased risk¹⁷.

Changing practice among healthcare workers is challenging, particularly in long-established practices, however optimal hand hygiene has been shown to reduce infection rates and is an objective that all should be aiming for.

This article is based on the winning submission for the 2012-13 Innovating for Life Awards (neonatal category), sponsored by Cow & Gate and Infant.

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Abandoned babies: the Malaysian 'baby hatch'

Although not an immense problem in the UK, in many other countries babies are often abandoned by their parent/guardian to an unknown fate. 'Baby hatches' have existed in one form or another for many centuries and are a re-emerging facility in many countries. In Malaysia available data and media reports of known foundling babies imply that the number of abandoned babies is increasing annually. This article explores the implementation of a system in Malaysia, where mothers or guardians who choose to abandon their baby are enabled to do so anonymously within a safe environment.

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The United Nations Convention on the Rights of the Child describes how every child has the right to an adequate standard of living to enable them to develop not only physically and mentally, but also spiritually, morally and socially¹. Despite this, the phenomenon of the abandoned child, seen historically in many cultures, still exists today.

Abandonment

Abandonment can be viewed in many contexts but this article considers 'foundlings' ie babies who are left somewhere by their parent or guardian and subsequently, either discovered by another person and given care and attention, or remain undiscovered and die.

How could anyone abandon a child? There is a plethora of literature about child abandonment. One Brazilian study found that in an impoverished society where there is high fertility, high infant mortality tends to occur². Within a shanty town, mothers with several children allocated their scarce resources to their stronger children and selectively neglected or abandoned their weaker children. The study highlighted how these mothers had very strong religious beliefs and took comfort in their belief that God would care for their child.

Similarly, it is suggested that poverty and domestic violence are precursors to child abandonment³ and that following abandonment, mothers may become depressed and anxious through living with the guilt of deserting their child.

In Malaysia cultural, religious and social stigma exists around unmarried mothers or rape victims. This possible stigma and the feeling of hopelessness in providing for a child without financial or family stability may be the main reason for mothers abandoning their babies.

Baby hatches

The baby hatch concept is based upon 12th century 'foundling wheels' – many European churches and convents installed a wooden cylinder in the wall in which a baby could be placed. The parent/guardian rotated the wheel, relocating the child to the inside of the building, and alerted the nuns by ringing a bell.

In the 1950s, Germany initiated a baby hatch programme and many other countries have adopted this programme or provide an adaptation of it, to enable mothers or guardians to leave their babies, anonymously, in a safe place.

One hospital in Vancouver has revived the concept of a foundling wheel, which they term an 'angel's cradle'. This is a crib, located within the emergency department, sign-posted by an angel sign above it. It can also be accessed from outside the emergency department. Anonymity is assured and no surveillance cameras are trained on this particular area⁴.

In the USA, 47 States have 'safe-haven laws' where mothers or guardians can leave their babies in certain facilities (eg hospitals, manned fire stations) while maintaining their anonymity⁵. Safe-haven laws also provide the mother or guardian

Keywords

abandoned babies; baby hatch; Malaysia

Key points

Cochrane J., Ming G L. Abandoned babies: the Malaysian 'baby hatch'. *Infant* 2013; 9(4): 142-44.

1. Abandoned babies are a worldwide phenomenon but abandonment can be enabled so that the baby is cared for in safety and the mother/guardian has protected anonymity.
2. The baby hatch concept has been adopted in Malaysia to care for abandoned babies and nurture them to live full and healthy lives within families and communities.
3. Despite controversy more baby hatches are needed within Malaysia to ensure infant safety at the point of abandonment.

with immunity from prosecution.

In contrast, within the UK baby abandonment (dependent upon the context of the abandonment) may be considered to be a criminal offence and therefore prosecution may ensue⁶.

The Malaysian programme

Official reporting mechanisms probably underestimate the number of cases of child abandonment in Malaysia. Due to the highly forested areas of some provinces, it is impossible to ascertain how many babies may be abandoned within the remote countryside – it is possible that many abandoned babies go undetected or unreported⁷. Police statistics often embed abandonment cases within overall statistics for maltreatment of children. Abandonment statistics from the Social Welfare Department of Malaysia⁸ are shown in **TABLE 1**.

Media statistics indicate that there were 472 reported abandonments between 2005 and 2010⁹. Of these, a total of 258 infants were found dead. There were 65 reported abandonments in the first eight months of 2010. By comparison, the UK recorded five abandonments in 2010. The Malaysian media frequently report abandonment of newborn infants not only in maternity units but also on doorsteps or in garbage bins^{10,11}. Babies have been reported in drains, hedgerows and toilets with many babies perishing before their discovery^{10,11}.

The Malaysian government has explored many avenues for those impoverished mothers or guardians who, for whatever reason, want to give up their babies. OrphanCARE was established in 2008. It is a non-governmental and non-profit making organisation. Their main aim is to assist in changing society's point of view about leaving children permanently in orphanages. They view an orphanage as a 'transit point' before placing a child within a family. Their mission statement – 'Every child needs a family' – is supported by research findings revealing that spending very little time in an institution, or some time in foster care prior to adoption, appears to have minimal impact upon a



FIGURE 1 The Malaysian baby hatch.

child's development¹².

Under the OrphanCARE programme a baby hatch was opened in 2010. The two-year planning process involved collaboration and networking with nurses and professionals from other countries that had already established such programmes. The baby hatch facility aims to provide hope for the lives of abandoned babies through provision of a safe haven in which to be abandoned. It is the first facility of its kind within Malaysia and it operates 24 hours a day, every day of the year. The facility also affords opportunities for mothers or guardians considering abandonment to have informal discussions, if they wish, with nurses or social care staff. The staff need to be well educated and non-judgemental when talking to the mothers or guardians. They need to have great insight into the needs and issues that surround abandoned babies.

A public awareness campaign using mass media and public road shows and forums promoted the baby hatch. Within three months of opening, seven babies were received at the hatch. A baby can be left anonymously in a cot in a dedicated room (**FIGURE 1**). Following closure of the door, a bell or alarm alerts staff to the baby's presence.

OrphanCARE is keen to provide mothers or guardians with information regarding their options. There are numerous multi-lingual pamphlets and leaflets in prominent areas of the facility. These provide relevant information for the person leaving the baby, including reassurance that if there is a change of heart or mind, the baby will be returned to its

rightful guardian. In the event of this not happening, the baby is placed for adoption.

In the UK, it has been proposed that abandoned children are ineligible for adoption due to a lack of required birth details and medical history¹³. However, adoption law in England indicates that foundlings are not ineligible for adoption and that an adoption order would be made by the court if it was satisfied that all attempts had been made to find the parent(s). For abandoned babies, it should be recognised that it is difficult to give a full picture of the baby's background within an adoption report because of the lack of social and medical history. Any adoptive parents would need to accept that little was known about the child's background and medical history.

The Malaysian media reports that the baby hatch has reduced the mortality of abandoned babies within one region of Malaysia and, as a consequence, there are plans to establish more facilities across other regions of the country¹⁴. It could be argued, though, that there is no way of knowing what the outcomes would have been for those infants if the baby hatch had not been available¹⁵.

There is a need for an efficient national database in Malaysia for recording data, as many cases of abandonment are not documented and many are unreported. Media headlines of abandoned babies are often negative but are considered to be of social interest. Using the media in a positive way to promote the baby hatch informs the public that the facility provides a safe place for mothers or guardians who opt, probably out of desperation, to abandon their babies.

Currently special dedicated teams of police officers are being established in every Malaysian police district headquarters. This is to ensure that each case of child abandonment outside of OrphanCARE is investigated swiftly and effectively.

Controversy and future measures

There is much controversy surrounding the concept of baby hatches. There are many anecdotal criticisms of the American safe-haven laws suggesting that there is no evidence of a reduction in the number of abandonments nor any change to the reasons for possible abandonment. Other objections include: the availability of the baby hatch induces abandonment of infants; some people abuse it for selfish

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|
| Number of cases | 71 | 70 | 121 | 98 | 26 | 68 | 53 | 63 | 58 | 62 | 115 |

TABLE 1 Total number of child abandonment cases reported to the Social Welfare Department of Malaysia, 2000-2010⁸.

reasons; the number of babies killed does not diminish; the rights of one parent can be ignored if the other surrenders a child without his or her consent; the baby can be put in medical jeopardy; the needs of a desperate mother are not met¹⁶. During a radio interview, Herczog, a member of the United Nations Convention on the Rights of the Child (UNCRC) committee¹⁷, raised concerns around the number of 'baby boxes' being established globally. She maintained that allowing anonymous abandonment of a child is a violation of the UNCRC, which states that children must be able to identify their parents. While this may be considered by some to be a vital and valid point, there needs to be bespoke global programmes for all, regarding sex and reproductive health education. This may influence pregnancy and childbirth choices. Many societies still attach social stigma to the mothers/guardians where there is illegitimacy, rape, teenage pregnancy and poverty. Service provision must constantly be evaluated to establish what is provided and how effectively the service is performing. Consideration must be given to ways in which some potential future problems can be addressed – it is well documented that abandoned babies often suffer psychological trauma in later life if, or when, they discover they were abandoned⁶.

It is indicated that having a name is a core element of identity⁶. An abandoned child often has no identity or original birth date; some children may be abandoned with letters or mementos and there is a belief that these mementos may assist in the child's long-term identity and psychological development^{6,12}. Similarly abandoned children have no knowledge of any genetic or family medical history that may impact upon their lives. Some research is currently being undertaken in the UK to examine the experiences of and the impact on, those persons present when abandoned babies are found¹⁸.

Adoptive parents are usually in a differing socioeconomic position than the child's birth mother or guardian^{19,20} and many adoptive parents suffer from post-adoption depression²⁰. There is therefore a need to work in partnership with adoption services to provide additional support and advice to adoptive parents to ensure a safe

transition, for adopters and adoptees, from abandonment to family life. Where countries have high levels of baby/child abandonment, efforts could be channelled toward teaching life skills and financial literacy, providing social and emotional support and ensuring that cultural practices do not endanger a child's well-being.

Conclusion

Prompt discovery and access to possible medical attention is crucial to ensure the future well-being of abandoned babies. Despite controversy, more baby hatches are needed within Malaysia to ensure infant safety at the point of abandonment. However providing information and advice which may pre-empt possible abandonment is also vital as other alternatives may not have been considered. The baby hatch staff need to be well educated and non-judgemental when talking to the mothers or guardians. They need to have great insight into the needs and issues that surround abandoned babies. The development of possible future specialist practitioner posts will enhance service provision and possibly assist in reducing the number of abandoned babies within Malaysia.

Evaluation of services providing safe places for abandonment is vital to determine the long-term effectiveness of such facilities. Future research studies may also provide an evidence base for policy development and inform future practice. Governments, families and groups within society have a responsibility to provide emotional and social support mechanisms and to equip all young people with life skills and financial literacy while ensuring that beliefs and cultural systems do not impinge on the well-being of a child.

An abandoned baby today cannot wait for society to develop humane enlightenment. There is a need for a place which facilitates care and provides safety until such a time that the child can be placed with a caring and loving family.

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New paediatric services at the Portland Hospital

The installation of a Definition AS+ CT scanner from Siemens Healthcare at the Portland Hospital in central London is all part of an evolution in services at the hospital, transforming it into an institution of clinical excellence for women and children. The Definition AS+ CT was chosen due to its ability to select the right dose for the patient, to support not only the diagnostic needs of paediatric patients, but also as a valuable postoperative imaging tool. It is being used in the areas of neurology, spinal cases and craniofacial 3D reconstruction.

Lucy Hall, Imaging Services Manager at Portland Hospital, says: "The new detectors and low dose features of the Siemens



Pictured left to right are Imaging Services Manager Lucy Hall, Senior 1 Radiographer Abhi Rajamohan, Senior 1 Radiographer Chiara Shenoy and Regional Sales Manager at Siemens Healthcare Malcolm Pickering.

scanner made me confident that when the need arose to introduce CT as a new service at the Portland Hospital, Siemens was the right choice."

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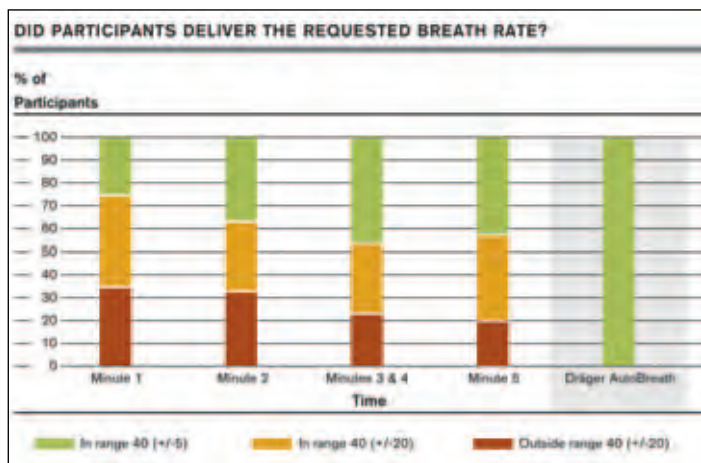
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Train the Trainer

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Venue: London

Cost: £695

Breastfeeding and Relationship Building

5-6 September 13

Venue: London

Cost: £395

Breastfeeding and Lactation Management for Neonatal Staff

2-3 October 13

Venue: London

Cost: £395

Further information on each course and how to book: <http://unicefbfi.force.com/signup/EventsHome>

THROUGHOUT 13

Paediatric and Infant Critical Care Transport Course

The course provides knowledge and skills for the safe transfer of critically ill infants and children between and within hospitals. For medical and senior nursing staff involved in the transfer of infants and children.

9-10 September 13

7-8 October 13

Venue: Glenfield Hospital, Leicester

Cost: £385 (£350 if booked at least three months prior to the course)

Contact: Tel: 0116 2502305
sam.thurlow@uhl-tr.nhs.uk

26-28 JULY 13

NeoSAVE

A neonatal stabilisation, ventilation and transport course taught by a Consultant Neonatologist and Senior Neonatal Nurse.

Venue: Ashford, Kent

Cost: £450

Contact: lynshorter@yahoo.co.uk

5-6 SEPTEMBER 13

Summer Conference on Neonatology

A conference for neonatal care professionals covering current aspects of neonatal care.

Venue: Palais des Papes Convention Center, Avignon, France

Contact: info@mcaevents.org
www.neonatalinprovence.org

5-8 SEPTEMBER 13

Eighth International Neonatal Nursing Conference

Organised by The Council of International Neonatal Nurses (COINN), the conference focuses on neonatal nursing and aims to translate latest findings into clinical practice.

Venue: Belfast, Northern Ireland

Contact: Kenes UK Ltd

Tel: +44 (0) 207 383 8037

coinn@kenes.com

www.kenes.com/uk

<http://coinn2013.com/>

12 SEPTEMBER 13

Uncertainty and Loss in Maternity and Neonatal Care

The 5th annual conference hosted by Sands, Bliss and the Royal College of Midwives. The 2013 programme is aimed at improving the knowledge base of health professionals faced with critical illness, loss and bereavement in the delivery of maternity and neonatal care.

Venue: Brunei Gallery, London

Cost: £55-£130

Contact: events@bliss.org.uk
www.profileproductions.co.uk

12-13 SEPTEMBER 13

BAPM Annual General and Scientific Meeting 2013

The annual meeting of the British Association of Perinatal Medicine.

Venue: Arena and Convention Centre (ACC), Liverpool

Cost: £0-£175

Contact: bapm@rcpch.ac.uk
www.bapm.org/meetings

17-18 SEPTEMBER 13

Fourth Teesside Neonatal Cardiology and Haemodynamics Conference

An international conference aimed at neonatologists, paediatricians, ANNPs and neonatal nurses. Including lectures on hot topics, research and evidence-based practices with a live heart demonstration showing morphology of congenital heart defects.

Venue: Billingham, Tees Valley

Contact: Zoë Holland

Tel: 01642 282825

zoe.holland@tees.nhs.uk

www.neonatalcardiology.co.uk/

23 SEPTEMBER 13

Advanced Neonatal Ventilation Workshop

This workshop is aimed at consultants, specialist registrars, senior house officers, ANNPs and senior nurses.

Venue: John Radcliffe Hospital, Oxford

Contact: CFS Events Ltd

Tel: 0800 9177 405

wendy@cfsevents.co.uk

www.cfsevents.co.uk

23-24 SEPTEMBER 13

Preterm Nutrition

One-day courses for clinical staff with an interest in neonatal and preterm feeding.

Preterm Lactation and Breastfeeding

23 September 13

An Introduction to Preterm Nutrition

24 September 13

Venue: London

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(discount for booking both days)

Contact: cpd@imperial.ac.uk
www.imperial.ac.uk/cpd/breastfeeding

25-27 SEPTEMBER 13

27th Annual Paediatric Intensive Care Society Conference

PICS 2013 provides paediatricians, nurses and paediatric anaesthetists with the latest scientific research and analysis – as presented by international experts in the field. The meeting offers networking opportunity for local and European health professionals working in paediatric intensive care.

Venue: Royal College of Surgeons, London

Cost: £65-£540

Contact: Kenes International
Tel: +44 (0) 207 383 8030
pics@kenes.com
www.picsmeeting.com

26 SEPTEMBER 13

Developing the Role of the Neonatal Nurse Consultant

Venue: Colmore Gate, Birmingham

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Contact: SBK Healthcare
Tel: 01732 897788
bookings@sbk-healthcare.com
www.sbk-healthcare.com

30 SEPTEMBER 13

To intervene or not to intervene?

A one-day meeting looking at labour, birth and caesarean section.

Venue: Royal Society of Medicine, London

Cost: £35-£160

Contact: Rachel Catley
maternity@rsm.ac.uk
www.rsm.ac.uk/academ/mbd02.php

10-14 OCTOBER 13

54th Annual Meeting of the European Society for Paediatric Research (ESPR)

ESPR 2013 aims to advance paediatric research in Europe and help exchange of information. It serves the European Society of Neonatology members and European neonatology by a focus on training and accreditation.

Venue: Centro de Congressos da Alfândega, Porto, Portugal

Cost: €150-620

Contact: info@mcaevents.org
www.espr2013.eu

17 OCTOBER 13

St George's Basic Ventilation Workshop

This workshop organised by Chiesi Connect is aimed at junior doctors and paediatric/neonatal registrars as well as neonatal nurses and midwives.

Venue: St George's Hospital, London

Cost: £70

Contact: CFS Events Ltd
Tel: 0800 9177 405
robyn@cfsevents.co.uk
www.cfsevents.co.uk

29 OCTOBER 13

Growth and Nutrition Issues in Clinical Practice for the Under-fives

Designed for a multi-professional audience, this evening event will consider common nutritional deficiencies in early years, growth charts and advising on infants at risk of obesity.

Venue: RCPCH, London

Cost: £15-£20

Contact: Tel: 02070 926104
events@rcpch.ac.uk
www.rcpch.ac.uk/events/evening-evidence-growth-and-nutrition-issues-clinical-practice-under-fives

5-6 NOVEMBER 13

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The annual North Trent and Yorkshire Neonatal Network conference, sponsored by Chiesi Ltd. Save the date for this popular conference. More details available soon on the CFS website.

Venue: The Waterton Park Hotel, Wakefield, South Yorkshire

Contact: Wendy Wombwell
Tel: 0800 9177 405
wendy@cfsevents.co.uk
Registration online:
www.cfsevents.co.uk

14 NOVEMBER 13

Supporting Parents through Pregnancy Loss and Death of a Baby

Venue: Manchester

Cost: £60

Contact: Child Bereavement UK
Tel: 01494 568910
conferences@childbereavementuk.org

18-19 NOVEMBER 13

Understanding Newborn Behaviour and Supporting Early Parent-Infant Relationships

Training courses organised by The Brazelton Centre.

Neonatal Behavioural Assessment Scale (NBAS)

Venue: Addenbrooke's Hospital, Cambridge

Cost: £675

Contact: info@brazelton.co.uk
Tel: 01223 314429
www.brazelton.co.uk

22 NOVEMBER 13

Nephrology Day for General Paediatricians

This one-day course gives an overview of paediatric nephrology. This year's themes include perinatal nephrourology and postnatal follow-up.

Venue: UCL Institute of Child Health, London

Cost: £175 (early bird, book before 13 Oct)

Contact: ICH Events
Tel: +44 (0)207 905 2204
info@ichevents.com

25-29 NOVEMBER 13

Neonatal Update 2013: The Science of Newborn Care

The annual five-day international meeting organised by Imperial College London regularly attracts a capacity international audience of senior neonatologists and paediatricians.

Venue: BMA House, London

Cost: £750 (£630 before 31 July 2013)

Contact: The Symposium Office
Tel: 02075 942150
sympreg@imperial.ac.uk
www.symposia.org.uk

27-28 NOVEMBER 13

2013 Baby Friendly Initiative Annual Conference

Organised by UNICEF UK, the BFI conference is now in its 16th year. The conference covers a wide range of issues associated with supporting breastfeeding.

Venue: Scottish Exhibition and Conference Centre, Glasgow

Cost: Both days £220, single day £130

Contact: Tel: 02073 756052
bfi@unicef.org.uk
www.unicef.org.uk/babyfriendly/health-professionals/conferences/

5-6 DECEMBER 13

Neonatal and Paediatric Ventilation

A course combining lectures with practical workshop sessions. The programme includes initiation, maintenance, weaning off assisted ventilation and special ventilatory techniques.

Venue: UCL Institute of Child Health

Cost: Doctors £499, Nurses £329

Contact: ICH Events
Tel: +44 (0)207 905 2699
info@ichevents.com

6 DECEMBER 13

The Neonatal Experience – Loss and Grief Without a Bereavement

Venue: Saunderton, Bucks

Cost: £120

Contact: Child Bereavement UK
Tel: 01494 568910
conferences@childbereavementuk.org

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Corniche Hospital



Neonatal Intensive Care Vacancies

Corniche Hospital is the premier maternity hospital in the Middle East. Located in downtown Abu Dhabi, this Joint Commission International accredited institution is the United Arab Emirate's leading referral hospital for obstetric and neonatal care. With specialty clinics including lactation, fetal medicine, and obstetric medicine, the hospital can accommodate up to 285 in-patients with facilities and space for up to 64 neonatal cots of which over 30 can be intensive.

We are looking to recruit a number of qualified Healthcare Professionals for our Neonatal Intensive Care Unit in return for a competitive tax free salary and other allowances including housing for employee and family, employer funded medical insurance and a generous annual leave entitlement.

Abu Dhabi offers year-round sunshine, pristine beaches, luxurious hotels and a pulsating cosmopolitan lifestyle, combined with distinct Arabic hospitality and mystique and world class infrastructure.

The positions we are seeking to recruit to are:

- **Consultant Neonatologist**
- **Clinical Educator**
- **Unit Manager/Senior Sister**
- **Neonatally qualified Staff Nurses**

To discuss these vacancies please call:

Dr. Julian Eason +971506129207 or Shirley Hargreaves +971506120273

To apply please submit a CV with covering letter to:

- Consultant/Specialist Physicians thomasv@cornichehospital.ae
- Unit Manager/Clinical Educator/Neonatal Nurse (Females only) graceg@cornichehospital.ae

For further information about our hospital, please visit: www.cornichehospital.ae



Gloucestershire Hospitals **NHS**
NHS Foundation Trust

NEONATAL UNIT

Band 5 & 6 Nursing Staff
Full and part time hours available

Come and join us at this exciting time now that we have settled into our brand new, state of the art, 32 cot Countywide Neonatal Unit. The 32 cots consist of 10 ITU/HDU cots, 18 Special Care and 4 Transitional Care.

Located on the edge of the Cotswolds, within easy reach of the spa town of Cheltenham and offering excellent local schools the cathedral city of Gloucester offers both an attractive location and affordable quality of life. All new staff are offered a 6-8 week supernumerary induction programme and assigned named mentors. Ongoing, continuous, professional development is an expectation of all Unit staff.

Applicants for the Band 6 posts must be Registered Nurses with a relevant Neonatal Critical Care Qualification and at least eighteen months post course experience. A Teaching & Assessing qualification is desirable along with shift management experience. Recent Neonatal Intensive Care experience is essential. Band 5 posts would be suitable for Registered Nurses (Child), although Registered Nurses (Adult) with relevant experience will also be welcomed. These posts are suitable for experienced or newly qualified nurses. Applicants who do not already hold the Neonatal Critical Care Qualification would be expected to undertake this as soon as possible.

Relocation expenses may be payable for successful Band 6 applicants.

If you are interested in any of the above positions, and would like more information or to attend for an informal visit, then please contact:

Senior Sister Michelle Richardson or the Lead Sister on 0300 422 5529/5570.
E-mail: Michelle.Richardson@glos.nhs.uk or LeadSister.NICU@glos.nhs.uk

To view the job description and apply for this post please visit our website www.jobs.nhs.uk

Job Ref: 318-13-262

Closing Date: 7 August 2013



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For further information,
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- > Enable more timely and efficient newborn resuscitation³

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¹ Shah N. et al. *J Clin Anesth*. 2012 Aug;24(5):385-91. ² Castillo A et al. Pediatric Academic Societies Annual Meeting. 2007. ³ Baquero H et al. *Acta Paediatrica*. 2011.
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CUROSURF® Endotracheopulmonary Instillation Suspension (Poractant alfa) Please refer to Summary of Product Characteristics (SmPC) before prescribing
PRESCRIBING INFORMATION. Presentation Single dose vials of 1.5ml or 3.0ml containing either 120mg or 240mg of phospholipid fraction from porcine lung. **Indications** Treatment of Respiratory Distress Syndrome (RDS) or hyaline membrane disease in newborn babies with birthweight over 700g. Prophylactic use in premature infants between 24 and 31 weeks estimated gestational age at risk from RDS or with evidence of surfactant deficiency. **Dosage** (See SmPC for full details) **Rescue treatment** Recommended starting dose is 100-200mg/kg (1.25-2.5ml/kg) administered as a single dose as soon as possible after diagnosing RDS. Additional doses of 100mg/kg (1.25ml/kg) at about 12 hourly intervals may be given (maximum total dose of 300-400 mg/kg). **Prophylaxis** Single dose of 100-200mg/kg as soon as possible after birth (preferably within 15 minutes). Further doses of 100mg/kg can be given 6-12 hours after the first dose and then 12 hours later for persistent signs of RDS and ventilator-dependency (maximum total dose of 300-400mg/kg). **Administration** Warm vial to room temperature (e.g. by holding in the hand for a few minutes) and gently turn upside down a few times without shaking. Withdraw the suspension using a sterile needle and syringe (see SmPC for full details). A suitable catheter or tube should be used to instil CUROSURF into the lungs. Doses are administered either by: **1). Disconnecting the baby momentarily from the ventilator** Administer

1.25 to 2.5ml/kg of suspension, as a single bolus directly into the lower trachea via the endotracheal tube. Perform one minute of hand-bagging and then reconnect baby to the ventilator at original settings. Further doses (1.25ml/kg) can be administered in the same manner; **OR 2). Without disconnecting the baby from the ventilator** Administer 1.25 to 2.5ml/kg of the suspension, as a single bolus, directly into the lower trachea by passing a catheter through the suction port and into the endotracheal tube. Further doses (1.25ml/kg) can be administered in the same manner. After administration pulmonary compliance can improve rapidly, requiring prompt adjustment of ventilator settings. Rapid adjustments of the inspired oxygen concentration should be made to avoid hyperoxia. Continuous monitoring of transcutaneous PaO₂ or oxygen saturation is advisable; **OR 3). A third option** is to administer through an endotracheal tube in the delivery room before mechanical ventilation has been started – a bagging technique is used and extubation to CPAP is an option either in the delivery room or later after admission to neonatal unit (Intubation SURfactant Extubation – INSURE). **Contraindications** Hypersensitivity to active substance or excipients. **Warnings and Precautions** (See SmPC for full details). The baby's condition should be stabilised. Correction of acidosis, hypotension, anaemia, hypoglycaemia and hypothermia is recommended. Reflux, mucus plugging, bradycardia, hypotension, reduced oxygen saturation, signs of infection. Administration to preterm infants with severe hypotension has not been studied. **Undesirable effects** (See SmPC for

full details) *Uncommon* sepsis, haemorrhage intracranial, pneumothorax. *Rare* bradycardia, hypotension, bronchopulmonary dysplasia, pulmonary haemorrhage, oxygen saturation decreased. *Not known* hyperoxia, cyanosis neonatal, apnoea, electroencephalogram abnormal, endotracheal intubation complication. **Pharmaceutical Precautions** Store in a refrigerator (2°C-8°C), protected from light. Unopened, unused vials that have been warmed to room temperature can be returned to refrigerated storage within 24 hours for future use. Do not warm to room temperature and return to refrigerated storage more than once. For single use only. Discard any unused portion left in the vial. Do not keep for later administration. **Legal category** POM **Basic NHS cost** Single dose vial 120mg/1.5ml - £281.64, Single dose vial 240mg/3ml - £547.40 **Marketing Authorisation Number** PL 08829/0137. Full prescribing information is available on request from the Marketing Authorisation Holder Chiesi Limited, Cheadle Royal Business Park, Highfield, Cheadle, SK8 3GY, United Kingdom. **Date of Preparation** August 2010. Curosurf is a Registered Trade Mark.

Adverse events should be reported. Reporting forms and information can be found at www.yellowcard.gov.uk. Adverse events should also be reported to Chiesi Limited. (address as above) Tel: 0161 488 5555

Further information and full prescribing information is available on request from: Chiesi Ltd., Cheadle Royal Business Park, Highfield, Cheadle, SK8 3GY United Kingdom.

Tel: 0161 488 5555 Fax: 0161 488 5566

Date of preparation: February 2011

 **Chiesi**

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