NNAP
National Neonatal Audit Programme

RCPCH Audits

National Neonatal Audit Programme 2020 Annual report on 2019 data

"This is a photo of my son, Benjamin (born at 33+4 weeks) being soothed by his older sister as he receives phototherapy in his incubator."

Rebecca Owen, Mother

HQIP
Healthcare Quality Improvement Partnership

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Leading the way in Children's Health

NNAP

National Neonatal Audit Programme

National Neonatal Audit Programme (NNAP) 2020 annual report on 2019 data

The National Neonatal Audit Programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage and develop the NCAPOP, comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies www.hqip.org.uk/national-programmes.

Data management, analysis and statistical services are provided by the Neonatal Data Analysis Unit, Imperial College London.

RCPCH Royal College of Paediatrics and Child Health *Leading the way in Children's Health*

HQIP Healthcare Quality Improvement Partnership

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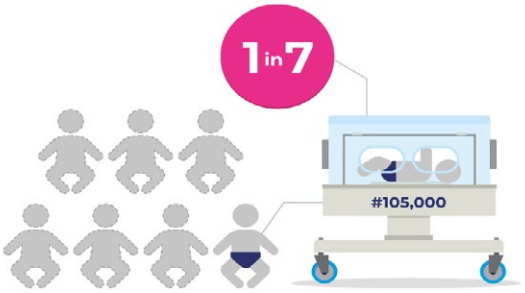
Background



1 in 7 babies have too low a birth weight or have a medical condition that requires specialist treatment. In this report the National Neonatal Audit Programme (NNAP) focuses on key measures of the care provided to babies in 2019 in the 181 neonatal services in England, Wales, Scotland and the Isle of Man.

The NNAP uses routine data collection to report on a range of care processes and outcomes throughout the pathway of neonatal care, from antenatal interventions to follow-up of developmental outcomes after discharge from neonatal care. For most audit measures, this 2020 report looks at care provided to babies with a final discharge from neonatal care between 1 January 2019 and 31 December 2019. This report includes network level reporting of mortality until discharge from the neonatal unit, and adherence to neonatal nurse staffing standards, for only the second time. In this report we also describe the rates of maternal breastmilk feeding at 14 days of age, for the first time.

Conclusion

UK neonatal professionals, together with the NNAP team, have demonstrated that aspects of neonatal care continue to improve. Examples include ongoing improvements in use of magnesium sulphate, and improvements in thermal care of very preterm infants – which is as good or better than any nation in the world. Such improvements show that we can modernise our care. Processes, such as measures of parental partnership in care, on-time screening for retinopathy of prematurity and developmental follow-up, are also improving.

Neonatal professionals, working with parents and others, need to use this demonstrated ability to deliver improvement to address the marked variations in care that this report highlights. The important variations observed in measures of process are now clear in outcomes such as infection, bronchopulmonary dysplasia, necrotising enterocolitis and death. Neonatal care should continue to improve and we need to learn from one another – to be partners in improvement.

The recommendations this report makes are designed to support networks and hospitals in planning and delivering improvements to their care. They have been developed by a large multi-professional consensus group with wide representation. Careful attention has been given to describing, and making recommendations about improving, neonatal unit nurse staffing. Some recommendations may not be applicable or helpful to every service, but all networks and units should relate each recommendation to their own priorities and their audit results. Unit and network level results are visible on NNAP Online.

Key Messages

Key message 1: Mortality until discharge home in very preterm babies

Rates of mortality in very preterm babies (less than 32 weeks' gestational age) vary widely among the 14 networks, from 4.5% to 9.0%. Variations in case mix do not explain differences in mortality.

Key message 2: Neonatal outcomes

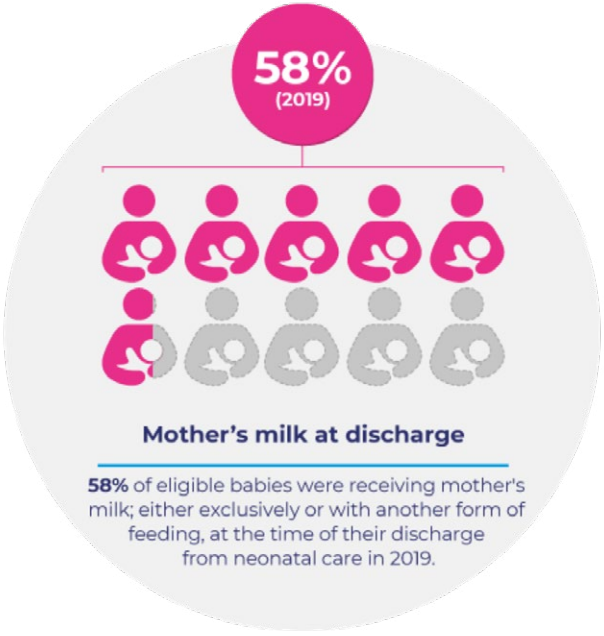
This audit shows that outcomes, such as bronchopulmonary dysplasia (BPD), necrotising enterocolitis (NEC) and late onset neonatal infection, vary strikingly between neonatal units and networks in a way that is unlikely to be explained by patient characteristics.

Key message 3: Ongoing improvement in care processes

Improvements in care processes, such as thermoregulation (cold babies experience more complications) and administration of intravenous magnesium sulphate (which improves neurodevelopmental outcome in the least mature babies) demonstrate the ability of perinatal teams to alter their care in light of published quality improvement objectives. However, unwarranted variation in these and other measures of care persists among neonatal units and networks, which identifies further opportunities for improvement of care. Nurse staffing, in particular, remains well below nationally agreed desired levels.

Key message 4: Rates of breastmilk feeding

The proportion of very preterm infants fed with some of their mother's own milk at the time of discharge has remained persistently low over 5 years, with marked geographical variation.



NNAP Recommendations

Recommendation (1) – Antenatal Steroids (Key Finding A):

Neonatal units and obstetric services should work as a perinatal team to:

- Optimise the timing and dosing of antenatal steroids for eligible babies
- Avoid the inappropriate use of multiple courses
- Adopt evidence-based practices to predict preterm birth, by using the following guidance and methodologies to guide improvement:
  - BAPM Perinatal Optimisation Care Pathway Toolkit
  - Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) quality improvement programme
  - Scottish Patient Safety Programme

To help reduce the severity of respiratory disease and other serious complications in preterm babies.

The National Maternity and Perinatal Audit (NMPA) should:

Consider developing reporting of antenatal steroid use in order to encourage timely exposure of eligible infants to it.

Recommendation (2) – Antenatal magnesium sulphate (Key finding B):

Neonatal networks, units and obstetric services should work as a perinatal team to:

- Ensure that all women who may deliver their baby at less than 30 weeks' gestational age are offered magnesium sulphate where possible
- Adopt and implement the following guidance and methodologies to guide improvement:
  - BAPM Perinatal Optimisation Care Pathway Toolkit
  - Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) quality improvement programme
  - Scottish Patient Safety Programme

To help reduce the risk of babies who are born prematurely developing cerebral palsy.

Recommendation (3) – Birth in a centre with a NICU (Key finding C):

Departments of Health in England, Scotland and Wales and Neonatal Networks should:

Prioritise structural changes and operational management to ensure that babies who require intensive care are cared for in the units best equipped to deliver it.

Local Maternity Systems (LMS) and equivalent bodies in devolved nations should:

- Ensure that appropriate clinical pathways exist

To enable delivery of intensive care to all infants where this is required, with a minimum of postnatal transfers.

Recommendation (4) – Parental consultation within 24 hours of admission (Key finding D, E):

Neonatal units with lower rates of parental consultation, and particularly those with low outlying performance, should:

- Reflect on their rates of parental consultation
- Use a quality improvement approach and consider using novel means such as video calls where parents are unable to enter the neonatal unit

In order to improve parental partnership in care.

Recommendation (5) – Parental presence at consultant ward rounds (Key findings F, G):

Neonatal units, in collaboration with parents, should:

Build relationships and trust between parents, family members and neonatal unit staff by:

- Understanding the unique role of parents as partners in care, and involving them in developing and updating care plans and decision making
- Empowering parents to feel comfortable and able to contribute to discussions about their baby's care
- Taking the time to explain to parents why decisions about aspects of care are being suggested
- Reflecting on audit results with parents, identifying the reasons for any gaps in parental presence on ward rounds, any lack of consultant wards or documentation of consultant ward rounds, and working with parents to address any barriers to participation identified

So that parents are partners in the care of their baby in the neonatal unit.

Recommendation (6) – On-time screening for retinopathy of prematurity (ROP) (Key findings H, I J, K):

Neonatal Intensive Care Units (NICUs) with persistently low levels of ROP screening should ensure that:

- Babies requiring ROP screening are accurately identified
- Safety systems for appropriate ROP screening are in place

So that babies who are at the highest risk of loss of vision, can be screened and receive timely treatment if required.

Neonatal Networks with low rates of ROP screening should:

- Implement a mechanism for real time measurement of their unit's adherence to ROP screening guidelines

So that they can identify where related quality improvement activities need to be undertaken.

Recommendation (7) – Infection (Key Findings L, M, N, O):

Neonatal units with higher reported rates of infection should:

- Compare practices with units with lower rates of infection, identified via NNAP Online and consider whether their rates of infection could be decreased
- Ensure that their use of evidence-based infection reduction strategies is optimised

In order to minimise the number of babies infected in their units.

Neonatal networks and units with both low and high rates of infection should:

- Facilitate invitations for units with higher rates of infection to visit units with lower rates in order to jointly agree whether potentially better practices could be used and consider requiring units to participate in such quality improvement activity
- Ensure that the proposed visits should be multidisciplinary and focussed on identification and implementation of potentially better practices including "infection prevention bundles"

In order to reduce the risk of exposing sick and premature babies to infection.

Recommendation (8) – Bronchopulmonary dysplasia (BPD) (Key Finding P):

Neonatal units with high treatment effect should:

- Seek to identify potentially better practices from neonatal units with lower treatment effect

Neonatal units and networks should:

- Seek to understand the extent to which care practices explain the differences in rates of BPD
- Implement potentially better care practices, including any identified from NICE guidance about specialist respiratory care

The British Association of Perinatal Medicine (BAPM) should:

- Consider developing a care pathway identifying potentially better practices and the optimal means for their implementation

In order to reduce the proportion of babies affected by bronchopulmonary dysplasia.

Recommendation (9) – Necrotising entercolitis (NEC) (Key findings Q, R):

Units with validated NEC data should:

- Compare their rates of NEC to those of other comparable units with validated data, and if their rates of NEC are relatively high, seek to identify and implement potentially better practices

In order to reduce the associated higher risk of mortality and, for those babies who survive, the risk of longer term developmental, feeding and bowel problems.

All neonatal units should:

- Ensure the accurate recording of NEC diagnoses

In order to facilitate valid comparisons of the rates of NEC, and the development of preventative measures based on variations in rates of NEC.

Recommendation (10) – Minimising separation of mother and baby (term and late preterm) (Key finding S):

Neonatal networks should:

- Review the admission durations of their units, alongside admission rates, as part of planning maximally effective use of neonatal bed days

Neonatal and maternity teams should:

- Ensure discharge practices minimise inappropriate separation of mother and baby
- Consider introducing measures to facilitate timely discharge such as criterion-based discharge
- Consider delivering some care as transitional care

So that babies born at term and late preterm admitted to neonatal units are not separated from their mothers for longer than is necessary.

Recommendation (11) – Breastmilk feeding at discharge home (Key findings T, U, V):

Neonatal units and networks should:

Focus on both the early initiation and sustainment of breastmilk feeding in conjunction with parents by:

- Reviewing data and processes in order to undertake selected quality improvement activities suited to the local context
- Removing barriers to successful breastmilk feeding by ensuring that appropriate and comfortable areas are provided with adequate, regularly cleaned expressing equipment
- Seeking and acting on feedback from local parents on their experience of starting and sustaining breast feeding
- Working to achieve and sustain both UNICEF UK Baby Friendly Initiative Neonatal Unit accreditation and Bliss Baby Charter accreditation
- Implementing the guidance and evidence-based care practices set out in the BAPM Maternal Breastmilk Toolkit
- Working with local parents to review and improve local practices around the early communication of the benefits of breastmilk, ideally prior to birth wherever possible

So that the many health benefits to the preterm baby and the mother of breastfeeding can be realised.

Recommendation (12) – Follow-up at two years of age (Key finding W):

Neonatal units should:

Produce detailed plans to provide or organise follow up of care for preterm babies in accordance with NICE guidance and consider arrangements for:

- Communicating with families about follow up at discharge
- Families who live far from the hospital of care
- Families who do not attend appointments
- Families who move to different areas
- Completing and documenting assessments made

So that very preterm babies can be monitored and checked for any problems with movement, the senses, delays in development or other health problems and so that parents can get reassurance about how their baby is developing, and any support that they might need.

The British Association for Neonatal Neurodevelopmental Follow Up (BANNFU) should:

- Describe and promote best practice and successful models of delivery of high rates of follow up using appropriate instruments

To improve the long-term outcomes of all babies that have had neonatal care.

Recommendation (13) – Mortality until discharge home in very preterm babies (Key finding X):

Neonatal networks and their constituent neonatal units should, following a review of local mortality results, take action to:

- Consider whether a review of network structure, clinical flows, guidelines and staffing may be helpful in responding to local mortality rates
- Consider a quality improvement approach to the delivery of evidence-based strategies in the following areas to reduce mortality: timely antenatal steroids, deferred cord clamping, avoidance of hypothermia and management of respiratory disease
- Ensure that shared learning from locally delivered, externally supported, multi-disciplinary reviews of deaths (including data from the local use of the Perinatal Mortality Review Tool) informs network governance and unit level clinical practice

The patient safety team in NHS Improvement and equivalent bodies in the devolved nations should:

- Facilitate national dissemination of learning from mortality reviews

Recommendation (14) – Nurse staffing in neonatal units (Key finding Y):

Departments of Health in England, Scotland and Wales should:

- Ensure that sufficient resources are available for the education and employment of suitably trained professionals to meet and maintain nurse staffing ratios described in service specifications

Universities and Health Education England or equivalent bodies in the devolved nations should:

- Consider revising, renewing and standardising models of specialist neonatal nursing education

In order that future rises in numbers of nurses who are qualified in speciality result in the comparable increments in nursing expertise in different neonatal networks, universities and Health Education England

Neonatal Units and Neonatal Networks should:

- Prioritise data quality assurance in submitting nurse staffing data
- Monitor adherence to recommended nurse staffing standards
- Develop action plans to address any deficits in nursing staffing and skill mix

So that babies and their parents are cared for at all times by the recommended number of trained professionals.

1. Introduction

Established in 2006, the National Neonatal Audit Programme (NNAP) is a national clinical audit of NHS-funded care for babies admitted to neonatal services in England, Scotland, Wales and the Isle of Man. Approximately 1 in 7 babies will require neonatal care because they are born too early, have too low a birth weight or have a medical condition that needs specialist treatment.

The audit reports on key measures of the process and outcomes of neonatal care and supports professionals, families and commissioners to improve the care provided to babies requiring specialist treatment. The NNAP aims to assess the care given to babies admitted to neonatal units and identify areas for quality improvement. For more about our aims, see Appendix I: Aims of the NNAP.

The NNAP is delivered by the Royal College of Paediatrics and Child Health (RCPCH), commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England, the Scottish Government and the Welsh Government.

This is the 12th annual NNAP report published by the RCPCH. Previous reports can be downloaded from: www.rcpch.ac.uk/national-neonatal-audit-programme.

1.1. Scope

Since starting in 2006, the scope of the audit has evolved to reflect developments in care delivery and progress made by neonatal services in delivering that care. Progress in data completeness and national compliance in the audit measures from the point of their introduction show the power of national reporting to drive change. Long-standing measures such as administration of antenatal steroids and on-time retinopathy of prematurity (ROP) screening now achieve high rates of data completeness and high rates of compliance nationally. Variation still exists regionally and locally, highlighting the importance of continuing to report and benchmark through audit.

The audit continues to evolve. Measures included in the audit are reviewed and developed in consultation with stakeholders and with consideration of new guidelines and evidence. A full guide to the audit measures for the 2019 data year is available at: https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme-nnap/about

1.2. NNAP governance

The audit is governed by a Project Board, chaired by the RCPCH Vice President for Science and Research. It comprises members from key stakeholder organisations and groups, including several parent representatives. The Methodology and Dataset Group assists the Project Board with technical matters, such as analysis planning, presentation of results, and development and review of measures.

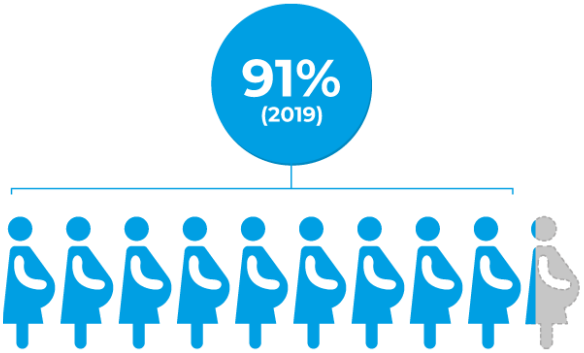
The Project Board is responsible for overseeing the audit and providing oversight and advice to the programme. Clinical accountability is provided by the Vice President for Science and Research. Clinical leadership is provided by the NNAP Clinical Lead and organisational and contractual accountability is provided by the RCPCH Director of Research and Quality Improvement. The Neonatal Data Analysis Unit (NDAU) provide data analysis, statistical expertise, data management and data storage.

Appendix D includes more information about governance of the NNAP and a list of Project Board and Methodology and Dataset members.

2. Results, key findings and recommendations

2.1. Antenatal steroids

Is a mother who delivers a baby between 23 and 33 weeks' gestational age inclusive given at least one dose of antenatal steroids?



Babies born at less than 34 weeks' gestational age sometimes have breathing difficulties in the first few days after they are born. Antenatal steroids are a powerful health intervention, given to mothers by obstetricians and midwives before delivery of a preterm baby. Antenatal steroids help reduce breathing difficulties (respiratory distress syndrome) and reduce the likelihood of other serious complications, such as bleeding into the brain. The NNAP developmental standard is that 85% of eligible mothers should receive at least one dose of antenatal steroids. *For more information on this measure, check out our* measures guide.

Results

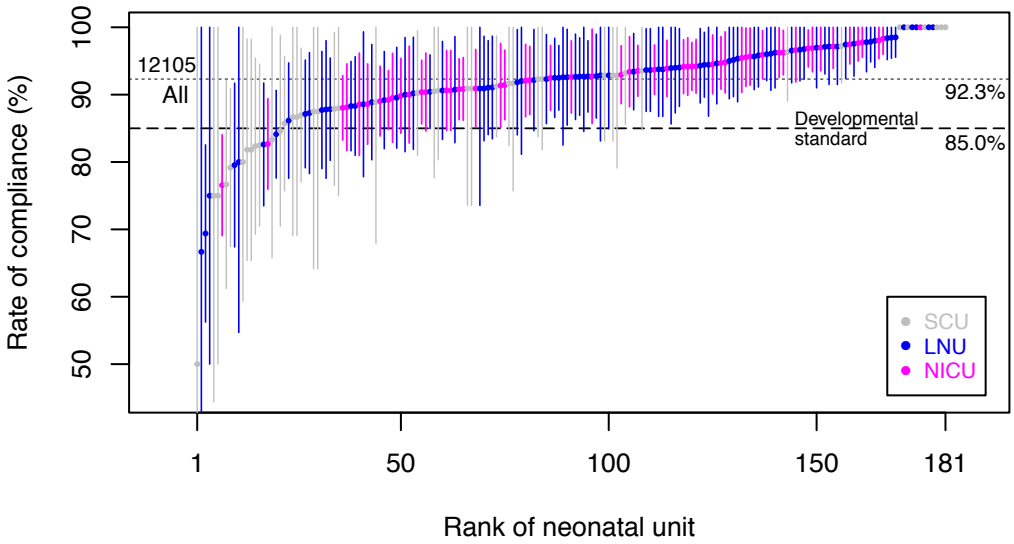
12,397 eligible mothers were identified from data submitted for 14,182 babies by 181 neonatal units and 22 places of birth not allied with an NNAP participating unit. If the mother delivered at home, in transit, in an unknown location or in a maternity unit not allied to an NNAP participating unit, these results are not included in Figure 1 and Figure 2. Figure 2 does not include the Isle of Man.

Table 1. Administration of antenatal steroids, by neonatal unit level.

Unit level	Eligible mothers	With data entered	Steroids given	Steroids not given	Missing data
Other*	251	243	103 (42%)	141 (58%)	7 (2.8%)
SCU	1,061	1,048	930 (88.7%)	118 (11.3%)	13 (1.2%)
LNU	4,667	4,653	4,300 (92.4%)	353 (7.6%)	14 (0.3%)
NICU	6,418	6,404	5,944 (92.8%)	460 (7.2%)	14 (0.2%)
Total	**12,397**	**12,348**	**11,277 (91.3%)**	**1,072 (8.7%)**	**48 (0.5%)**

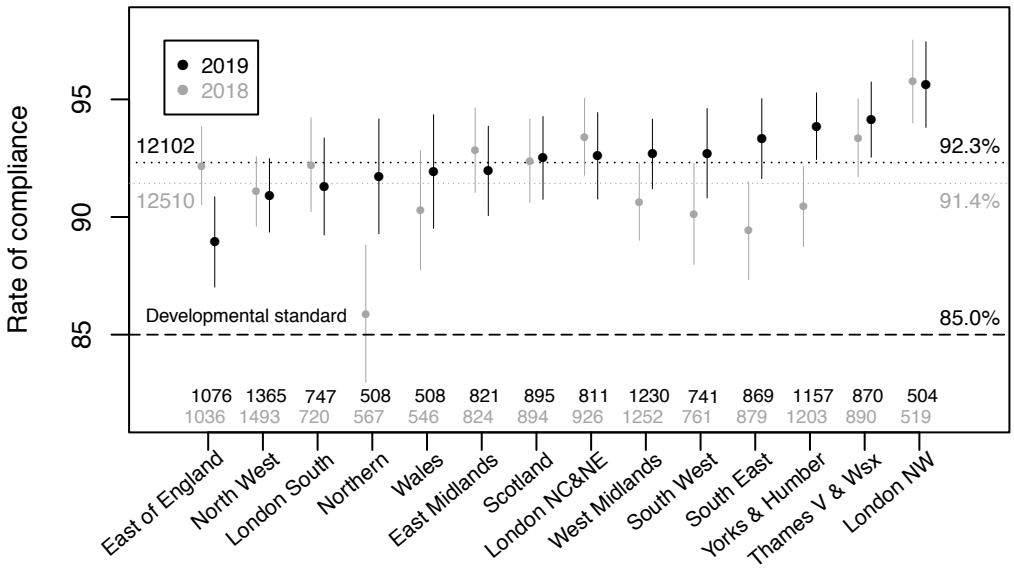
**Delivered at home, in transit, in an unknown location or in a maternity unit not allied to an NNAP participating unit.*

Figure 1. Caterpillar plot of the rates of administration of antenatal steroids: neonatal units, 2019.



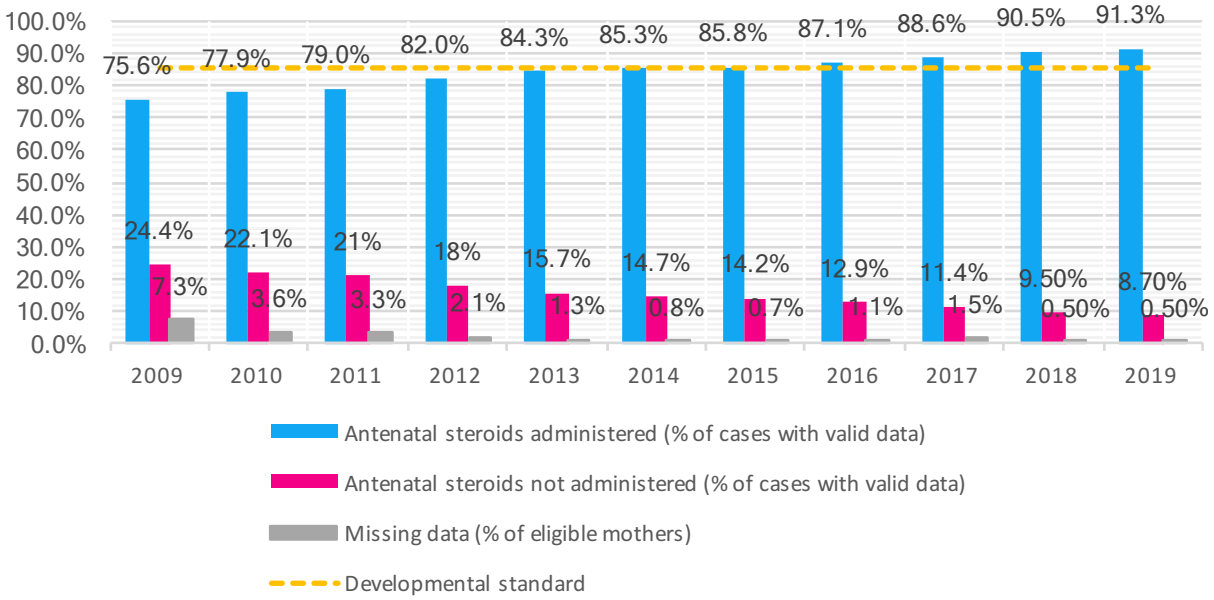
Rates of administration of antenatal steroids are presented by dots. NICUs are shown in pink, LNUs in blue and SCUs in grey. The 95% confidence intervals for a unit are shown by a vertical line with each dot. The developmental standard is shown by a bold dashed line, and the national rate is indicated by a grey dotted line. Neonatal units are presented in the ascending order of the rates and can be identified on NNAP Online.

Figure 2. Caterpillar plot of the rates of administration of antenatal steroids: neonatal networks, 2018 and 2019.



Rates of administration of antenatal steroids are presented by black dots and the 95% confidence intervals are indicated by vertical bars. The networks are presented in the ascending order of the rates. The national rate is represented by the line with short dashes and the developmental standard is represented by the line with long dashes.

Figure 3. Administration of antenatal steroids, cases with data entered, by NNAP reporting year (2009 to 2019).



Note: The gestational age inclusion criteria changed in 2018 from 24 to 34 weeks inclusive to 23 to 33 weeks inclusive.

Key Findings and Recommendations

Key finding (A) – Antenatal Steroids

At least one dose of antenatal steroids was administered to 91.3% (11,277 of 12,397) of women whose baby was born at 23-33 weeks' gestation and was admitted for neonatal care. This national level coverage was higher than in 2018 (90.5%). Some rapid improvements since 2018 can be seen in many networks, but low outliers can also be detected at both unit and network levels.

Recommendation (1):

Neonatal units and obstetric services should work as a perinatal team to:

- Optimise the timing and dosing of antenatal steroids for eligible babies
- Avoid the inappropriate use of multiple courses
- Adopt evidence-based practices to predict preterm birth, by using the following guidance and methodologies to guide improvement:
  - BAPM Perinatal Optimisation Care Pathway Toolkit
  - Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) quality improvement programme
  - Scottish Patient Safety Programme

To help reduce the severity of respiratory disease and other serious complications in preterm babies.

The National Maternity and Perinatal Audit (NMPA) should:

Consider developing reporting of antenatal steroid use in order to encourage timely exposure of eligible infants to it.

2.2. Antenatal magnesium sulphate

Is a mother who delivers a baby below 30 weeks' gestational age given magnesium sulphate in the 24 hours prior to delivery?

Giving magnesium sulphate to women who are at risk of delivering a preterm baby reduces the chance that their baby will develop cerebral palsy by 32%.[i] The NICE quality standard Preterm Labour and Birth recommends that all women who may deliver their baby at less than 30 weeks' gestational age are offered magnesium sulphate where possible.[ii] The NNAP developmental standard is that 85% of eligible mothers should receive antenatal magnesium sulphate, which maps to the target in the NHSE PRECEPT programme. *For more information on this measure, check out our measures guide*.

Results

3,991 eligible mothers were identified from data submitted for 4,469 babies by 179 neonatal units and 12 places of birth not allied with an NNAP participating unit. If the mother delivered at home, in transit, in an unknown location, Isle of Man or in a maternity unit not allied to an NNAP participating unit, these results are not included in Figure 4 and Figure 5. Figure 6 does not include the Isle of Man.

Table 2. Administration of magnesium sulphate, by neonatal unit level.

Unit level	Eligible mothers	With data entered	Magnesium given	Magnesium not given	Missing (% of eligible mothers)
Other*	98	95	27 (28.7%)	68 (71.3%)	3 (3.1%)
SCU	178	175	127 (72.6%)	48 (27.4%)	3 (1.7%)
LNU	1,080	1,067	867 (81.2%)	200 (18.8%)	13 (1.2%)
NICU	2,635	2,623	2,230 (85%)	393 (15%)	12 (0.5%)
Total	**3,991**	**3,960**	**3,251 (82.1%)**	**709 (17.9%)**	**31 (0.8%)**

**Delivered at home, in transit, in an unknown location or in a maternity unit not allied to an NNAP participating unit.*

Figure 4. Caterpillar plot of the rates of compliance for administration of magnesium sulphate: neonatal units, 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

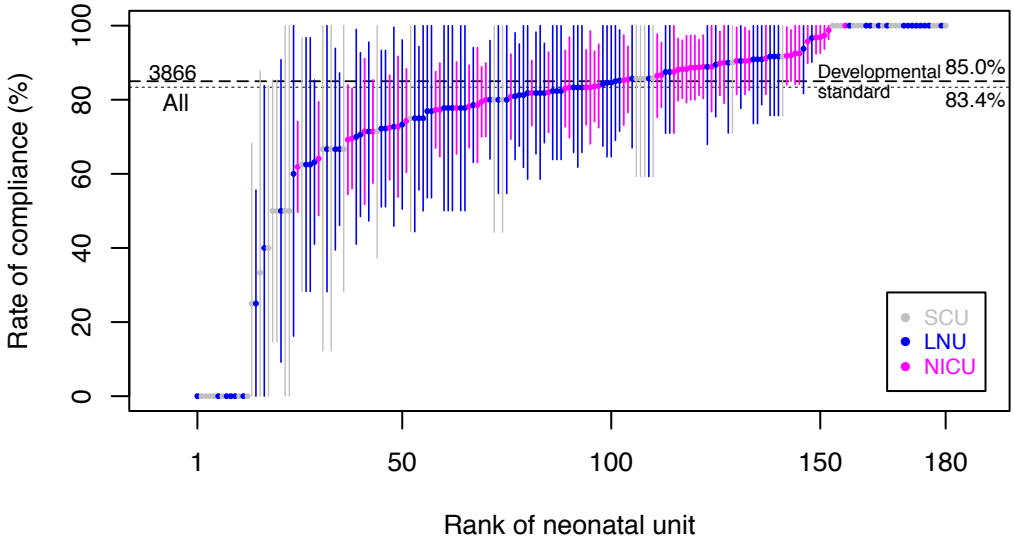


Figure 5. Caterpillar plot of the rates of compliance for administration of magnesium sulphate: neonatal networks, 2018 and 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

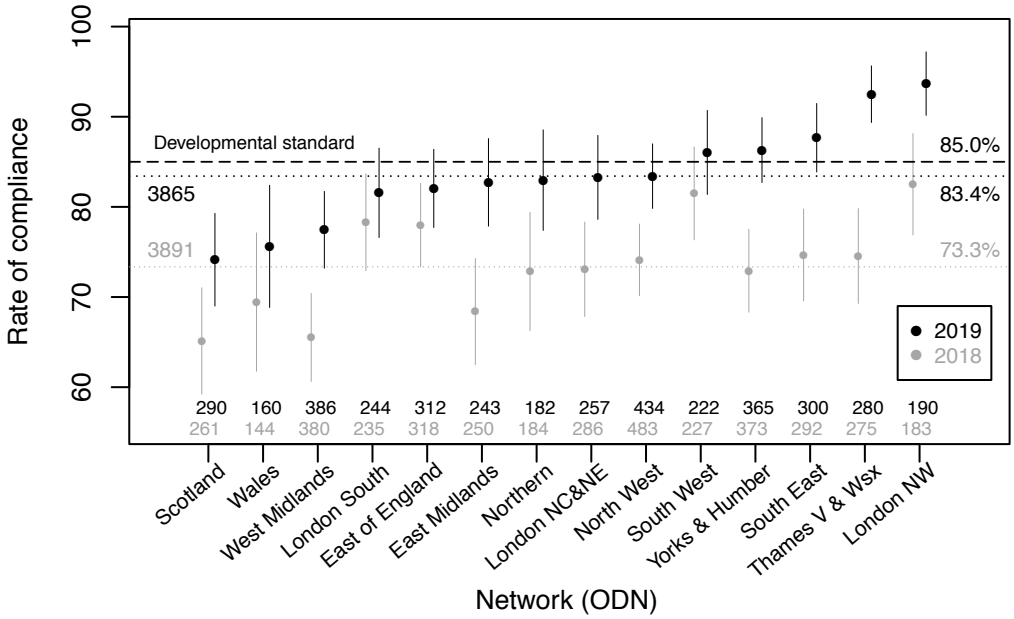
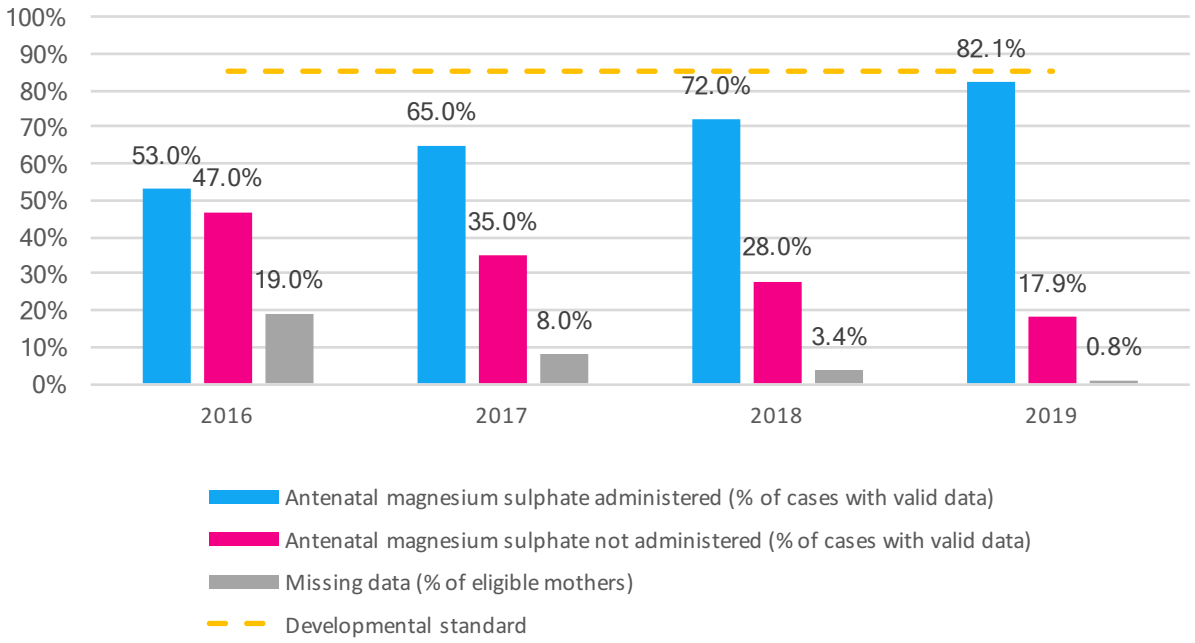


Figure 6. Antenatal magnesium sulphate administered, by NNAP reporting year (2015-2019).



Key Findings and Recommendations

Key finding (B) – Antenatal magnesium sulphate

The rate of administration of antenatal magnesium sulphate has risen markedly by over 10% since 2018 (2016 – 53%; 2017 – 64%; 2018 – 72%; 2019 – 82%). Rates of missing 2019 data are very low (<1%). The lower rates of magnesium sulphate administration in the Wales and Scotland neonatal networks in 2019 may be indicative of the effectiveness of the PReCePT quality improvement programme, which is centrally funded and regionally delivered in England.

Recommendation (2):

Neonatal networks, units and obstetric services should work as a perinatal team to:

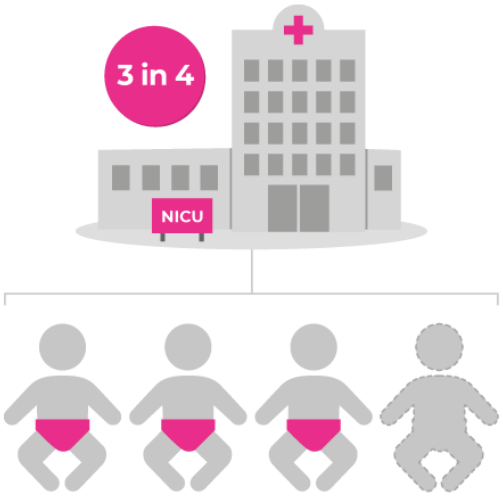
- Ensure that all women who may deliver their baby at less than 30 weeks' gestational age are offered magnesium sulphate where possible
- Adopt and implement the following guidance and methodologies to guide improvement:
  - BAPM Perinatal Optimisation Care Pathway Toolkit
  - Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) quality improvement programme
  - Scottish Patient Safety Programme

To help reduce the risk of babies who are born prematurely developing cerebral palsy.

2.3. Birth in a centre with a neonatal intensive care unit (NICU)

Is an admitted baby born at less than 27 weeks' gestational age delivered in a maternity service on the same site as a designated NICU?

Babies who are born at less than 27 weeks' gestational age are at high risk of death and serious illness. National recommendations in England and Scotland[iii,iv,5] state that neonatal networks should aim to configure and deliver services to increase the proportion of babies at this gestational age being delivered in a hospital with a neonatal intensive care unit (NICU) on site. This is because there is evidence that outcomes improve if such premature babies are cared for in a NICU from birth. At least 85% of babies born at less than 27 weeks' gestational age should be delivered in a maternity service on the same site as a NICU. Whether networks are optimally configured should be considered when interpreting high rates of performance on this measure. *For more information on this measure, check out our* measures guide.



Results

Figure 7. Caterpillar plot of the rates of birth of babies of less than 27 weeks' gestation in a centre with a NICU: neonatal networks, 2018 and 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation. The Isle of Man is not included in this figure.

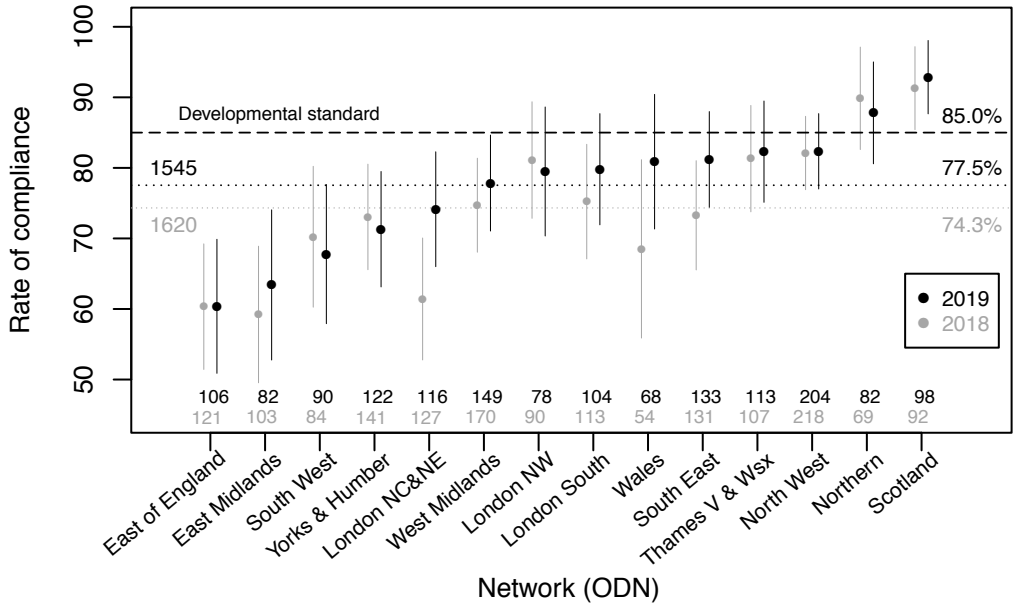


Table 3. Birth of babies of less than 27 weeks' gestation in a centre with a NICU by NNAP reporting year, 2018-2019. Isle of Man is included here.

Year	Babies	Delivery location	
		Hospital with Designated NICU (%)	Other (%)
2018	1,620	1,204 (74.3%)	416 (25.7%)
2019	1,546	1,198 (77.5%)	348 (22.5%)

Key findings and Recommendations

Key finding (C) – Birth in a centre with a neonatal intensive care unit (NICU)

The proportion of babies born at less than 27 weeks' gestation in a hospital with an on-site NICU has improved only marginally from 2018 to 2019 (from 74.3% to 77.5%). This is a major concern because of the evidence that outcomes are improved when the least mature babies are cared for in a NICU. Most networks have improved only marginally since 2018, although the London North Central and East, and Wales networks have achieved improvements of more than 12% in a single year.

Recommendation (3):

Departments of Health in England, Scotland and Wales and Neonatal Networks should:

Prioritise structural changes and operational management to ensure that babies who require intensive care are cared for in the units best equipped to deliver it.

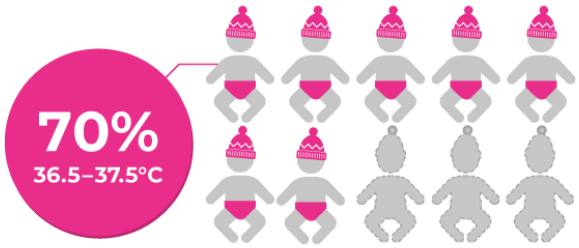
Local Maternity Systems (LMS) and equivalent bodies in devolved nations should:

- Ensure that appropriate clinical pathways exist

To enable delivery of intensive care to all infants where this is required, with a minimum of postnatal transfers.

2.4. Promoting normal temperature on admission for very preterm babies

Does an admitted baby born at less than 32 weeks' gestational age have a first temperature on admission that is both between 36.5–37.5°C and measured within one hour of birth?



Low admission temperature is associated with an increased risk of illness and death in preterm babies. Low temperature (or hypothermia) is a preventable condition in vulnerable newborn babies. Staff on the neonatal unit need to know if a baby is too cold or too hot, so they can take appropriate action.

This NNAP measure assesses neonatal units' success in achieving a normal first temperature within an hour of birth in very preterm babies. The NNAP developmental standard is that temperature should be taken within an hour of birth for all eligible babies. At least 90% of babies should have a temperature taken within an hour of birth with the result in the normal range. *For more information on this measure, check out our* measures guide.

Results

7,435 babies were born very preterm (gestation less than 32 weeks) in 180 NNAP units and 8 'Other' places of birth not associated with an NNAP participating unit. For 3 babies the temperature was reportedly not taken, and for 19 babies temperature and/or timing data were missing. Place of delivery is classified as 'Other' if the mother delivered at home, in transit, in an unknown location or in a non-NNAP unit. Figure 8 and Figure 9 do not include 'other' delivery locations and Figure 9 does not include the Isle of Man.

Table 4. Temperature on time and within normal range, by neonatal unit level.

Unit Level	Babies	With data entered	Temperature taken on time					After hour	Not taken	Un-known
			< 32°C	32-35.9°C	36-36.4°C	36.5-37.5°C	> 37.5°C			
Other*	85	83	2 (2.4%)	28 (33.7%)	7 (8.4%)	27 (32.5%)	6 (7.2%)	12	1	2
SCU	450	447	0 (0%)	20 (4.5%)	71 (15.9%)	287 (64.2%)	48 (10.7%)	21	0	3
LNU	2,468	2,465	0 (0%)	96 (3.9%)	306 (12.4%)	1,698 (68.9%)	312 (12.7%)	53	0	3
NICU	4,432	4,421	2 (0%)	114 (2.6%)	482 (10.9%)	3,174 (71.8%)	547 (12.4%)	100	2	11
Total	**7,435**	**7,416**	**4 (0.1%)**	**258 (3.5%)**	**866 (11.7%)**	**5,186 (69.9%)**	**913 (12.3%)**	**186**	**3**	**19**

**Delivered at home, in transit, in an unknown location or in a maternity unit not allied to an NNAP participating unit.*

Figure 8. Caterpillar plot of the rates of compliance for very preterm infants' temperature on admission (measured on time, and in normal range): neonatal units, 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation. Units are presented in ascending order of the rates and can be identified on NNAP Online.

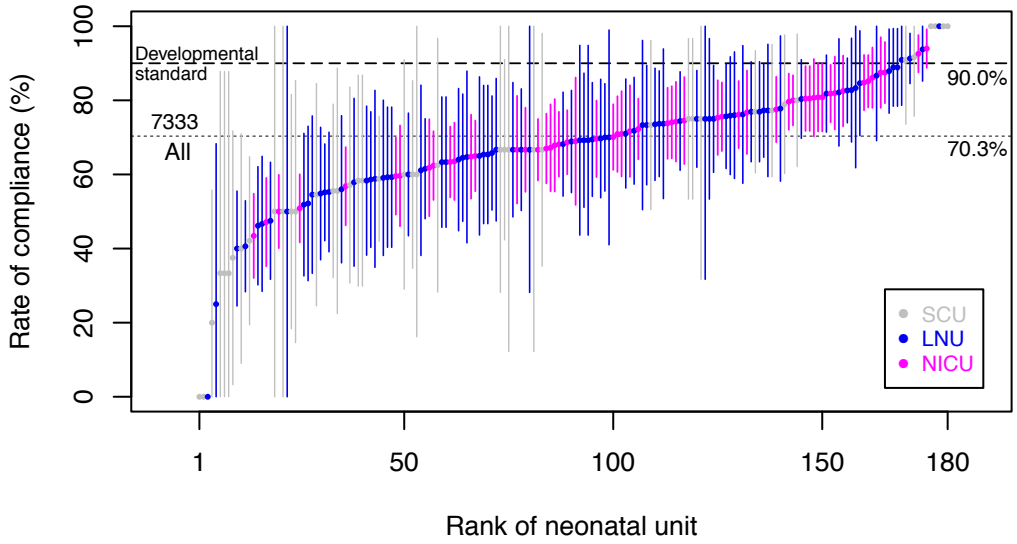


Figure 9. Caterpillar plot of the rates of compliance for temperature on admission: neonatal networks, 2018 and 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

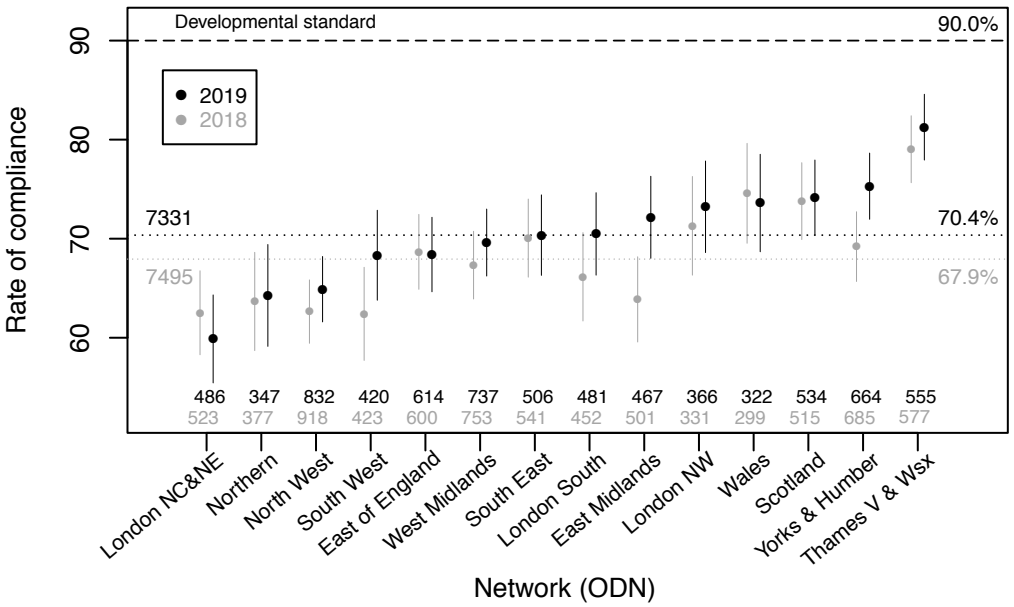
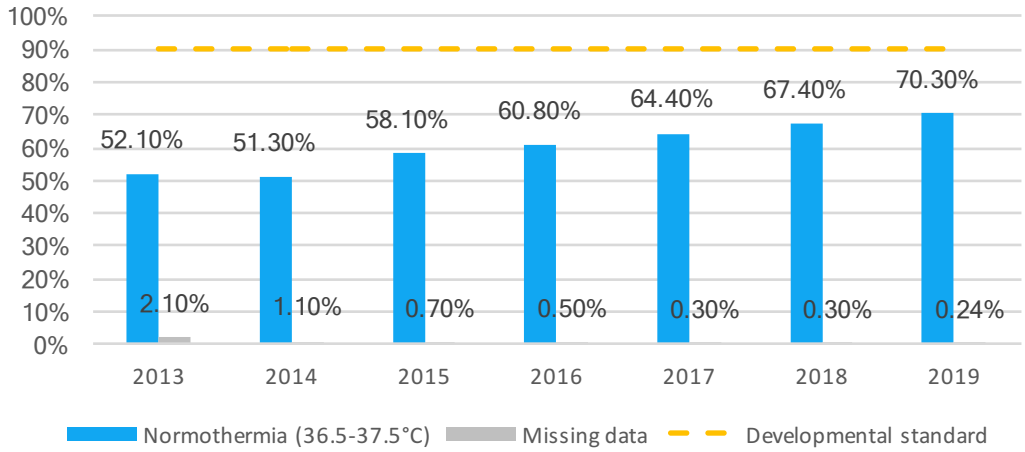


Figure 10. Temperature on time and within normal range, very preterm infants, by NNAP reporting year (2013-2019).



NOTE: For 2015-2019 data babies born at less than 32 weeks were included in the audit measure. In previous years, only babies born at less than 29 weeks were included.

Key findings

70.3% (5,186 of 7,382) of very preterm babies had a normal first temperature within an hour of admission. This is a further improvement on previous years (2015 – 58.1%; 2016 – 60.8%; 2017 – 64.4%; 2018 – 67.4%) and was achieved without any increase in hyperthermia. All networks except for one, have improved. Two networks have made striking improvements in thermoregulatory management (East Midlands and Yorkshire and the Humber).

There has been a further reduction in marked hypothermia (temperature less than 36.0°C), which has strongest relationship with adverse outcome (2015 – 8.8%; 2016 – 6.9%; 2017 – 5.6%; 2018 – 4.4%; 2019 – 3.1%)

Networks vary importantly, with three high outlying performers, and three low outlying networks. At unit level, success in keeping babies warm varies strikingly by unit (60-80%). The same unit was identified as a high performing outlier as in the 2018 data. Two low performing outlier units are identified.

2.5. Parental consultation within 24 hours of admission

Is there a documented consultation with parents by a senior member of the neonatal team within 24 hours of a baby's first admission?[v,vi,vii]

It is important that families understand and are involved in the care of their baby. This first consultation provides an opportunity for a senior staff member to meet the parents, listen to their concerns, explain how their baby is being cared for and respond to any questions. This measure of care assesses whether parents have been spoken to by a senior member of the neonatal team within the first 24 hours of their baby being admitted. It applies to all babies who require care on a neonatal unit. A consultation should take place with 24 hours of first admission for every baby. *For more information on this measure, check out our measures guide.*

Results

There were 72,459 first episodes of care (lasting at least 12 hours) reported by 181 neonatal units considered for this question. Babies who did not receive Healthcare Resource Group (HRG) 1,2, or 3 on a neonatal unit during their first day of care or whose admission was for less than 12 hours were excluded from the analysis; this left 54,097 first episodes eligible for the audit measure. Data were missing or "unknown" for 862 episodes (1.6%).

Figure 12 does not include the Isle of Man.

Table 5. Time of first consultation, by neonatal unit level.

Unit level	Eligible admissions	With data entered	Time of first consultation				Unknown
			Within 24 hours	Before admission	After 24 hours	No Consultation	
SCU	6,456	6,330	6,107 (96.5%)	84	97	42	126
LNU	22,962	22,695	22,007 (97%)	238	275	175	267
NICU	24,679	24,210	23,365 (96.5%)	181	416	248	469
Total	**54,097**	**53,235**	**51,479 (96.7%)**	**503**	**788**	**465**	**862 (1.6%)**

Figure 11. Caterpillar plot of the rates of first consultation within 24 hours of admission: neonatal units, 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation. Units are presented in ascending order of the rates and units can be identified on NNAP Online

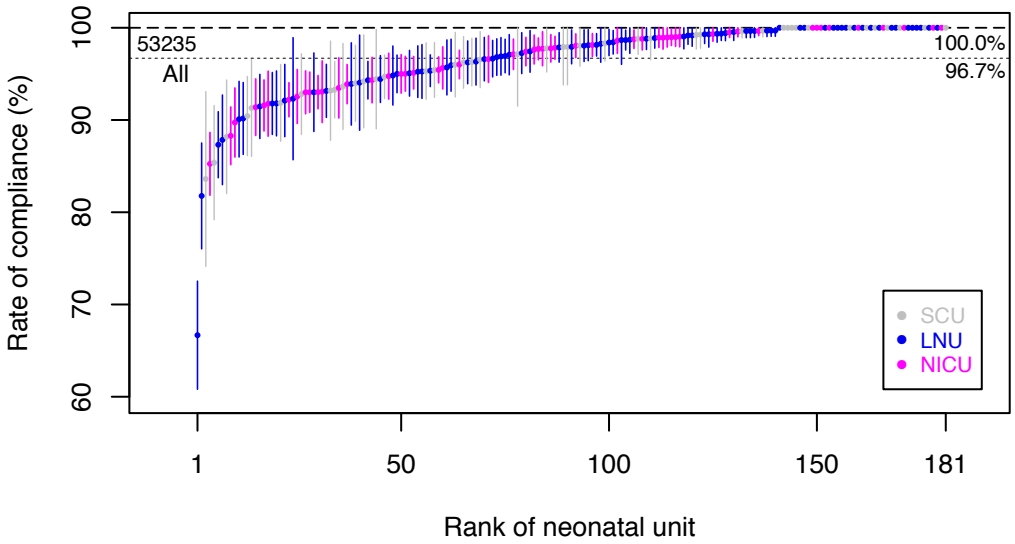


Figure 12. Caterpillar plot of the rates of first consultation within 24 hours of admission: neonatal networks, 2018 and 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

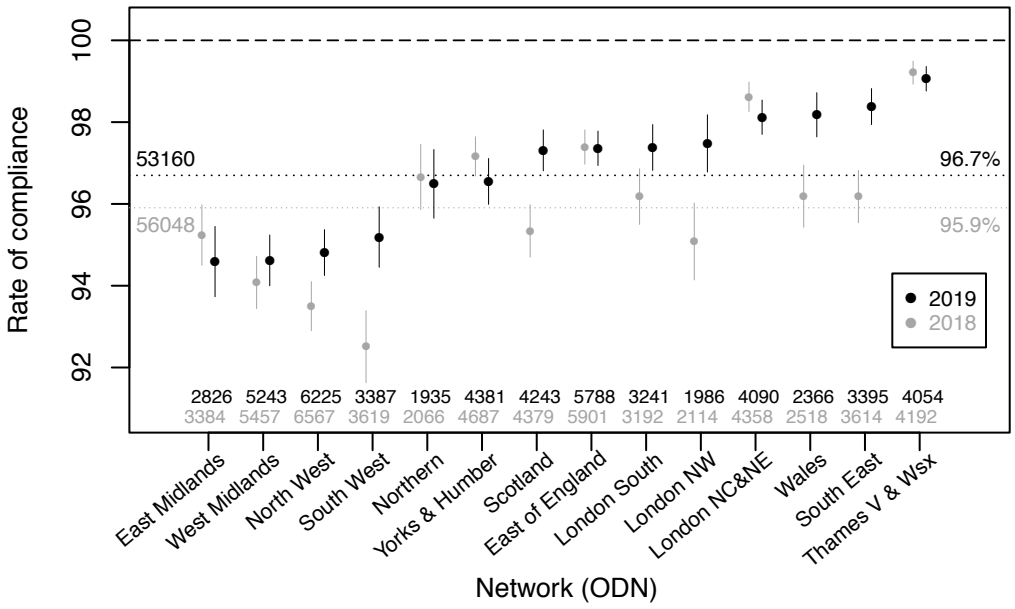
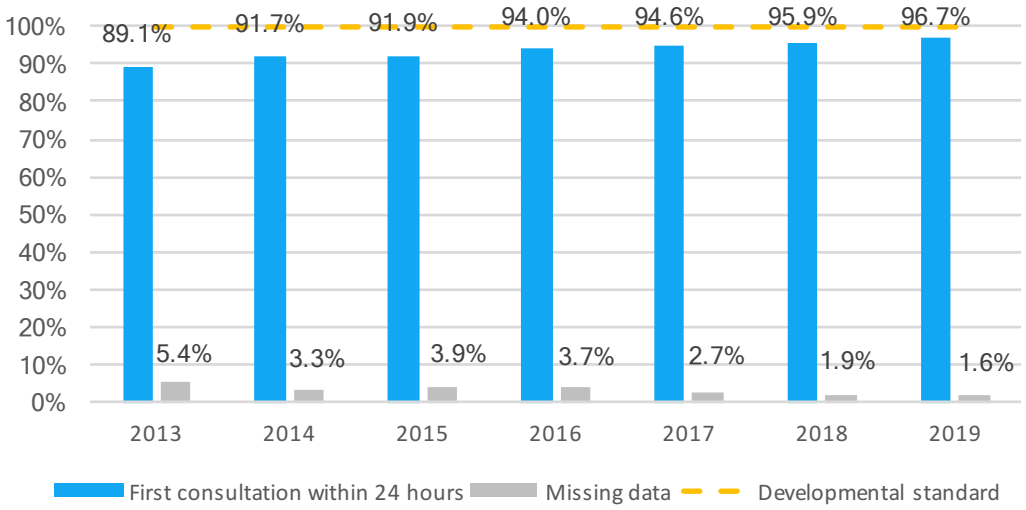


Figure 13. Time of first consultation, by NNAP reporting year (2013 to 2019).



Key Findings and Recommendations

Key finding (D) – Parental consultation within 24 hours of admission

Only 3.3% of babies have no record of a consultation between parents and medical staff within 24 hours of admission to the neonatal unit. This is an improvement on 2018 (4.1%). Of the five lowest performing networks in 2018, four have made substantial improvements in 2019, making an important contribution to the overall improvement across all networks.

Key finding (E) – Parental consultation within 24 hours of admission

Performance overall at unit level was generally good, but there was a wide variation in how successful units were at meeting this standard (range 82 – 100%, with one exception of 67%). Units of all levels have good and bad performance, and 33 are identified as having unusually low (outlying) performance.

Recommendation (4):

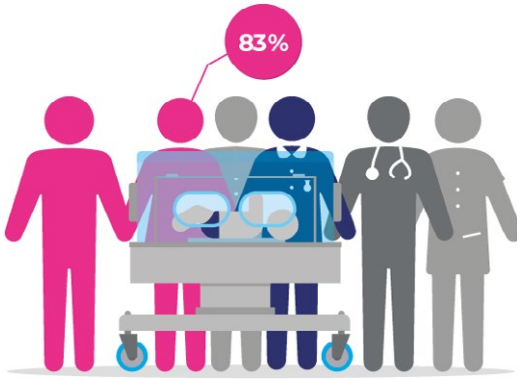
Neonatal units with lower rates of parental consultation, and particularly those with low outlying performance, should:

- Reflect on their rates of parental consultation
- Use a quality improvement approach and consider using novel means such as video calls, where parents are unable to enter the neonatal unit

In order to improve parental partnership in care.

2.6. Parental presence at consultant ward rounds

For a baby admitted for more than 24 hours, did at least one parent attend a consultant ward round at any point during the baby's admission?[6,7,viii]



Neonatal care is very stressful for babies and parents. Professionals, parents' advocates, and parents agree that including parents in consultant ward rounds supports parental partnership in care. Consultant ward rounds occur regularly (usually daily) on neonatal units. This measure looks at the proportion of admissions where parents were present on a consultant ward round on at least one occasion during a baby's stay. We acknowledge that this measure is an imperfect and incomplete description of this element of parental partnership in care, but feel that the measure has potential utility in assessing the spread of shared care planning. *For more information on this measure, check out our* measures guide.

Results

66,577 babies were admitted for more than 24 hours. Of these admissions, 5,203 (7.8%) had missing data for every day of their stay, leaving 61,374 admissions for inclusion in this measure.

Table 6: Parent present on one or more consultant ward rounds, by length of stay.

Length of stay (days)	Eligible admissions	With data entered	Parental presence on one or more ward rounds		Missing data
			Parent not present	Parent present	
≤7 days	35,666	31,147	7,279 (23.4%)	23,868 (76.6%)	4,519 (12.7%)
8-14 days	12,240	11,762	1,535 (13.1%)	10,227 (86.9%)	478 (3.9%)
15-21 days	6,361	6,239	657 (10.5%)	5,582 (89.5%)	122 (1.9%)
22-28 days	3,501	3,467	315 (9.1%)	3,152 (90.9%)	34 (1%)
>28 days	8,809	8,759	538 (6.1%)	8,221 (93.9%)	50 (0.6%)
Total	**66,577**	**61,374**	**10,324 (16.8%)**	**51,050 (83.2%)**	**5,203 (7.8%)**

Key findings and recommendations

Key finding (F) – Parental presence at consultant ward rounds

The reduction in missing data (2018 – 11.6%; 2019 – 7.8%) and the fact that in 2019 parents joined a consultant ward round on one or more occasion for more than 75% of all eligible admissions, suggests that this practice is gaining wider acceptance in neonatal care.

Key finding (G) – Parental presence at consultant ward rounds

Rates of parental attendance at consultant ward rounds vary across all units as a whole and across levels of units (e.g. NICUs vary from 45 – 100%). This illustrates that significant progress remains to be made in prioritising this form of parental partnership in care.

Recommendation (5):

Neonatal units, in collaboration with parents, should:

Build relationships and trust between parents, family members and neonatal unit staff by:

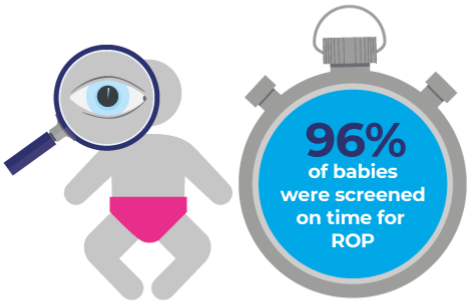
- Understanding the unique role of parents as partners in care, and involving them in developing and updating care plans and decision making
- Empowering parents to feel comfortable and able to contribute to discussions about their baby's care
- Taking the time to explain to parents why decisions about aspects of care are being suggested
- Reflecting on audit results with parents, identifying the reasons for any gaps in parental presence on ward rounds, any lack of consultant wards or documentation of consultant ward rounds, and working with parents to address any barriers to participation identified

So that parents are partners in the care of their baby in the neonatal unit.

2.7. On-time screening for retinopathy of prematurity (ROP)

Does an admitted baby born weighing less than 1501g, or at gestational age of less than 32 weeks, undergo the first retinopathy of prematurity (ROP) screening in accordance with the NNAP interpretation of the current guideline recommendations?[xi]

Babies born very early or with a very low birth weight are at risk of retinopathy of prematurity (ROP). This condition affects the development of the blood vessels in the back of the eye. ROP can lead to loss of vision, but this is usually prevented by timely treatment. Therefore, screening babies for ROP at the right time is important to help babies have the best vision in the future. By 'on time' we mean within a three-week period centred on the target week. All eligible babies should be screened 'on time'. *For more information on this measure, check out our* measures guide.



Results

There were 9,047 babies born with a birth weight less than 1,501g or with a gestational age at birth less than 32 weeks in an NNAP contributing unit. Of these babies, 17 were excluded because they did not have a recorded episode of care in a neonatal unit until after the closure of the ROP screening window. 24 babies were removed as a responsible unit could not be assigned. Further, 25 babies were excluded because they were transferred to non-neonatal units before, or during, the ROP screening window. Finally, 567 babies were excluded because they died before the closure of the screening window. This left 8,414 babies eligible for ROP screening in 181 neonatal units.

The Isle of Man is not included in Figure 15.

Table 7. Timing of ROP screening, by neonatal unit level.

Unit level	Eligible babies	Any screen	Screened Early	Screened on time			Screened late	No screen
				During care	After discharge	On time total		
SCU	795	774 (97.4%)	4 (0.5%)	628	124	752 (94.6%)	18 (2.3%)	21 (2.6%)
LNU	3,214	3,187 (99.2%)	15 (0.5%)	2,619	497	3,116 (97%)	56 (1.7%)	27 (0.8%)
NICU	4,405	4,345 (98.6%)	13 (0.3%)	3,786	400	4,186 (95%)	146 (3.3%)	60 (1.4%)
Total	**8,414**	**8,306 (98.7%)**	**32 (0.4%)**	**7,033**	**1,021**	**8,054 (95.7%)**	**220 (2.6%)**	**108 (1.3%)**

Figure 14. Caterpillar plot of the rates of on-time ROP screening: neonatal units, 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation. Units are presented in ascending order of the rates and units can be identified on NNAP Online.

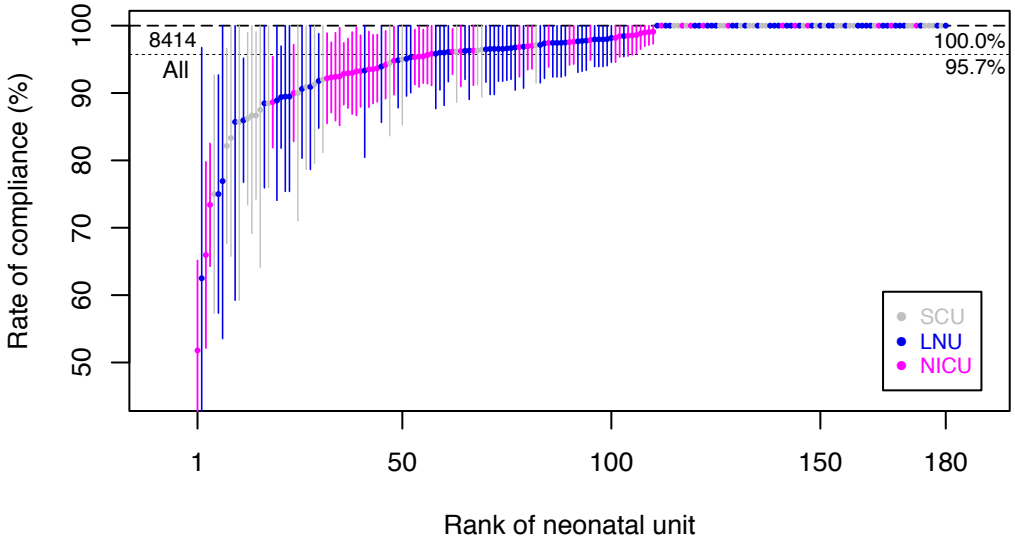


Figure 15. Caterpillar plot of the rates of compliance with on-time ROP screening: neonatal networks, 2018 and 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

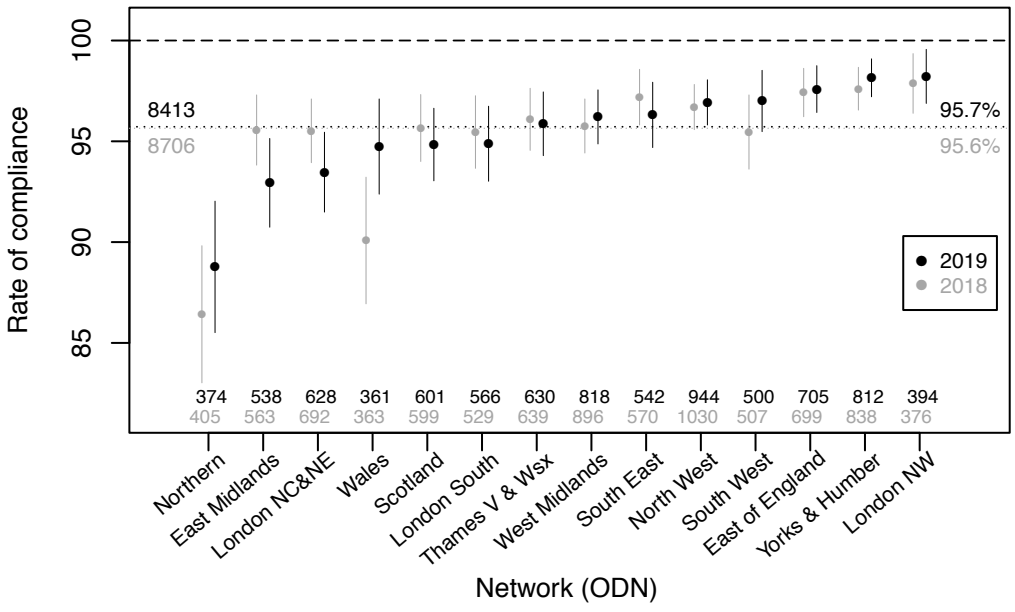
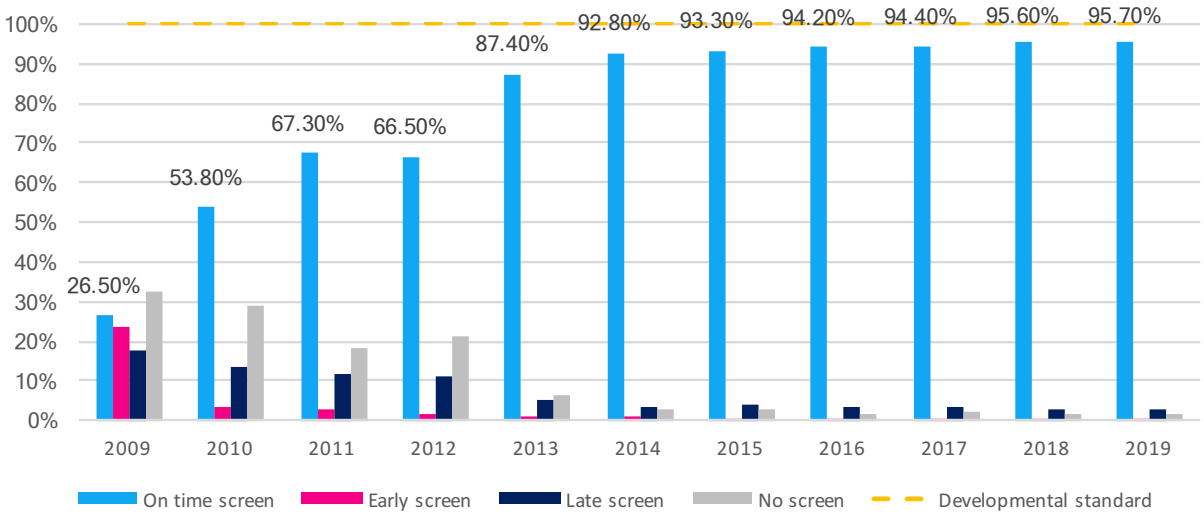


Figure 16. Timing of ROP screening, by NNAP reporting year (2009-2019).



Key findings and recommendations

Key finding (H) – On-time screening for retinopathy of prematurity (ROP)

After more than 10 years of measurement in the NNAP, 1.3% of babies still have no record of screening at any time, and a further 2.6% (220 of 8,414) of babies were screened after the NNAP interpretation of national screening guidance. Limited availability of ophthalmology screening in SCUs might explain some missed or delayed screening, but the majority (146/220) of late or missed screens were for babies in NICUs.

Key finding (I) – On-time screening for retinopathy of prematurity (ROP)

Networks also vary significantly in their delivery of on-time screening. Three networks can be identified as low outliers, including one identified also in 2018 and 2017. Three NICUs in these networks can be identified as low outliers in 2019, with on-time screening rates of 52%, 66% and 73%, suggesting a role for leading units in driving regional quality improvement.

Key finding (J) – On-time screening for retinopathy of prematurity (ROP)

Ten un-screened babies were less than 30 weeks' gestation and below 1,000g in birthweight, and thus at a high risk of life-changing disease. For 49 babies we were unable to ascertain if screening had happened at all, usually because of transfer to non-NNAP units.

Key finding (K) – On-time screening for retinopathy of prematurity (ROP)

70 out of 181 units (38.6%) screened all their babies on time, which is an improvement on 2018 data (33.9%).

Recommendation (6):

Neonatal Intensive Care Units (NICUs) with persistently low levels of ROP screening should ensure that:

- Babies requiring ROP screening are accurately identified
- Safety systems for appropriate ROP screening are in place

So that babies who are at the highest risk of loss of vision, can be screened and receive timely treatment if required.

Neonatal Networks with low rates of ROP screening should:

- Implement a mechanism for real time measurement of their unit's adherence to ROP screening guidelines

So that they can identify where related quality improvement activities need to be undertaken.

2.8. Late onset infection

Sick and premature babies are prone to infection with a variety of germs, including some that are normally harmless to healthy people. Infections increase the risk of death, can lengthen the stay in the neonatal unit and may worsen the long-term developmental outlook for babies.[x] Neonatal unit staff and parents can reduce the risk of infection by following good infection prevention and control practice.

The NNAP reports two measures of late onset bloodstream infection. To look for infection in babies, neonatal staff usually take blood cultures to check whether bacteria or other organisms are present in their blood. Units are encouraged to report positive blood cultures: that negative blood cultures are underreported is accepted as likely, or even inevitable. The NNAP reports rates of blood cultures positive for bacteria, fungi or yeasts, as well as a measure of bloodstream infection that occurs on the same day as a central line is present. Neither measure takes account of case mix, so when comparisons between trusts are made, case mix should be considered as one possible explanation for any differences in rates. A significant strength of the bloodstream infection measure is that it is not undermined by any differences in use of central venous access that might exist between units.

For more information on this measure, check out our measures guide.

Late onset bloodstream infection

Late onset bloodstream infection: does an admitted baby have one or more episodes of bloodstream infection, characterised by one or more positive blood cultures taken, after 72 hours of age?

Results

Some organisms grown may either represent true bloodstream infection or contamination of the blood culture sample with skin organisms. For this reason, results for bloodstream infection are presented in two columns. One column presents the number of babies from whom a blood culture grew any organism. The other column presents the number of babies for whom one or more culture grew an organism of clear pathogenicity. Clearly pathogenic organisms were those whose growth indicates significant infection with or without the presence of clinical confirmation. A list of such organisms is presented in Appendix E. Babies contribute to the denominator for this measure for all units in which they were cared for, after the age of 72 hours.

Overall, 15,030 blood cultures were reported from 53,230 babies who were admitted to 181 neonatal units at or after 72 hours of age. Of these blood cultures, 90.7% have a result entered. For very preterm babies, 8,802 blood cultures were reported from 7,634 babies; for moderate and late preterm and term babies, 6,228 blood cultures were reported from 45,596 babies. Comparisons of rates of infections between years should not be made because of revised methodology in this year's report.

In 113 of 180 units, our survey of units told us that all positive blood cultures were reported to the audit, with implications for the comparability of data between hospitals.

Table 8a. Positive blood cultures, by gestational age group (<32 weeks and ≥32 weeks).

Gestational age group	Babies	Number of babies with any positive blood culture	Number of babies with growth of clearly pathogenic organism
< 32 weeks	7,634	1,213	376
≥ 32 weeks	45,596	350	96
Total	**53,230**	**1,563**	**472**

Note: In previous years, rates of late onset bloodstream infection were presented using a denominator of all admitted babies, not just those present on the unit at, or after, 72 hours of age. In addition, a new organism list was used to classify cultures in this year's report – see Appendix E

Table 8b. Positive blood cultures, by gestational age group (<32 weeks and ≥32 weeks) from units who confirmed validation of their positive blood cultures data.

Gestational age group	Babies	Number of babies with any positive blood culture	Number of babies with growth of clearly pathogenic organism
< 32 weeks	5,459	916	342
≥ 32 weeks	27,381	232	66
Total	**32,840**	**1,148**	**408**

Note: In previous years, rates of late onset bloodstream infection were presented using a denominator of all admitted babies, not just those present on the unit at, or after, 72 hours of age.

Central Line Associated Bloodstream Infection (CLABSI):

Central line associated bloodstream infection: how many babies have a positive blood culture (any species) with a central line present, after the first 72 hours of life, per 1000 central line days?

Results

53,230 babies who stayed for more than 72 hours in 181 neonatal units received 978,126 days of care. In total, 15% of all care days included a central line and 979 bloodstream infections were reported for these central line days. Line days were attributed to the unit in which they occurred, and infections were attributed to the unit in which the blood culture was taken. Comparisons of rates of infections between years should not be made because of revised methodology in this year's report.

Table 9a. Babies with central line associated bloodstream infections (CLABSI), by gestational age group.

Gestational age group	Babies	Babies with one or more CLABSI episode (any growth)	Babies with central line associated bloodstream infection that was clearly pathogenic	Line days	Babies with one or more CLABSII episode (any growth) per 1000 central line days
< 32 weeks	7,634	630	187	101,084	6.23
≥ 32 weeks	45,596	132	35	45,930	2.87
Total	**53,230**	**762**	**222**	**147,014**	**5.18**

Note: In previous years, rates of CLABSI were presented using a denominator of line days for all admitted babies, not just those present on the unit at, or after,72 hours of age.

Table 9b. Babies with CLABSI, in units who confirmed validation of their cultures data, by gestational age.

Gestational age group	Babies	Babies with one or more CLABSI episode (any growth)	Babies with central line associated bloodstream infection that was clearly pathogenic	Line days	Babies with one or more CLABSI episode (any growth) per 1000 central line days
< 32 weeks	5,459	476	139	63,632	7.48
≥ 32 weeks	27,381	95	27	28,359	3.35
Total	**32,840**	**571**	**166**	**91,991**	**6.21**

Note: In previous years up to 2017, rates of central line associated bloodstream infection were presented using a denominator of line days all admitted babies, not just those present on the unit at or after 72 hours of age.

Key findings and recommendations

Key finding (L) – Late onset bloodstream infection

The rate of bloodstream infections is lower than in previous years, at least in part because of the changes in how the NNAP reports infection rates and how it has revised the denominators and improved and clarified the list of "clearly pathogenic organisms" - see Appendix E of this report.

Key Finding (M) – Late onset bloodstream infection

113 out of 181 (63%) units confirmed that all positive blood cultures had been submitted to the audit. This is slightly lower than in 2018 (66%) and may be due to the onset of the COVID-19 pandemic as the data validation window was planned to end around the time that preparations for COVID-19 were at their peak.

Key Finding (N) – Late Onset bloodstream infection

The proportion of very preterm infants experiencing infection with clearly pathogenic organisms varied between 0% and 12.8% in the NICUs which reported all of their positive blood cultures to the NNAP, variation which is very unlikely to be explained by case mix.

Key finding (O) – Central Line Associated Bloodstream Infection (CLABSI):

The rate of CLABSI for babies born at less than 32 weeks' gestation in the 39 of 54 NICUs which have submitted all their positive blood cultures to the unit is 8.06. This is higher than the comparable rate for all NICUs of 5.40, reflecting complete reporting.

Recommendation (7):

Neonatal units with higher reported rates of infection should:

- Compare practices with units with lower rates of infection, identified via NNAP Online and consider whether their rates of infection could be decreased
- Ensure that their use of evidence-based infection reduction strategies is optimised

In order to minimise the number of babies infected in their units.

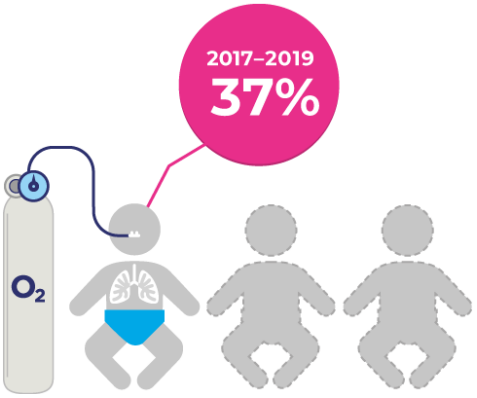
Neonatal networks and units with both low and high rates of infection should:

- Facilitate invitations for units with higher rates of infection to visit units with lower rates in order to jointly agree whether potentially better practices could be used and consider requiring units to participate in such quality improvement activity
- Ensure that the proposed visits should be multidisciplinary and focussed on identification and implementation of potentially better practices including "infection prevention bundles"

In order to reduce the risk of exposing sick and premature babies to infection.

2.9. Bronchopulmonary dysplasia (BPD)

Does an admitted baby born at less than 32 weeks' gestational age develop bronchopulmonary dysplasia (BPD)?



Babies born preterm often do not have fully developed lungs and may require support with their breathing from a ventilator or another device. Simply being born early can cause some ongoing breathing difficulties but being on a ventilator can cause additional damage to the lungs. When a baby needs additional oxygen or support with breathing until near term, their condition is called bronchopulmonary dysplasia (BPD)or 'chronic lung disease'. BPD may be associated with breathing problems later in life and put these babies at increased risk of chest infections. NNAP reports on the proportion of babies born very preterm who are still receiving help with their breathing or supplementary oxygen four weeks before their due date. Only babies who survive their early course can develop BPD, and therefore it is important that we consider rates of BPD alongside rates of death. For this reason, we report the combined outcome of 'BPD or death'.

Differing rates of BPD between units and networks might be the result of differing treatments or might result, at least in part, from differences in the readiness of clinicians to administer oxygen to very preterm infants.

Where rates of BPD differ, it may also be that case mix explains the variation. For this reason, we have considered the baseline characteristics of the babies cared for in units and networks. 'Treatment effect' is the difference between the rate of BPD or death in babies cared for in a unit or network compared to the observed rate for a matched group of babies with very similar case mix, cared for in all neonatal units. A positive treatment effect indicates that the rate of significant BPD or death is higher in the unit or network of interest than for a comparable group of babies cared for in all neonatal units, which is not desirable. Where the 95% confidence interval for this effect does not include zero, the treatment effect is unlikely to be a chance finding. *For more information on this measure, check out our* measures guide.

Results

24,314 babies born at less than 32 weeks' gestational age, discharged between 1 January 2017 and 31 December 2019 as reported by 182 neonatal units, and 34 other places of birth not associated with an NNAP participating unit. Babies were assigned to their recorded place of birth for this analysis. In Table 10, responses are assigned 'Other' if the mother was recorded as delivering the baby at home, in transit, in an unknown location, Isle of Man or in a maternity unit not allied with a NNAP participating unit in the first neonatal unit admission. 'Other' responses are not included in Figure 17 and Figure 18 or the 'Total' row in Table 10. Of the 24,314 babies born at less than 32 weeks' gestational age, 21,884 babies had enough data entered to attribute BPD and did not die before 36 weeks' corrected gestational age.

Table 10. Rates of BPD or death, by neonatal network.

Neonatal Network	Eligible babies	With data entered	No BPD	BPD	Death before 36 weeks' corrected gestational age	BPD or death	Missing data
East Midlands	1,513	1,511	1,023	366	122	488 (32.3%)	2
East of England	1,890	1,883	1,259	530	94	624 (33.1%)	7
North Central & North East London	1,650	1,640	1,055	512	73	585 (35.7%)	10
North West London	1,097	1,095	718	301	76	377 (34.4%)	2
North West	2,865	2,853	1,735	841	277	1,118 (39.2%)	12
Northern	1,050	1,047	602	365	80	445 (42.5%)	3
Scotland	1,608	1,601	986	485	130	615 (38.5%)	7
South East Coast	1,675	1,669	1,045	488	136	624 (37.4%)	6
South London	1,478	1,476	887	491	98	589 (39.9%)	2
South West	1,439	1,435	880	467	88	555 (38.7%)	4
Thames Valley & Wessex	1,885	1,878	1,242	514	122	636 (33.9%)	7
Wales	988	987	622	283	82	365 (37.0%)	1
West Midlands	2,370	2,349	1,447	655	247	902 (38.4%)	21
Yorkshire & Humber	2,264	2,259	1,504	581	174	755 (33.4%)	5
Total	**23,772**	**23,683**	**15,005**	**6,879**	**1,799**	**8,678 (36.6%)**	**89**
Other*	542	523	296	161	66	227 (43.4%)	19

**Includes deliveries at home, in transit, in an unknown location or in a maternity unit not allied with a NNAP participating unit in the first neonatal unit admission. Also includes Nobles Hospital, Isle of Man.*

Figure 17. Caterpillar plot of the rates of BPD or death (2017-2019): neonatal units (TOP) and 'treatment effect' on rates of BPD or death (BOTTOM). (LNUs and NICUs only) 2017 – 2019.

Rates of the combined outcome of significant BPD or death. Rates are marked with red (NICUs) and blue dots (LNUs) and the 95% confidence intervals are indicated by vertical bars. Neonatal units are presented in ascending order of the rates. For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

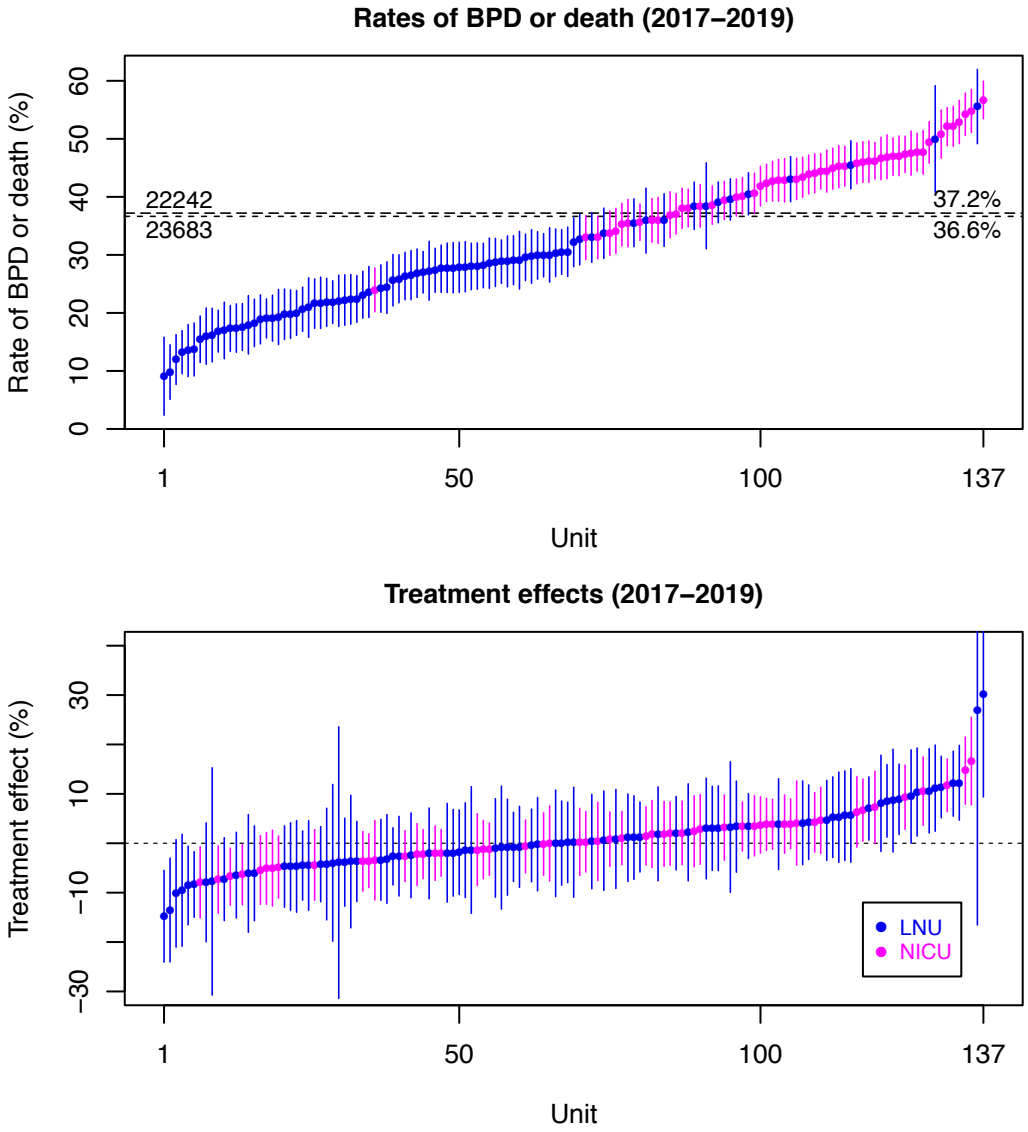
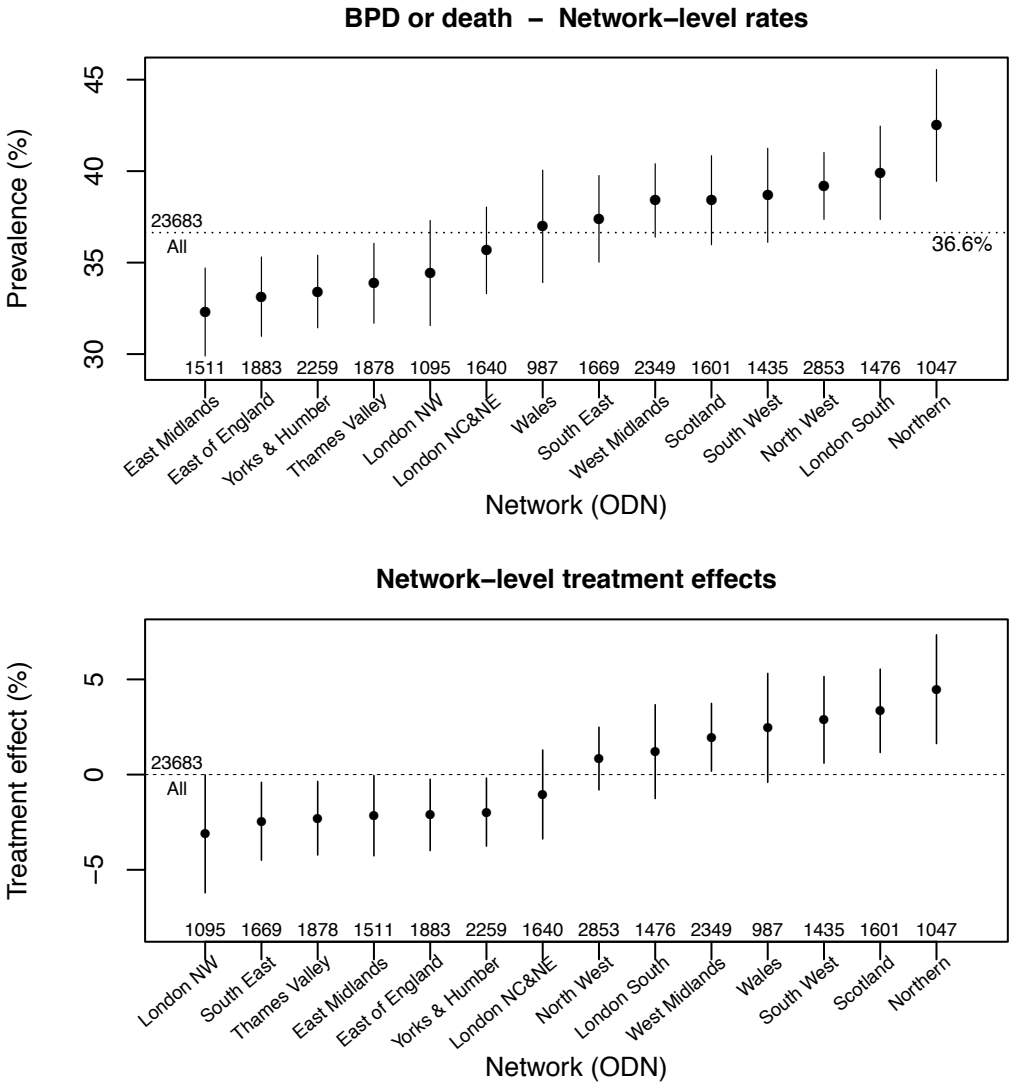


Figure 18. Caterpillar plot of the rates of significant BPD or death (2017-2019): neonatal networks (TOP) and 'treatment effect' on rates of significant BPD or death (BOTTOM).



For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

Table 11. Rates of BPD only, and the combined outcome of BPD and death, by NNAP reporting period (2013-2019).

NNAP Year	Babies	With data entered	BPD	BPD or death	Missing data
2013-2015	21,805	21,673	6,508 (30%)		132 (0.6%)
2014-2016	22,049	21,978	6,792 (30.9%)		71 (0.3%)
2015-2017	24,517	22,595	6,971 (30.9%)	8,851 (39.2%)	42 (0.2%)
2016-2018	23,849	23,773	6,931 (29.2%)	8,671 (36.5%)	76 (0.3%)
2017-2019	23,772	23,683	6,879 (29%)	8,678 (36.6%)	89 (0.4%)

Note: Prior to 2015-2017, the combined outcome of BPD or death was not reported.

Key findings and recommendations

Key finding (P) – Bronchopulmonary dysplasia (BPD)

Overall, about one third of surviving very preterm infants develop BPD. There is huge variation in the rate of BPD or death between units (range 9.1 - 57%) and between networks (32-42%). This variation occurs across both LNUs and NICUs and cannot be accounted for by case mix (range of treatment effect attributable to neonatal network negative 3.1% to positive 4.5%).

Sixteen units are identified as having outlying high treatment effect, meaning that babies born in these units are more likely than expected to be diagnosed with BPD, or die, than comparable babies cared for in all units. Eight units have outlying low treatment effect, suggesting that treatment in these units leads to lower rates of BPD or death.

Recommendation (8):

Neonatal units with high treatment effect should:

- Seek to identify potentially better practices from neonatal units with lower treatment effect

Neonatal units and networks should:

- Seek to understand the extent to which care practices explain the differences in rates of BPD
- Implement potentially better care practices, including any identified from NICE guidance about specialist respiratory care

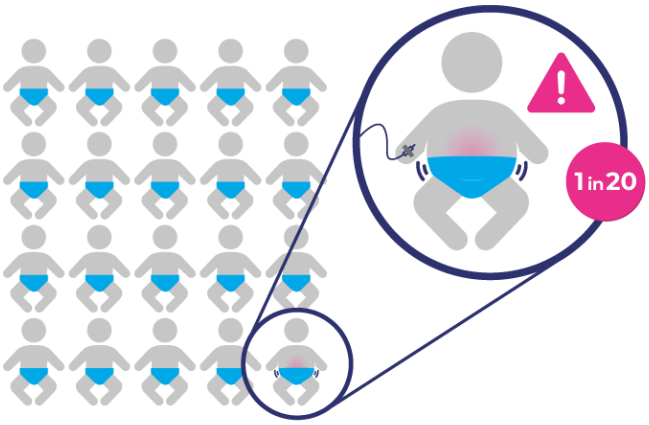
The British Association of Perinatal Medicine (BAPM) should:

- Consider developing a care pathway identifying potentially better practices and the optimal means for their implementation

In order to reduce the proportion of babies affected by bronchopulmonary dysplasia.

2.10. Necrotising enterocolitis (NEC)

Does an admitted baby born at less than 32 weeks' gestational age meet the NNAP surveillance definition for necrotising enterocolitis (NEC) on one or more occasions?



Necrotising enterocolitis (NEC) is a devastating illness which can follow preterm birth. Bowel inflammation prevents milk feeding and surgery may be needed. Babies who develop NEC typically stay in hospital for a long time. Rates of mortality in babies with NEC are high, at over 20%. Babies who survive NEC can have developmental as well as long-term feeding and bowel problems. Reporting of NEC is based on a surveillance definition, and cases and denominators are attributed to the unit at which the baby is nursed at 48 hours. *For more information on this measure, check out our* measures guide.

Results

117 of 180 (65%) NNAP neonatal units provided assurance of the accuracy of their data for this outcome. This is a slight decrease on 2018 when 71% of units provided such assurance. We note that the final 2 weeks of the planned data assurance window coincided with the beginning of lockdown measures to address COVID19. The window was extended to allow more time for data assurance.

There were 7,692 babies who were born very preterm and survived to 48 hours after birth. For 174 babies it was not possible to determine whether the baby had NEC at any point in their neonatal care. 413 of these 7,692 (5.5%) are known to have had NEC according to the surveillance definition used by NNAP. This is similar to previous years (2018: 410 of 7810, 5.5%; 2017: 428 of 8,228, 5.6%), although incomplete and unvalidated data could affect all years.

Table 12. NEC status, by neonatal unit level – all units.

Unit level at 48 hours	Babies	With data entered	NEC status			Missing data		
			Died prior to discharge, but no NEC	No NEC	NEC	Total missing	Death before discharge	Alive at discharge
Other	18	14	0	13	1 (7.1%)	4 (22.2%)	0 (0%)	4 (22.2%)
SCU	158	154	0	150	4 (2.6%)	4 (2.5%)	0 (0%)	4 (2.5%)
LNU	2,261	2,215	16	2,129	70 (3.2%)	46 (2%)	0 (0%)	46 (2%)
NICU	5,255	5,135	334	4,463	338 (6.6%)	120 (2.3%)	36 (0.7%)	84 (1.6%)
Total	**7,692**	**7,518**	**350**	**6,755**	**413 (5.5%)**	**174 (2.3%)**	**36 (0.5%)**	**138 (1.8%)**

Table 13. NEC status, units who provided assurance that their NEC diagnosis data was complete.

Unit Level	Babies	With data entered	Died prior to discharge but no NEC	No NEC	NEC	Total missing	Missing died	Missing alive
SCU	109	107	105	0	0 (0%)	2 (1.8%)	2 (1.8%)	0
LNU	1,317	1,301	1,261	0	13 (1%)	16 (1.2%)	16 (1.2%)	0
NICU	3,630	3,596	3,122	12	235 (6.5%)	22 (0.6%)	22 (0.6%)	0
Total	**5,056**	**5,004**	**4,488**	**12**	**248 (5%)**	**40 (0.8%)**	**40 (0.8%)**	**0**

Table 14. NEC status, by network – all units.

Network	Babies	With data entered	NEC status			Missing data		
			Died prior to discharge home, but no NEC	No NEC	NEC	Alive at discharge	Death before discharge	Total missing
East Midlands	481	468	19	414	35 (7.5%)	10 (2.1%)	3 (0.6%)	13 (2.7%)
East of England	611	602	15	550	37 (6.1%)	7 (1.1%)	2 (0.3%)	9 (1.5%)
North Central & North East London	525	505	20	457	28 (5.5%)	15 (2.9%)	5 (1%)	20 (3.8%)
North West London	394	391	16	359	16 (4.1%)	2 (0.5%)	1 (0.3%)	3 (0.8%)
North West	913	900	58	803	39 (4.3%)	9 (1%)	4 (0.4%)	13 (1.4%)
Northern	354	309	12	269	28 (9.1%)	35 (9.9%)	10 (2.8%)	45 (12.7%)
Scotland	569	556	29	498	29 (5.2%)	11 (1.9%)	2 (0.4%)	13 (2.3%)
South East Coast	526	513	29	456	28 (5.5%)	8 (1.5%)	5 (1%)	13 (2.5%)
South London	493	481	15	433	33 (6.9%)	11 (2.2%)	1 (0.2%)	12 (2.4%)
South West	451	445	20	409	16 (3.6%)	6 (1.3%)	0 (.%)	6 (1.3%)
Thames Valley & Wessex	576	572	17	524	31 (5.4%)	4 (0.7%)	0 (.%)	4 (0.7%)
Wales	316	316	21	283	12 (3.8%)	0 (.%)	0 (.%)	0 (0%)
West Midlands	749	738	50	639	49 (6.6%)	10 (1.3%)	1 (0.1%)	11 (1.5%)
Yorkshire & Humber	715	707	29	647	31 (4.4%)	6 (0.8%)	2 (0.3%)	8 (1.1%)
Other*	19	15	0	14	1	4	0	0
Total	**7,692**	**7,518**	**350**	**6,755**	**413 (5.5%)**	**138 (1.8%)**	**36 (0.5%)**	**174 (2.3%)**

*Includes Isle of Man

NB there are no networks for which all units confirmed they had validated data for all their admissions.

Key findings and recommendations

Key finding (Q) – Necrotising enterocolitis (NEC)

5.5% of very preterm infants were diagnosed with NEC in 2019.

Rates of NEC appear to vary more than two-fold between neonatal networks, although missing data, as much as ~13% in one neonatal network, can make comparisons between networks imprecise. Differences between neonatal networks are unlikely to be fully explained by differences in case mix but should be considered alongside mortality figures for the networks – rates of NEC appear to be lower where mortality is higher, which you can see in Appendix H.

Key Finding (R) – Necrotising enterocolitis (NEC)

117 out of 181 (64%) NNAP units confirmed that their submitted NEC data were validated as accurate; this was less than in 2018 (129 – 71%). The overall rate of missing data decreased from 5.4% in 2018 to 2.3% in 2019. Units who indicated that they had their NEC data included 38 out of 54 (70%) NICUs and these accounted for 5,056 out of 7,692 eligible babies across all unit levels. Restricting measurement of the rate of NEC to NICUs with validated data did not alter the rate of NEC substantially (6.5% compared to 6.4%).

Recommendation (9):

Units with validated NEC data should:

- Compare their rates of NEC to those of other comparable units with validated data, and if their rates of NEC are relatively high, seek to identify and implement potentially better practices

In order to reduce the associated higher risk of mortality and, for those babies who survive, the risk of longer term developmental, feeding and bowel problems.

All neonatal units should:

- Ensure the accurate recording of NEC diagnoses

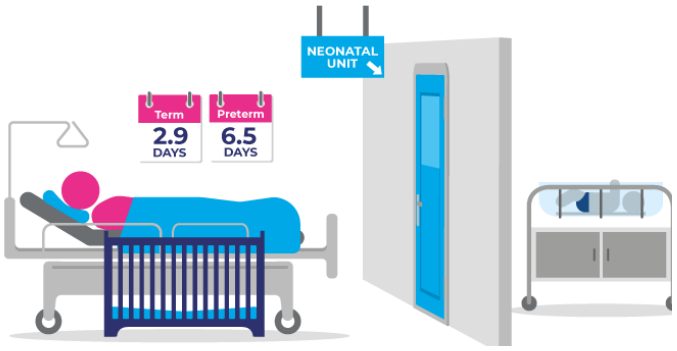
In order to facilitate valid comparisons of the rates of NEC, and the development of preventative measures based on variations in rates of NEC.

2.11. Minimising separation of mother and baby (term and late preterm)

1. ***For a baby born at gestational age greater than or equal to 37 weeks, who neither had surgery, nor were transferred during any admission, how many special care or normal care days were provided when oxygen was not administered?***

2. ***For a baby born at 34-36 weeks' gestational age, who neither had surgery nor were transferred during any admission, how many special care or normal care days were provided when oxygen was not administered?***

Some babies admitted to neonatal units may be separated from their mothers for longer than necessary. It may be possible to care for some such babies in transitional care, a setting which takes an interdisciplinary approach with both midwives and neonatal staff delivering high-quality care to both mother and baby, avoiding separation.[xi]



This measure describes the number of separation days for each admission to a neonatal unit. Separation days are defined as days of low dependency care when breathing support is not needed. Even when a neonatal unit admission is unavoidable, there may still be opportunities to reduce separation care days. Average numbers of separation days for a unit or network should be interpreted alongside the rates of admission of term, and late preterm babies per 1,000 live births. *For more information on this measure, check out our measures guide.*

Results

86.9% (25,110 of 28,893) of admitted babies born at 37 weeks' gestational age or greater, who did not have surgery and were not transferred, had some special care days on which oxygen was not administered, or some normal care days. 57,273 special care days and 27,420 normal care days (84,693 days in total) were provided to these 28,893 babies.

93.8% (13,077 of 13,936) of admitted babies born at 34 to 36 weeks' gestation, who did not have surgery and were not transferred, had some special care days on which oxygen was not administered, or some normal care days. 70,585 special care and 20,211 normal care days (90,796 days in total) were provided to these 13,936 babies.

Table 15. Term babies spending one or more days receiving special or normal care, by neonatal unit level (includes only those special care days when oxygen was not administered).

Unit Level	Babies	Babies who spent one or more eligible days in normal or special care	Number of eligible care days			Average number of separation days per baby
			Special care	Normal care	Total days	
SCU	3,778	3,383 (89.5%)	7,369	3,769	11,138	2.9
LNU	11,988	10,552 (88%)	22,973	11,963	34,936	2.9
NICU	13,127	11,175 (85.1%)	26,931	11,688	38,619	2.9
Total	**28,893**	**25,110 (86.9%)**	**57,273**	**27,420**	**84,693**	**2.9**

Table 16. Late preterm babies receiving special or normal care, by neonatal unit level (includes only those special care days when oxygen was not administered)

Unit Level	Babies	Babies who spent one or more eligible days in normal or special care	Number of eligible care days			Average number of separation days per baby
			Special care	Normal care	Total days	
SCU	2,052	1,981 (96.5%)	10,927	3,467	14,394	7
LNU	6,307	6,006 (95.2%)	33,794	10,321	44,115	7
NICU	5,577	5,090 (91.3%)	25,864	6,423	32,287	5.8
Total	**13,936**	**13,077 (93.8%)**	**70,585**	**20,211**	**90,796**	**6.5**

Key findings and recommendations

Key finding (S) – Minimising separation of mother and baby (term and late preterm)

Striking variation persists across 2018 and 2019 in the average number of term baby separation days between units of all levels (range 1-5 days), which is very unlikely to be explained by case mix alone.

There was a shorter average stay in NICUs compared to LNUs and SCUs (NICU 5.8 days, n=5,557; LNU and SCU 7 days, n= 8,359) and a striking variation in the average duration of stay between units of the same level (NICUs 1.5-10.4; LNUs 2.6 - 12; SCUs 2.6 – 10.4).

Recommendation (10):

Neonatal networks should:

- Review the admission durations of their units, alongside admission rates, as part of planning maximally effective use of neonatal bed days

Neonatal and maternity teams should:

- Ensure discharge practices minimise inappropriate separation of mother and baby
- Consider introducing measures to facilitate timely discharge such as criterion-based discharge
- Consider delivering some care as transitional care

So that babies born at term and late preterm admitted to neonatal units are not separated from their mothers for longer than is necessary.

2.12. Maternal breastmilk feeding

Breastmilk feeding is unquestionably beneficial to the baby and the mother. During neonatal care it protects against necrotising enterocolitis and infection. It helps to protect babies from later infection, diabetes, asthma, heart disease, obesity and sudden infant death syndrome. Premature babies are vulnerable to infection, and their own mother's milk provides an important line of defence through protective antibodies. Breastfeeding also helps to build the relationship between the mother and baby. *For more information on this measure, check out our* measures guide.

Early Breastmilk Feeding

Does a baby born at less than 32 weeks' gestational age receive any of their own mother's milk on day 14 of life? This measure is designed to help units understand their rates of mothers' own milk feeding during babies' stay in greater detail, and is supported by the publication of graphics describing milk use in very preterm infants for each unit and network – see Figure 19 and NNAP Online.

Results

Of the 7,359 babies born at less than 32 weeks, 7,345 had data available from day 13-15 of life. Of these 7,345 babies, 82.4% (6,054 babies) were receiving some of their own mothers' milk at 14 days of life. Data were missing for 14 (0.2%) eligible babies.

Table 17. Breastmilk feeding on day 14 of life, by neonatal unit level.

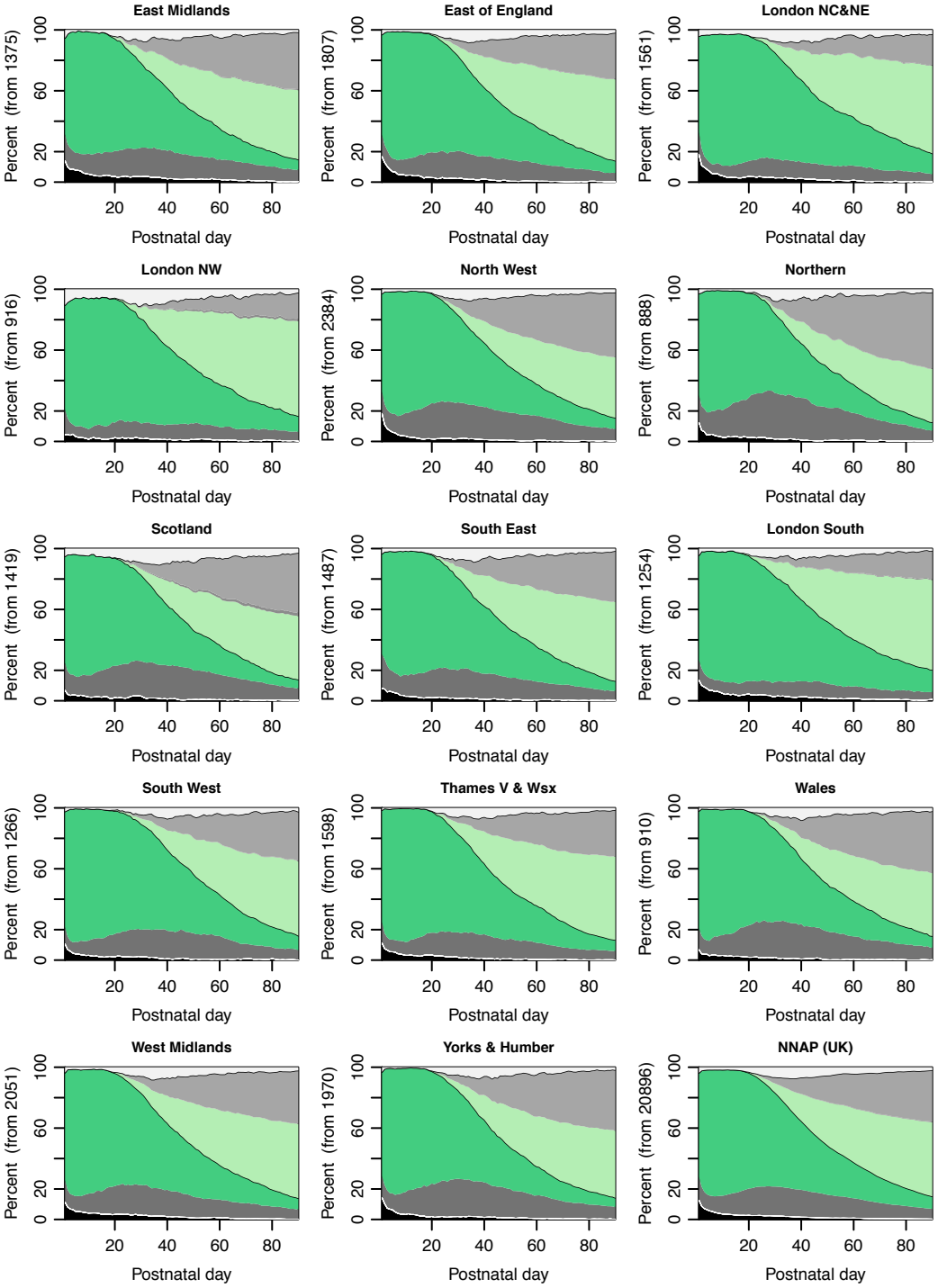
Unit level at 48 hours	Babies	With data entered	Enteral feeds at day 14		Missing data
			Any of own mother's milk	None of own mother's milk	
Other	1	1	1 (100%)	0 (0%)	0 (0%)
SCBU	154	153	116 (75.8%)	37 (24.2%)	1 (0.6%)
LNU	2,230	2,228	1,870 (83.9%)	358 (16.1%)	2 (0.1%)
NICU	4,974	4,963	4,067 (81.9%)	896 (18.1%)	11 (0.2%)
Total	**7,359**	**7,345**	**6,054 (82.4%)**	**1,291 (17.6%)**	**14 (0.2%)**

Table 18. Breastmilk feeding on day 14, by neonatal network.

Network	Babies	With data entered	Enteral feeds at day 14		Missing
			Any of own mother's milk	None of own mother's milk	
East Midlands	464	462	382 (82.7%)	80 (17.3%)	2 (0.4%)
East of England	596	592	484 (81.8%)	108 (18.2%)	4 (0.7%)
Isle of Man	1	1	1 (100%)	0 (0%)	0 (0%)
North Central & North East London	504	501	439 (87.6%)	62 (12.4%)	3 (0.6%)
North West London	380	379	326 (86%)	53 (14%)	1 (0.3%)
North West	870	870	688 (79.1%)	182 (20.9%)	0 (0%)
Northern	335	335	256 (76.4%)	79 (23.6%)	0 (0%)
Scotland	541	539	443 (82.2%)	96 (17.8%)	2 (0.4%)
South East Coast	499	499	407 (81.6%)	92 (18.4%)	0 (0%)
South London	482	482	416 (86.3%)	66 (13.7%)	0 (0%)
South West	438	437	372 (85.1%)	65 (14.9%)	1 (0.2%)
Thames Valley & Wessex	557	556	488 (87.8%)	68 (12.2%)	1 (0.2%)
Wales	300	300	246 (82%)	54 (18%)	0 (0%)
West Midlands	703	703	576 (81.9%)	127 (18.1%)	0 (0%)
Yorkshire & Humber	688	688	529 (76.9%)	159 (23.1%)	0 (0%)
Total	**7,358**	**7,344**	**6,053 (82.4%)**	**1,291 (17.6%)**	**14 (0.2%)**

Figure 19. Use of mother's own milk in very preterm infants by day of life. Neonatal networks, 2019.

These figures illustrate mother's own milk use for very preterm infants (gestation at birth less than 32 weeks), by the unit of care, on each day of life. Unit, and network, level figures are available on NNAP Online and enable comparisons of changes over time in usage of mothers' own milk.



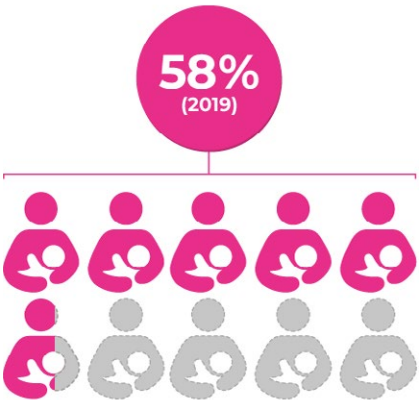
Key

Black: nil by mouth
Dark grey: inpatient and not fed own mother's milk
Green: inpatient and fed at least partially with own mother's milk
Light grey: discharged home after receiving none of own mother's milk on last day of hospitalisation
Light green: discharged home after receiving some own mother's milk on last day of hospitalisation
White: missing data

Breastmilk feeding at discharge home

Does a baby born at less than 32 weeks' gestational age receive any of their own mother's milk at discharge to home from a neonatal unit?[9]

For very preterm babies who received all their care in one neonatal unit without being transferred this measure describes the proportion receiving any of their own mother's milk when they were discharged home.



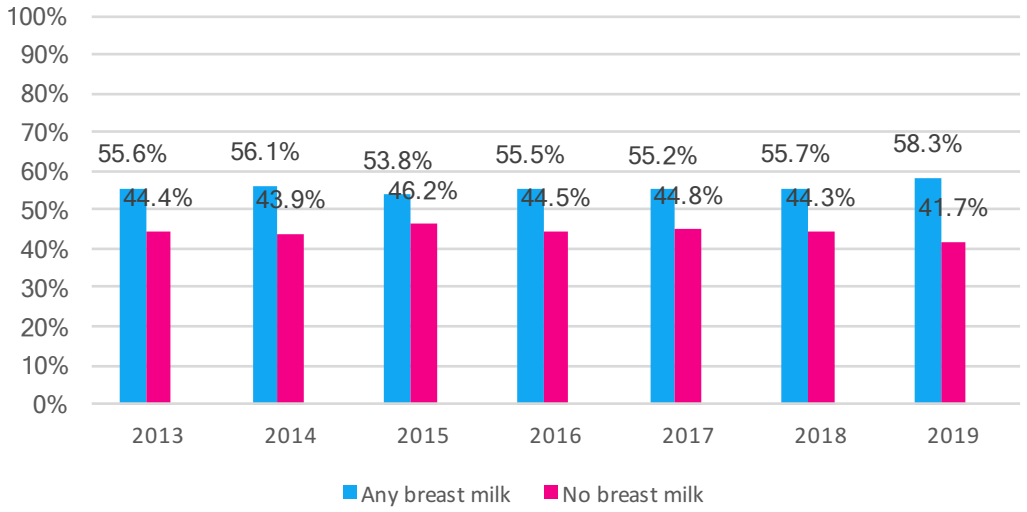
Results

Of the 6,756 eligible babies born at less than 32 weeks, there were 6,747 babies with data available from the final or penultimate day of care. Data were missing for 9 (0.1%) eligible babies. Of the 6,747 babies with data entered, 58.3% (3,935 babies) were receiving any of their mothers' own milk at time of discharge.

Table 19. Breastmilk feeding at discharge home, by neonatal unit level.

Unit level	Babies	With data entered	Enteral feeds at the time of discharge		Missing data
			Any breast milk	No breast milk	
SCU	918	918	475 (51.7%)	443 (48.3%)	0 (0%)
LNU	3,013	3,010	1,825 (60.6%)	1,185 (39.4%)	3 (0.1%)
NICU	2,825	2,819	1,635 (58%)	1,184 (42%)	6 (0.2%)
Total	**6,756**	**6,747**	**3,935 (58.3%)**	**2,812 (41.7%)**	**9 (0.1%)**

Figure 20. Breastmilk feeding at discharge home, by NNAP reporting year (2013 to 2019), for very preterm babies



Note: The eligibility for this measure has changed between 2018 and 2019. From 2019 onwards, only very preterm infants (those born at less than 32 weeks' gestation) are included in this measure, replacing previous eligibility of less than 33 weeks' gestation.

Key findings

Key finding (T) – Early Breastmilk Feeding

82% of very preterm babies experienced the benefits of having received some of their own mother's milk on 14 days of age.

Key Finding (U) – Early Breastmilk Feeding

There is wide variation in the proportion of babies receiving some of their own mothers' milk on 14 days of age by neonatal network (76-88%), consistent with known geographical variation in breastmilk feeding of term babies in the UK. This variation is seen in the plots representing milk feeding of different networks and units in Figure 19.

It is of concern that NICUs do not, on average, have higher rates of babies receiving some of own mother's milk feeding at 14 days than SCUs or LNUs, given that smaller and sicker babies are more likely to need and benefit from their own mother's expressed breast milk.

There is wide variation among neonatal units in the proportion of babies fed some of their own mother's milk on day 14 (NICU range 68 – 92%), but only two NICUs can be identified to have low outlying rates.

Key finding (V) – Breastmilk feeding at discharge home

Around 6 in 10 very preterm babies were receiving some of their own mother's milk as part of their feeding at discharge home. This has not changed significantly since 2013, which is concerning given the importance of breastmilk to the health of preterm babies.

Recommendation (11):

Neonatal units and networks should:

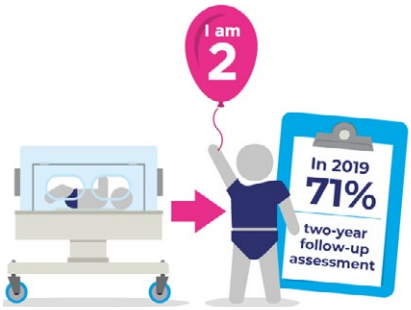
Focus on both the early initiation and sustainment of breastmilk feeding in conjunction with parents by:

- Reviewing data and processes in order to undertake selected quality improvement activities suited to the local context
- Removing barriers to successful breastmilk feeding by ensuring that appropriate and comfortable areas are provided with adequate, regularly cleaned expressing equipment
- Seeking and acting on feedback from local parents on their experience of starting and sustaining breast feeding
- Working to achieve and sustain both UNICEF UK Baby Friendly Initiative Neonatal Unit accreditation and Bliss Baby Charter accreditation
- Implementing the guidance and evidence-based care practices set out in the BAPM Maternal Breastmilk Toolkit
- Working with local parents to review and improve local practices around the early communication of the benefits of breastmilk, ideally prior to birth wherever possible

So that the many health benefits to the preterm baby and the mother of breastfeeding can be realised..

2.13. Follow-up at two years of age

Does a baby born at less than 30 weeks' of gestational age receive medical follow-up at two years corrected age (18-30 months gestationally corrected age)?



It is important that the development of very preterm babies is monitored after the baby is discharged from the neonatal unit. This measure looks at whether there is a documented medical follow-up consultation at two years of age for babies born at less than 30 weeks' gestational age between July 2016 and June 2017 who survived and were discharged home from the neonatal unit.

The follow-up consultation assesses whether there are any significant problems with movement, the senses, and general development or other health problems. Babies born very early encounter these problems more often than those born at full-term. It is important for those involved in the care of babies to know how they are developing as they get older, so that they can arrange appropriate treatment.

Results

There were 4,221 babies born at less than 30 weeks' gestational age between July 2016 and June 2017 who survived and were discharged from a neonatal unit to home, to a ward or to foster care. Of these, 70.8% (2,987 of 4,221) had at least some two-year follow-up health data entered. *For more information on this measure, check out our* measures guide.

Figure 21. Caterpillar plot of the rates of two-year follow-up assessment: neonatal units, 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation. Units are presented in ascending order of the rates and units can be identified on NNAP Online.

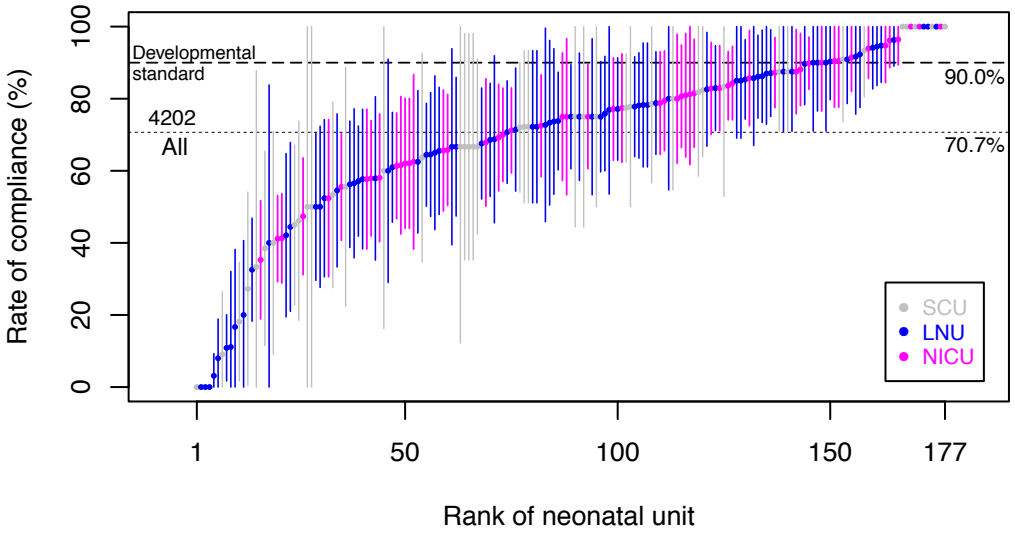


Figure 22. Caterpillar plot of the rates of two-year follow-up assessment: neonatal networks, 2019.

For help interpreting these caterpillar plots, please see appendix G: Methodology and Interpretation.

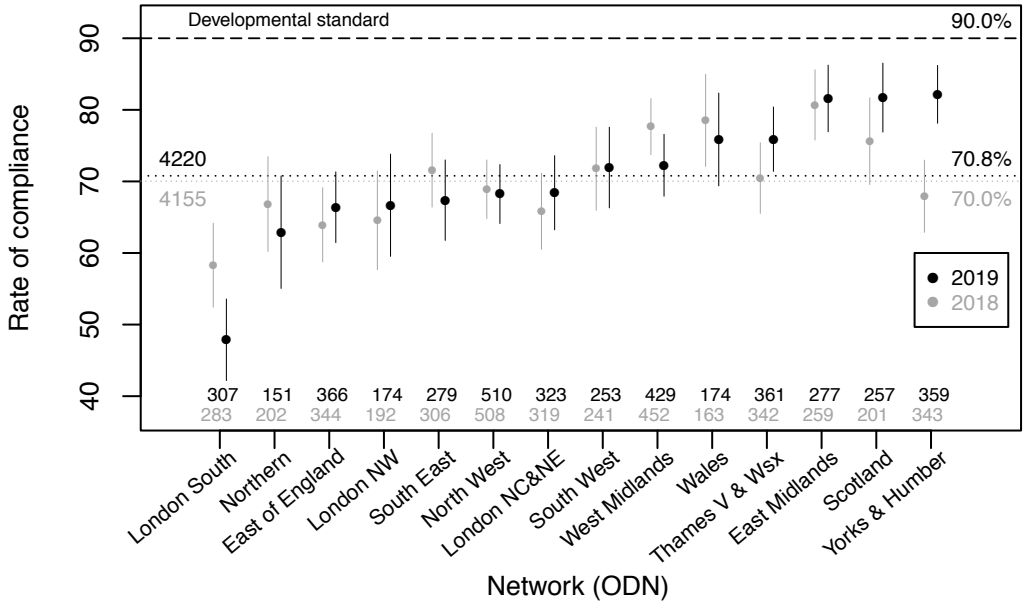
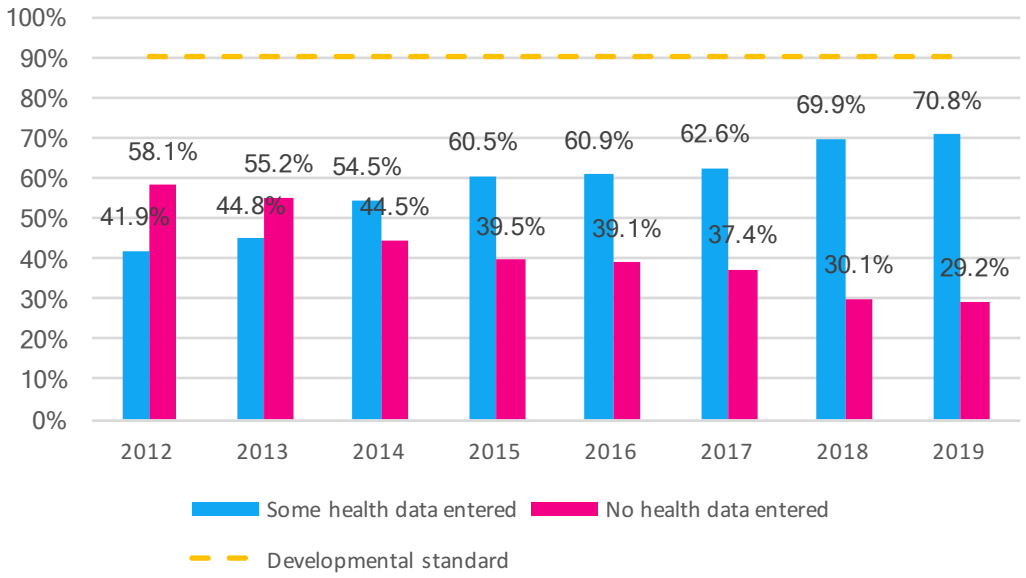


Figure 23. Two-year follow-up rates, by NNAP reporting year (2012-2019).



Key findings

Key finding (W) – Follow-up at two years of age

There is marked variation between neonatal networks in rates of follow up (range 48 – 82%). No network is close to recording at least some clinical follow up data for all its babies. One network has recorded a marked decline in follow-up rates since 2018.

Neonatal units record a wide range of follow up achievement from 0 – 100%. All unit types show some exceptional, and low rates of follow up.

Recommendation (12):

Neonatal units should:

Produce detailed plans to provide or organise follow up of care for preterm babies in accordance with NICE guidance and consider arrangements for:

- Communicating with families about follow up at discharge
- Families who live far from the hospital of care
- Families who do not attend appointments
- Families who move to different areas
- Completing and documenting assessments made

So that very preterm babies can be monitored and checked for any problems with movement, the senses, delays in development or other health problems and so that parents can get reassurance about how their baby is developing, and any support that they might need.

The British Association for Neonatal Neurodevelopmental Follow Up (BANNFU) should:

- describe and promote best practice and successful models of delivery of high rates of follow up using appropriate instruments

To improve the long-term outcomes of all babies that have had neonatal care.

2.14. Mortality until discharge in very preterm babies

What proportion of very preterm babies die before discharge home, or before reaching 44 weeks' of post-menstrual age (whichever occurs sooner)?

Mortality is a tragic outcome of neonatal care, that is unlikely to be preventable in all cases. The NNAP reports mortality until discharge, or 44 weeks' post-menstrual age (whichever occurs sooner) for a three-year cohort of babies born at 24 to 31 weeks' gestational age inclusive, between 1 July 2016 and 30 June 2019.

We chose to report this measure of mortality to supplement other measures of mortality, such as that reported by Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries in the UK (MBRRACE-UK). The NNAP measure focuses only on very preterm babies (those born at less than 32 weeks' of gestation), because they experience higher mortality. MBRRACE-UK report mortality for all gestation ages. Also, unlike MBRRACE-UK, NNAP reporting is limited to those babies born alive and admitted to neonatal units. An important additional strength of NNAP mortality reporting is that it describes mortality rates up to the point of hospital discharge. MBRRACE-UK report neonatal mortality, defined as that occurring before 28 days of age, by centre. There is evidence that substantial numbers of babies die after 28 days[xii]. MBRRACE-UK have published data showing national rates of infant mortality (death before a year of age) for a subset of very preterm babies[xiii].

We present both actual, or crude rates of mortality, as well as estimates of the treatment effect. This treatment effect is defined by comparing the mortality of very preterm babies within a network to the mortality of a group of babies in the whole country, matched for background variables. These background variables are: birthweight; gestation; birth year; maternal age; number of previous pregnancies; maternal ethnicity; multiplicity; maternal smoking; medical problems of pregnancy; placental abruption; onset of labour. Deprivation is not matched for in this analysis. This treatment effect measure presents an answer to the question "what would the outcome for a network's babies have been, had they been cared for elsewhere".

NNAP mortality reporting will facilitate mortality focussed quality improvement initiatives between neonatal networks. Crude mortality alone is reported for Scotland because of incomplete participation. Mortality is not reported for the Isle of Man as it is not part of a neonatal network. *For more information on this measure, check out our measures guide*.

Results

23,906 babies were eligible for inclusion in this measure. One baby was excluded from the analysis on the account of unknown birthweight and mortality outcome was unknown for 138 babies. The total number of babies included in the analysis was 23,767. Before the final extract of data was taken, a review exercise was conducted with neonatal units to reduce the number of babies with unknown mortality outcome.

Table 20. Rates of mortality before discharge of very preterm infants born 1st July 2016 – 30th June 2019: crude rates and treatment effect: neonatal networks.

Network	Total eligible babies	Missing survival status*	Total included in the analysis	Died before 44 weeks PMA	Survived to 44 weeks PMA or discharge home	Crude mortality rate (%)	Treatment effect	Standard error
East Midlands	1,484	8	1,476	108	1,368	7.32	1.28	0.71
East of England	1,883	9	1,874	84	1,790	4.48	-1.77	0.52
North Central & North East London	1,665	14	1,651	74	1,577	4.48	-2.46	0.53
North West London	1,087	4	1,083	65	1,018	6.00	-0.91	0.86
North West	2,924	14	2,910	221	2,689	7.59	0.62	0.48
Northern	1,065	19	1,046	70	976	6.69	-0.08	0.82
Scotland	1,662	21	1,641	113	1,528	6.89		
South East Coast	1,673	11	1,662	109	1,553	6.56	-0.54	0.58
South London	1,468	4	1,464	88	1,376	6.01	-0.65	0.77
South West	1,425	4	1,421	85	1,336	5.98	-0.20	0.73
Thames Valley & Wessex	1,916	15	1,901	103	1,798	5.42	-0.98	0.56
Wales	981	3	978	65	913	6.65	1.01	0.81
West Midlands	2,405	7	2,398	215	2,183	8.97	2.62	0.61
Yorkshire & Humber	2,268	6	2,262	167	2,095	7.38	1.00	0.58
Total	**23,906**	**139**	**23,767**	**1,567**	**22,200**	**6.59**		

* This includes 1 baby with missing birth weight

Figure 24. Caterpillar plot of crude mortality until discharge and treatment effect: neonatal networks. Very preterm infants (<32 weeks' gestational age) born 1st July 2016 to 30th June 2019

Dots indicate rates of crude mortality (upper panel) and treatment effect (lower panel). The vertical lines indicate the 95% confidence intervals. Scotland is not included in the treatment effect analysis.

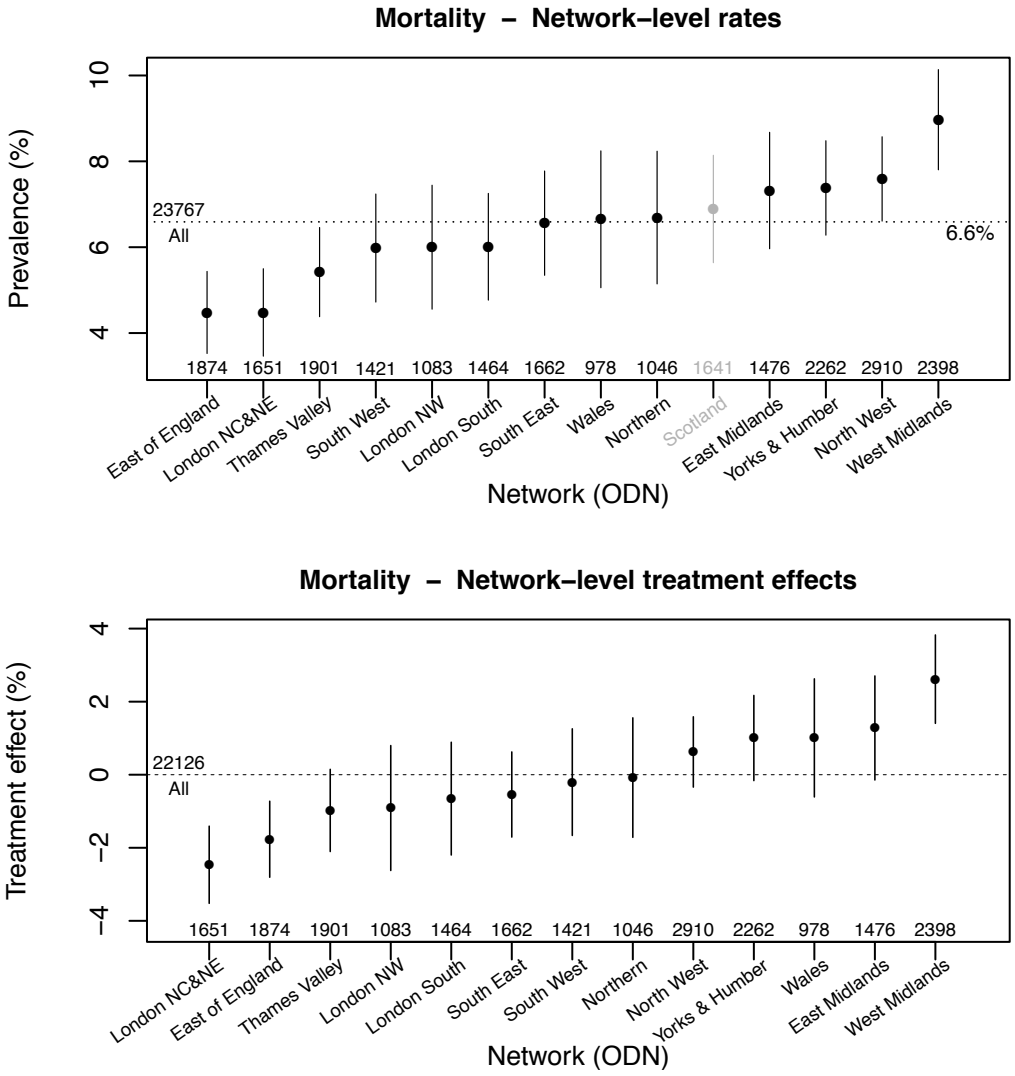
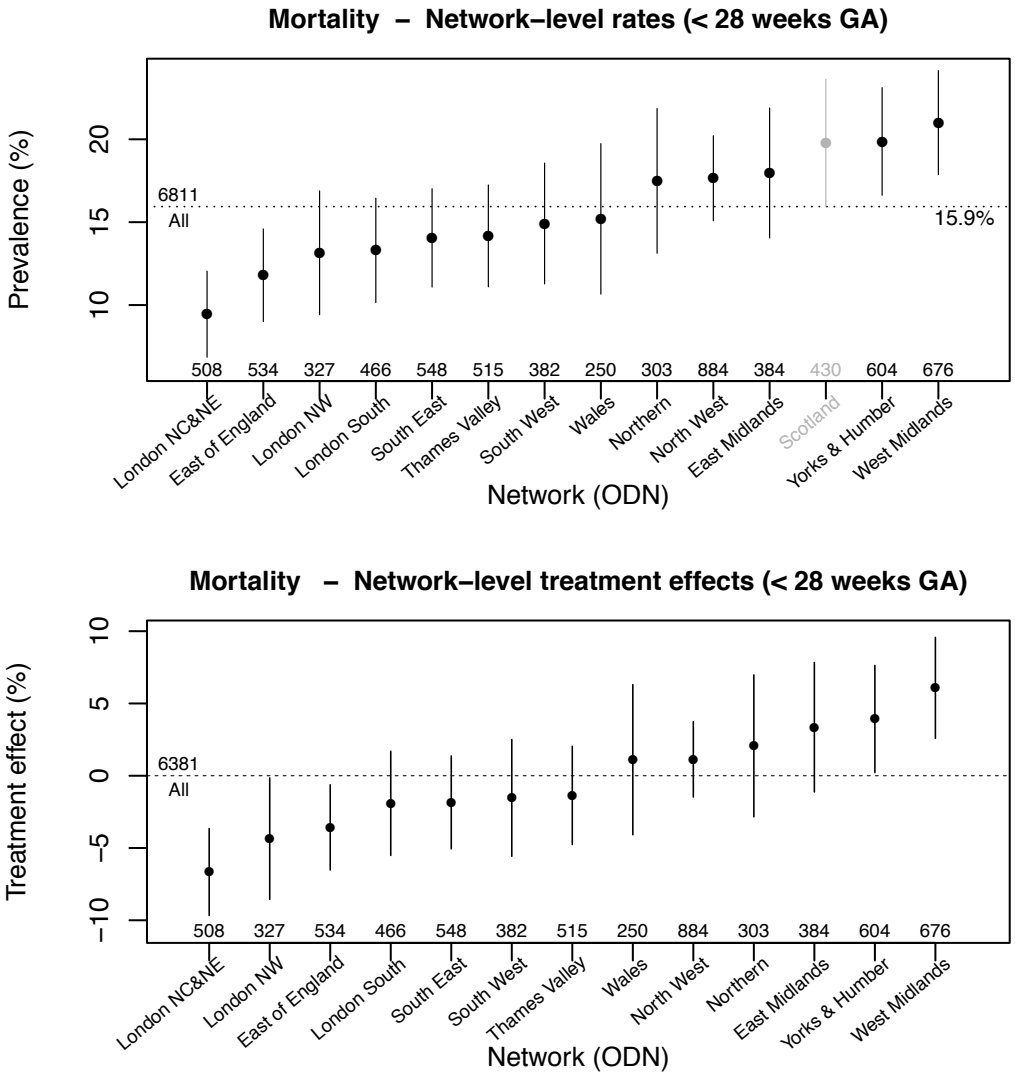


Figure 25. Caterpillar plot of crude mortality until discharge and treatment effect: neonatal networks. Very preterm infants (< 28 weeks' gestational age) born 1st July 2016 to 30th June 2019



Key findings and recommendations

Key finding (X) – Mortality until discharge home in very preterm babies

Mortality before discharge, or 44 weeks' post-menstrual age, of very preterm infants admitted for neonatal care, varies between neonatal networks from 4.5 – 9%. A similar pattern of variation is seen in mortality of the least mature babies – those born at less than 28 weeks' of gestation, whose mortality varies from 9.5 – 21%.

The variation is not explained by differences in case mix. Where the mortality for a network's cases is compared to mortality of a similar group of babies cared for in the whole country, significant differences in outcome are seen. These are presented as estimated treatment effect for care of very preterm babies admitted in the units of each network, and vary from negative 2.5% to positive 2.6%. Two networks can be identified as having "excellent" low (outlying) mortality treatment effect, and one network can be identified as having high (outlying) mortality treatment effect.

The rate of missing data in 2019 (0.5%) in this report is much lower than in the previous report (1.4%).

Recommendation (13):

Neonatal networks and their constituent neonatal units should, following a review of local mortality results, take action to:

- Consider whether a review of network structure, clinical flows, guidelines and staffing may be helpful in responding to local mortality rates
- Consider a quality improvement approach to the delivery of evidence-based strategies in the following areas to reduce mortality: timely antenatal steroids, deferred cord clamping, avoidance of hypothermia and management of respiratory disease
- Ensure that shared learning from locally delivered, externally supported, multidisciplinary reviews of deaths (including data from the local use of the Perinatal Mortality Review Tool) informs network governance and unit level clinical practice.

The patient safety team in NHS Improvement and equivalent bodies in the devolved nations should:

- Facilitate national dissemination of learning from mortality reviews.

2.15. Nurse staffing on neonatal units

What proportion of nursing shifts are numerically staffed according to guidelines and service specification?

What proportion of shifts have sufficient staff qualified in speciality (QIS)?

How many additional nursing shifts are required to be worked to meet guidelines and service specification?

Neonatal units in England are commissioned according to the NHS England service specification[3,8]. Services in Scotland and Wales are commissioned on a comparable basis according to the British Association of Perinatal Medicine (BAPM) standards[xiv]. Higher nurse staffing levels are associated with improved outcomes[xv]. Direct caring staffing ratios of one nurse per intensive care baby, one nurse to two high dependency babies, and one nurse for four special care babies with an additional shift coordinator are recommended. Furthermore, at least 70% of registered nursing staff on duty should have a neonatal specialist qualification.

Staffing variation may be due in part to the unplanned nature of neonatal care, with variation in demand. Appointing, retaining and providing career progression for a highly specialised nursing workforce also presents a challenge to neonatal services.

This measure describes the proportion of nursing shifts that met the service specification. This is done by comparing the maximum number of babies on a neonatal unit during each shift to the number and type of nurses working on that shift. We also report the average number of additional nurses that would be required to address any shortfall. *For more information on this measure, check out our* measures guide.

Results

173 units were eligible for inclusion in this measure; 7 units were excluded, as less than 25% of their shifts were recorded and 1 unit did not enter any shifts for the period. Units where more than 50% of shifts are staffed with three registered nurses or fewer are excluded from the calculation of the number of shifts meeting the qualified in specialty (QIS) element of the service specification; 55 units were excluded. This is because of the challenges of the audit applying the QIS criterion of the recommendations to shifts with small numbers of nurses.

Table 21. Compliance with neonatal nurse staffing standards: neonatal unit level.

Unit level	Eligible shifts	Eligible QIS shifts	Shifts meeting sufficient staffing specification (%)	Shifts meeting qualified in speciality specification (%)	Additional nurse shifts required	Additional average number of nurses per unit per shift required
SCU	29,686	4,380	22,953 (77.3%)	2,519 (57.5%)	5,023.4	0.2
LNU	58,332	44,710	42,370 (72.6%)	21,706 (48.5%)	21,199.0	0.4
NICU	37,591	36,983	21,369 (56.8%)	13,847 (37.4%)	41,630.4	1.1
Total	**125,609**	**86,073**	**86,692 (69.0%)**	**38,072 (44.2%)**	**67,852.8**	**0.5**

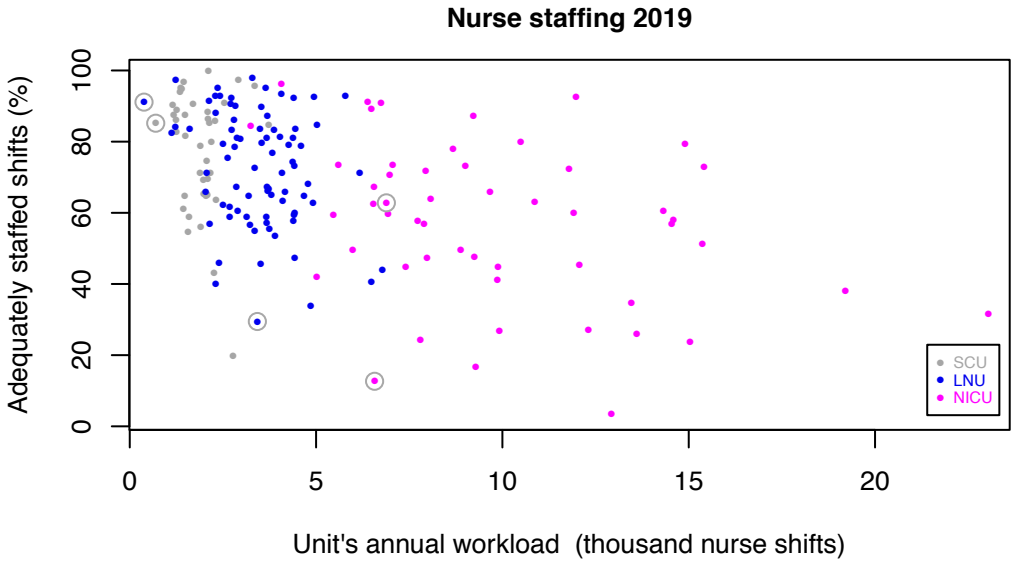
Table 22. Compliance with neonatal nurse staffing standards: neonatal networks.

Network (Neonatal ODN)	Eligible shifts	Eligible QIS shifts	Shifts meeting sufficient staffing specification (%)	Shifts meeting qualified in speciality specification (%)	Additional nurse shifts required	Average number of additional nurses per unit per shift required
East Midlands	7,300	5,840	5,587 (76.5%)	1,305 (22.3%)	3,039.6	0.4
East of England	12,410	8,760	9,621 (77.5%)	4,378 (50%)	2,721.95	0.2
Isle of Man	730	0	602 (82.5%)	. (.%)	104.225	0.1
North Central & North East London	3,156	2,674	1,834 (58.1%)	1,875 (70.1%)	3,682.525	1.2
North West London	4,258	2,920	1,899 (44.6%)	1,392 (47.7%)	12,239.18	2.9
North West	15,330	10,950	10,619 (69.3%)	6,731 (61.5%)	7,802.825	0.5
Northern	7,786	2,190	5,267 (67.6%)	762 (34.8%)	2,240	0.3
Scotland	8,030	7,300	6,293 (78.4%)	3,858 (52.8%)	2,646.525	0.3
South East Coast	9,490	5,840	6,818 (71.8%)	2,213 (37.9%)	3,473.775	0.4
South London	7,300	5,840	4,148 (56.8%)	2,595 (44.4%)	4,888.125	0.7
South West	8,760	6,570	5,470 (62.4%)	2,783 (42.4%)	5,942.35	0.7
Thames Valley & Wessex	10,220	5,840	6,847 (67%)	2,290 (39.2%)	4,863.25	0.5
Wales	7,480	5,290	6,071 (81.2%)	2,007 (37.9%)	2,664.625	0.4
West Midlands	10,220	7,300	5,945 (58.2%)	2,150 (29.5%)	7,780.8	0.8
Yorkshire & Humber	13,139	8,759	9,671 (73.6%)	3,733 (42.6%)	3,763.025	0.3
Total	**125,609**	**86,073**	**86,692 (69.0%)**	**38,072 (44.2%)**	**67,852.8**	**0.5**

Figure 26. Adherence to recommended nurse staffing levels. Neonatal units England, Wales, Scotland, 2019.

On the horizontal axis is a measure of unit activity related to staffing – namely, the number of nurse shifts required to deliver adequate staffing according to the guidelines for all 2019 shifts, based on the babies present on each shift. The vertical axis shows the proportion of these nurse shifts reported to be staffed according to guidelines.

A unit's annual workload is defined as the total number of shifts that would have been necessary for adequate staffing over the year. For instance, a unit that required four nurses to care for its babies for every one of its 730 shifts had a workload of 4 x 730 = 2920.



Key findings and recommendations

Key Finding (Y): Nurse staffing in neonatal units

Nurse staffing on neonatal units in England, Scotland and Wales remains significantly below nationally recommended levels. Overall, 69% of shifts are numerically staffed according to national recommendations – showing modest improvement on 2018 data (64%), but such high levels of understaffing in some units are a serious cause of concern.

As in 2018, NICUs experience the highest proportion of shifts not staffed according to the recommendations when compared to SCUs and LNUs, although neonatal units of all levels report increases in the proportion of shifts staffed adequately. This is of particular concern as the babies in a NICU are usually the most unwell and require the most attention.

Considerable variation exists between neonatal units in their reported staffing. For example, NICUs adherence to the numerical staffing criterion ranged from 3.4% to 99% of shifts.

The proportion of nursing shifts with sufficient staff with the relevant specialist qualification remains problematic. Just 44% of shifts were staffed according to this element of the recommendations. On average, NICU adherence to this element of national recommendations has worsened, in contrast to modest improvements seen in other measurements of staffing.

Recommendation (14):

Departments of Health in England, Scotland and Wales should:

- Ensure that sufficient resources are available for the education and employment of suitably trained professionals to meet and maintain nurse staffing ratios described in service specifications

Universities and Health Education England or equivalent bodies in the devolved nations should:

- Consider revising, renewing and standardising models of specialist neonatal nursing education

In order that future rises in numbers of nurses who are qualified in speciality result in the comparable increments in nursing expertise in different neonatal networks, universities and Health Education England

Neonatal Units and Neonatal Networks should:

- Prioritise data quality assurance in submitting nurse staffing data
- Monitor adherence to recommended nurse staffing standards
- Develop action plans to address any deficits in nursing staffing and skill mix

So that babies and their parents are cared for at all times by the recommended number of trained professionals.

2.16. Spine Plots

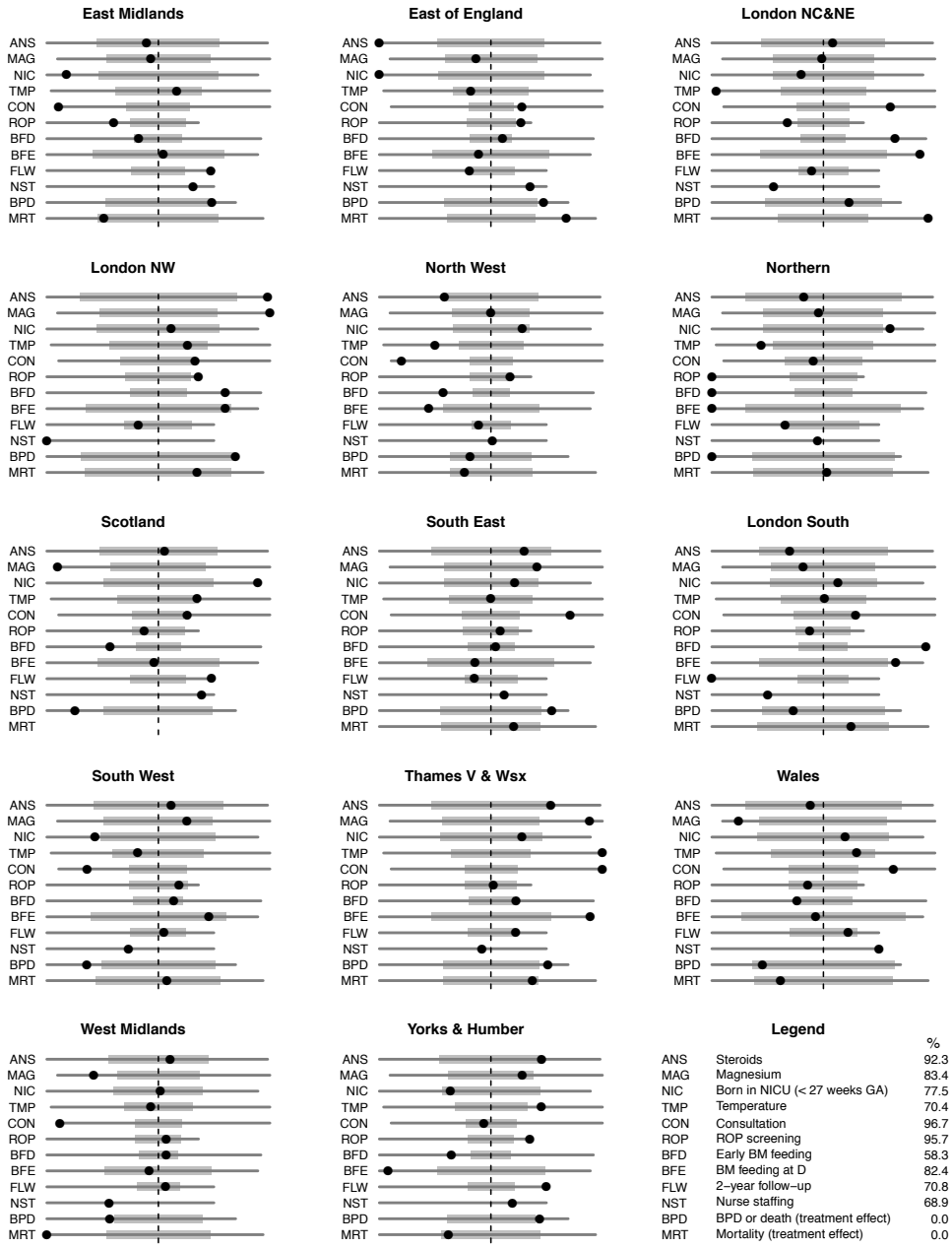
In Figure 27 we present spine plots that allow neonatal networks and units to review their performance in all NNAP measures in a single compact diagram.

Each network is presented as a panel alongside the other networks. Performance on each measure is shown with a black disk positioned on a horizontal line for each measure. The line extends from the lowest to the highest value for that measure among all the networks.

The rates are scaled so that the national rates are aligned to a single vertical line for all measures and orientated so that better performance is to the right hand side. A grey bar describes the expected range - two standard deviations either side of the national rate, akin to a funnel plot. No standard deviations are presented for the nurse staffing measure.

The measures of "BPD or death" and "Mortality" are represented by 'treatment effect' – favourable outcomes are presented as a dot to the right of the line. Unit level plots can be seen on NNAP Online.

Figure 27: Spine plots by neonatal network



3. Local quality improvement case studies

Case study 1: Do all low gestation babies in the Yorkshire and Humber Neonatal ODN receive all of the appropriate early interventions; identified locally as the 'Big 5'?

Presented by

Charlotte Bradford, Senior Information Manager, Yorkshire & Humber Neonatal ODN

Background:

To determine whether individual low gestation babies receive five, core, early care interventions. Ultimately, to determine whether provision of the 'Big 5' impacts on BPD outcome/mortality as well providing a focus for future QI projects.

Historically, the provision of individual clinical interventions has been reviewed in isolation; to date reviewing interventions at baby level hasn't been performed.

The network wanted to understand whether units achieving high rates of provision for one element of care did so for all, or whether in fact concentrating on one element to improve their rate of achievement meant that it was at the detriment of other elements of care.

Reviewing whether each low gestation baby receives the 'Big 5' identified as:

- *Delivery in appropriate location for gestational age*
- *Antenatal steroids*
- *Maternal Magnesium Sulphate*
- *Physiologically-based cord clamping*
- *Normothermia on admission*

All measures based on NNAP criteria apart from Deferred Cord Clamping (DCC) as that was not a measure when this work was commenced but has subsequently been brought in line with the NNAP criteria for DCC.

Measures:

A retrospective review of 'Big 5' data from BadgerNet from all 18 units in the Network, for all infants born <32 weeks. Data collated by the ODN with unit level summaries and network level, unit comparisons, to review the number of babies receiving 100% provision of the 'Big 5'.

A quarterly review of the data at unit level, as well as Unit type, LMS footprint & Network overviews are provided.

The initial phase of the project was to determine what the baseline for the provision of the 'Big 5' was. Review and discussion has taken place around the 'weighting' given to some elements and whether there should be 'grades' of compliance. These continue to be reviewed.

Our improvement plan:

The main change that this project has brought about is the focus on the baby rather than the individual elements of care.

Outcomes

This alternative approach to reviewing quality of care in individual babies is already contributing to improving working relationships between obstetric and neonatal services. Presenting the data in a relevant & easy to digest format supports clinicians to take responsibility for the care they provide by reporting meaningful and measurable metrics which can be linked to outcomes. There is scope for further extensive data review, which will be used to direct QI initiatives both at Unit and Network level to improve clinical outcomes.

Initial results from Q1 19/20 data demonstrated that only 17% (32) of cases across the Network had 100% provision of the 'Big 5'.

- *In NICUs the range was from 0% (0/23) to 38% (10/26)*
- *In LNUs the range was from 0% (0/9) to 33% (1/3)*
- *In SCUs all of the 4 units achieved 0%*

Deferred cord clamping was the most common reason for not achieving the 'Big 5' at all unit levels.

- *If DCC is not factored in compliance ranges from 0% to 100% with the mean being 47%.*

By Q4 19/20 the data demonstrated that there have been improvements at NICU level but that other unit types are not seeing such significant changes.

- *In NICUs the range was from 19% (3/16) to 52% (14/27)*
- *In LNUs the range was from 0% (7 units) (0/9) to 22% (2/9)*
- *In SCUs all 4 units achieved 0% - they will never achieve 100% though as none of these babies should be delivered in a SCU setting. However one unit did achieve all of the other criteria for the 2 babies that they admitted. Previous quarters the unit has achieved 0% and 50%.*

DCC continues to be one of the main factors contributing to units not achieving the 'Big 5'. It is clear that there is still a considerable way to go before we see the Big 5 being achieved for all babies.

It is hoped that continual monitoring along with the introduction of the DCC question in the NNAP audit will help to improve this, both in terms of change in clinical practice and as well as data recording.

Further work will be focused on:

- *Refining the reporting process and feeding back to maternity and obstetric colleagues via the LMS*
- *Reviewing if type of delivery or location of delivery impacts on receipt of 'Big 5'*
- *Reviewing final outcomes in relation to receiving the 'Big 5', specifically relating to BPD & mortality*
- *Reviewing the impact of increased provision of DCC and its introduction into the NNAP dataset*

Sample of a unit level summary

Delivery					Correct Delivery Location (<27wks or <800g)				Magnesium Sulphate (<30wks)	Admission Temperature (36.5-37.5)		Antenatal Steroids (<32wks)	Delayed Cord Clamping (<32wks)			Final Outcome	5 metrics (<30 wks)	
																	4 metrics (>=30 wks)	
Referral Type	Location of Birth	Fetus Number	Birth Order	Delivery Type	Gestation Weeks	Gestation Days	Birth weight	Correct Location	MgSO4	Admit Temp	In Range	ANS Given	DCC	DCC Time Minute	DCC Time Second	Final Outcome	Number of Metrics	% of Metrics Met
Inborn-booked	Labour ward	1	1	Vaginal- spontaneous	23	6	520	0	0	35.8	0	1	0			Died	1	20%
Inborn-booked	Labour ward	2	1	Vaginal- spontaneous	27	5	950	1	0	37.4	1	1	0			Home	3	60%
Inborn-booked	Labour ward	2	2	Vaginal- spontaneous	27	5	1350	1	0	38.8	0	1	0			Home	2	40%
Inborn-booked	Theatre	1	1	Emergency caesarean section - not in labour	28	5	930	1	1	36.7	1	1	0			Home	4	80%
Inborn-booked	Theatre	1	1	Emergency caesarean section - in labour	29	6	1220	1	1	37	1	1	1	1	0	Home	5	100%
Inborn-booked	Theatre	1	1	Emergency caesarean section - not in labour	30	3	1220	1	1	36.6	1	1	0			Home	3	75%
Inborn-booked	Theatre	1	1	Emergency caesarean section - not in labour	30	3	980	1	1	36.3	0	1	0			Died	2	50%
Inborn-booked elsewhere	Theatre	1	1	Emergency caesarean section - in labour	30	4	1090	1	0	37.5	1	1	0			Home	3	75%
Inborn-booked	Labour ward	1	1	Vaginal- spontaneous	30	5	1750	1		36.4	0	1	0			Home	2	50%
Inborn-booked	Labour ward	1	1	Vaginal- spontaneous	31	1	1450	1	1	36.5	1	1	0			Home	3	75%
Inborn-booked	Theatre	1	1	Elective section - not in labour	31	2	1470	1	1	36.7	1	1	0			Home	3	75%
Inborn-booked	Theatre	1	1	Emergency caesarean section - not in labour	31	5	1320	1	1	36.9	1	1	0			Home	3	75%
Inborn-booked	Theatre	1	1	Emergency caesarean section - not in labour	31	3	890	1		36.8	1	1	0		30	Home	3	75%
Inborn-booked	Theatre	1	1	Emergency caesarean section - in labour	31	5	2100	1		37.4	1	1	0			Ward	3	75%
Inborn-booked	Labour ward	1	1	Vaginal- spontaneous	31	3	1740	1	1	37	1	1	0		30	Home	3	75%
Inborn-booked	Theatre	1	1	Vaginal- spontaneous	31	6	1700	1	0	36.6	1	1	0			Home	3	75%
Inborn-booked elsewhere	Theatre	3	1	Elective section - not in labour	31	5	1390	1	0	36.8	1	1	0			Home	3	75%
Inborn-booked elsewhere	Theatre	3	2	Elective section - not in labour	31	5	840	1		36.7	1	1	0			Home	3	75%
Inborn-booked elsewhere	Theatre	3	3	Elective section - not in labour	31	5	1540	1		37.5	1	1	0		30	Home	3	75%
		Number of Mothers	16		19	<32 wks		18	8		15	19	1					1
					5	<30 wks		95%	42%		79%	100%	5%					5%

Case study 2: Prevention of Cerebral Palsy in Preterm Labour (PReCePT): National implementation programme and nested randomised controlled trial

Presented by

Karen Luyt (PReCePT Programme Clinical Lead and PReCEPT Study Chief Investigator), Ellie Wetz (Programme Manager, West of England AHSN on behalf of the AHSN Network), Pippa Craggs (PReCePT2 Project Manager, University Hospitals Bristol & Weston NHS Foundation Trust)

Background

Being born preterm is the leading cause of Cerebral Palsy (CP), with lifelong impact on children and families. Magnesium Sulphate (MgSO4) given intrapartum during preterm labour reduces the relative risk of CP in very preterm infants by 30%[1]. The NNT (below 30 weeks' gestation) to prevent one case of CP is 37[2], and yet UK use was inconsistent[3], leading to preventable health inequalities.

In West-England we co-designed, with parents, obstetric, midwifery and neonatal clinical teams, a scalable Quality Improvement (QI) initiative called PReCePT (Prevention of Cerebral Palsy in Preterm Labour), which was piloted as PReCePT1 in five maternity units from 2015. The uptake of MgSO4 increased from 21% to 88% within 6 months[4]. PReCePT1 influenced the UK national preterm labour guideline, which recommends intrapartum MgSO4 in preterm labour, < 30 weeks' gestation[6].

PReCePT1 achieved: a) scalable QI intervention ready for national adoption/spread b) development of the national metric for MgSO4 uptake, in partnership with NNAP.

In 2018 the Health Foundation funded us to scale-up and research how best to support teams to adopt PReCePT[7]. The national implementation of PReCePT was commissioned by NHS England to be delivered by the Academic Health Science Network (AHSN) across England[8].

Measures

The primary measure is percentage uptake of MgSO4 per unit as reported by NNAP. The size of the national adoption problem became evident in the 2017 NNAP report. Only 44% of preterm babies received the benefit of MgSO4 neuroprotection, with large variability (26-71%) between ODNs.

Our improvement plan

The Aim: for every maternity unit to adopt the NICE NG25 guidance and achieve 85% uptake of administration of MgSO4 to eligible mothers in preterm labour in England by April 2020.

A novel network QI delivery model:

- delivery by 15 AHSNs, aligned to Neonatal ODNs, in all 152 maternity/neonatal units
- regional QI and clinical leads, working with unit-level midwife champions (clinical time funded)
- PReCePT obstetric and neonatal lead in each unit, enabling a perinatal team approach
- standardised QI resources (toolkit, implementation guide, training presentations and promotional collateral)[8]
- nested randomised control research trial, in 40 maternity units, designed to assess the effectiveness of two different QI implementation methods[9]

Outcomes

Mean average MgSO4 uptake achieved in England in 2019 was 84.9% Variability between English ODNs was substantially reduced (Range in 2016: 26-71% vs. range in 2019 77.5-93.7%). The likely impact will be a substantial ongoing reduction of avoidable cerebral palsy. PReCePT enabled a national perinatal QI network and will provide best practice evidence for national scaling up of perinatal QI initiatives.

Challenges and learnings

Lessons learnt to foster success:

- Place babies and families at the heart of the programme - parent advisers have strongly advised that MgSO4 be offered to all eligible mothers to help improve the life chances of preterm babies – *video clips* [10,11]
- Funded support/time for front-line clinicians to deliver the project key to successful delivery
- Fostering a perinatal team, joining together obstetric, midwifery and neonatal clinicians – developing perinatal clinical leadership in every unit – *video clip*[12]
- National strategic alignment to the Maternity and Neonatal Safety Improvement Programme and ODNs
- Positive use of social media to engage a truly national PReCePT community-@ PReCePT_MgSO4 @PReCePT_Study

Challenges:

- Designing a project that was responsive to differences in unit level culture and microsystems
- High number of stakeholders to engage/coordinate with, challenged by regional variation
- Access to real-time data to support the monitoring of MgSO4 uptake

Top tips for implementation

- Engage and empower perinatal clinicians to lead at local and regional level
- Provide the QI skills, evidence and support to effect change
- Create a social media community of practice and communication plan
- Development a metric for national measurement of MgSO4 uptake, utilising routine data
- Influence national policy; MgSO4 neuroprotection has become routine practice by inclusion in the NHS Long-Term plan[13], "Saving Babies' Lives Care Bundle"[14] and NICE guidance[6], enabling sustainability of uptake.

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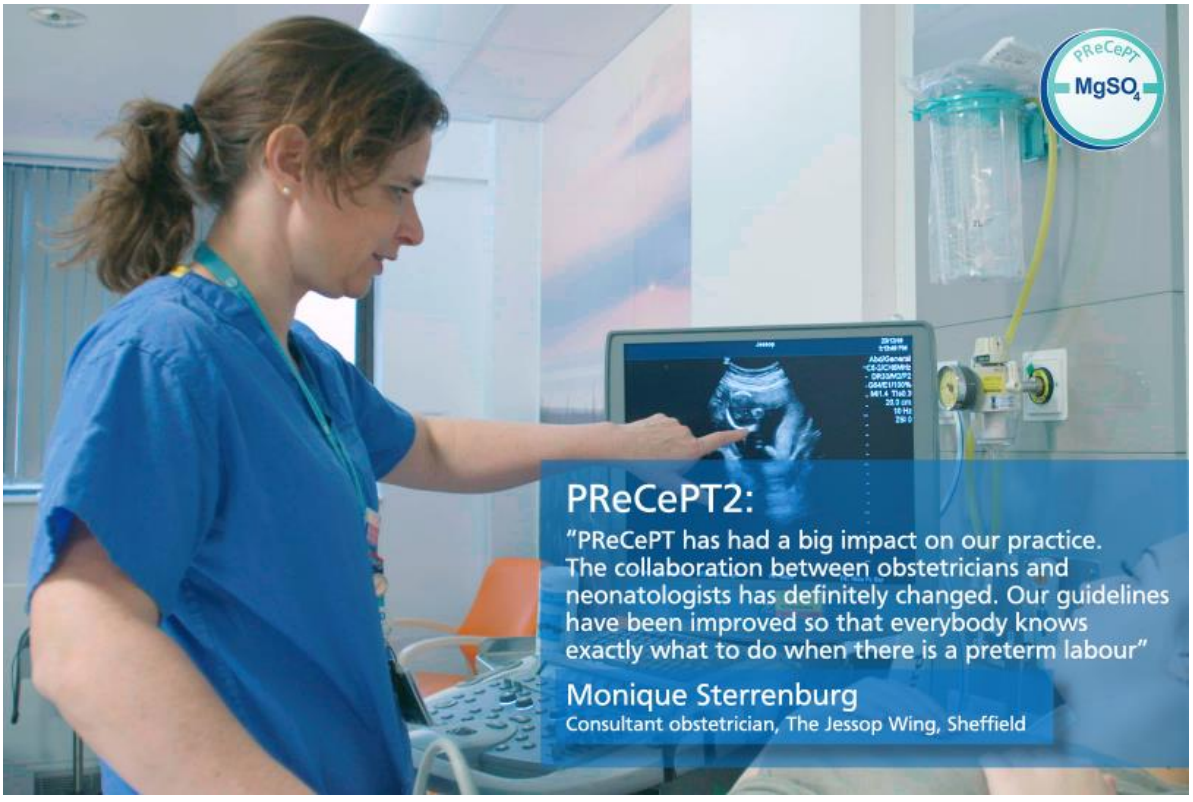
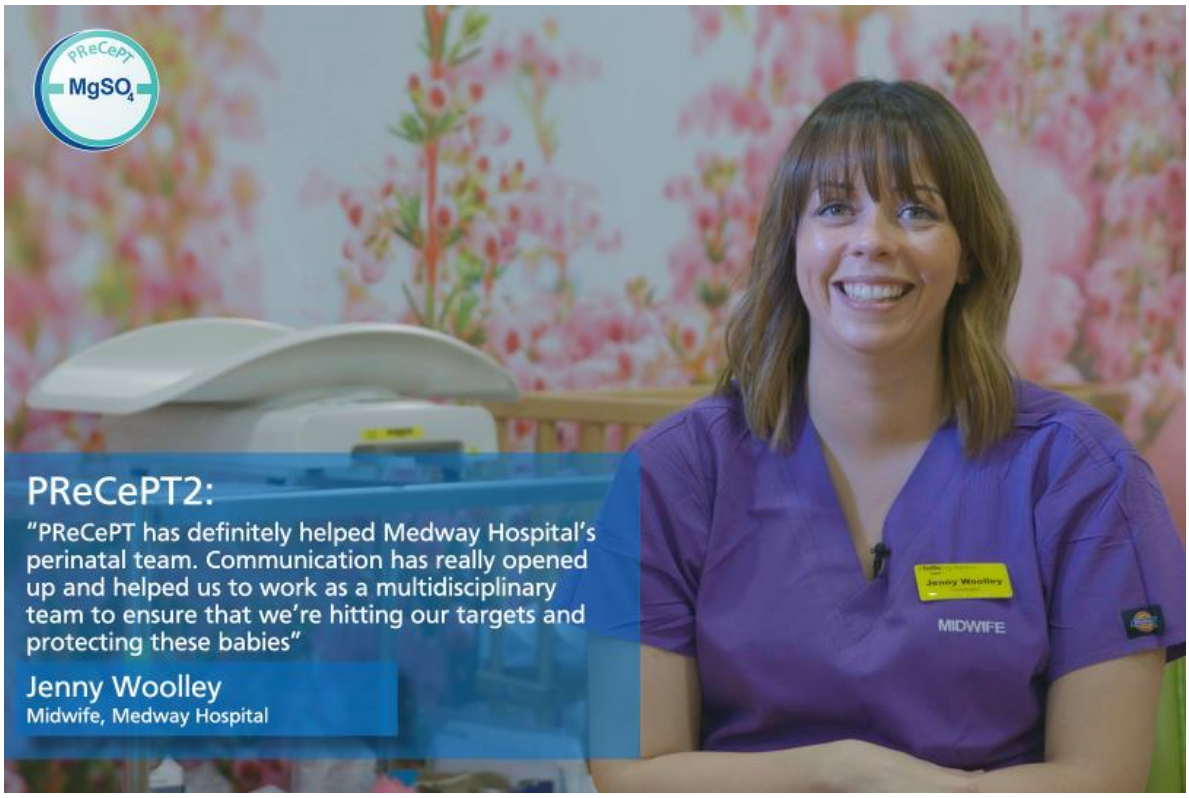
Acknowledgements

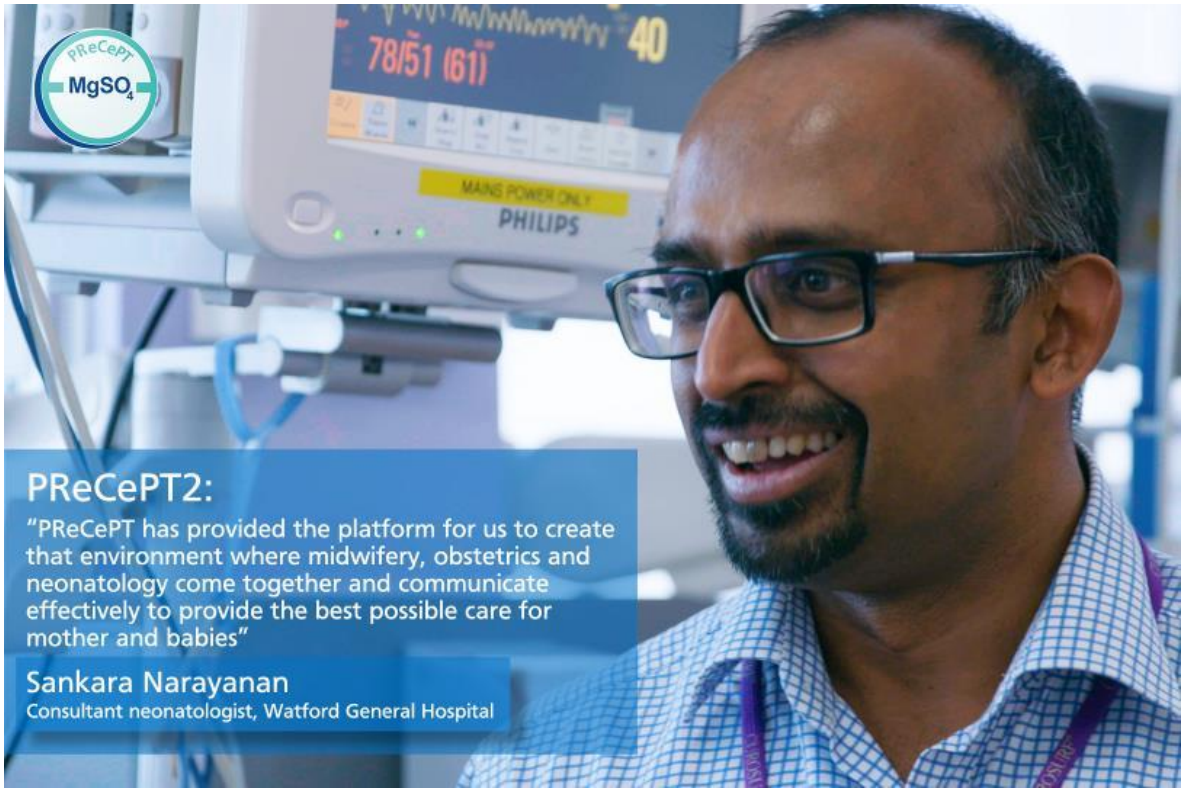
- West of England Academic Health Science Network (WEAHSN)
- National Academic Health Science Network
- University Hospitals Bristol and Weston NHS Foundation Trust
- The Health Foundation
- National Institute for Health Research Applied Health Collaboration West (NIHR ARC West)

Supportive Quotes from service users and perinatal teams


PReCePT
MgSO4
PARENT
PReCePT2:
"In the first PReCePT project we learned that the whole perinatal team needed to be developed to work as one, and I'm really pleased to see that this is what's happening up and down the country"
Monica Bridge
Parent advisor


PReCePT
MgSO4
PReCePT2:
"PReCePT has had a big impact on our practice. The collaboration between obstetricians and neonatologists has definitely changed. Our guidelines have been improved so that everybody knows exactly what to do when there is a preterm labour"
Monique Sterrenburg
Consultant obstetrician, The Jessop Wing, Sheffield


PReCePT
MgSO4
PReCePT2:
"PReCePT has definitely helped Medway Hospital's perinatal team. Communication has really opened up and helped us to work as a multidisciplinary team to ensure that we're hitting our targets and protecting these babies"
Jenny Woolley
Midwife, Medway Hospital
MIDWIFE


PReCePT
MgSO4
78/51 (61)
40
MAINS POWER ONLY
PHILIPS
PReCePT2:
"PReCePT has provided the platform for us to create that environment where midwifery, obstetrics and neonatology come together and communicate effectively to provide the best possible care for mother and babies"
Sankara Narayanan
Consultant neonatologist, Watford General Hospital

Case study 3: Keeping mothers & babies together: getting it right first time

Presented by

Shanthi Shanmugalingam, Lorraine Gallagher, Rose Villar. Royal Free London NHS Foundation Trust

NNAP Measure: Minimising inappropriate separation of mother and term baby

Background:

The Atain (avoiding term admissions into neonatal units) programme aims to address rising term (≥37^{+0} weeks) admissions by identifying the main reasons for admissions (respiratory conditions, hypoglycaemia, jaundice, asphyxia). Observation of the clinical journey for infants with risk factors for postnatal compromise ('at-risk' infants) highlights the complex pathways our teams were navigating. Clinical guidelines differed according to the specific risk factor in frequency and length of observations and support offered leading to variation in care delivery. This extended to the management of late preterm (34^{+0}-36^{+6} weeks) infants who were often pre-emptively separated from their mothers. Parent diaries highlighted how disempowered and vulnerable they felt in looking after their 'at-risk' baby. The need for standardisation and simplification was clear.

Aim:

We extended the NNAP measure to include both term and late preterm infants and aimed to reduce neonatal admissions to 6% by creating a single unified pathway of care for all 'at risk' infants.

Our improvement plan:

The traditional approaches of focusing on individual risk factors fail to address the underlying drivers of unwarranted variation in care delivery. The Royal Free Keeping mothers and babies together (KMB2) pathway centres on standardising care through the introduction of a single, simplified pathway focussing on the following key elements:

1. Standardised assessment of early respiratory distress
2. First hour care bundle
3. Orange 'hat-risk' nudge
4. Unified observation regime for all at-risk infants and revised Newborn Early Warning Trigger Tool (NEWTT) chart
5. Written information for families.

We started by devising a unified observation regime. Each step was tested, revised using rapid plan-do- study-act (PDSA) cycles and embedded before incremental introduction of another facet of the pathway. Collaboration with families and staff has been central in producing the pathway. The pathway team includes a father. Focus groups, one-to-one interviews and video feedback were used to inform the development of the pathway documents and continued to ensure rapid revision and retesting to hone the accessibility and utility of the pathway.

Measures & Outcomes:

The baseline admission rate for infants born after 34 completed weeks' gestation was 8.3%. We reduced this to 6.7% over a 2 year period (November 2017-November 2019). We continue to work towards achieving our target of 6%. Each PDSA cycle was tested using both qualitative (questionnaires, focus groups and interviews) and quantitative (e.g. number and quality of NEWTT charts and first hour care bundles being completed and obstacles to this) process measures. These measures were used to revise each step. Balancing measures included length of stay of mothers on the postnatal wards and presentation or readmission through accident & emergency departments within 7 days of birth. Both of these measures remained unchanged indicating that these infants are being safely transitioned home.

Sustainability

Sustainability has been primarily achieved by involving frontline staff in designing, refining and implementing the pathway and ensuring we achieved our brief of simplifying the process. During the implementation phase, the Trust introduced electronic patient records (EPR). We digitalised the pathway within the EPR to support sustainability and our midwifery team have welcomed this introduction reporting it was "*straight forward…makes sense*.".

Challenges and learning

We initially tried to implement the whole pathway at once, which resulted in staff rejecting it as too complex. Implementing a single aspect of the pathway, with rapid revision and refinement based on staff and parent feedback, proved more successful. Challenging preconceptions was difficult. Taking the lead from Richard Thaler's Nudge theory, we wanted to introduce orange hats for 'at risk' infants so they can be easily identified on a busy postnatal ward as requiring extra observations and feeding and temperature support. Staff were concerned that families would feel stigmatised. Parents were overwhelmingly enthusiastic citing increased confidence to ask for the extra support they needed. Hearing this directly from parents led to rapid adoption.

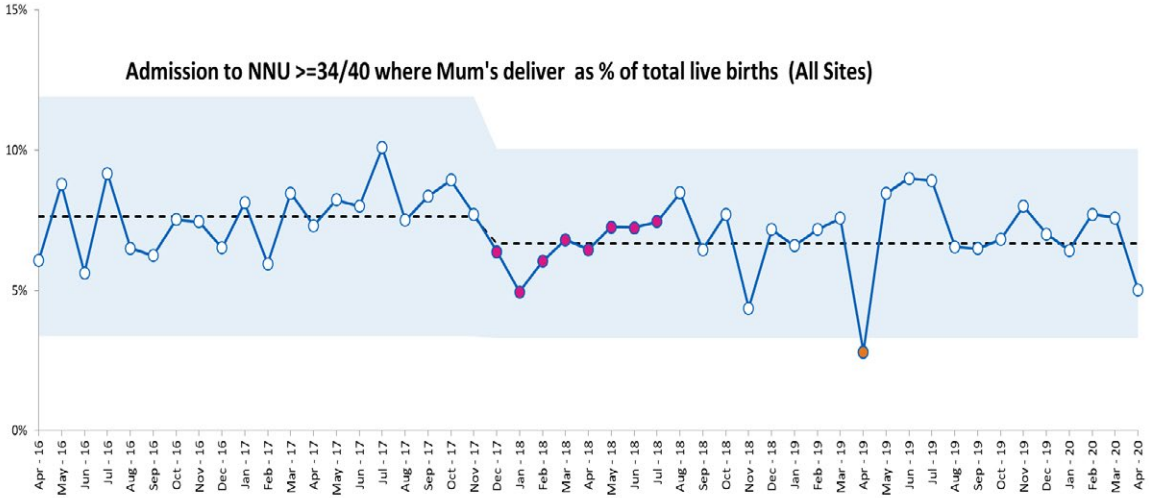
Top tips for implementation

- It was important that the vision was clear and the name of the project was chosen to reflect this. One parent commented, *"the name of the pathway…really captured what it was setting out to do"*.
- Engagement with all members of the team was crucial. Using a variety of feedback methods ensured a wide reach.
- The role of the parent voice cannot be underestimated.
- Communication within and across our teams has been important. Involving all the team by actively seeking feedback and acting on it brought a whole team ethos to this work.
- Board level support was important in terms of support offered but also in recognising and celebrating our successes.
- Spreading learning is important to ensure other teams were not reinventing the wheel. We have presented the KMB2 pathway at national and international conferences, through medical literature and shared widely through social media (our twitter handle is @MumBaby2gether). The pathway (in whole or aspects) has been adopted by Trusts across the UK and is available to all NHS Trusts via the NHS Improvement hub.

Acknowledgements

The maternity and neonatal teams at both Barnet and Royal Free Hospitals have positively embraced the KMB2 pathway. Their energy, drive and passion has been matched by the families who have contributed to producing this pathway.

Measures (Run Charts)



Case study 4: Improving Achievement and Documentation of Parental Consultation Within 24 Hours of Admission

Presented by

Dr. Kristin Tanney (Clinical Lead), Dr. Sajit Nedungadi (NNAP Lead), Dr. Ngozi Edi-Osagie (Clinical Head of Division, Newborn Services), Ms. Kath Eaton (Lead Nurse, Newborn Services), Mr. Marc Hutchison-Saxon (Neonatal Critical Care Audit Facilitator), Mrs. Chris Ashworth (Divisional Director, Newborn Services) Newborn Intensive Care Unit, St. Mary's Hospital, Manchester University NHS Foundation Trust

Background

We have struggled to achieve required standards in providing and documenting senior clinician updates for parents in the first 24 hours of admission. In 2018, NNAP reported us at 81% vs NA of 95.9%. We deemed the problem to be multi-factorial, related to: high turnover of babies and doctors; transition of babies from room to room; change in NNAP standard which excluded Tier 1 ANNPs from communications; switchover to electronic patient records with resultant documentation challenges. The aim of the project was to raise awareness of the issue, improve quality of parental discussions and documentation, and to reach (and ideally surpass) the NA success. Stakeholders involved: NNAP team as in author list above, Neonatal Consultants, senior clinical fellows and trainees, senior nursing staff, and our NICU parents.

Measures

With our audit facilitator emailing daily any outstanding parental updates, and a monthly visualisation of NNAP parameters on the NICU dashboard, we have been able to follow improvements closely.

Our improvement plan

By discussing outstanding updates at handovers, making parents aware that they should have a senior update soon after baby's admission and involving the Room Lead nurse in the process, there were frequent reminders and prompts. Circulating monthly data on individual consultants' success has had a positive effect on communication and documentation, introducing an important element of competition. Barriers to success included: nuances in our EPR leading to suboptimal documentation, occasional language barriers, availability of senior doctors to give updates out of hours, and keeping consultants engaged in the project. We have overcome these barriers by making tweaks to our EPR communication tabs, increasing our use of BigWord, targeted daily consultant emails, introduction of a "twilight" registrar shift, and the publication of the Consultant Leader Board.

Outcomes

We were delighted to see that expected Q1 2020 NNAP data sees us at 95.1%, above the NA of 94%, and in keeping with the expected 93% for 2019. We are confident that the results reflect our commitment to providing timely, high-quality updates for parents of our NICU babies. We will work to sustain the improvement, keeping all above measures in place.

Challenges, learnings and top tips for implementation

As this QI project has been very successful, we would not do anything differently were we to do it again, and would be happy to share our story and interventions with other units facing similar challenges.

4. Methods

4.1. Audit measures and measure development

The NNAP has developed the measures reported here with its partners and with input from audit users, professional organisations, parent support organisations, neonatal networks, national initiatives or members of the NNAP Methodology and Dataset Group and Project Board.

Table 4.1 summarises the measures included in the 2019 data report.

The NNAP sets standards for measures included in the audit where it is appropriate to do so. The developmental standard is a long-term goal to which units and networks should work. Where standards do not already exist as part of national guidelines and guidance, the standard is set by consensus with the NNAP Methodology and Dataset Group, Project Board, and other key stakeholders.

The comparison standard is set at the national mean rate for the year of analysis. Outlier analysis compares units and networks to this standard to determine whether there is enough evidence to identify them as high or low outliers.

Table 4.1. NNAP audit questions, standards and associated guidelines

NNAP question	Start year	Measure type	Developmental standard	Comparison standard	Associated guidelines
Is a mother who delivers a baby between 23 and 33 weeks' gestational age inclusive given at least one dose of antenatal steroids?	2008	Process	85% of mothers should receive at least one dose of antenatal steroids.	National rate	NICE guideline [NG25], Preterm Labour and Birth
Is a mother who delivers a baby below 30 weeks' gestational age given magnesium sulphate in the 24 hours prior to delivery?	2016	Process	85% of mothers should be given magnesium sulphate in the 24 hours prior to delivery.	National rate	NICE guideline [NG25], Preterm Labour and Birth
Is an admitted baby born at less than 27 weeks' gestational age delivered in a maternity service on the same site as a designated NICU?	2017	Process	85% of babies born at less than 27 weeks GA should be delivered in a maternity service on the same site as a NICU.	National rate (network only)	NHS England, Neonatal Critical Care Service Specification
Does an admitted baby born at less than 32 weeks' gestational age have its first measured temperature of 36.5–37.5°C within one hour of birth?	2013	Outcome	The composite measure of timeliness and normal temperature should be met for at least 90% of babies.	National rate (for timeliness and normal temperature)	NHS England, Neonatal Critical Care Service Specification

NNAP question	Start year	Measure type	Developmental standard	Comparison standard	Associated guidelines
Is there a documented consultation with parents by a senior member of the neonatal team within 24 hours of a baby's first admission?	2013	Process	A consultation should take place within 24 hours of first admission for every baby.	National rate	Scottish Gvt, Neonatal Care in Scotland: A Quality Framework NHS Wales. All Wales Neonatal Standards – 2nd Edition. Department of Health. Toolkit for high quality neonatal services
For a baby admitted for more than 24 hours, did at least one parent attend a consultant ward round at any point during the baby's admission?	2017	Process	None, benchmarking only	Not applicable, no outlier analysis.	Scottish Gvt, Neonatal Care in Scotland: A Quality Framework NHS Wales. All Wales Neonatal Standards – 2nd Edition. Bliss Family Friendly Accreditation Scheme
Does an admitted baby born weighing less than 1501g, or at gestational age of less than 32 weeks, undergo the first ROP screening in accordance with the NNAP interpretation of the current guideline recommendations?	2009	Process	100% of eligible babies should receive ROP screening within the recommended time windows for first screening.	National rate	RCPCH, RCOphth, BAPM, BLISS. Guideline for the Screening and Treatment of Retinopathy of Prematurity.
Does an admitted baby have one or more episodes of bloodstream infection, characterised by one or more positive blood cultures taken, after 72 hours of age?	2014-2016	Outcome	None, benchmarking only.	Not applicable, no outlier analysis.	
How many babies have a positive blood culture (any species) with a central line present, after the first 72 hours of life, per 1000 central line days?	2014-2016	Outcome	None, benchmarking only.	Not applicable, no outlier analysis.	
Does an admitted baby born at less than 32 weeks develop BPD?	2013-2015	Outcome	None.	Treatment effect of 0%.	
Does an admitted baby born at less than 32 weeks' gestational age meet the NNAP surveillance definition for NEC on one or more occasion?	2017	Outcome	None, benchmarking only.	Not applicable, no outlier analysis.	

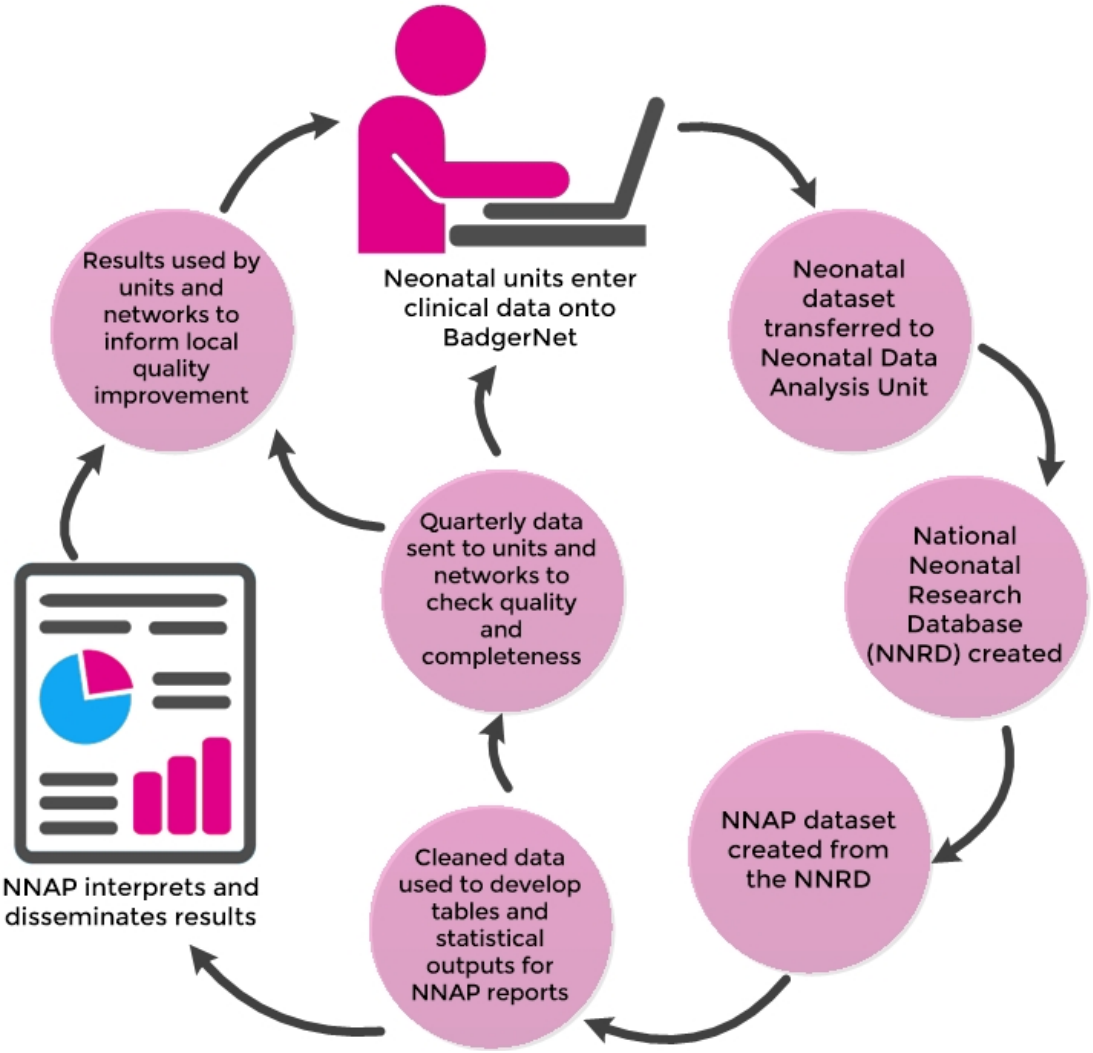
NNAP question	Start year	Measure type	Developmental standard	Comparison standard	Associated guidelines
For a baby born at gestational age greater than or equal to 37 weeks, who did not have any surgery or a transfer during any admission, how many special care(a) or normal care(b) days were provided when oxygen was not administered?	2017	Process	None, benchmarking only.	Not applicable, no outlier analysis.	
For a baby born at 34-36 weeks' gestational age, who did not have any surgery or a transfer during any admission, how many special care(a) or normal care(b) days were provided when oxygen was not administered?	2017	Process	None, benchmarking only.	Not applicable, no outlier analysis.	
Does a baby born at less than 32 weeks' gestational age receive any of their own mother's milk at day 14 of life?	2019	Outcome	None, benchmarking only	Not applicable, no outlier analysis	
Does a baby born at less than 32 weeks' gestational age receive any of their own mother's milk at discharge to home from a neonatal unit?	2013	Outcome	None, benchmarking only.	Not applicable, no outlier analysis.	
Does a baby born at less than 30 weeks' gestational age receive medical follow-up at two years corrected age (18-30 months gestationally corrected age)?	2012	Process	90% of babies with two-year follow-up data entered.	National rate	NICE guideline [NG72], Developmental follow-up of children and young people born preterm.
1. What proportion of nursing shifts are numerically staffed according to guidelines and service specification? **2. What proportion of shifts have sufficient staff qualified in speciality (QIS)?** **3. How many additional nursing shifts are required to be worked to meet guidelines and service specification?**	2018	Structure	100% of shifts compliant with guidelines and service specification.	Not applicable, no outlier analysis.	NHS England. Neonatal Critical Care Service Specification Department of Health. Toolkit for high quality neonatal services BAPM. Service Standards for Hospitals Providing Neonatal Care
Does a baby born at less than 32 weeks' gestational age die before discharge home, or 44 weeks' post-menstrual age (whichever occurs sooner)?	2018	Outcome	None	Not applicable, no outlier analysis.	

4.2. Data flow

Data for the NNAP analyses are extracted from the National Neonatal Research Database (NNRD) held at the Neonatal Data Analysis Unit (NDAU). The NNRD contains a predefined set of variables (the National Neonatal Dataset) obtained from the electronic neonatal patient records of each participating NHS trust or health board.

Figure 28 describes this data flow and the feedback loop, which disseminates results and recommendations to neonatal units, networks and the wider system to inform and promote quality improvement.

Figure 28. Simplified NNAP data flow diagram



4.3. Case ascertainment and unit participation

In usual practice, every baby admitted to a participating neonatal unit is entered on the BadgerNet patient record system is eligible for inclusion in NNAP. The audit therefore achieves 100% case ascertainment in the participating organisations, unless a parent or carer has chosen to opt out of having their baby's information submitted to the audit. For the calendar year 2019, no babies were opted out. Babies receiving special care alongside their mother in transitional care areas or postnatal wards can also be entered, but it is known that some units do not enter data for such babies. For this reason, NNAP's measures do not concentrate on care outside neonatal units.

All neonatal units in England, Wales and Scotland associated with a delivery unit are eligible to take part, including special care units (SCUs), local neonatal units (LNUs) and neonatal intensive care units (NICUs). All neonatal units in England, Scotland and Wales participated in the audit in 2019.

Where there is a change in unit name, unit level or network configuration, the NNAP will apply the status as at the end of the data reporting year. For example, if the configuration of a network changes on 1 April 2019, 2019 data will be presented as per the network configuration on 31 December 2019.

4.4. Data quality and completeness

The NNAP project team produces quarterly reports. These are sent to NNAP-participating unit clinical leads and other unit staff involved in the audit, to provide regular updates on their data completeness and measured adherence to the NNAP standards. The reports are a prompt to review data accuracy and completeness. The final quarterly report serves as a summary report of their annual data in January. Following that, there is a final period for units to review and amend their data on the BadgerNet system up until 30 April. For the 2019 data report, this period was impacted by the measures to prepare for the COVID19 pandemic, and the NNAP team understand that the loss of focus this led to may have had deleterious effects on data checking processes. To mitigate this, NNAP extended the data checking window by a further two weeks. However, it remains possible that some data will neither be as complete, nor as accurate as it would have been had COVID19 not been occurring at the time of the planned closure of the data validation window.

The final data download used in the report is extracted from BadgerNet after the review period has closed. Units can also access and review their data in real- time using the BadgerNet system reporting tools.

NDAU applies a data cleaning and validation process to the raw dataset before creating the NNAP dataset used to produce the data included in this report.

Babies who were finally discharged, or have died, during the NNAP reporting period form the NNAP dataset. The exceptions to this are the datasets used for Bronchopulmonary dysplasia, Two-year follow-up and Mortality until discharge for very preterm babies.

4.5. Outlier identification and management

Performance on audit measures is presented using descriptive statistics, and data are available to review on NNAP Online. Outliers are identified by funnel plot analysis, using the national rate as the standard. Table 4.1 describes the questions to which outlier identification applies. The full *NNAP statistical analysis plan for the 2019 data year* is available on the RCPCH website

The NNAP manages outlier status in line with the RCPCH policy Detection and Management of Outlier Status for Clinical Indicators in National Clinical Audits, with the specific application and timelines associated with NNAP reporting for the 2019 data year set out in the outlier management plan. All neonatal services identified as outliers for one or more NNAP measures were notified according to the policy prior to publication of this report.

4.6. Managing small numbers in the NNAP

The NNAP considers the risk of disclosure on a measure-by-measure basis from a variety of methods resulting from the publication of results based on small numbers of cases. Given the frequent occurrence of small numbers at the unit level, annualised reporting, applying blanket masking to all cells would significantly reduce the utility of published NNAP results for improvement purposes. To further minimise the risk, the NNAP does not publish demographic data about the cohort of babies included in the audit, which would have the potential to be used alongside published data for the audit measures to aid identification of a baby.

4.7. Developing key findings and recommendations

The NNAP brings together a multidisciplinary group, including parents, to identify key findings and to translate the key findings and results of the audit into a set of recommendations that can be acted upon to improve neonatal care. The recommendations are made to support the existing goals and priorities of neonatal and perinatal services and are targeted to the audience with the ability to action the recommendation.

Recommendations are designed to be specific to each audit measure. However, there are several recommendations that relate to more than one audit measure.

5. Driving improvements in neonatal care

5.1. Recommendations and action plan development

Recommendations are listed by measure in Chapter 2 and by audience in Appendix B.

What to do next:

1. Share your unit's NNAP results with your multidisciplinary team, using NNAP Online and the *NNAP results presentation template*.
2. With the multidisciplinary team, set goals and develop action plans where your unit results require improvement and your unit is not meeting the audit recommendations.
3. Use the recommendations checklist to track your unit, trust/health board or network's status.
4. Monitor your unit's performance through the year using NNAP quarterly reports and real time data. Regularly revisit the recommendations checklist and your unit's action plan throughout the year.

5.2. Useful resources

- *NNAP Online*:www.nnap.rcpch.ac.uk/.NNAP results at unit, network and national level are hosted on NNAP Online. We recommend that neonatal units and networks use NNAP Online to view their results and compare themselves against other units of the same designation. Use it to share results with the wider team, share best practice between units and networks, and to stimulate quality improvement activities.

- *NNAP results presentation template:* www.rcpch.ac.uk/national-neonatal-audit-programme. Use this template to help you communicate the main national and unit level audit findings to your team.

- *NNAP recommendations checklist*: www.rcpch.ac.uk/national-neonatal-audit-programme. Use this checklist to track your progress against this year's NNAP recommendations.

- *The NNAP quality improvement map*:www.rcpch.ac.uk/national-neonatal-audit-programme. Use this map to find national and international quality improvement resources, research, policies, guidelines, quality assurance programmes, audits and registries by NNAP measure area.

- **British Association for Perinatal Medicine (BAPM) quality resources:** www.bapm.org/quality. BAPM's repository of quality resources, alerts, safety and improvement stories.

- **RCPCH QI Central**:www.qicentral.org.uk/. The RCPCH quality improvement sharing hub. You can find this year's NNAP case studies, as well as those from previous years, on QI Central.

- **Maternity and Children Quality Improvement Collaborative (MCQIC) resources:** www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/. MCQIC is part of the Scottish Patient Safety Programme. A number of QI resources are available on their website.

- **Maternal and neonatal health safety collaborative resources:** www.improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/#resources. The maternal and neonatal health safety collaborative is a three-year programme to support improvement in the quality and safety of maternity and neonatal units across England. Various resources are available on their website.

5.3. Information for parents, carers and families

Your baby's care is a parent and carer's guide to the NNAP and the audit results. Available in English and Welsh, it tells families: what the audit is, what it aims to achieve, explains the results for key audit measures, and what families can do in response to the results. We ask units to make the booklet available to parents and carers in their unit. Your baby's care is available here: [new link to be added for 2020 leaflet] www.rcpch.ac.uk/resources/your-babys-care-measuring-standards-improving-neonatal-care-2019

The NNAP fair processing and parent information leaflet Your baby's information is available here: www.rcpch.ac.uk/resources/national-neonatal-audit-programme-your-babys-information

The NNAP unit results posters summarise a selection of the unit's NNAP results that are most relevant to parents, families and wider members of the multidisciplinary team caring for the baby. Neonatal units display the posters in a public area, and complete a second poster, which explains the actions they are taking in response to their audit results. Designed to be used alongside Your baby's care, the posters help to communicate the meaning and relevance of the audit results not only to parents, but to the wider team involved in caring for the baby and mother.

NNAP unit results posters can be downloaded from NNAP Online www.nnap.rcpch.ac.uk.

All our information for parents, carers and families is developed in collaboration with our parent, nurse and charity representatives.

5.4. Future developments in the NNAP

As a well-established programme achieving high levels of engagement with the multi-professional neonatal clinical community, the NNAP can respond quickly to changing quality improvement priorities. The NNAP has made considerable positive impact since its launch in 2006; achieving improvements across many areas of clinical practice, from antenatal interventions, achieving normothermia on admission, to parental involvement in care and clinical follow-up at two years of age. Variation remains, and the audit will continue to support neonatal units and networks to achieve best practice in these areas.

Following feedback from audit users, the NNAP has introduced a measure of deferred cord clamping in very preterm infants from 2020. There is evidence that the practice leads to a large reduction in mortality. By reporting this measure the NNAP has an opportunity to facilitate benchmarking and review of practise.

In 2021 the NNAP anticipates commencement of measurement of intraventricular haemorrhage, post haemorrhagic ventricular dilatation and periventricular leukomalacia according to consensus definitions.

The NNAP will continue to work closely with the wider neonatal community, through its participants, stakeholder groups and national programmes of work. There are opportunities to work with NHS Digital and the National Maternity and Perinatal Audit (NMPA) to improve data linkage between the processes and outcomes of neonatal care and maternity care in England.

Index of appendices

Appendices are available at: www.rcpch.ac.uk/resources/national-neonatal-audit-programme-annual-report-2019-2018-data

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National Neonatal Audit Programme (NNAP) 2020
Annual report on 2019 data

Healthcare Quality Improvement Partnership (HQIP)
Dawson House, 5 Jewry Street,
London EC3N 2EX

Royal College of Paediatrics and Child Health
5-11 Theobalds Road,
London, WC1X 8SH