# Using an individualised approach to understand term admissions: the Homerton experience

This article considers a system devised at Homerton University Hospital Foundation NHS Trust to support understanding of the term infant patient group who have been admitted to the regional neonatal intensive care unit. The aim was to go beyond trends of diagnosis on admission to the neonatal unit, allowing a more individualised approach and learning from cases.

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**Key points**

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1. Looking at individual infants gives more in-depth information about reasons for admission to the NICU.
2. Collaborative working with obstetric and midwifery colleagues supports patient safety and improved outcomes.
3. Labelling trends and groups may not always reveal why infants are admitted to the NICU.
4. Proceed with balance and caution; term infants do often need neonatal care.

During the last three decades the number of infants admitted to neonatal units in the UK has grown and continues to expand.[1] The pioneering work of neonatal teams delivering highly technological and complex management has created a new population of extremely premature neonates and, with this growth, an expanding demand for neonatal cots.

Term infants (babies born at ≥37 weeks' gestation) have always been part of the neonatal care admissions population but are now under question due to capacity issues and a change of culture in which keeping mothers and their babies together is a priority. The Neonatal Data Analysis Unit (NDAU) has demonstrated that almost 60% of admissions to neonatal units in England are term infants.[2,3]

NHS England Patient Safety is prioritising reduction of the admission of full term infants to neonatal care in line with indicator 5.5 of the NHS Outcomes Framework,[4] with the aim of delivering measurable improvement through an understanding of the many complex issues.[5]

Neonatal, obstetric and midwifery clinicians are aware that understanding the factors leading to admission of term babies is very important. High admission rates may be indicators of sub-optimal intrapartum or early newborn care. Identifying trends can support quality improvements, which keep mothers and babies together. This in turn saves valuable resources and optimises capacity, truly meeting the quality, innovation, productivity and prevention (QIPP) agendas for health care.[6] Many neonatal services with term admissions on their radars have undertaken local audit and data reviews to allow a better understanding of the infants they are admitting.

## Understanding your unit's term admission rates

Many services across England have committed to the specialised commissioning for quality and innovation (CQUIN) payment framework[7] for term admissions for the financial year 2015/16, which supports both the QIPP and fiscal benefit of CQUIN approach. This CQUIN requires a joint review of all unexpected term admissions to neonatal units undertaken collaboratively between obstetric and neonatal teams. Completion, where possible within a month of admission, promotes timely case review that aims to drive change and improvements from identified trends.

Having a baseline understanding of the reasons why infants are admitted is key to the success of this work. Many units have undertaken reviews, analysis and audit looking at term admissions. The Phillips and Geethanath study[8] is a good example of reviewing admission trends for neonatal care and allowing an overview of outlying trends that could be addressed through practice change. This type of study is replicable using the BadgerNet[9] raw data download facility, thus demonstrating the considerable value of data readily available to the neonatal community.

## The HUH neonatal service

The Homerton University Hospital Foundation NHS Trust (HUH) provides one of the largest neonatal intensive care unit (NICU) services in London. The service delivers medical intensive care, ophthalmology laser surgery and supports the local population of preterm and sick term infants of Hackney. The unit works within the North Central and North East London neonatal operational delivery network, which has a total of 12 units delivering different levels of care according to their designation and in line with the Neonatal Toolkit[1,10] and national specialised services commissioning specifications.[11]

The north east of London has the highest birth rate for the capital and the network delivers approximately 32,000 infants per year. The local population of Hackney presents many neonatal challenges due to diversity of ethnicity, migration, immigration and deprivation. Babies are often of very low birth weight.

The service admits 850-900 infants a year. The unit has a total of 46 cots (16 intensive care, eight high dependency and 22 special care), with occupancy varying from 70-100+%.

## Audit methodology

There was a monthly review of all term infants admitted to the NICU who fulfilled all of the following criteria:

- >37 weeks' gestation at delivery
- mother's pregnancy was booked at HUH
- the infant was born at HUH
- the infant had one episode of care in the NICU.

Raw patient data were downloaded from BadgerNet at the end of each month, from 2013 to date. This article focuses on 2013-2014 data.

A template was designed that focused on key factors that would allow an overview of the general trends for term admissions and then expanded to a more in-depth review of individual cases. Simple questions were considered for inclusion in the template:

- Did anything happen in the antenatal period that would highlight the need for NICU care?
- Were there complications during labour (eg cord prolapse, antepartum haemorrhage)?
- Was there a mode of delivery trend?
- Were there multiple births?
- Were the infants small?
- Were the infants hypoglycaemic?
- Were the infants cold?
- What was the principle diagnosis?
- What care level was needed on admission to the NICU?
- How long was the stay in NICU?
- Where were the infants admitted from?

Each admission was reviewed and the demographics for the infant were sent to the maternity risk/governance midwives to cross reference against the cases they were looking at as part of their risk and governance work reviewing avoidable and unexpected admissions to the NICU.

## Process of the audit

The audit was undertaken in two stages. Stage 1 provided an initial overview of information to give a percentage of admissions of term infants to the NICU, to define a monitoring baseline and support effective use of maternity and neonatal quality dashboards in the services (**FIGURE 1**).

At stage 2, the discharge summary from BadgerNet was analysed for each term infant that was admitted to the NICU that fell within the audit inclusion criteria. Each case was assessed and a 'red flag' was applied to the case if there was suggestion that admission might have been avoidable or if there were other factors that influenced admission that may have represented a trend. The red flag could demonstrate a possible issue or areas of learning requiring change of practice; it could be an indicator for obstetric, midwifery or neonatal care. Key questions were considered when applying a red flag; **FIGURE 2** gives examples of some of the questions.

It was made clear to all the teams that the application of a red flag was a highlighter for further consideration of the case – it was not a judgement on the admission being avoidable or unexpected. The aim of the flag was to act as a trigger to look at the case in more depth to define learning.

Once an individual infant's review had taken place, details of the results were summarised in a table that was shared with the obstetric, midwifery and neonatal leads. The obstetric and maternity team then looked at all the patient details and focused on the red flags. Any neonatal red flags were referred to a neonatal consultant or senior registrar for a further medical notes review. If there were any aspects of the neonatal case that presented a risk incident or near miss then a datix risk form was completed to allow alignment of the monitoring of admissions and inclusion in HUH's dedicated neonatal dashboard.

Application of a red flag was subjective as assessment was made by one individual, however, in order to reduce this

| Admission breakdown | Number of infants |
|---|---|
| Total infants admitted | |
| Total of HUH booked infants admitted | |
| Total term HUH infants with x1 episode | |
| Total HUH term admissions for the month (%) | |
| Sets of twins for month | |
| Weight range of term infants | |
| Admission temperature range | |
| **Care level at admission** | **Number of infants** |
| Intensive | |
| High dependency | |
| Special care | |
| Social care | |
| **Management on admission** | **Number of infants** |
| Ventilation | |
| CPAP | |
| Oxygen | |
| TPN | |
| Cooled | |
| **Discharge destination** | **Number of infants** |
| Postnatal ward | |
| Home | |
| Cardiac centre | |
| Surgical centre | |
| Died | |
| Other | |
| **Length of stay** | **Days** |
| Range | |
| Mean for month | |

**FIGURE 1** The form designed to capture monthly overview information for term admissions at stage 1 of the audit.
Key: HUH = Homerton University Hospital, CPAP = continuous positive airway pressure, TPN = total parenteral nutrition.

subjectivity and any bias, various principles were applied to the discharge summary assessments (**FIGURE 3**).

## Audit results

A full year of audit results were presented to the joint obstetric and neonatal weekly meeting; sharing the analysis for the purpose of this article was agreed by both teams to be a positive and open way of supporting the national work that is being undertaken.

Over the 24-month period a total of 664 term infants that were booked and born at HUH were admitted to the NICU. In the same time period there were a total of 11,679 births of booked infants in the hospital. The admission rate was 5.6% of total births, when applied to all booked and born babies at all gestations. On average 47% of infants admitted to the NICU were term infants (**FIGURE 4**).

### Antenatal factors

Identified antenatal factors in the audit can be seen in **FIGURE 5**.

### Admission sources

Admission sources can be seen in **FIGURE 6**. Note that there is no transitional care facility at HUH, which could account for the high special care admissions.

### Trends from diagnosis

Conditions identified from diagnosis were:

- respiratory distress syndrome
- transient tachypnoea of the newborn
- sepsis
- low blood glucose following a management plan on the postnatal ward
- poor feeding following a management plan on the postnatal ward
- known antenatal diagnosis
- asphyxia/poor umbilical cord gas analysis with clinical signs
- meconium aspiration syndrome
- neonatal abstinence syndrome.

### Red flags

Of the 664 term infants that were admitted to the NICU in the time frame of the audit, 119 (18%) may have had modifiable factors that could have prevented admission. One hundred and sixteen obstetric flags were awarded. Three neonatal flags were applied where there was a delay in admission as clinical opinion was to wait and assess the effect of a management plan. In retrospect, for two of these flags it was found that admission at the point of first examination would have been optimal, but no harm was incurred due to this delay.

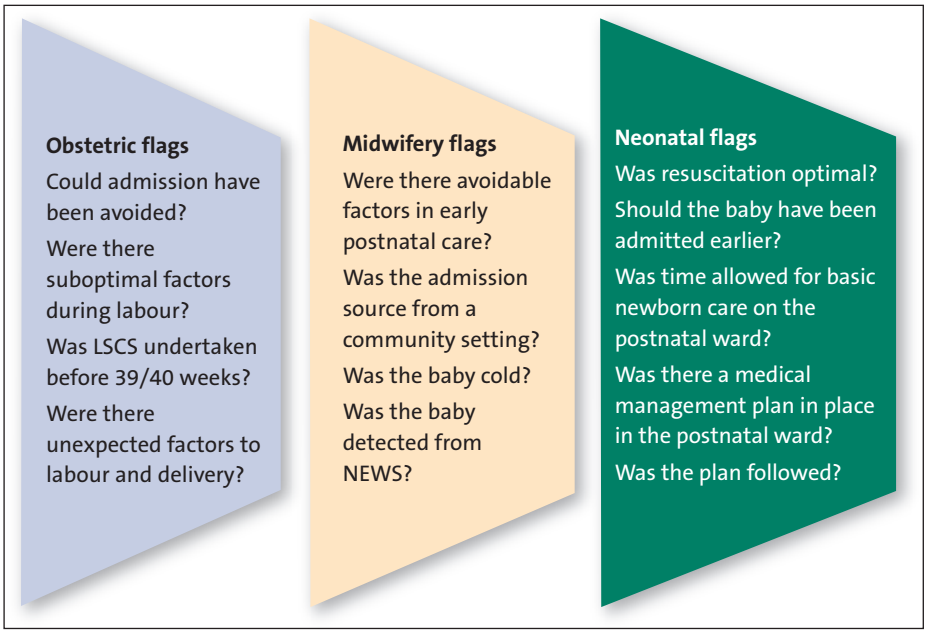


**FIGURE 2** Examples of key questions considered when applying a red flag against an assessed case. Key: LSCS = lower segment caesarean section, NEWS = newborn early warning score.

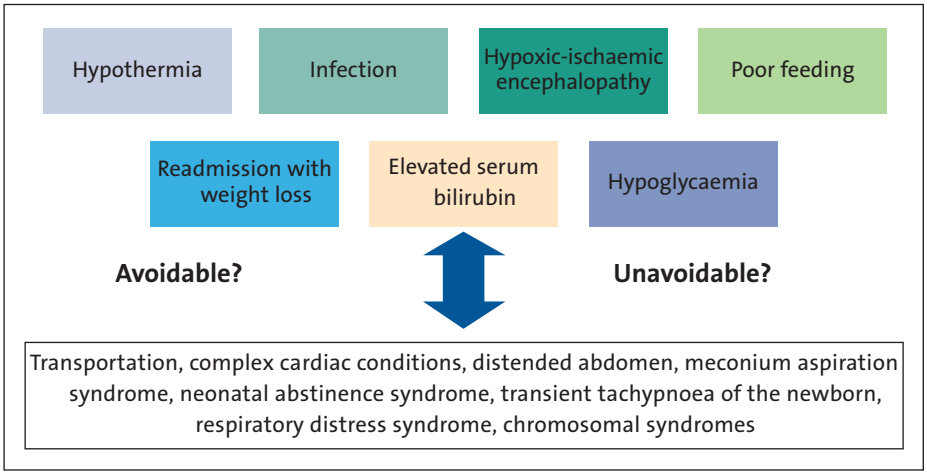


**FIGURE 3** Using diagnosis trends from discharge summary assessments to determine if admission to the NICU was avoidable or unavoidable.

### General trends: length of stay, weight and temperature

For 2014, length of stay ranged from one to 25 days with the mean per month at 4.3 days. Across the whole audit, birth weight ranged from 1.8kg to 4.9kg. The mean temperature on admission to the NICU was 36.7°C and the temperature range across the whole audit was 31-38.9°C (including infants receiving cooling treatment and those born at home).

## What did the audit reveal?

The results of the audit demonstrated areas of strong practice (warm babies, low levels of hypoglycaemia, reasonable weight ranges) and areas where more work is needed, including the need to reflect on early indicators to potentially avoid admission.

Discussion regarding the definition of 'unexpected' or 'avoidable' when looking at the outcome of the audit is important. These terms are driving some work streams and it may be timely to review what is really meant here. For example, it is perfectly reasonable that an infant born of very low birth weight that is not feeding well should receive neonatal care to avoid becoming hypoglycaemic and to ensure an optimal nutrition plan. Conversely, as a broad statistic, the baby could have been seen to have avoided admission by falling under a principle diagnosis of hypoglycaemic or poor feeding on admission.

## The value of an individualised approach

Looking at each infant's clinical case supports a far more in-depth analysis of what could have been done better. This approach also highlights that there are very specific factors or indicators for each baby, which may not necessarily fall into a trend that led to admission.

Broad data sweeps for term admissions may not be the best way forward for working towards a reduction in admission numbers. Many hospitals and networks have tried to address baseline data that demonstrated a trend of hypothermia or poor feeding; yet rates of term admissions continue to rise.[3] Phillips and Geethanath's retrospective study[8] also shows the value of a broader view and identification of a trend that may not have been clearly recognised in day-to-day practice.

The work undertaken at HUH feeds well into the CQUIN projects for the coming year. The key flaw concerns the timeliness of the reviews – sometimes the data were not presented until a month or more after the admission. The aim for the audit was to have the data and in-depth review completed each month by the second week of the month. A lack of dedicated and protected time to do this work made the audit challenging.

The key for success in maximising the CQUIN impact will lie in ensuring there is clinical time put aside for supporting timely review and that this is embraced by the team. The demands of clinical care and service delivery coupled with generic work in all NHS acute organisations places obstetric and neonatal teams in a pressurised position to undertake complex analysis and review as part of their routine work. However, the benefits that will be derived from the CQUIN could be far reaching and impact positively on patient safety, cost efficiency and capacity utilisation. Neonatal teams need to embrace this work and within individual organisations start to really understand what is happening with the term infant patient group and, where appropriate, work in collaboration to support reduction of admission rates.

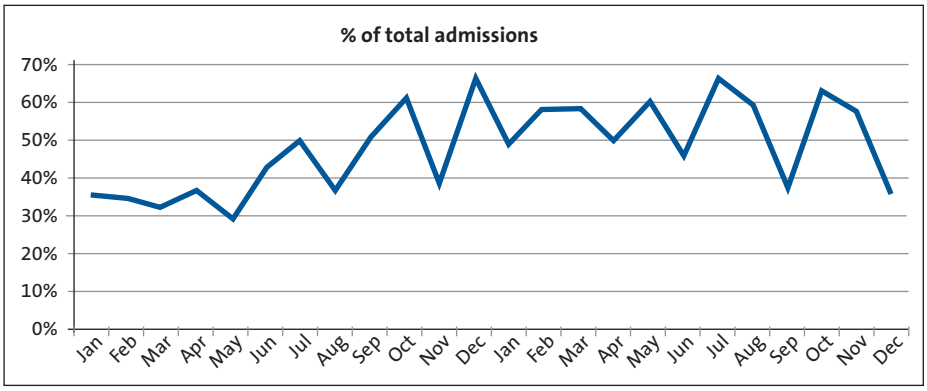


**FIGURE 4** The percentage of term infants admitted to the NICU from the total number of Homerton booked and born admissions.

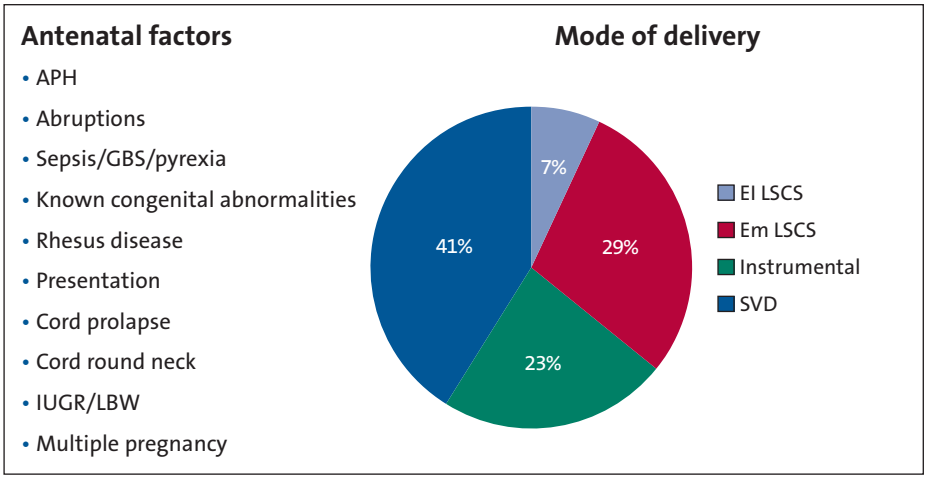


**FIGURE 5** Identified antenatal factors in the audit. Key: APH = antepartum haemorrhage, GBS = group B streptococcus, IUGR = intrauterine growth restriction, LBW = low birth weight, El LSCS = elective lower segment caesarean section, Em LSCS = emergency lower segment caesarean section, SVD = spontaneous vaginal delivery.

## Is the audit missing any term admissions?

Within the methodology of this audit, some term babies who were admitted to other hospital environments were not being captured. This patient group is generally older and following a normal postnatal care pathway but it is important

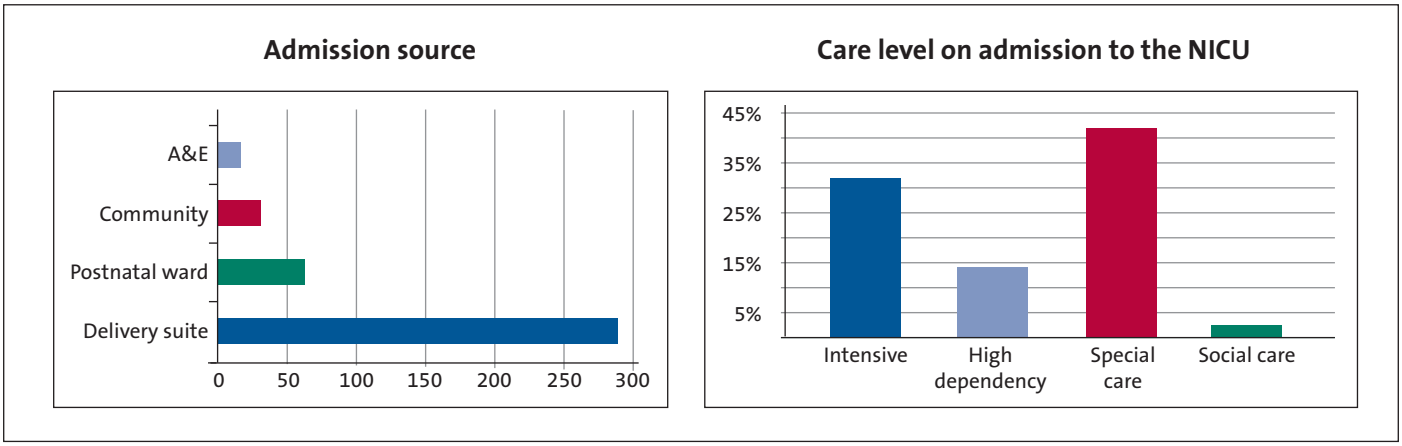


**FIGURE 6** Admission sources for 2014.

to consider them in more depth as they are part of the term infant group and they may highlight trends and offer insights for further improvement. This patient group consists of term infants:

- readmitted to the postnatal ward following discharge home
- cared for on the postnatal ward, who have support and management from the neonatal team but are not captured on BadgerNet
- admitted via accident and emergency departments from home to the children's ward
- admitted via accident and emergency departments and then transferred out to other units for surgery or paediatric care
- who have come to the NICU at term but went on to have more than one episode of care
- who do not pass through the NICU and therefore are not on the BadgerNet system.

## Conclusion

The needs of term infants admitted for neonatal care have changed over the last three decades. The profoundly septic and very sick infants admitted from a postnatal ward in the 1980s are rarely seen today, as babies who need support are identified far earlier and managed prophylactically from birth. The desire to reduce neonatal admission rates must not be at the cost of unintended consequences, where those that truly need admission to a neonatal unit do not receive this in the name of cost savings.

This patient group does often need neonatal care and healthcare professionals should proceed with caution in applying too rigid a label to term infants. As understanding improves, it may become acceptable that a cautious approach promotes the best outcome for each baby and with that premise it is possible that the NICU will see more term babies.

It is likely that many units could improve their admission rates by taking simple actions and working collaboratively with their obstetric and maternity colleagues to reduce admissions.

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