

Audit of Neonatal Enteral and Parenteral Nutrition in Northern Ireland

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Executive Summary

Extreme Prematurity is a nutritional emergency as infants enter a catabolic state within hours of birth. Nutrition is therefore considered a vital aspect of care which should be optimised. Parenteral nutrition (PN) is the administration of nutrition intravenously and is an essential component of neonatal care whilst enteral nutrition (EN) is established and the immature gut matures. PN is a complex process, requiring placement of an appropriate feeding catheter, catheter care, accurate calculation and administration of calorific requirements, monitoring of electrolytes and blood chemistry. There are many potentially serious complications. The aim is therefore to establish full enteral feeds sufficient for growth. Maternal human milk is the ideal enteral feed but due to preterm delivery, stress and maternal ill health, there can be a delay and difficulty in obtaining maternal expressed breast milk. If unavailable, alternative options include donor breast milk and preterm formula.

Aims

The aim of the project was to assess the practices and support for delivery of Neonatal Parenteral Nutrition and progression of Enteral Nutrition in the five Trusts in Northern Ireland against standards derived from the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) nutrition guidelines, National Confidential Enquiry into Patient Outcomes and Death (NCEPOD) Report on Parenteral Nutrition and the National Institute for Health and Care Excellence (NICE) Quality Standards for Specialist Neonatal Care. It was anticipated that the results will inform neonatal nutrition practice in Northern Ireland and support the development of regional guidelines for neonatal parenteral and enteral nutrition.

Key Findings

The records of the first 40 infants consecutively admitted to five neonatal units in Northern Ireland after 1 April 2012 were audited (~ 10% of all NI admissions).

- 100% have a policy for PN and access to multi-disciplinary team (MDT) nutritional expertise; 80% had access to standard PN.
- All units have breastfeeding policies and 80% EN progression guidelines
- Infant characteristics were gestation median (range) 34 (24-41) weeks; birth weight median (range) 2.24 (0.6-4.97) kg.

- PN commenced at a median (range) age 9 (1-96) hrs; Individual unit medians ranged from 2–24 hrs.
- Overall 48% initially commenced standard PN. This varied between units with a range of 15-95%
- Access used for PN delivery was; 75% peripheral, 19% umbilical venous catheter (UVC), 6% long line. 2% (4 infants) had complications with central access. One accidental removal, one extravasation and two sepsis of which one coagulase negative staphylococcus (CoNS) and one staph epidermis.
- 100% of chart entries regarding Intravenous access (IV) access had doctor's name, grade, date, time and catheter type, 95% documented tip position.
- PN duration median (range) was 3 (0-89) days.
- EN commencement median (range) was 1 (0-74) days. Full EN was reached median (range) 4 (0-21) days.
- Initial milk used was; 48% expressed breast milk (EBM), 35% formula, 14% donor EBM (DEBM) and 3% did not receive any EN.
- 63% of all babies received some EBM; 27% received DEBM.
- Milk at full EN was; 36% formula, 30% EBM, 14% EBM + formula, 9% DEBM, 7% didn't reach full EN prior to death or transfer, 3% DEBM + EBM, 1% DEBM + formula.
- On discharge or transfer 55% were on formula, 29% EBM, 8% EBM & formula, 6% were not on full EN at transfer/death, 2% DEBM.
- Median (range) of corrected age at discharge was 37 (28-44) weeks with weight median (range) 2.47 (0.8-4.97) kg.
- Patient outcomes; 75% home, 19% transferred, 4% postnatal ward, 2% died.

Conclusions and Recommendations

Each unit has excellent aspects of care and areas for potential improvement. However, there is significant variation in practice for PN administration across the region, particularly the timing of initiation and type of PN used. There may be overuse of PN in some infants. A unified approach to PN prescription as a regional guideline may assist with ensuring each infant receives care determined by regional consensus 'best practice.'

Whilst there is an increasing emphasis on the use of maternal breast milk in preterm infants, rates of EBM use fell from 48% on initiation of enteral feeds to 28% at discharge. Only 63% of neonatal admissions in Northern Ireland ever received EBM. On discharge, 55% of babies were receiving exclusively formula milk. A quality improvement initiative to improve

support and encouragement of mothers breastfeeding and expressing milk for their infants is recommended.

Background/rationale

Parenteral nutrition is the administration of nutrition intravenously. PN is a vital component of neonatal care whilst EN is established and the immature gut matures. Human milk from the infant's own mother is the ideal enteral feed for the preterm infant. Where this is not possible donor milk or preterm formula milk are also available options.

PN is a complex process, requiring placement of an appropriate feeding catheter, care of the catheter, accurate calculation and administration of calorific requirements, monitoring of electrolytes and blood chemistry. It has the potential for many serious complications. Complications can be metabolic or non-metabolic. Metabolic complications relate to nutritional formula and include hyperglycaemia and hyperosmolarity. Non-metabolic complications are a consequence of delivery techniques: pneumothorax formation, thromboembolisation, catheter-related sepsis and extravasation leading to PN accumulation in a body cavity e.g. thorax or peritoneum, are well recognised non-metabolic complications of PN therapy.

There is guidance available from ESPGHAN regarding the nutritional requirements and recommended content of PN for the preterm population. However, there is no comprehensive guidance available for the mechanism of administration, monitoring and practical application. Thus practice in individual centres is predominantly based on clinical experience and local consensus. The report by the National Confidential Enquiry into Patient Outcomes and Death (NCEPOD) 'Parenteral Nutrition: A Mixed Bag (2010)' showed that only 23.5% of infants had PN care that was considered to represent good practice. It identified significant delays in initiation of neonatal PN after birth (28%), poor documentation of requirements for PN, inadequate first PN (37%) and a considerable number of avoidable metabolic complications (40%) which were managed inappropriately in 19% cases. There is a growing need for a more comprehensive assessment of current practice and standards in order for national guidelines to be developed. Whilst the NCEPOD enquiry did cover Health and Social Care (HSC) Trusts in Northern Ireland, very few local neonatal cases were examined.

Whilst parenteral nutrition is a lifesaving intervention in the preterm population the aim of care is to establish the infant on full enteral feeds sufficient for growth. The ideal milk is usually maternal breast milk. However, due to preterm delivery, stress and potential ill health in the mother herself there can be a delay and difficulty in obtaining maternal expressed breast milk for the infant. NICE quality care standards for breastfeeding state that there should be 'evidence of a written local policy on breastfeeding and expressing milk for infants receiving specialist neonatal care. Mothers of infants receiving specialist neonatal care can expect to be offered support to start and continue to breastfeed, including support to express milk.' (NICE Quality Standard for Specialist Neonatal Care QS4 October 2010).

Aim

This audit aims to assess the practices and support for delivery of neonatal parenteral and enteral nutrition in the five HSC Trusts in Northern Ireland against standards derived from the ESPGHAN nutrition guidelines, NCEPOD Report on Parenteral Nutrition and the NICE Quality Standards for Specialist Neonatal Care.

This audit will inform neonatal nutrition practice in each of the neonatal units and support the development of regional guidelines for neonatal parenteral and enteral nutrition in Northern Ireland.

Objectives

1. To determine the availability of local policy/guideline for use of PN.
2. To determine the availability of local policy/guideline on breastfeeding, maternal breast-milk expression and use of donor breast milk for infants in neonatal units.
3. To assess the timing of initiation of PN and use of standardised PN.
4. To assess whether prescribing PN is appropriate to infant requirements.
5. To determine the frequency of biochemical monitoring.
6. To examine the use of central lines, the type of lines used and the documentation of their insertion, maintenance and complications.
7. To determine the complications of parenteral nutrition e.g. line sepsis/metabolic complications.
8. To ascertain the access to specialist nutritional expertise.
9. To assess enteral feeding – initiation of milk, type of milk and progress to full enteral feeds.

Standards/Guidelines/Evidence Base

Criteria		Target (%)	Exceptions	Source & Strength* of Evidence	Instructions for where to find data
1	No undue delay in recognising the need of and starting PN	100	None	C	NCEPOD website
2	The first PN must be appropriate to the neonate's requirements	100	None	C	NCEPOD website
3	Adequate details of patient's PN requirements should be documented in notes	100	None	C	NCEPOD website
4	Close monitoring to avoid metabolic complications	100	None	C	NCEPOD website
5	Clear documentation of central venous catheter (CVC) in notes	100	None	C	NCEPOD website
6	Written policy on Parenteral nutrition	100	None	C	NCEPOD website
7	Access to local Nutritional Expertise e.g. Pharmacist, Dietician	100	None	C	NCEPOD website
8	No other feed than breast milk unless medically indicated	100	None	A	NICE, UNICEF website
9	No dummy to be used once breastfeeding established	100	None	B	NICE, UNICEF website
10	Written policy for breastfeeding support and expressing milk	100	None	B	NICE website

*Strength of Evidence

A At least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation

B Availability of well-conducted clinical & social care studies but no randomised clinical trials on the topic of the recommendation

C Expert committee reports or opinions and/or clinical experience of respected authorities. Absence of directly applicable clinical studies of good quality

D Recommended good practice based on clinical & social care experience (local consensus)

Methodology

Data Source

Analysis of patient records on a prospective basis.

Audit Type

Criterion based audit.

Sample Size

The sample size was 200 infants. This represents > 10% of the annual neonatal unit admissions in Northern Ireland (1,769 patients were admitted to a neonatal unit in NI in 2009 - source Neonatal Intensive Care Outcomes, Research and Evaluation (NICORE).

Population

The primary neonatal units in all five Trusts in Northern Ireland were included in the audit.

1. Royal-Jubilee Maternity Service (Belfast HSC Trust)
2. Ulster Hospital (South Eastern HSC Trust)
3. Antrim Hospital (Northern HSC Trust)
4. Craigavon Hospital (Southern HSC Trust)
5. Altnagelvin Hospital (Western HSC Trust).

The first 40 infants admitted to each of the five main neonatal units in Northern Ireland commencing 1 April 2012 were selected for inclusion in the audit. Identification of cases was done prospectively and data collection completed prior to each infant's discharge.

Exclusions

None

Timeframe

Patients were included into the audit from 1 April 2012 and data collection was completed once the last infant was discharged approximately six months later.

Data Collection and Analysis

Each infant was assigned an ID number for the audit depending on the unit to which they were admitted and their sequence of entry into the audit. e.g. RJMH1, RJMH2, RJMH3,

ALT1, ALT2, ALT3 etc. Data was collected via case-note review and completion of an agreed proforma as described below.

A proforma regarding policies, procedures and access to nutritional expertise was completed for each unit (see appendix A).

For each infant, a review of the case notes allowed completion of a proforma on both parenteral and enteral nutrition practices (see appendices B and C).

Confidentiality and Data Protection

Only anonymised data was collected. No patient identifiable data was collected on the proforma or held electronically at any time during the project.

Data analysis

Data was inputted to Microsoft excel and a formal report produced using Microsoft word which included text and graphic representation of the data.

The audit findings were provisionally presented using Microsoft PowerPoint to the Northern Ireland Neonatal Network in November 2012 and to the first Belfast HSC Trust nutrition audit meeting in March 2013.

The formal report will be circulated to the Northern Ireland Neonatal Network and each of the five units involved in the audit. Final results were presented in March 2014 to allow a planning meeting with the network for development of the action plan.

Key Findings

N=200

Criteria		Target (%)	Exceptions	Achieved (%)	Recommendation
1	No undue delay in recognising the need of and starting PN	100	None	74.6	PN Guideline
2	The first PN must be appropriate to the neonate's requirements	100	None	100	PN Guideline
3	Adequate details of patient's PN requirements should be documented in notes	100	None	98	PN Guideline
4	Close monitoring to avoid metabolic complications	100	None	100	PN Guideline
5	Clear documentation of central venous catheter (CVC) in notes	100	None	95	
6	Written policy on parenteral nutrition	100	None	100	PN Guideline
7	Access to local nutritional expertise e.g. pharmacist, dietician	100	None	100	PN Guideline
8	No other feed than breast milk unless medically indicated	100	None	28	Quality Improvement Initiative Commenced
9	No dummy to be used once breastfeeding established	100	None	Not assessed	Breastfeeding Quality Improvement Initiative
10	Written policy for breastfeeding support and expressing milk	100	None	100	None required

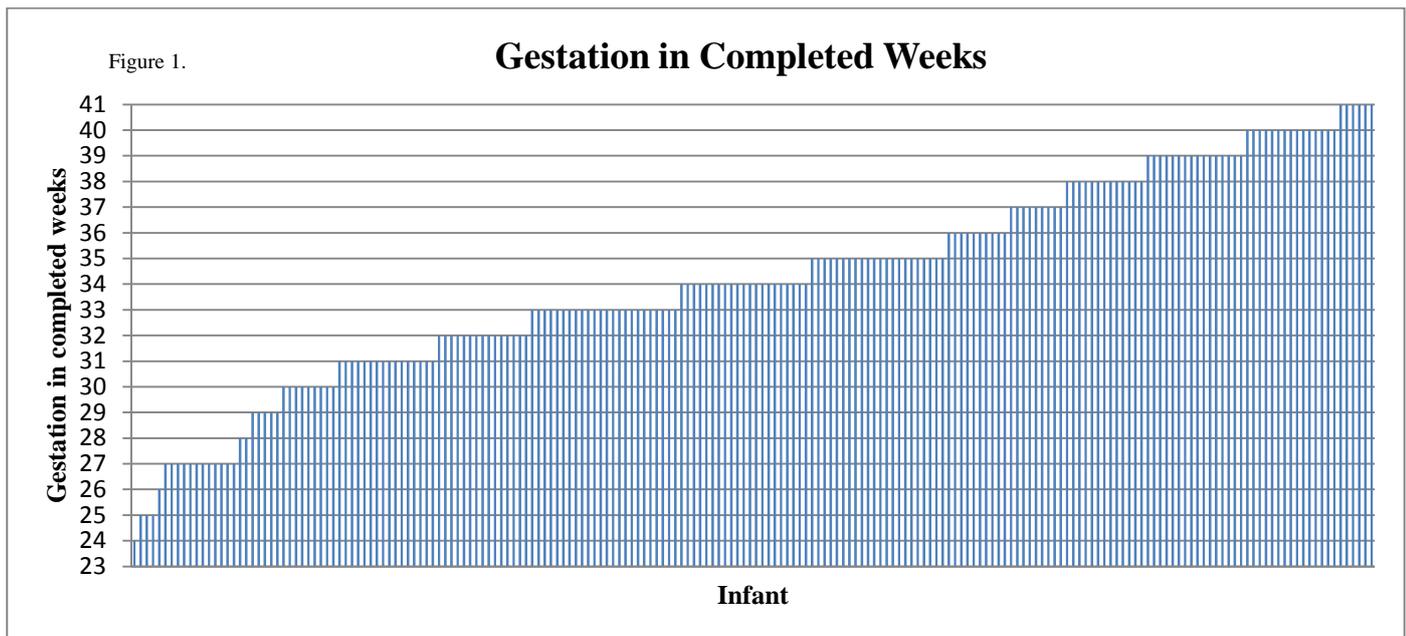
Results in Detail

Unit Policies

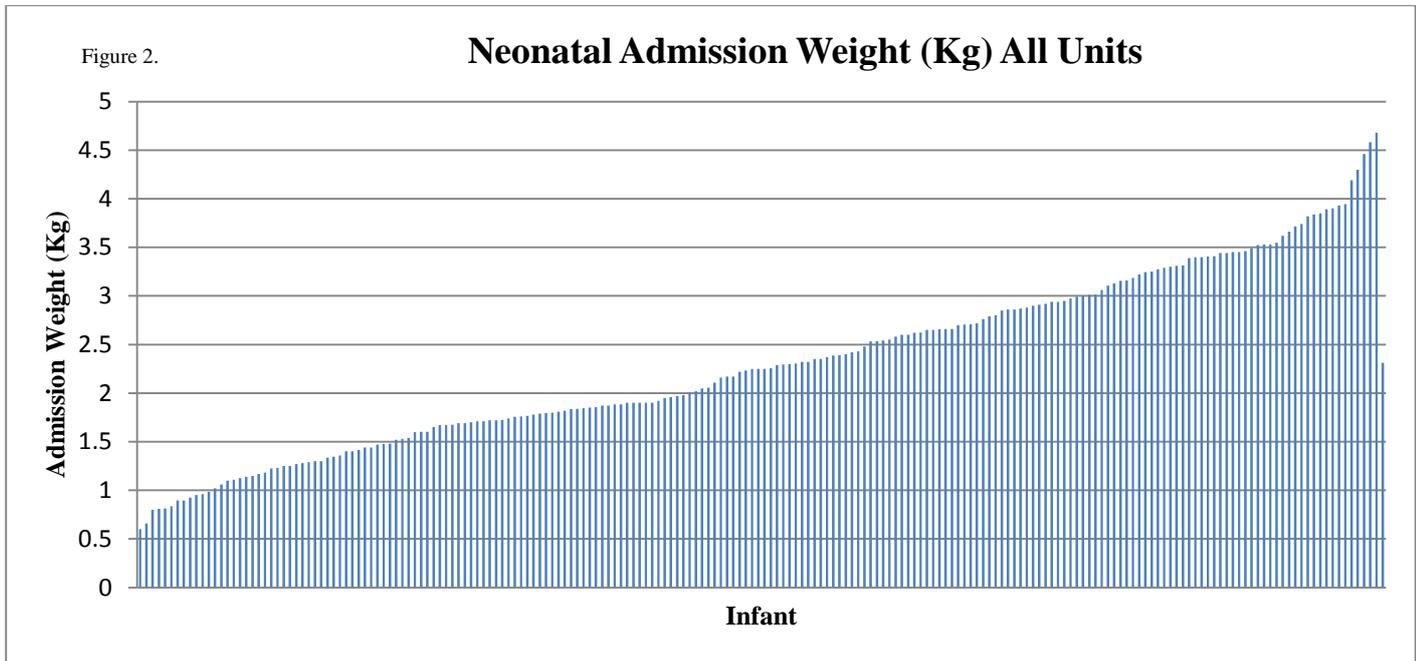
One hundred percent of the five neonatal units have a formal written unit policy for use of parenteral nutrition and breastfeeding and 80% have a written policy regarding the speed of progression of enteral feeds. Eighty percent of the units have standard bags of parental nutrition available and the remaining unit introduced these halfway through the audit. All units have access to nutritional expertise from allied health professionals. All units have formal policies for the use of IV catheters and 80% have catheter care bundles in place.

Demographics

The gestation in completed weeks of infants on admission to the audit ranged from 24-41 weeks with a median gestation of 34 weeks. This is illustrated in Figure 1 below.

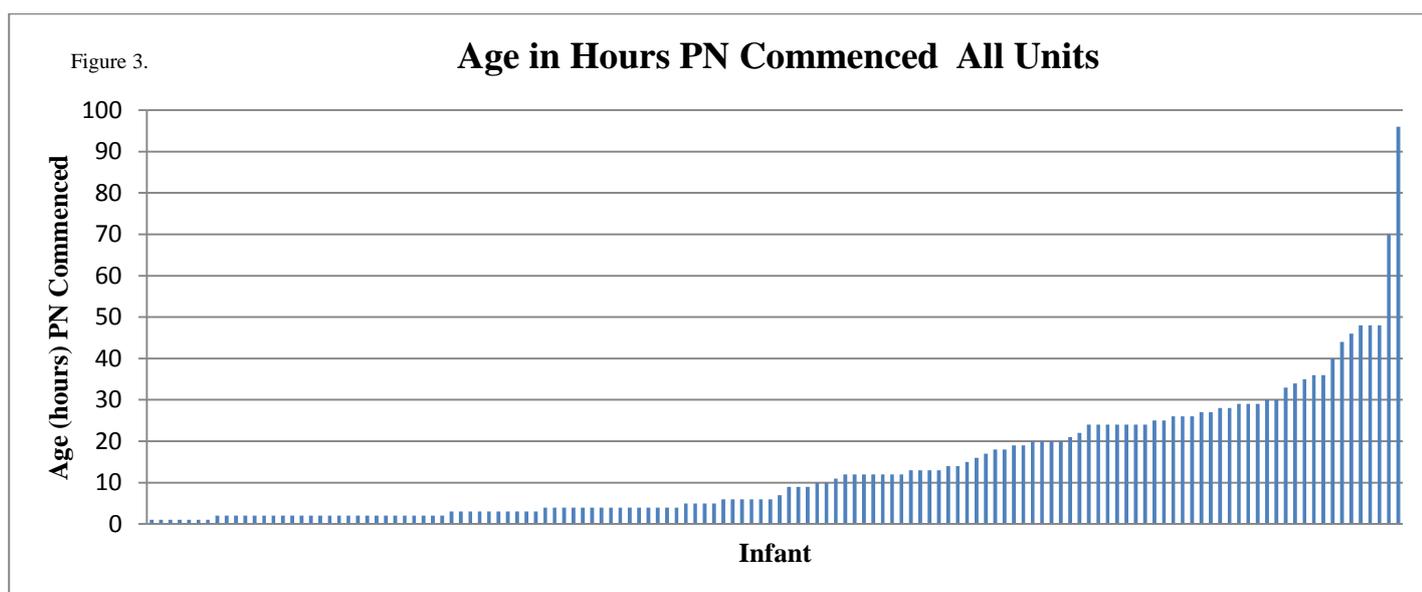


The weight of infants on admission ranged from 0.6Kg – 4.97kg with a median weight on admission of 2.24kg. This is illustrated in Figure 2 below.



Parenteral Nutrition (PN)

Initiation: 134 infants required PN. The timing of initiation of PN following admission ranged from less than an hour to 96 hours with a median age at initiation of PN of six hours. Twenty four infants never required parenteral nutrition and 42 infants only required 10% dextrose with additives. These infants are excluded from the graph. Of the 134 infants who required PN, 34 (25.4%) did not commence it until ≥ 24 hours of age. This is illustrated in Figure 3 below.



Indication: The primary indication for initiation of PN was prematurity (50%). Respiratory distress (19%) and congenital abnormalities (8%) were the next most prevalent indications for PN. This is illustrated in Table 1 below.

Table 1

Indication	Number of Babies	Percentage
Preterm	100	50
Resp. Distress	37	19
No Total Parenteral Nutrition (TPN)	23	11
Congenital Abnormalities	16	8
Other	9	4.5
Hypoxic Ischemic Encephalopathy (HIE)	9	4.5
Hypoglycaemia	6	3

Type of PN: Forty eight of infants were initially commenced on standard bags of PN. Twenty percent were commenced directly onto bespoke PN and 20% received 10% dextrose with or without additives. These figures are illustrated in table 2 below.

Table 2

Type of PN	Number of Babies	Percentage
Standard	94	48
Bespoke	40	20
None	24	12
10% with additives	21	10
10% dextrose	21	10

PN Prescription: Of the 134 infants who received PN 98% had their individual prescriptions filed in their notes.

Venous Access: The access used for delivery of PN was predominantly a peripheral cannula (67%) with 17% of infants having a UVC sited and only 5% requiring placement of a long line. This is illustrated in Table 3 below.

Table 3

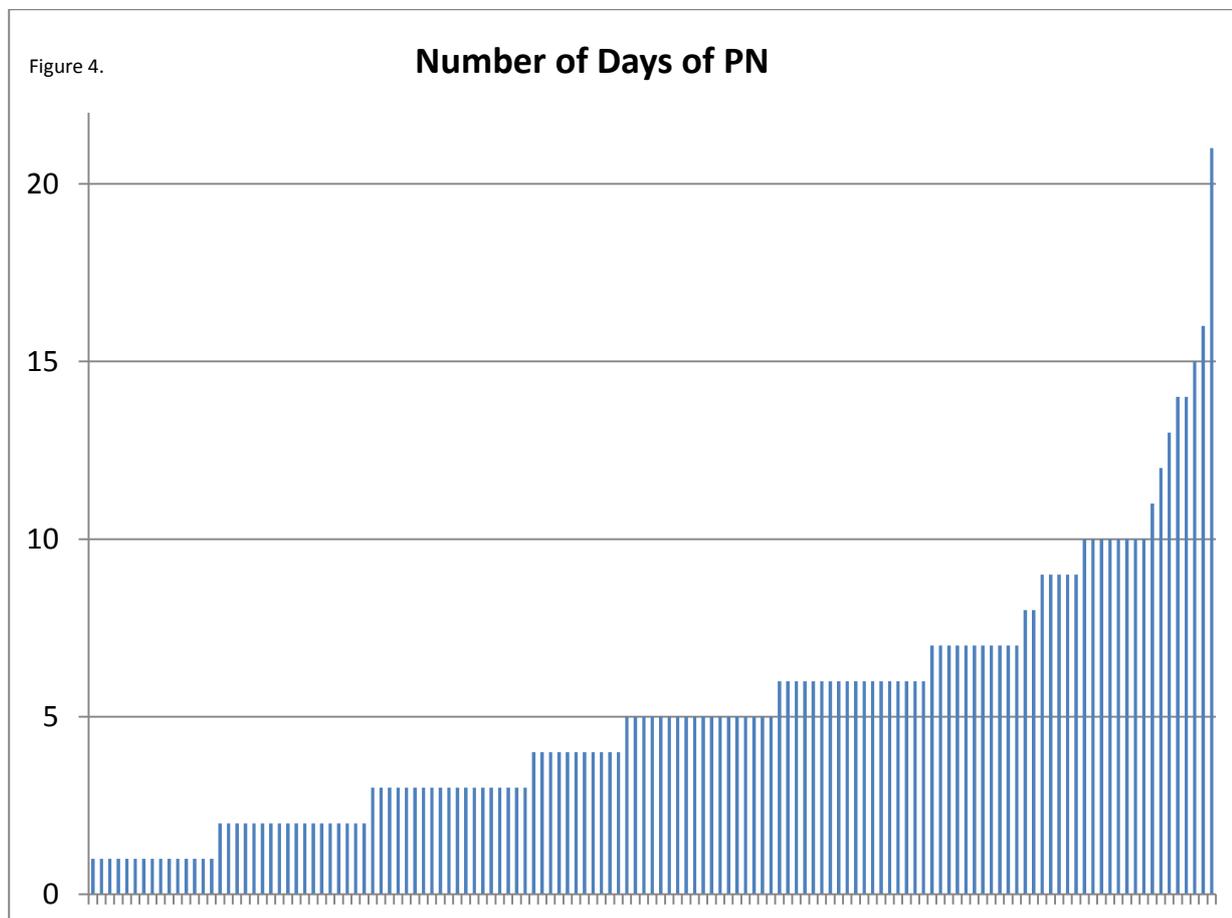
Type of Access	Number of Babies	Percentage
Peripheral	134	67
UVC	33	17
None	23	11
Long Line	10	5

Catheter Complications: Of the 43 infants who had central access for PN delivery three had complications. One infant had accidental removal of their central catheter and one infant had an extravasation injury. Two infants had an episode of confirmed sepsis whilst they had a central venous catheter in place. The organisms isolated were coagulase negative staphylococcus (CoNS) in a 27 week infant weighing 0.985kg with a UVC in situ

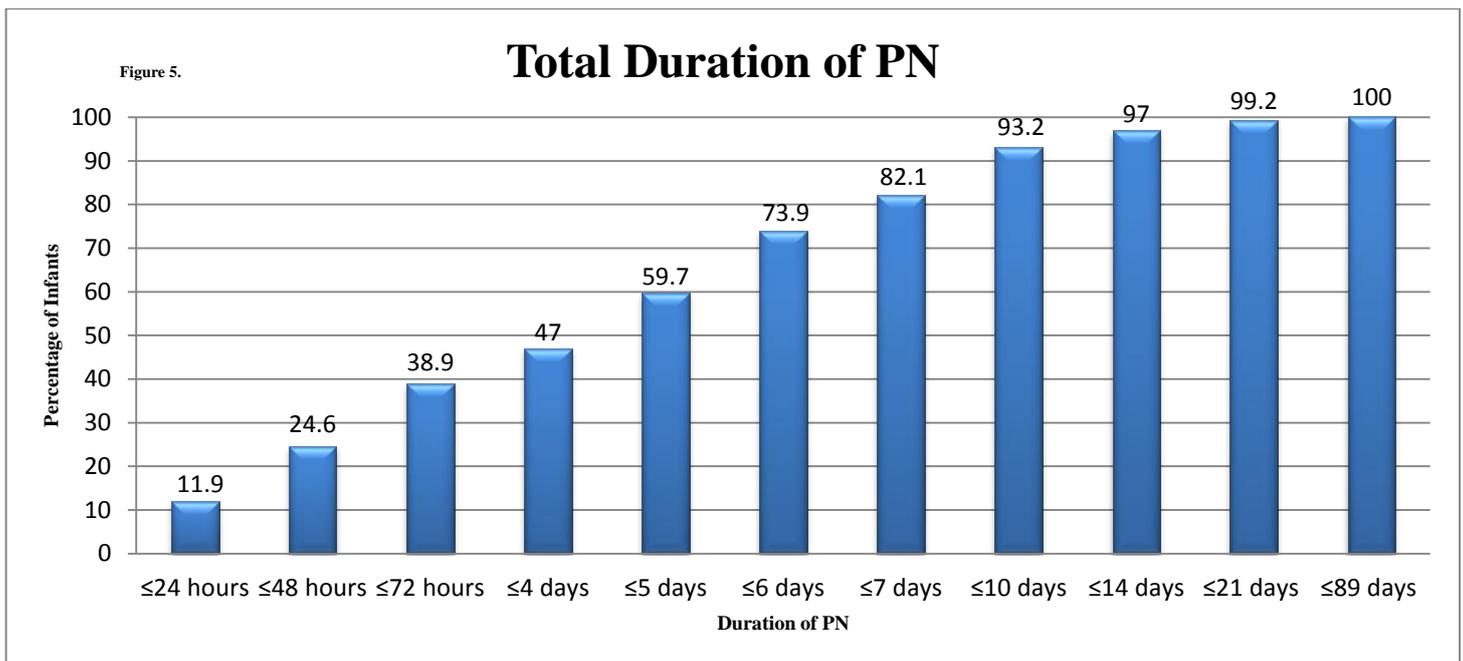
and staphylococcus epidermidis requiring treatment with vancomycin in a 26+1 week infant weighing 0.600Kg also with a UVC in situ.

PN Monitoring: Of the 134 infants who received PN 99% had a daily U+E whilst on their PN. The two infants who did not have daily monitoring for the duration of their PN were infants who were stable on longer term PN and their frequency of monitoring was appropriately decreased accordingly. Thirty three percent of infants who were receiving PN had biochemical abnormalities at some point. These included hypo/hypernatraemia hypo/hyperkalaemia and abnormal levels of magnesium, phosphate and calcium and an increased direct bilirubin. There were three infants who had a direct bilirubin measured at >25 during the time they were receiving PN. These infants all required PN for a longer period and included an infant with a trachea oesophageal fistula (TOF) and charge syndrome who required 89 days of PN.

PN Duration: The duration of PN administered for each infant ranged from none at all to 89 days with a median duration of PN of five days. These results are illustrated in Figure 4 below. The infant who required 89 days PN and the 66 infants who never received PN have been excluded from the graph to improve the clarity of the other results.



Of the 200 admissions included in the audit 66 (33%) did not receive parenteral nutrition. Of these 66 infants 24 (36%) did not require any IV supplementation of fluids or nutrition and 42 (64%) required only 10% dextrose or 10% dextrose with additives. Of the 134 infants who did receive PN, cumulative percentages for the duration of PN are displayed in figure 5: 11.9% (16/134) received PN for ≤ 24 hours, 24.6% (33/134) ≤ 48 hours, 38.8% (52/134) ≤ 72 hours, 59.7% (80/134) ≤ 5 days, 82.1% (110/134) ≤ 7 days, 93.2% (125/134) ≤ 10 days, 97% (130/134) ≤ 14 days and 99.2% (133/134) ≤ 21 days. There was one infant who received a total of 89 days PN.



Of the 33 infants who received PN for ≤ 48 hours, 85% (28) received standard PN and 15% (5) received bespoke PN. Gestational ages at birth of this subgroup ranged from 27 to 41 weeks with a median gestation of 34 weeks. Birth weight ranged from 0.895kg to 4.97kg with a median of 2.27kg. Of these infants two died (38wks 2.65kg with a congenital cardiac abnormality and 28wks 1.3kg with premature rupture of membranes (PROM) and seven were transferred to another hospital for ongoing care whilst on PN. The remaining 24 infants (72%) ranged in gestational age at birth from 32 to 41 weeks with a median of 35 weeks. Their weights ranged from 1.6kg to 4.97kg with a median of 2.29kg.

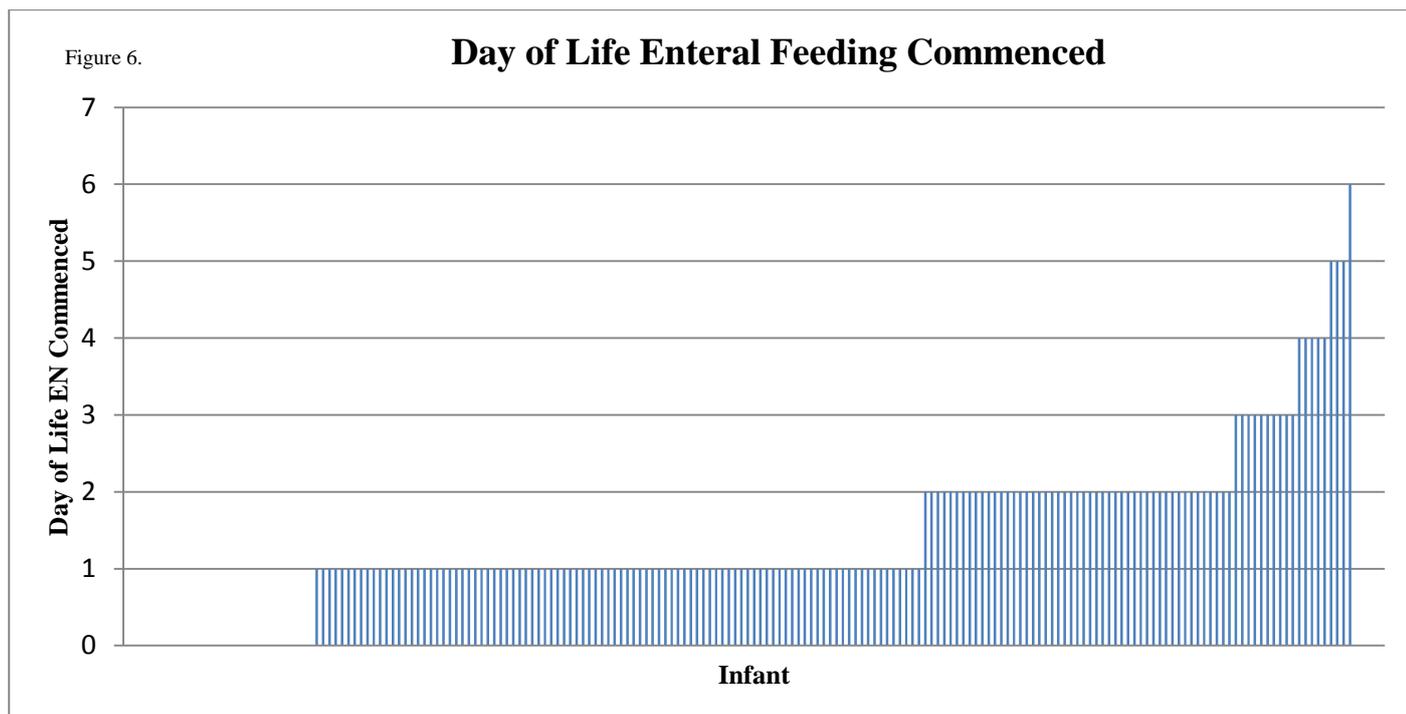
Of the 52 infants who received PN for ≤ 72 hours, 78.9% (41) received standard PN and 21.1% (11) received bespoke PN. Gestational ages at birth of this subgroup ranged from 28 to 41 weeks with a median gestation of 34 weeks. Birth weight ranged from 1.06kg to 4.97kg with a median of 2.27kg. Of these infants two died as described above and 16 were transferred to another hospital for ongoing care whilst on PN. The remaining 34 infants

(65%) ranged in gestational age at birth from 32 to 41 weeks with a median of 35 weeks. Their weights ranged from 1.6kg to 4.97kg with a median of 2.33kg.

Catheter Care and Documentation: All 43 infants who had a CVC inserted had documentation of the name and grade of inserting doctor, the date and time of catheter insertion and the type of venous catheter inserted. The catheter tip position was documented for 41 (95%) of these infants.

Enteral Nutrition (EN)

EN Commencement: The day of life enteral feeding was commenced ranged from the day of birth to day 74 with a median age of commencement of enteral nutrition of day one (where day of birth =D0). Five infants never received EN due to either death or transfer. This is illustrated in Figure 6 below. The infant who commenced EN on day 74 has been excluded from the graph to improve clarity of the other results.

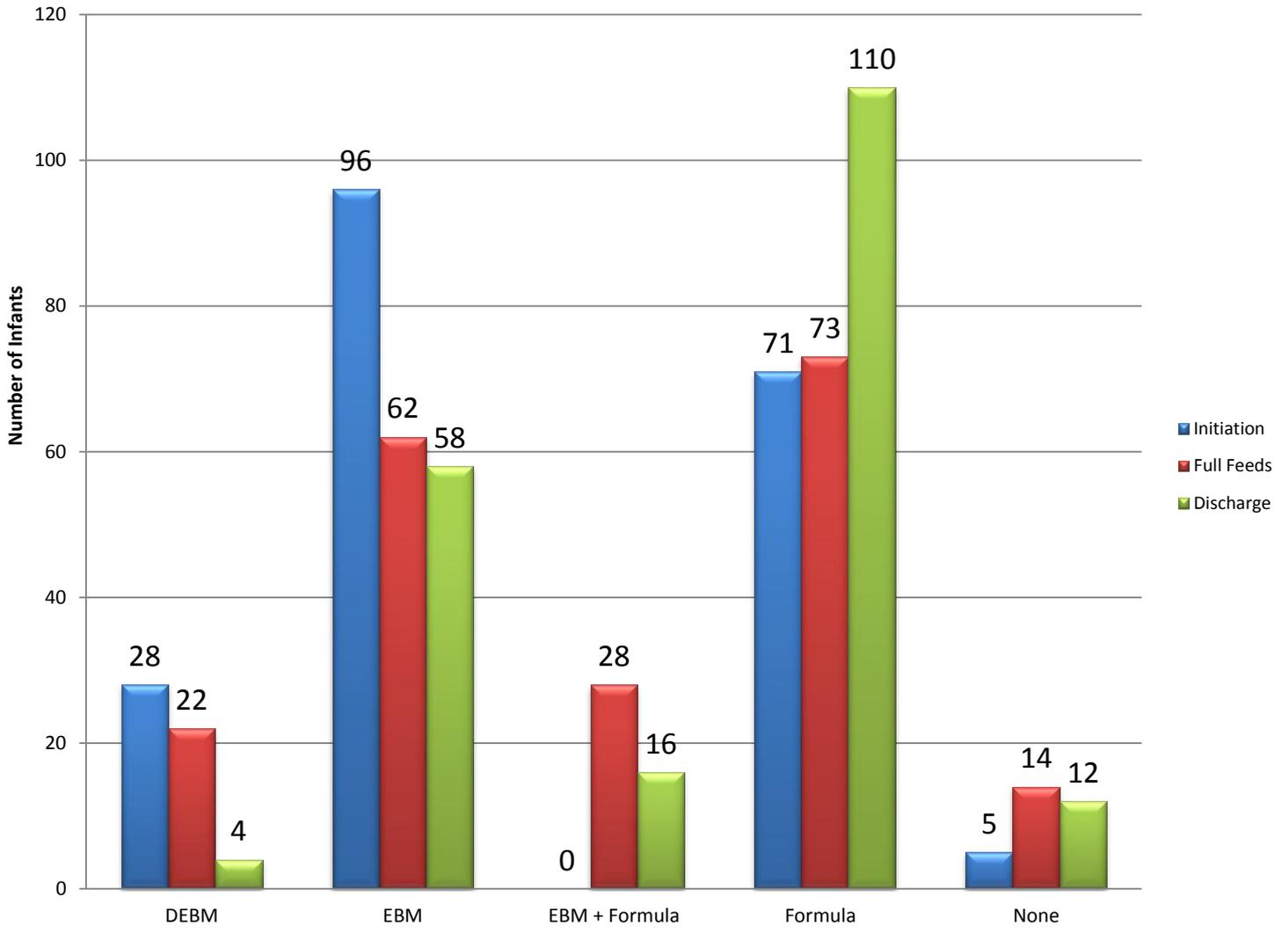


EBM/DEBM Use: Sixty four percent of infants admitted received maternal expressed breast milk at some point during their admission. Twenty seven percent of infants admitted received donor expressed milk at some point during their admission.

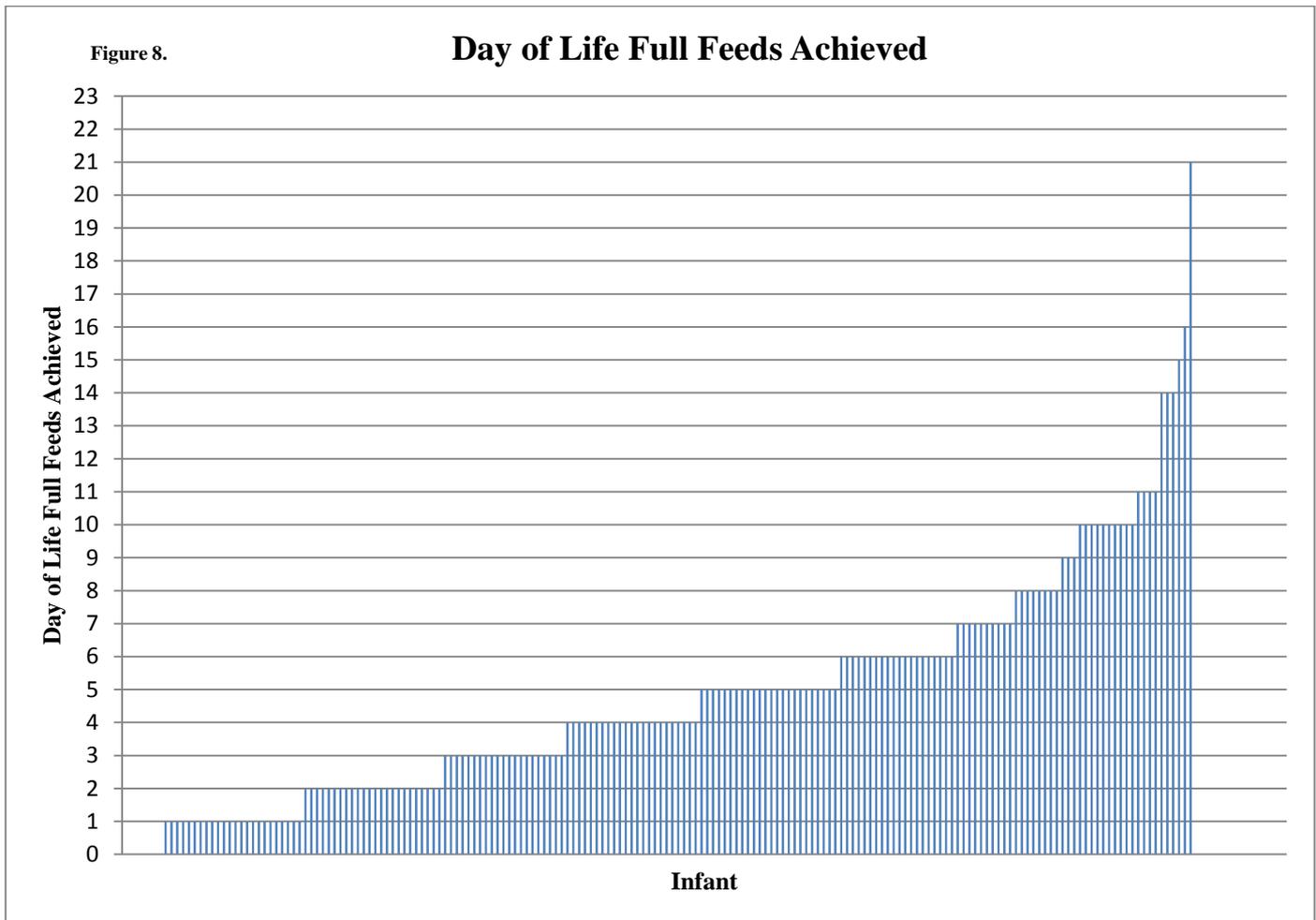
Type of Milk Used: Figure 7 below illustrates how the type of milk used for EN changed from initiation of EN, to achievement of full Use EN to the milk received on discharge. EBM use fell from 48% on initiation of enteral nutrition to 29% on discharge home or to another unit. The use of formula milk increased from 35% on initiation of EN to 55% on discharge home or to another unit.

Figure 7.

Type of Milk Used as Enteral Feeding Progressed



Day of Life Full EN Achieved: Achievement of full EN ranged from the day of birth to day 21. The median day of life full EN was achieved was day four. Sixteen infants failed to reach full enteral feeds either due to transfer to another hospital or because they died. This is illustrated in Figure 8.



Discharge Demographics: The range of corrected gestational ages at transfer or discharge was 28 weeks to 44 weeks. The median corrected gestation at discharge was 37 weeks. The infants' weight at discharge or transfer ranged from 0.81kg to 4.97kg with a median of 2.47kg

Outcome: The majority of infants were discharged directly home (75%) with 19% requiring transfer to another hospital either for ongoing step down care or for tertiary care. Two percent of infants in this audit died and 4% were transferred out to the postnatal ward to rejoin their mothers.

Observations and interpretations

Parenteral Nutrition

Each unit has excellent aspects of care and areas for potential improvement. Areas which were accomplished particularly well across all units included:

1. All units have a formal written policy for the use of PN and the use of IV catheters.
2. All units have access to nutritional expertise from allied health professionals.
3. By the end of the audit all units had standard bags of PN available to be commenced to avoid undue delay where PN is deemed appropriate.
4. All infants who received PN had appropriate biochemical monitoring undertaken throughout.
5. Every infant in the study who had a CVC inserted had documentation of the name and grade of inserting doctor, the date and time of catheter insertion and the type of venous catheter inserted.
6. The catheter tip position was documented in 95% of infants who had a central venous catheter inserted.

Areas for potential improvement

1. There is evidence of undue delay in commencing PN (ie. >24hrs after birth) as 25.4% (34 infants) did not commence PN until >24 hours of age. Units should ensure access to standard PN if required within a maximum of 24 hours.
2. The results suggest that there may be some infants receiving PN unnecessarily. Of the 134 infants who received PN, excluding infants who died or were transferred, 11.9% received PN for ≤ 24 hours, 24.6% ≤ 48 hours and 38.8% for less than 72 hours. It is unlikely that receipt of PN for less than 48 hours provides significant clinical benefit, particularly in infants for higher birth weights and/or gestation. The group of infants in this audit who received ≤ 48 hours PN had a median gestational age at birth of 34 weeks and a median weight of 2.27kg.

Enteral Nutrition

Whilst there is an increasing emphasis on the use of maternal breast milk in preterm infants, this audit suggests that there is still room for improvement. The areas which are accomplished well across all units included:

1. All units have breastfeeding policies.
2. Eighty percent of units have guidelines for the progression of EN.
3. EN is commenced early on a median of day 1.
4. Full EN is reached on a median of day 4.

Areas for potential improvement

1. Rates of EBM use fell from 48% on initiation of enteral feeds to 28% at discharge.
2. Only 63% of neonatal admissions ever received EBM.
3. On discharge, 55% of infants were receiving exclusively formula milk.

Recommendations

Parenteral Nutrition

1. A unified approach to PN prescription in the form of a regional guideline would assist with ensuring that each infant receives care determined by regional consensus as best practice. Each HSC Trust in Northern Ireland should work collaboratively with the newly established Northern Ireland Neonatal Network to develop a common PN guideline.
2. The circulation of this report will disseminate awareness of the overuse of PN revealed by this audit. This will also be highlighted and discussed at the next meeting of the Northern Ireland Neonatal Network.
3. Prior to commencement of PN clinicians must consider carefully the necessity of this intervention in light of the known risks and benefits for their patient.
4. Should PN be deemed appropriate, it should be commenced without undue delay.
5. Maintain vigilant aseptic technique in the placement of central catheters.
6. Re-audit

Enteral Nutrition

1. Breastfeeding rates, use and availability of EBM remain suboptimal and therefore a quality improvement initiative should be commenced to support mothers to breastfeed and express milk for their infants.
2. Once this initiative is complete a re-audit should be undertaken to ascertain progress in this respect.

References

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3. NICE Quality Standard for Specialist Neonatal Care
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4. NICE Quality Standard for Breastfeeding
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Appendices

Neonatal Enteral and Parenteral Nutrition Audit - Unit Proforma

Neonatal Unit name	
Written policy available for PN – composition, timing, rate of increase?	
Standard TPN bags available 'off the shelf' without delay?	
Written policy for breastfeeding support and expressing milk?	
Written policy for enteral feed progression esp. VLBW	
Access to local Nutritional Expertise e.g. Pharmacist, Dietician	
Policies for insertion and maintenance of intravenous catheters	
Catheter care bundles in use?	

Neonatal Enteral and Parenteral Nutrition Audit - Infant PN Proforma

Infant ID Number	
Gestation (wks)	
Birth Weight (kg)	
Age (hrs) at PN commencement	
Indication for PN (prematurity/congenital abnormality)	
Type of PN started initially (standard/bespoke)	
Individual PN prescription filed in patient notes?	
PN use appropriate according to local policy?	
Route of PN delivery (Peripheral/Umbilical/Long-line)	
Catheter complications? (Line fracture/pneumothorax/accidental removal)	
Sepsis requiring removal of catheter? (Y/N)	
U+E monitored daily? (Y/N)	
Biochemical abnormalities during PN? (Y/N)	
Direct bilirubin $\geq 25 \mu\text{mol/l}$ during PN? (Y/N)	
Number of days of PN	
Vascular Access for PN documentation	
Name/Grade identified? (Y/N)	
Date/Time of insertion recorded? (Y/N)	
Type of access (umbilical/long-line/Broviac/peripheral) recorded? (Y/N)	
Catheter tip location documented? (Y/N)	

Neonatal Enteral and Parenteral Nutrition Audit - Infant Enteral Nutrition Proforma

Infant ID Number	
Gestation (wks)	
Birth Weight (kg)	
Day of life enteral feeds started.	
Type of milk at first feed. (Maternal BM / Donor BM / Preterm Formula / Term Formula / other)	
Breast milk used at any time? (Y/N)	
Donor milk used at any time? (Y/N)	
Number of days to full enteral feeds.	
Type of milk at full enteral feeds.	
Type of milk at discharge.	
Corrected GA (wks) at discharge.	
Weight (kg) at discharge.	
Outcome (discharged home/died/transferred)	

Project Team

Name	Job Title/Specialty	Trust	Role within Project (data collection, Supervisor etc)
Dr S Craig	Consultant Neonatologist	Belfast HSC Trust	Project Lead and Supervisor, Protocol formulation, analysis of data, report writing
Dr C Mayes	Consultant Neonatologist	Belfast HSC Trust	Project Co-leader and Supervisor, Protocol formulation, analysis of data, report writing
Dr M Hogan	Consultant Paediatrician and Chair of N Ireland Neonatal Network	Southern HSC Trust	Project advisor & Supervisor
Dr N Saxena	Consultant Paediatrician	South Eastern HSC Trust	Supervisor
Dr M Ledwidge	Consultant Paediatrician	Western HSC Trust	Supervisor
Dr S Bali	Consultant Paediatrician	Northern HSC Trust	Supervisor
Dr J Courtney	Paediatric Registrar	South Eastern HSC Trust	Protocol formulation, collection & analysis of data, report writing
Dr C Gupta	Paediatric Registrar	Belfast HSC Trust	Protocol formulation, collection & analysis of data, report writing
Ms M Moohan	Pharmacist	Belfast HSC Trust	Advisor
Mrs A McDougall	Dietician	Belfast HSC Trust	Advisor
Ms N Lyttle	Dietician	South Eastern HSC Trust	Advisor
Ms D Wilson	Advanced Neonatal Nurse Practitioner	South Eastern HSC Trust	Advisor
Dr S Subramanian	Paediatric Registrar	Belfast HSC Trust	Data collection
Dr M Magowan	Paediatric Registrar	Southern HSC Trust	Data collection
Dr K Tanney Dr S Callaghan	Paediatric Registrars	Western HSC Trust	Data collection
Dr K Courtenay	Paediatric Registrar	Northern HSC Trust	Data collection

Clinical Audit Action Plan

Project title	Audit of Neonatal Parenteral and Enteral Nutrition in Northern Ireland		
Action plan lead	Name: Stan Craig	Title: Consultant Neonatologist	Contact: stan.craig@belfasttrust.hscni.net

	Action (i.e. How Recommendation will be implemented)	'Implement By' Date	Staff Member Responsible	Comments	Change Stage (see key)	Change Stage Key
1	Development of Regional Guideline for Parenteral Nutrition. (recommendations 1,3 and 4)	1/1/2015	SC	A 'nutrition group' has been formed and discussions have commenced.	2	1. Agreed but not yet actioned 2. Action in progress 3. Made – partial implementation 4. Full implementation completed
2	Report Circulation	1/3/2014	SC	Report is now complete and ready for circulation pending final approval.	3	
3	Maintain vigilant aseptic technique in the placement of central catheters.	Continuous	CM	Regular infection audits and teaching maintain high profile.	4	
4	Quality Improvement initiative to improve breastfeeding/expressing rates	1/6/2014	CM	Northern Ireland Neonatal Network has commenced planning this.	2	
5	Re-Audit	1/3/2015	CM SC	Re-audit once PN guideline in place and quality improvement initiative for breastfeeding complete.	1	