Neonatal Intensive Care Outcomes Research & Evaluation (NICORE)

Neonatal Care in Northern Ireland, 2013

DATA TABLES

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Summary of main findings

1. Key clinical issues

- **Quality dashboard**

Northern Ireland performance remains higher than the UK benchmark for administration of antenatal steroids to mothers who deliver between 24 and 34 weeks' gestation (90% vs 83%). Almost half of infants less than 27 weeks' gestations are born and receive initial neonatal care outside the regional centre. This is less than optimal. There are also further opportunities for improvement with respect to admission temperature, breast milk feeding rates at discharge and consultation of parents by a senior member of staff within 24 hours all of which fell below the UK benchmark.

- **Neonatal activity**

The proportion of live born infants receiving neonatal care has remained stable for the last three years 2011 to 2013 at 7.2%, 7.3% and 7.4% respectively. Across the NNNI a total of 3777 intensive care, 6505 high dependency and 16129 special care days were provided for infant born in 2013. A further 1364 days were miscoded as normal care days due to idiosyncrasies within the BadgerNet™ software which have been highlighted within the main body of the report.

- **Mortality and key morbidities**

Overall 97% of infants, who required admission for neonatal care, survived; for extremely preterm infants (less than 28 weeks' gestation) survival was 74%. More than half (53%) of intensive care days are now being provided in the tertiary NNU at the Royal Maternity Hospital.

Intraventricular haemorrhage and periventricular leukomalacia are important determinants for survival free of neurodevelopmental delay: unfortunately, the data for cranial ultrasound scanning is not robust enough to draw any conclusions. Please refer to your Unit Vermont

Oxford Network 2013 data report for cranial ultrasound data since these are collated from BadgerNet Neonatal System (BNNS) and from the discharge letter. In addition, the NICORE data download request for 2014 has been refined to include all cranial ultrasound data to provide more detailed analyses.

We have been unable to provide sepsis data in this report as recording of blood culture results on the system are unreliable. For example, for infants less than 32 weeks' gestation 46% did not have a blood culture result recorded during the first episode of care. Please refer to your Unit Vermont Oxford Network 2013 data report for sepsis data since these are collated from BNNS and from the discharge letter.

We have not provided Retinopathy of Prematurity (ROP) screening data in this report as we had anticipated utilising the Northern Ireland ROP summary discharge data which is not available. However, we have refined our data download for 2014. Please refer to your Unit Vermont Oxford Network 2013 data report for ROP data since these are collated from BNNS and from the discharge letter.

Clearly, as a network, we can strive to improve the quality of these data and other data issues as summarised in the following section.

2. Key data issues

Data must be recorded in BadgerNet™ neonatal system (BNNS) in the appropriate location in order to be exported for analyses. Additional discharge letter content is NOT exported.

- **Importance of entering daily data items for generating:**

1. Level of Care: items must be selected for special care otherwise the system will categorise the day as normal care as is evident in Tables 10 to 26.
2. Major respiratory morbidity at 28 days and at 36 weeks' adjusted gestation.

- **Importance of recording procedures and results on BNNS:**

1. Cranial ultrasounds on or before day 28.
2. Retinopathy of prematurity screen.

3. Blood cultures.

- **The following key data items appear to be under reported on BNNS:**

1. Primary reason for admission.
2. Congenital malformations.
3. Major Surgical procedures.
4. Cranial Ultrasounds.
5. Sepsis.

3. The way forward

1. Data Reporting

- Neonatal Care in Northern Ireland, 2014 will be available in September.
- Neonatal Care in Northern Ireland, 2015 will be available by end of year 2016 with the aim, in future, to report annual data by the end of the following year.

2. BadgerNet™ training day

- A regional advanced BadgerNet™ training day will be arranged for September 2016. The focus of this day will be using BadgerNet™ data for benchmarking and an exploration of standardised reporting facilities.

3. Focus on improving data quality for key indicators using the 'Aide Memoire' provided.

4. NNNI thermoregulation immediately at birth quality improvement initiative (TEMP Study) is underway as is the development of NNNI evidence-based thermal care guidelines.

Section 1.0 Introduction

1.1 Background

"Neonatal Care in Northern Ireland, 2013" provides information relating to all infants born and admitted to neonatal care (NC) in Northern Ireland (NI) during the time period 1st January 2013 (00:01) to 31st December 2013 (23:59). This report provides a summary of neonatal care activities within the Neonatal Network Northern Ireland (NNNI); outcomes in terms of mortality and morbidities; and an assessment of performance against national and local (NICORE) evidence-based key quality standards. Denominator data for live births (resident and non-resident live infants born in NI hospitals, at home or en-route) have been sourced from the Northern Ireland Maternity Administration System (NIMATS) held by the Public Health Agency (PHA). All infants are allocated to calendar year by date of birth as with other perinatal datasets.

1.2 Source of data

Anonymised neonatal data were downloaded from the BadgerNet™ neonatal system (BNNS) supplied and managed by Clevermed Ltd. These data were exported from BNNS securely to the NICORE neonatal database on behalf of the Neonatal Network Northern Ireland (NNNI); as approved by each Health and Social Care Trust Personal Data Guardian and in accordance with the Northern Ireland neonatal data sharing agreements in place at that time.

1.3 Limitations of the NICORE neonatal database

- Infants born in 2012 and admitted to neonatal care during 2013 are excluded;
- Infants re-admitted to neonatal care from home are excluded;
- Data pertaining to the provision of level 3 (special care) on postnatal wards are excluded and

- Infants who died in delivery suite are excluded.

1.4 Report focus

- Completeness of data on BNNS;
- Data quality checks for BNNS and
- Test data analyses and reporting.

1.5 Aims

- To assess the completeness and quality of data on BNNS and to highlight opportunity for improvements.
- To provide a 'dry run' of analyses using the 2013 dataset in order to ascertain the feasibility of our chosen report formats and to liaise with Clevermed Ltd. regarding any data 'glitches' with respect to the data download processes and specifications as per NNNI request.

1.6 Supplemental information

This report should be read in conjunction with the Vermont Oxford Network report for your neonatal unit particularly for nosocomial sepsis rates, cranial ultrasounds on or before 28 days and screening for retinopathy of prematurity (ROP). Sepsis data and ROP screening data will be available for 2014 via BNNS.

For data definitions you should refer to BNNS data dictionary which is available via the BadgerNet™ platform.

Section 2.0 Data completeness and Quality Assurance

2.1 Scope

This report provides information and analyses for all infants who were born between 1st January 2013 (00:01) and 31st December 2013 (23:59) and admitted to a neonatal unit (NNU) in Northern Ireland (NI) for intensive care (IC), high dependency care (HDC) or special care (SC). This report excludes neonatal unit (NNU) admissions in 2013 where the infant was born in 2012 and includes NNU admissions in 2014 for those infants born in 2013.

NNU Abbreviations: Altnagelvin Area Hospital (ALT), Antrim Area Hospital (ANT), Craigavon Area Hospital (CAH), Daisy Hill Hospital (DH), Royal Maternity Hospital (RMH), South West Acute Hospital (SWAH) and Ulster Hospital (ULST), Neonatal Network Northern Ireland (NNNI), **QAP (n):** Quality Assurance point e.g. QAP1

2.2 Episodes of care (admissions)

Table 1 Admissions (episodes of care) registered on the Badger Net Neonatal System (BNS) compared to counts from NNU manual admission books.

NNU	Episodes Admission book	Episodes BNNS
ALT	257	256(99.6%)
ANT	291	*296(101.7%)
CAH	364	357(98.1%)
DH#	192	139(72.3%)
RMH	556	545(98.0%)
SWAH	127	*128(100.7%)
ULST	343	*348(101.5%)
NNNI	**2130**	**2069(97.1%)**

* Possible duplicate entries, # Delayed installation of BadgerNet ™

Admission book data provided by NNUs: March 2014, re-checked November 2014.
Phase 1 BNNS check: 18/03/2014.

Phase 2 BNNS check: 30/06/2014.
Final BNNS data download received: 25/11/2014.

2.3 Health & Care (H&C) Number coverage

For 2013, the Health and Care (H&C) Number was entered for all infants (100%) on BNNS.

NICORE receives encrypted H&C numbers as the infant unique key. This facilitates the linkage of individual infant episodes of care both across and within NNUs (re-admissions). This is dependent upon complete coverage of H&C numbers for all infant episodes of care. This ensures that the H&C number, for each episode of care associated with an infant, is encrypted in the same way every time and is therefore valid as a unique key.

If the H&C number is not entered the BNNS creates a temporary number which is in a different format to the H&C number and is not valid as a unique key. The BNNS can differentiate between the two and NICORE receives a data item called 'HSCNumberType' which allows us to ascertain H&C coverage.

QAP1: Checking H&C numbers at a NNU level is one of the most important quality assurance checks carried out prior to the download date.

2.4 Discharge NOT complete on BNNS

There were two of 2069 episodes of care (admissions) registered on the BNNS where the 'discharge' was not completed (i.e. no date of discharge).

QAP2: Checking discharges at NNU level ensures the accuracy of activity data. If the infant is not discharged on BNNS the system automatically counts this infant as 'still in' and expects to find appropriate daily data entries.

2.5 Daily data completeness

For those episodes of care 'discharged' on the BNNS (2067), daily data needed to generate the BAPM (2011) levels of care were not entered for 25 episodes of care (admissions).

Table 2 Episodes with no levels of care (LOC) data.

NNU	Episodes
CAH	1
DH	7
RMH	11
ULST	6
Total	**25**

These episodes of care equate to 93 days without an assigned level of care. This figure does not include additional missing daily data where episodes of care are partially complete.

QAP3: BAPM 2011 levels of care are generated by the BNNS. Daily data items are essential to this process. This ensures that neonatal activity data are accurate.

QAP4: For BAPM 2011 level 3 Care: if at least one criteria fulfilling the level 3 specification is NOT ticked then the system will allocate 'Normal Care' category to this day. Ensure that your BNNS default is set for 2011 BAPM levels of care.

2.6 Complete infant journey registered on BNNS

Episodes of care (admissions) were sorted by encrypted H&C Number (unique database key) and by infant episode number. A new variable was created 'complete record' and was coded 'yes' if all episodes of care from first admission to final discharge from neonatal care were accounted for on BNNS. 'Complete record' was coded as 'No' if an episode of care for that infant was not registered on BNNS.

Table 3 Complete infant journey registered on BNNS

Episodes of care (admissions) Registered on BNNS.	2069
Infants Registered on BNNS	1791
Episodes (admissions) Registered and Discharged on BNNS.	2067 (99.9%)
Infants Registered on BNNS and discharged	1789 (99.9%)
Completed infant journey i.e. all episodes of care (admissions) for that infant registered on BNNS.	1752 Complete 20 Incomplete 19 Unsure

'Complete' infant records (episodes) with 'suspect' data	41 (2.3%)

Section 3.0 Neonatal activity & workloads

3.1 Scope

This section provides details of neonatal care provided in Northern Ireland neonatal units for infants born in 2013. Live birth denominator data for have been provided by the Public Health Agency (PHA) and are derived from the Northern Ireland Maternity Administration System (NIMATS). For reporting purposes, infants are categorised according to completed weeks' gestation[1] as follows:

	Extremely preterm (less than 28 weeks' gestation) EPT
	Very preterm (28 to 31 weeks' gestation) VPT
	Moderately preterm (32 to 33 weeks' gestation) MPT
	Late preterm (34 to 36 weeks' gestation) LPT
	Term (greater than or equal to 37 weeks' gestation) T

3.2 Live births and neonatal admissions

From 1st January 2013 to 31st December 2013, there were 24313 live born infants in NI hospitals, en-route or at home (resident and non-resident to NI). During the same time period 2069 episodes of neonatal care were provided for 1791 infants equating to 7.4% of live born infants. Table 4 demonstrates the proportion of live born infants receiving neonatal care for each gestational age category for 2011, 2012 and 2013.

QAP5: It is important to ensure that accurate gestational ages (completed weeks and days) are recorded on BNNS. As is evident in Table 4, there appears to be inconsistencies across data sources particularly for infants born at lower gestational ages (23 to 25 weeks). Inaccuracies in recording gestational age could potentially impact of calculated survival rates.

Table 4 **Live born infants in NI & number of infants admitted to neonatal care by gestation during 2013, 2012 and 2011.**

Gestation (weeks)	[α]Live born infants NI 2013	Infants receiving neonatal care 2013	[α]Live born infants NI 2012	Infants receiving neonatal care 2012	[β]Live born infants NI 2011	Infants receiving neonatal care 2011
<22	16	0	10	0	16	0
22	7	0	7	0	14	2
23	9	0	7	3	6	2
24	9	*11	*8	*11	17	16
25	10	*14	12	12	15	14
26	16	16	*19	*20	18	18
27	16	14	29	29	*16	*20
Sub-total EPT	**83**	**55 (66.3%)**	**92**	**75 (81.5%)**	**102**	**72 (70.6%)**
28	45	42	29	28	38	37
29	43	*44	41	35	*32	*34
30	45	44	*53	*55	55	52
31	92	*95	*66	*70	*56	*58
Sub-total VPT	**225**	**225 (100.0%)**	**189**	**188 (99.5%)**	**181**	**181 (100.0%)**
32	96	94	91	90	83	79
33	130	127	152	143	162	163
Sub-total MPT	**226**	**221 (97.8%)**	**243**	**233 (95.9%)**	**245**	**242 (98.8%)**
34	237	188	247	193	246	196
35	406	179	367	162	379	159
36	654	150	732	152	706	157
Sub-total LPT	**1297**	**517 (39.9%)**	**1346**	**507 (37.7%)**	**1331**	**512 (38.5%)**
# ≥ 37 T	22482	773 (3.4%)	23720	874 (3.7%)	23736	831 (3.5%)
NK	**0**	**0**	**0**	**0**	1	**0**
Total	**24313**	**1791 (7.4%)**	**25590**	**1877 (7.3%)**	**25596**	**1838 (7.2%)**

[α] Northern Ireland Maternity Administration System (NIMATS), [β]Child Health System Bureau Service.
* Discrepancies in the recording of gestational age across data sources.

3.3 Principal reason for admission, admission type and category

On BNNS, the primary clinical reason for the episode of care is a single pick choice that aims to give the single principal reason the episode of care was started. Table 5 shows the principal reason for admission (episode of care) for first admissions, subsequent admissions and all admissions to neonatal care. Table 6, details the principal reason for first admissions to neonatal care for infants of ≥ 37 weeks' gestation.

QAP6: Principal reason for first admission was missing in 4.7% of cases and 'other' category was recorded for 8.8% of cases (Table 5). The majority of missing data for first admissions 74/85 (87.1%) or 'other' category 115/158 (72.8%) pertains to term infants. The BNNS principal reason for admission pick list has now been expanded which should alleviate the need to select 'other' category. This should result in improved data quality.

Table 5 Principal reason for admission: first admissions, subsequent admissions and all admissions to neonatal care.

	First Admissions	Subsequent Admissions	All Admissions
Preterm	546	115	661
Respiratory distress	635	38	673
Cardiovascular disease	38	4	42
Failed oximetry screening	1	0	1
Jaundice	40	4	44
Poor feeding	47	15	62
Hypoglycaemia	85	3	88
Convulsions	7	1	8
Asphyxia	32	3	35
Other neurological disease	25	3	28
Congenital abnormality	51	4	55
Social issues/foster care	7	1	8
Surgery	8	9	17
Cardiac disease	10	2	12
Investigation	16	1	17
Other	158 (8.8%)	68 (24.5%)	226 (10.9%)
Missing	85 (4.8%)	7 (2.5%)	92 (4.5%)
NNNI	**1791**	**278**	**2069**

Table 6 Principal reason for first admission to neonatal care: Term Infants (≥ 37 weeks' gestation).

	First Admissions
Preterm	1
Respiratory distress	328
Cardiovascular disease	32
Failed oximetry screening	1
Jaundice	18
Poor feeding	28
Hypoglycaemia	47
Convulsions	6
Asphyxia	28
Other neurological disease	22
Congenital abnormality	38
Social issues/foster care	5
Surgery	8
Cardiac disease	10
Investigation	12
Other	**115 (14.9%)**
Missing	**74 (9.6%)**
NNNI	**773**

A national audit of term infants admitted to neonatal care in England is underway which aims to prevent separation of mother and baby by reducing avoidable neonatal admissions to level 1, 2 or 3 neonatal care. Further information is available at https://www.england.nhs.uk/wp-content/uploads/2015/07/align-national-workstreams.pdf
In order to facilitate benchmarking we need to improve the quality of these data for term admissions.

Table 7 Admission type: first admissions, subsequent admissions and all admissions to NC. Category of care at the time of start of episode.

	First Admissions	Subsequent Admissions	All Admissions
Medical IC	862 (48.1%)	59 (21.1%)	921(44.5%)
Medical HDC	522 (29.1%)	100 (36.0%)	622 (30.1%)
Medical SC	367 (20.5)	103 (37.1%)	470 (22.7%)
Surgical care	7 (0.4%)	5 (1.8%)	12 (0.6%)
Cardiac care	14 (0.8%)	3 (1.1%)	17 (0.8%)
Tertiary specialist investigation	5 (0.3%)	0	5 (0.2%)
Social care	2 (0.1%)	0	2 (0.1%)
Back transfer continuing medical IC	0	1 (0.4%)	1 (not computable)
Back transfer continuing medical HDC	0	4 (1.4%)	4 (0.2%)
Back transfer for continuing medical SC	0	3 (1.1%)	3 (0.1%)
Other	12 (0.7%)	0	12 (0.6%)

NNNI	**1791**	**278**	**2069**

Table 8 categorises the type of admission based on place of booking, place of birth and previous admission history. Table 9 details the source of first admission to neonatal care by sending hospital and receiving neonatal unit.

Table 8 Type of admission for first admission to neonatal care.

Category	Infants (%)
Inborn - booked	1449 (80.9%)
Inborn - booked elsewhere	206 (11.5%)
Inborn – unbooked	0
Re-admission	Not applicable
Home admission	6 (0.3%)
Postnatal transfer in	72 (4.0%)
Cannot derive	58 (3.2%)
NNNI	**1791**

Table 9 Source of first admission to neonatal care.

Source of Admission	Neonatal Unit							NNNI
	ULST	CAH	RMH	ANT	SWA	ALT	DH	
Missing	1	0	0	0	0	0	2	3
Altnagelvin	0	0	0	0	0	235	0	235
Antrim Hospital	0	1	1	238	0	1	0	241
Causeway Hospital	0	0	6	19	0	7	0	32
Craigavon Area Hospital	0	299	0	0	0	0	1	300
Daisy Hill, Newry	0	4	3	0	0	0	88	95
Home	0	2	1	1	0	1	1	6
Lagan Valley	3	0	0	0	0	0	0	3
Letterkenny General Hospital	1	0	0	0	0	0	0	1
Mater Infirmorum, Belfast	0	0	10	0	0	0	0	10
Royal Jubilee Maternity Belfast	2	0	474	0	0	0	0	476
Royal Victoria Hospital, Belfast	0	1	6	0	0	0	0	7
South West Acute Hospital (SWAH)	0	0	0	0	109	0	0	109
Ulster, Dundonald	268	0	1	0	0	1	0	270
Unknown location	0	0	0	0	2	1	0	3
NNNI	**275**	**307**	**502**	**258**	**111**	**246**	**92**	**1791**

QAP7: Caution when entering source of admission i.e. hospital and neonatal unit codes (locations).

3.4 Neonatal activity data

Levels of care data are based on the BAPM 2011 categories of care[2] and are generated in the BNNS based on the daily data items entered. Neonatal Network activity data, for infants born in 2013, are presented by gestational age group and by neonatal unit for first admissions and total admissions to neonatal care (Tables 10 to 26). First admissions are also categorised by birthweight group for the time periods 2011 to 2013 (Table 27).

3.4.1 Network (NNNI)

Table 10 NI admissions (episodes) & activity (Levels of Care days BAPM 2011) by gestational age group.

Gestational age (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	55 (3.1%)	86	1027	1486	1272	43
≥ 28 & ≤ 31	225 (12.6%)	329	1571	2172	5630	372
≥ 32 & ≤ 33	221 (12.3%)	263	322	681	2969	238
≥ 34 & ≤ 36	517 (28.9%)	570	349	1006	3603	372
≥ 37	773(43.2%)	821	508	1160	2655	339
NNNI	**1791**	**2069**	**3777**	**6505**	**16129**	**1364**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 11 NI NC admissions (episodes) & activity (Levels of Care days BAPM 2011) by neonatal unit (NNU) – all admissions to neonatal care.

NNU	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
ALT	256	256	641	969	2379	4
ANT	290	296	506	870	3220	159
CAH	348	357	201	697	2984	232
DH	128	139	18	385	650	87
RMH	536	545	2033	2287	3320	222
SWA	125	128	27	159	1392	3
ULST	326	348	351	1138	2184	657
NNNI	***2009**	**2069**	**3777**	**6505**	**16129**	**1364**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

** Multiple admissions across NNUs.*

Table 12 NI NC admissions & activity (Levels of Care days BAPM 2011) by neonatal unit (NNU) – FIRST admissions to neonatal care.

NNU	Infants	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
ALT	246	614	839	2183	3
ANT	258	486	685	2552	114
CAH	307	163	447	2117	192
DH	92	10	179	234	39
RMH	502	1654	1946	3108	212
SWA	111	19	71	1090	3
ULST	275	311	694	1375	447
NNNI	**1791**	**3257**	**4861**	**12659**	**1010**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.2 Altnagelvin Neonatal Unit (ALT)

Table 13 Neonatal activity by gestational age group - all admissions ALT

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	12	12	133	282	204	1
≥ 28 & ≤ 31	35	35	352	493	861	2
≥ 32 & ≤ 33	28	28	51	76	494	0
≥ 34 & ≤ 36	70	70	29	61	423	0
≥ 37	111	111	76	57	397	1
Total	**256**	**256**	**641**	**969**	**2379**	**4**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 14 Neonatal activity by gestational age group – first admissions ALT

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	10	131	200	161	0
≥ 28 & ≤ 31	31	345	458	775	2
≥ 32 & ≤ 33	27	42	76	433	0
≥ 34 & ≤ 36	69	29	49	423	0
≥ 37	109	67	56	391	1
Total	**246**	**614**	**839**	**2183**	**3**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.3 Antrim Neonatal Unit (ANT)

Table 15 Neonatal activity by gestational age group - all admissions ANT

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	9	9	54	180	289	5
≥ 28 & ≤ 31	41	43	192	336	1093	46
≥ 32 & ≤ 33	42	42	118	97	720	30
≥ 34 & ≤ 36	91	92	91	133	734	39
≥ 37	107	110	51	124	384	39
Total	**290**	**296**	**506**	**870**	**3220**	**159**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 16 Neonatal activity by gestational age group – first admissions ANT

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	7	48	137	205	1
≥ 28 & ≤ 31	26	186	230	705	16
≥ 32 & ≤ 33	36	118	85	615	27
≥ 34 & ≤ 36	84	91	133	658	35
≥ 37	105	43	100	369	35
Total	**258**	**486**	**685**	**2552**	**114**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.4 Craigavon Neonatal Unit (CAH)

Table 17 Neonatal activity by gestational age group - all admissions CAH

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	11	14	24	121	341	13
≥ 28 & ≤ 31	62	64	83	267	1159	74
≥ 32 & ≤ 33	69	69	20	114	650	62
≥ 34 & ≤ 36	109	112	31	131	548	64
≥ 37	97	98	43	64	286	19
Total	**348**	**357**	**201**	**697**	**2984**	**232**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 18 Neonatal activity by gestational age group – first admissions CAH

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	6	20	15	76	3
≥ 28 & ≤ 31	50	57	152	806	57
≥ 32 & ≤ 33	59	20	101	560	55
≥ 34 & ≤ 36	101	30	119	438	61
≥ 37	91	36	60	237	16
Total	**307**	**163**	**447**	**2117**	**192**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.5 Daisy Hill Special Care Baby Unit (DH)

Table 19 Neonatal activity by gestational age group - all admissions DH

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	0	0	0	0	0	0
≥ 28 & ≤ 31	20	24	3	88	258	31
≥ 32 & ≤ 33	14	15	3	91	109	10
≥ 34 & ≤ 36	31	33	5	108	107	23
≥ 37	63	67	7	98	176	23
Total	**128**	**139**	**18**	**385**	**650**	**87**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 20 Neonatal activity by gestational age group – first admissions DH

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	0	0	0	0	0
≥ 28 & ≤ 31	2	1	0	10	1
≥ 32 & ≤ 33	6	1	33	31	4
≥ 34 & ≤ 36	23	1	73	70	12
≥ 37	61	7	73	123	22
Total	**92**	**10**	**179**	**234**	**39**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.6 Royal Maternity Neonatal Unit (RMH)

Table 21 Neonatal activity by gestational age group - all admissions RMH

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	36	37	786	719	250	4
≥ 28 & ≤ 31	99	102	755	665	997	37
≥ 32 & ≤ 33	65	66	83	211	551	46
≥ 34 & ≤ 36	128	131	159	336	798	69
≥ 37	208	209	250	356	724	66
Total	**536**	**545**	**2033**	**2287**	**3320**	**222**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 22 Neonatal activity by gestational age group – first admissions RMH

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	29	597	556	211	3
≥ 28 & ≤ 31	92	617	564	958	36
≥ 32 & ≤ 33	62	81	190	523	42
≥ 34 & ≤ 36	123	137	310	745	67
≥ 37	196	222	326	671	64
Total	**502**	**1654**	**1946**	**3108**	**212**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.7 South West Acute Special Care Baby Unit (SWA)

Table 23 Neonatal activity by gestational age group - all admissions SWA

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	3	3	0	42	65	0
≥ 28 & ≤ 31	11	14	12	42	344	0
≥ 32 & ≤ 33	4	4	3	6	101	0
≥ 34 & ≤ 36	47	47	5	46	562	1
≥ 37	60	60	7	23	320	2
Total	**125**	**128**	**27**	**159**	**1392**	**3**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 24 Neonatal activity by gestational age group – first admissions SWA

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	-	-	-	-	-
≥ 28 & ≤ 31	6	5	10	148	0
≥ 32 & ≤ 33	4	3	6	101	0
≥ 34 & ≤ 36	42	5	34	527	1
≥ 37	59	6	21	314	2
Total	**111**	**19**	**71**	**1090**	**3**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

3.4.8 Ulster Neonatal Unit (ULST)

Table 25 Neonatal activity by gestational age group - all admissions ULST

Gestational age group (completed weeks)	Infants	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	9	11	30	142	123	20
≥ 28 & ≤ 31	44	47	174	281	918	182
≥ 32 & ≤ 33	38	39	44	86	344	90
≥ 34 & ≤ 36	81	85	29	191	431	176
≥ 37	154	166	74	438	368	189
Total	**326**	**348**	**351**	**1138**	**2184**	**657**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 26 Neonatal activity by gestational age group – first admissions ULST

Gestational age group (completed weeks)	Episodes	Level 1 (IC) days	Level 2 (HDC) days	Level 3 (SC) days	Normal Care days
< 28	3	22	56	22	5
≥ 28 & ≤ 31	18	143	139	406	53
≥ 32 & ≤ 33	27	44	66	257	59
≥ 34 & ≤ 36	75	29	150	366	159
≥ 37	152	73	283	324	171
Total	**275**	**311**	**694**	**1375**	**447**

Note: *For BAPM 2011 level 3 Care: if at least one criterion fulfilling the level 3 specifications is NOT ticked then the system will allocate 'Normal Care' category to this day.*

Table 27 Neonatal Activity by birthweight Group - first admissions to neonatal care.

Birth weight Group (g)	ALT		ANT		CAH		DH		SWA		RMH		ULST		NNNI	
	2013	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**
≤ 999	9	8	6	6	5	5	0	2	0	0	39	40	5	2	64	63
1000 to 1499	29	17	22	22	26	31	0	2	3	4	69	53	12	20	161	149
1500 to 2499	76	91	93	88	135	107	20	37	39	39	169	158	82	82	614	602
≥ 2500	132	138	137	122	140	150	72	102	69	75	224	282	176	194	950	1063
Missing	0	0	0	0	1	0	0	0	0	0	1	0	0	0	*2	0
Total	**246**	**254**	**258**	**238**	**307**	**293**	**92**	**143**	**111**	**118**	**502**	**533**	**275**	**298**	**1791**	**1877**

** Two birthweight values entered incorrectly.*

Section 4.0 Pregnancy, birth & initial neonatal care

4.1 Scope

This section provides an overview of location of birth by gestational age group and by birthweight (Tables 28 and 29) and location of initial neonatal care by gestational age group (Table 30). The most frequently reported problems during this pregnancy, labour and delivery, number of fetuses this pregnancy and destination on discharge are also presented (Tables 31 to 34).

Table 28 Location of birth by Gestational age group (completed weeks), Gest (wks).

Gest (wks)	ALT	ANT	CAH	DH	SW	RMH	ULST	MT	CW	LV	H/ER	Other	NK	NNNI
< 28	10	8	6	0	0	27	3	0	1	0	0	0	0	**55**
≥ 28 & ≤ 31	30	25	49	2	6	91	17	1	1	0	3	0	0	**225**
≥ 32 & ≤ 33	26	35	57	7	5	62	25	0	2	0	1	1	0	**221**
≥ 34 & ≤ 36	68	85	98	24	42	121	75	2	1	0	0	0	1	**517**
≥ 37	101	89	87	65	59	183	152	5	25	2	5	0	0	**773**
Total	**235**	**242**	**297**	**98**	**112**	**484**	**272**	**8**	**30**	**2**	**9**	**1**	**1**	**1791**

H/ER: at home/en-route, MT: Mater, CW: Causeway, LV: Lagan Valley.

Table 29 Location of birth by birthweight group, BWG (g).

BWG (g)	ALT	ANT	CAH	DH	SW	RMH	RVH	ULST	MT	CW	LV	H/ER	Other	NK	NNNI
≤ 999	9	7	5	0	0	38	0	5	0	0	0	0	0	0	**64**
1000 to 1499	28	21	25	1	3	66	1	12	1	2	0	1	0	0	**161**
1500 to 2499	74	92	131	21	40	166	2	79	1	4	0	3	1	0	**614**
≥ 2500	124	122	135	76	69	205	5	176	6	24	2	5	0	1	**950**
Missing	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Total	**235**	**242**	**297**	**98**	**112**	**476**	**8**	**272**	**8**	**30**	**2**	**9**	**1**	**1**	**1791**

H/ER: at home/en-route, MT: Mater, CW: Causeway, LV: Lagan Valley.

Table 30 Location of initial NC (FIRST admission) by gestation.

Gest (wks.)	ALT	ANT	CAH	DH	SW	RMH	ULST	NNNI
< 28	10	7	6	0	0	29	3	55
≥ 28 & ≤ 31	31	26	50	2	6	92	18	225
≥ 32 & ≤ 33	27	36	59	6	4	62	27	221
≥ 34 & ≤ 36	69	84	101	23	42	123	75	517
≥ 37	109	105	91	61	59	196	152	773
Total	**246**	**258**	**307**	**92**	**111**	**502**	**275**	**1791**

4.2 Pregnancy and Delivery

Pregnancy and delivery details were analysed using data from the first admission to neonatal care. Note: for multiple births the mother's details are counted multiple times. However, the encrypted H&C number is available and if coverage was 100% then multiple infants could potentially be linked to same mother. For 2013 maternal H&C coverage was 1436/1791 (80.2%) with 355 cases not completed.

Problems during pregnancy were not recorded in 388 (21.7%) of cases. In all 674 (37.6%) of mothers were recorded as having no problems during this pregnancy. An extensive list of combinations of problems is available. Multiple problems are noted for each mother of an infant.

4.2.1 Diabetes (diabetes before pregnancy – excludes gestational diabetes)

Nine of 50 mothers (0.5%) were recorded as having diabetes; nine were recorded as 'unknown'. Data were missing for 1741 (97.2%) cases. Type of diabetes was not downloaded from Clevermed Ltd. but is available on the system.

4.2.2 Hepatitis B (HepB)

HepB status was recorded in 1491 of 1791(83.3%) records. However, status was recorded as 'unknown' in 72 of these 1491 (4.8%) cases. Two mothers of 1419 (14.1%) were recorded as having positive HepB high risk status.

4.2.3 Intrapartum antibiotics

Intrapartum antibiotics were administered to 571 of 1483 (31.9%) cases. Information was unavailable in 308 records.

4.2.4 Twin to Twin Transfusion

Eight cases of twin to twin transfusion were reported.

4.2.5 Drug use this pregnancy

Eighteen mothers (1.4%) were recorded as having used drugs during this pregnancy (Methadone, Opiates, Benzodiazepines, Cocaine and 'Other'). Data were missing in 542 cases.

4.2.6 Smoking status this pregnancy

Smoking status was recorded for 1660 mothers of whom 355 (21.4%) reported smoking during this pregnancy. Data were missing in 131 cases.

4.2.7 Alcohol use this pregnancy

Alcohol use during this pregnancy was recorded for 1637 mothers of whom 24 (1.5%) reported consuming alcohol this pregnancy. Data were missing in 154 cases.

4.2.8 Problems encountered this pregnancy

Four hundred and forty-three of 1444 (30.7%) mothers had no reported problems this pregnancy. Data were missing in 347 cases. The most frequently reported issues (with/without other problems) were Intra Uterine Growth Restriction (IUGR) 194 (13.4%), preterm rupture of membranes 147 (10.2%), Maternal Group B Streptococcus with/without other problems 115 (8.0%) and prolonged rupture of membranes 115 (8.0%). Fetal abnormalities were reported in 47 cases (3.1%). A full breakdown of pregnancy problems is available upon request.

4.2.9 Labour and delivery

Table 31 to 32 describe the presentation of the fetus just prior to delivery, mode of delivery and number of fetuses delivered.

Table 31 Labour presentation.

Presentation	Infants
Breech	222 (14.7%)
Cephalic	1179 (78.4%)
Transverse	18 (1.2%)
Other	33 (2.2%)
Total	**1504**
Missing data	**287**
Total	**1791**

Table 32 Mode of delivery.

Mode of delivery	Infants
Emergency CS – NOT IN LABOUR	375 (21.9%)
Emergency CS – IN LABOUR	306 (17.8%)
Elective CS NOT IN LABOUR	281 (16.4%)
Elective CS IN LABOUR	10 (0.6%)
Vaginal – forceps assisted	106 (6.2%)
Vaginal – spontaneous	567 (33.0%)
Vaginal – ventouse assisted	71 (4.1%)
Total	**1716**
Missing data	**75**
Total	**1791**

Table 33 Multiple births.

Gestational age Group (Completed weeks)	Number of Fetuses (NOF)				Total
	Singleton	Twins	Triplets	Multiple NOF not known	
< 28	41	14	0	0	**55**
28 to 31	145	74	6	0	**225**
32 to 33	143	75	3	0	**221**
34 to 36	392	118	6	0	**516**
≥ 37	748	22	0	1	**771**
Total	**1469**	**303**	**15**	**1**	**1788**

NR: Not recorded

Number of fetuses this pregnancy represents the total number of fetuses recorded at any time in the pregnancy, or after delivery, which resulted in the delivery of a baby. This excludes fetus papyraceous and fetuses reabsorbed *in-utero* and not delivered.

4.3 Destination on discharge

This section details the destination on discharge from initial admission to neonatal care (Table 34) and patterns of transfer by sending and receiving hospital (Table 35 and Table 36).

Table 34 Discharge destination after first admission to neonatal care.

Discharge destination First admission to NC)	**Infants**
Home	924 (52.1%)
Foster care	6 (0.3%)
Ward	466 (26.3%)
Died	43 (2.4%)
Transfer to another hospital for continuing care	244 (13.8%)
Transfer to another hospital for specialist care	15 (0.8%)
Transfer to another hospital for surgical care	49 (2.8%)
Transfer to another hospital for cardiac care	27 (1.5%)
Total	**1774**
Missing data	17
Total	**1791**

Table 35 Discharge destinations by sending NNU – first admissions to NC.

		Receiving																
Sending	**NT/died**	**ALT**	**ANT**	**BCH**	**CW**	**CAH**	**DH**	**GOS**	**GStT**	**HDH**	**OLLD**	**RBHSC**	**RMH**	**RVH**	**SWA**	**ULST**	***Not Known**	**Total**
ALT	228		2	0	1	0	0	1	0	0	0	4	3	0	3	4	0	**246**
ANT	212	1		0	22	3	1	0	0	1	0	7	6	0	0	3	2	**258**
CAH	249	0	1	0	0	0	26	0	0	0	0	4	13	0	4	8	2	**307**
DH	78	0	0	0	0	7		0	0	0	0	1	1	0	0	0	5	**92**
RMH	320	8	26	3	3	30	9	0	2	0	3	19		1	7	40	31	**502**
SWA	101	2	0	0	0	0	0	0	0	0	0	3	2	0	#1	0	2	**111**
ULST	251	0	2	0	0	2	0	0	0	0	0	6	9	0	0		5	**275**
Total	**1439**	**11**	**31**	**3**	**26**	**42**	**36**	**1**	**2**	**1**	**3**	**44**	**34**	**1**	**15**	**55**	**47**	**1791**

NT: Not Transferred out, BCH: Brimingham Children's Hospital, GOS: Great Ormond Street, GStT: Guys and St Thomas's, HDH: Harrogate District Hospital, OLLD: Our Lady of Lourdes Drogheda. * includes 17 records where 'Discharge destination' missing. # error in data.

Table 36 Discharge destination – all episodes of care (all admissions) by NNU.

Discharge destination All admissions to NC)	**ALT**	**ANT**	**CAH**	**DH**	**RMH**	**SWA**	**ULST**	**Total**
Home	152	160	156	78	243	82	272	1143 (55.8%)
Foster care	0	1	0	1	4	0	1	7 (0.3%)
Ward	79	82	127	43	62	35	42	470 (22.9%)
Died	5	2	4	0	31	0	5	47 (2.3%)
Transfer to another hospital for continuing care	14	39	57	10	147	3	9	279 (13.6%)
Transfer to another hospital for specialist care	2	2	3	2	3	3	3	18 (0.9%)
Transfer to another hospital for surgical care	3	6	6	0	29	3	9	56 (2.7%)
Transfer to another hospital for cardiac care	1	2	1	0	18	1	6	29 (1.4%)
Total	**256**	**294**	**354**	**134**	**537**	**127**	**347**	**2049**
Missing data	0	2	3	5	8	1	1	20
Total	**256**	**296**	**357**	**139**	**545**	**128**	**348**	**2069**

Section 5.0 NNNI Quality dashboard 2013

Benchmarking Key Audit Question (KAQ)	NI Performance	[3]NNAP Standard	NNAP Performance
How many infants, born between 32 and 36 weeks' gestation receive care on NI NNUs? (denominator: live births)	**49%**	-	**Not available.**
How many infants, born at ≥ 37 weeks' (term) gestation, receive care on NI NNUs? (denominator: live births)	**3%**	-	**Not available.**
How many infants < 27 weeks' gestation are born and receive their first neonatal care outside the regional centre (Royal Maternity)?	**46%**	-	**Not available.**
Are all mothers who deliver between 24 and 34 weeks' gestation given any dose antenatal steroid?	**90%**	**85%**	**83%**
Are all mothers at risk of preterm birth < 32 weeks' gestation given Magnesium Sulphate?	**45%**	-	-
Do all babies ≤ 28 weeks' gestation have temperature taken within one hour of admission?	**89%**	**98 to 100%**	**93%**
Temperature on admission 36.0 to 36.5^{0}C	**19%**	**10%**	**29%**
Temperature on admission 36.6 to 37.4^{0}C	**46%**	**90%**	**47%**
What proportion of infants < 33 weeks' gestation at birth, are receiving their own mother's milk when discharged home from neonatal care? (Note: discharged home directly from single admission to NC)	**45%**	**No standard set yet**	**59%**
Consultation with parents: Were parents seen by a senior member of staff within 24 hours after admission?	**70%**	**100%**	**84%**

[3]NNAP – National Neonatal Audit Programme

5.1 Scope: Key Audit Questions (KAQ)

The following key evidence-based audit questions (KAQ1, 3, 5, 6 & 7) are derived from those required by the National Neonatal Audit Programme (NNAP).[3] These have facilitated national benchmarking of NI 2013 performance with other NNUs in the United Kingdom (UK) during the same time period.[4]

The remaining key evidence- based audit questions (KAQ2 & 4) are deemed to be of clinical relevance to NNNI.

Benchmarking Key Audit Question 1 (KAQ1): How many babies, born between 32 to 36 and ≥ 37 weeks' gestation, receive care on NI NNUs?

For NI, during 2013, 3.4% (773/22482) live born term infants (greater than or equal to 37 weeks' gestation) received NC and 48.5% (738/1523) live born infants of 32 to 36 weeks' gestation, received neonatal care.

Benchmarking Key Audit Question 2 (KAQ2): How may infants < 26 weeks' gestation are born and receive their first NC outside the regional centre (Royal Maternity)?

During 2013, 9 of 25 (36.0%) infants less than 26 weeks' gestation were born outside the regional centre and 8 of 25 (32.0%) were born AND received the first episode of neonatal care OUTSIDE the regional centre.

During 2013, 20 of 41(48.8%) infants less than 27 weeks' gestation were born outside the regional centre and 19 of 41 (46.3%) were born AND received the first episode of neonatal care OUTSIDE the regional centre.

Benchmarking Key Audit Question 3 (KAQ3): Are all mothers who deliver between 24 and 34 weeks' gestation given any dose of antenatal steroid?

For NI, during 2013 there were 689 infants between 24 and 34 weeks' gestation admitted to NC with 580 of 647 (89.6%) of mothers receiving any dose of antenatal steroid. Information was unavailable in 42 cases. Note: Mothers who deliver more than one infant are counted for each infant.

Benchmarking Key Audit Question 4 (KAQ4): Are all mothers at risk of preterm birth < 32 weeks' gestation given Magnesium Sulphate?

For NI, during 2013, there were 280 infants of less than 32 weeks' gestation admitted to neonatal care with 110 of 243 (45.3%) of mothers receiving Magnesium Sulphate. Information was unavailable in 37 cases. Mothers who deliver more than one infant are counted for each infant.

Benchmarking Key Audit Question 5 (KAQ5): Do all babies ≤ 28 weeks' gestation have their temperature taken within the first hour of birth?

For NI, FIRST admissions to neonatal care during 2013, 84 of 94 (89.4%) infants less than or equal to 28 weeks' gestation had their temperature taken/ attempted within one hour of birth. Information was unavailable in three cases. Thirty-nine of 84 (46.4%) of admission temperatures were between 36.6 and 37.4 ºC, 16 of 84 (19.1%) were between 36.0 and 36.5ºC. Nine infants (10.7%) had a temperature greater than 37.4ºC. Temperature was un-recordable in three cases and these were allocated to the < 36.0 ºC category.

Table 37 Temperature taken within 1st hour of birth.

Temperature measured on admission	1st admission Temp taken within 1st hour of birth	1st admission Temp taken within 1st hr ≤ 28 weeks
Yes	882 (49.2%)	84 (89.4%)
No	848 (47.3%)	10 (10.6%)
Missing data	61	3
Total	**1791**	**97**

Table 38 Temperature (within 1 hour of birth).

Temperature (ºC)	1st admission temperatures within or after 1hr of birth	1st admission temperature within 1hr of birth	1st admission temperatures within 1 hr of birth ≤ 28 weeks
> 37.4	89 (5.1%)	46 (5.3%)	9 (10.7%)
36.6 to 37.4	977 (56.3%)	419 (48.2%)	39 (46.4%)
36.0 to 36.5	520 (30.0%)	302 (34.8%)	16 (19.1%)
< 36.0	152 (8.8%)	102 (11.7%)	20 (23.8%)
Missing data	56	13	0
Total	**1791**	**882**	**84**

Benchmarking Key Audit Question 6 (KAQ6): What proportion of babies < 33 weeks' gestation at birth, are receiving their own mother's milk when discharged from a neonatal unit?

There were 198 infants less than 33 weeks' gestation that had only one admission to neonatal care and discharged directly home. Overall, for those infants discharged home 81 of 180 (45.0%) infants were receiving some human milk at the time of discharge. Data were unavailable for 18 infants.

Table 39 Discharge milk by feeding method for infants < 33 weeks' gestation at birth and discharged home after ONE episode of neonatal care.

	Method				
Discharge Milk	**Suckling at breast**	**Suckling at breast and bottle**	**Bottle**	**Oro-gastric tube**	**Total**
Breast	18	7	22	0	49
Breast, FTF	1	4	2	0	7
Breast PTF	0	5	15	0	20
Breast, other	0	2	3	0	5
FTF	0	0	33	1	38
FTF, other	0	0	1	0	1
PTF	0	0	55	0	57
Other	0	0	3	0	3
Total	**19**	**18**	**134**	**1**	**180**

Benchmarking Key Audit Question 2 (KAQ7): Consultation with parents: Were parents seen by a senior member of staff within 24 hours after admission?

Table 40 Consultation with parents: Were parents seen by a senior member of staff within 24 hours after admission?

Seen by senior member of staff within 24 hours of admission	**N (%)**
Yes	1438 (89.3%)
No	172 (10.7%)
Unknown	151
Missing data	308
Total	**2069**

QAP8: Over 20% of the data were 'unknown' or 'missing'. There is a need to provide some mechanism to capture this data.

5.2 Discharge milk and discharge feeding method

In BNNS, discharge feeding data are available from two sources i.e. summary discharge data items 'DischargeMilk' and 'DischargeFeeding' and the more detailed daily data items which can be analysed for the day of discharge 'EnteralFeeds' and 'FeedingMethod'. Table 41 to Table 43 provide further feeding details for all infants discharged or transferred and for final discharge home.

Table 41 Feeding on discharge – all episodes of care where the infant was discharged/ transferred on BNNS (2067).

Discharge Milk	Infants
None	75 (4.2%)
Breast	415 (23.0%)
Breast, full-term formula	173 (9.6%)
Breast, pre-term formula	100 (5.5%)
Breast, other	19 (1.1%)
Full-term formula	740 (40.9%)
Full-term formula, other	3 (0.2%)
Pre-term formula	240 (13.3%)
Pre-term formula, other	2 (0.11%)
Other	41 (2.3%)
Missing data	259
Total	**2067**

Table 42 Feeding on final discharge home.

Discharge Milk	N (%)
Breast	225 (21.5%)
Breast, full-term formula	110 (10.5%)
Breast, pre-term formula	73 (7.0%)
Breast, other	11 (1.1%)
Full-term formula	417 (39.8%)
Full-term formula, other	3 (0.3%)
Pre-term formula	175 (16.7%)
Other	33 (3.2%)
Missing data	96
Total	**1143**

QAP9: Missing data rates are over 12.5% for all discharge infants and 8.4% for final discharges. It is important to complete daily data for the day of discharge.

Table 43 Feeding (discharge milk) on discharge directly home where infant had only one admission to neonatal care by NNU.

Discharge Milk	ALT	ANT	CAH	DH	RMH	SWA	ULST	Total
Breast	49 (34.0%)	32 (24.8%)	20 (19.2%)	6 (22.2%)	20 (10.7%)	20 (33.3%)	34 (17.7%)	181 (21.5%)
Breast, FTF	9 (6.3%)	9 (7.0%)	10 (9.6%)	3 (11.1%)	16 (8.6%)	2 (3.3%)	45 (23.4%)	94 (11.2%)
Breast, PTF	0 (0.0%)	1 (0.8%)	3 (2.9%)	1 (3.7%)	6 (3.2%)	4 (6.7%)	32 (16.7%)	47 (5.6%)
Breast, other	0 (0.0%)	5 (3.9%)	1 (1.0%)	0 (0.0%)	2 (1.1%)	0 (0.0%)	1 (0.5%)	9 (1.1%)
FTF	70 (48.6%)	49 (38.0%)	53 (51.0%)	13 (48.2%)	104 (55.6%)	19 (31.7%)	59 (30.7%)	367 (43.5%)
FTF, other	0 (0.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	1 (1.7%)	1 (0.5%)	3 (0.4%)
PTF	16 (11.1%)	22 (17.1%)	12 (11.5%)	4 (14.8%)	37 (19.8%)	13 (21.7%)	18 (9.3%)	122 (14.5%)
Other	0 (0.0%)	11 (8.5%)	4 (3.8%)	0 (0.0%)	2 (0.1%)	1 (1.7%)	2 (1.0%)	20 (2.4%)
Missing	**0**	**1**	**16**	**7**	**39**	**6**	**0**	**69**
Total	**144**	**130**	**120**	**34**	**226**	**66**	**192**	**912**

Abbreviations: FTF full-term formula, PTF pre-term formula.

Section 6.0 Neonatal Outcomes

6.1 Scope

This section provides an overview of mortality and key morbidity outcomes for infants born in 2013 and admitted to neonatal care.

6.2 Survival to discharge from neonatal care.

Information on final outcome was available for 1771 of 1791 (98.9%) of infants. Where information was available, the overall survival rate for infants born in 2013 and admitted to neonatal care was 97.4% with lower survival at lower gestations. For very low birth weight infants (< 1500g birthweight) 88.3% survived to discharge from neonatal care. Information was unavailable for four infants.

Table 44 Number of infants admitted to NC, Very Low Birth Weight (VLBW) infants by gestation during 2013.

Gestation (wks)	2013 Infants receiving NC	2013 Infants receiving NC Survivors	2013 VLBW (< 1500g)	2013 VLBW (< 1500g) Survivors
<22	0	NA	NA	NA
22	0	NA	NA	NA
23	0	NA	NA	NA
24	11	3/11(27.3%)	11	3/11(27.3%)
25	14	9/14(64.3%)	14	9/14(64.3%)
26	16	15/16(93.8%)	16	15/16(93.8%)
27	14	14/14(100.0%)	14	14/14(100.0%)
Sub-total EPT	55	41/55(74.6%)	55	41/55(74.6%)
28	42	35/40(87.5%)	42	35/40(87.5%)
29	44	41/43(95.4%	41	38/40(95.0%)
30	44	42/44(95.5%)	28	26/28(92.9%)
31	95	94/95(99.0%)	26	26/26(100.0%)
Sub-total VPT	225	212/222(95.5%)	137	125/134(93.3%)
32	94	91/94(96.8%)	17	16/17(94.1%)
33	127	126/127(99.2%)	8	7/8(87.5%)
Sub-total MPT	221	217/220(98.6%)	25	23/24(95.8%)
34	188	184/187(98.4%)	7	5/7(71.4%)
35	179	172/175(98.3%)	1	1/1(100.0%)
36	150	148/148(100.0%)	1	1/1(100.0%)
Sub-total LPT	517	504/510(98.8%)	9	7/9(77.8%)
≥ 37 T	773	750/764(98.2%)	1	1/1(100.0%)
Total	**1791**	**1724/1771 (97.4%)**	**227**	**197/223(88.3%)**

Extremely preterm (less than 28 weeks' gestation) EPT, Very preterm (28 to 31 weeks' gestation) VPT, Moderately preterm (32 to 33 weeks' gestation) MPT, Late preterm (34 to 36 weeks' gestation) LPT, Term (greater than or equal to 37 weeks' gestation) T

QAP10: In order to have accurate neonatal survival data for Northern Ireland all infants need to be discharged on BNNS and have completed infant journeys.

QAP11: Survival at 24 weeks' gestation may be diluted as a consequence of discrepancies in recording of gestational age for those infants born at 23 weeks' gestation.

6.3 Cause of death

Forty-seven of 1791 (2.62%) of infants born in 2013 and admitted to neonatal care died during their stay in neonatal care. Table 57 provides the causes of death. Information was not recorded in BNNS for 14 infants. Post-mortem consent was given in nine of 30 (30%) cases where information was recorded. No information was available for 17 cases. These data exclude infants who were discharged for palliative care or who died elsewhere after discharge from neonatal care.

Table 45 Cause of death.

Cause of death	Infants
Congenital abnormality +/- other (re-orientation of care, other fetal reason, other neonatal reason, other maternal reason)	11
Infection, prematurity, Necrotising Enterocolitis (NEC)	1
Intraventricular Haemorrhage +/- other (prematurity, other neonatal reason,)	3
Prematurity +/- other (reorientation of care, other neonatal reason, other fetal reason)	7
Necrotising Enterocolitis (NEC)	1
Reorientation of care, other neonatal reason	1
Other fetal reason	5
Other neonatal reason	4
Not recorded	14
Total deaths	**47**

6.4 Overall Morbidity Outcomes

It is important to note that Clevermed have only provided positive data (simple counts) for morbidity outcomes in the 2013 data download From BNNS i.e. 'no', 'Not applicable' and 'not recorded' are all 'null' values in the data download. This will be rectified for subsequent downloads.

6.4.1 KEY MORBIDITY: RESPIRATORY SYSTEM

Table 46 Respiratory activity data by Neonatal Unit (registered episodes).

NNU	Ventilation Days	CPAP Days	Oxygen Days	Oxygen Days with No Ventilation
ALT	150	1157	606	519
ANT	43	1020	877	839
CAH	60	533	759	724
DH	16	21	38	38
RMH	1109	1702	2571	1657
SWA	4	65	163	158
ULST	58	612	860	819
Total	**1440**	**5110**	**5874**	**4754**

Ventilation: Conventional and High frequency Oscillation.
CPAP: Nasal CPAP (prong or mask), BIPAP/SIPAP, High flow Oxygen/air device.

Table 47 Respiratory system outcomes and treatment during 2013.

Outcome or treatment	Infant (%)
Pneumothorax (PTX)	80/1791 (4.5%)
PTX with chest drain	42/1791 (2.4%)
Supplemental Oxygen at 36 weeks' corrected gestational age for infants ≤ 32 weeks' gestation.	25/374 (6.7%)
Supplemental Oxygen on discharge from neonatal care (home).	43/1127 (3.8%)

6.4.2 KEY MORBIDITY: CARDIOVASCULAR SYSTEM

Table 48 Cardiovascular system outcomes and treatment during 2013.

Outcome or treatment	Infant (%)			
	≤ 750g	**751 to 1000g**	**> 1000g**	**Total**
Patent ductus arteriosus (PDA)	14/22(63.6%)	8/44(18.2%)	12/1723(0.7%)	34/1791(1.9%)
PDA surgery	3/24(13.6%)	2/44 (4.5%)	2/1723(0.1%)	7/1791(0.4%)

Note: Birthweight not recorded for two infants.

6.4.3 KEY MORBIDITY: GASTROINTESTINAL SYSTEM

Table 49 Gastrointestinal system outcomes and treatment during 2013.

Outcome or treatment	Infant (%)
Necrotizing Enterocolitis (NEC) (Infants ≤ 34 weeks' gestation or < 1500g birth weight)	No 646 /684(94.4%) Confirmed 9/684 (1.3%) Suspected 29/648 (4.2%) Not known 7
NEC Treatment for suspected or confirmed (Infants ≤ 34 weeks' gestation or < 1500g birth weight)	5 Conservative treatment 33 missing data

6.4.4 KEY MORBIDITY: CENTRAL NERVOUS SYSTEM

Table 50 Central nervous system outcomes and treatment during 2013.

Outcome or treatment	Infant (%)
Infants undergoing cranial imaging (CI) on or before day 28 of life (< 32 weeks' gestation)	Data not good re: timing of scan
Head Scan first Result recorded any episode of care (< 32 weeks) Missing data 72/280 (25.7%)	Normal 145/208 (69.7%) Abnormal 63/208 (30.3%)
Periventricular-intraventricular haemorrhage (P-IVH) present (< 32 weeks' gestation)	Not available
Worst grade (P-IVH) (< 32 weeks' gestation)	Not available
Cystic-periventricular leukomalacia (CPVL) (<32 weeks' gestation)	Not available
Outcome or treatment	**Infant (%)**
Hypoxic ischaemic encephalopathy (HIE), for infants ≥ 36 weeks'	Total HIE = 56/923 (6.1%) Mild: 26 Moderate: 24 Severe: 6
Hypoxic ischaemic encephalopathy (HIE), for infants ≥ 35 weeks'	Total HIE = 58/1102 (5.3%) Mild: 26 Moderate: 25 Severe: 7
Therapeutic hypothermia ≥ 35 weeks' gestation	31/58 (53.4%)
Seizures (all infants)	45/1791 (2.5%)

QAP12: Cranial Ultrasound Scans, date of scan, time of scan and results (grade) need to be recorded on BNNS to facilitate calculation of the number of infants < 32 weeks' gestation scanned on or within 28 days of birth. Data were missing for 72 (25%) of infants.

6.4.5 KEY MORBIDITY: MAJOR SURGERY

Table 51 Major surgery during 2013.

	Infant (%)
*Any Major Surgery	9/1791
Surgical Categories	**No data available.**

Only nine infants were recorded on BNNS as having Major surgery. This is much lower than in previous years.

Fifty-two infants were transferred out to Royal Hospital for Sick Children and four were transferred to Birmingham Children's Hospital – Cardiac.

6.5 Congenital Malformations

Ninety-seven of 1791 (5.4%) of infants were recorded as having at least one congenital malformation. For ease of analyses, the NICORE congenital malformation data for 2013 have been peer reviewed by the Clinical Information Lead for the NNNI and the data have been categorised into broader groups as reported in Table 52. Further breakdown of these data are available upon request.

Table 52 Categories of congenital malformations during 2013.

Category of congenital malformation	Infants
Recognised trisomy/chromosomal syndromes	**13**
Respiratory system (e.g. pulmonary hypoplasia, diaphragmatic hernia, other respiratory)	**6**
Cardiovascular system	**30**
Central nervous system (e.g. neural tube defect, other)	**22**
Gastrointestinal (e.g. gastroschisis, exompholos, other)	**11**
Recognised malformation syndromes (e.g. vater, CAA, potter's sequence)	**12**
Genito-urinary	**6**
Musculo-skeletal	**14**
Undiagnosed dysmorphic syndromes	**8**
Hydrops fetalis (non-immune, iso-immunisation)	**0**
Endocrine	**0**
Uncategorised	**0**
Total number of malformations	**122**
Total number of infants with at least one of the above congenital malformations NI.	**97**

QAP13: Are congenital malformations being recorded on BNNS? 2012 data: 183 of 1877 infants (9.7%) were recorded as having at least ONE congenital malformation compared with 97 of 1791 (5.4%) in 2013.

Note: Eighteen infants with gastroschisis were recorded in the dedicated field 'gastroschisis' whereas only four cases were recorded in congenital malformation field.

6.6 Additional data items

Table 53 and Table 54 provide a list of additional data items extracted from BNNS which may be on interest and could be reported routinely.

Table 53 Additional data items of interest.

Data Item	Frequency
Inhaled NO_2	25/1791(1.4%)
ECMO	1/1791(0.1%)
VP Shunt surgery	4/1791(0.2%)
Ventricular drain	1/1791(0.1%)
Phototherapy	490/1791(27.4%)
Immunoglobulins	8/1791(0.5%)
Prostin	20/1791(1.1%)
Stoma	6/1791(0.3%)
Rectal washout	1/1791(0.1%)
Glucose electrolyte	1098/1791(61.3%)
Skin to skin	1131/1791(63.1%)
Neonatal Abstinance Syndrome	7/1791(0.4%)
Exchange Transfusion	8/1791(0.4%)
Full exchange transfusion	7/1791(0.4%)
Partial exchange transfusion	7/1791 (0.4%)
Tracheostomy	5/1791(0.3%)
Peritoneal dialysis	0/1701(0.0%)

Table 54 Additional data items by neonatal unit.

NNU	Parental nutrition days	Central line days
ALT	675	554
ANT	729	207
CAH	298	303
DH	5	0
RMH	2138	922
SWA	18	11
ULST	480	338
Total	**4343**	**2335**

Section 7.0 Demographics

7.1 Scope

This section provides an overview of the demographic profile for parents of infants admitted to neonatal care. Overall, parent characteristics were poorly documented.

7.2 Characteristics of fathers

Occupation was missing in 1433 (80.0%) of cases. There is also a needs for some categorisation procedure. Ethnicity was missing in the majority of cases 1484 (82.9%) of cases.

7.3 Characteristics of mothers

In the majority of cases 1086 (60.6%) mother's occupation was not recorded. Marital status was not recorded for 308 (17.2%) mothers. In 1139 (63.6%) of cases the mother's ethnicity was not recorded. In 465 (26%) of cases the mother's age was not recorded. There is a need to assign age group categories of clinical interest.

Table 55 Marital status of mother.

Marital Status	N (%)
Civil Partnership	2 (0.1%)
Married	875 (59.0%)
Married / Single supported	6 (0.4%)
Single supported	495 (33.4%)
Single unsupported	52 (3.5%)
Recorded as Unknown	53 (3.6%)
Missing data	308
Total	**1791**

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Appendix

- **Data Quality ‘Aide Memoire’ key indicators**

BENCHMARKING WITH BADGER

Can you answer these key clinical questions using the data items that you have entered for your discharged infant?

Was the infant's temperature measured within one hour after admission to your NICU?

Did the infant undergo cranial imaging (US/CT/MRI) on/or before day 28 of life? What was the Worst grade PIH?

Did the infant receive any oxygen on day 28 of life?

Did the infant receive any of the following at 36 weeks' adjusted gestation? Oxygen, conventional ventilation, high frequency ventilation, high flow nasal cannula, nasal IMV, nasal SIMV or nasal CPAP.

Did the infant develop any late bacterial Sepsis and/or Meningitis (after day 3 of life)? Coagulase Negative Staph or another pathogen?

Did the infant undergo a retinal exam prior to discharge? If so, what was the worst stage ROP?

What was the enteral feeding on discharge?

Have you discharged this infant on Badger?