

National Neonatal Audit Programme 2019 Annual report on 2018 data



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"This photo was taken last year for World Prematurity Day. It is a picture of Henry in his pre-school uniform at two-years-old holding a picture of himself on the unit. I love this picture because it really demonstrates how far he has come."

Nicki, Mother
.....

NNAP

National Neonatal Audit Programme

National Neonatal Audit Programme (NNAP) 2019 annual report on 2018 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 with some individual projects, other devolved administrations and crown dependencies www.hqip.org.uk/national-programmes.

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Foreword

It has been a privilege to represent the views of parents on the National Neonatal Audit Programme (NNAP) Board for the last four years. Since my twin girls were born in 2015, a great amount of progress and quality improvement has been highlighted by this annual report.

In the last four years, the audit has recorded significant progress across a range of measures: the administration of antenatal steroids has increased from 85.3% of appropriate cases to 90.4%; parental consultation within 24 hours of admission now occurs in 95.9% of appropriate cases as opposed to 91.7%; although the rates for babies receiving their own mother's milk at discharge have remained largely unchanged across this period. I do note that while at a population level improvement does continue, there is still marked variation in results at both network and unit level. More can and must be done to ensure that this variation is reduced.

A strength of the NNAP is its willingness to take on board the views of clinicians, adding new measures and changing those measures where the data did not deliver the anticipated evidence to drive quality improvement. This year, the audit reports against 17 measures compared to 10 in 2015. The measures implemented during this time are focused on patient process-based measures such as: nurse staffing levels, appropriate location of care and birth, and parent involvement in ward rounds. It is fantastic to see the NNAP report on such measures, which are important indicators of the provision of family-centred care.

Additionally, the launch of the revised Parent and Carer's Report and NNAP Online in 2016 were great steps in making the results of the audit more accessible to all those affected by the outcomes and processes measured.

This year's report emphasises several areas where progress can still be made. These areas include: reviewing and understanding why only three out of fifteen networks achieve the standard of 85% of babies being delivered in an appropriate centre of birth; understanding and tackling the reasons behind variation in mortality until discharge of very preterm babies. It is also particularly concerning to me as a parent that, in general, nurse staffing is well below recommended levels.

I would like to extend my thanks to colleagues on the Board for ensuring that the views of parents and carers and not only clinicians are being taken into account in the ongoing development the audit.

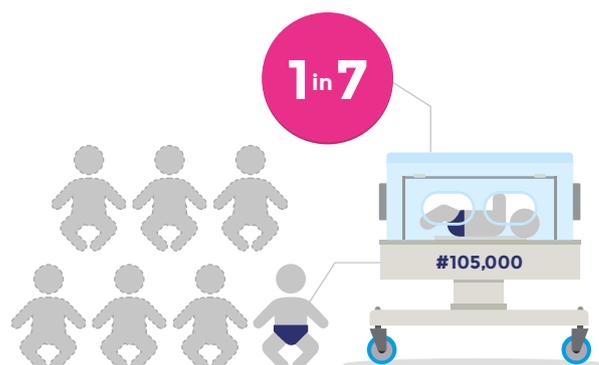
Patrick Tully, NNAP Parent Representative

Table of contents

Executive summary	5
1. Introduction	11
2. Results, key findings and recommendations	13
3. Local quality improvement case studies	65
4. Methods	76
5. Driving improvements in neonatal care	84
Index of appendices	87
References	88

Executive summary

Approximately one in seven babies born in England, Scotland and Wales need specialist neonatal care in a hospital because they are born too early, have too low a birth weight or have a medical condition that requires specialist treatment. The National Neonatal Audit Programme (NNAP) reports on key measures of the care provided to those babies in the 181 neonatal services in England, Wales, Scotland and the Isle of Man that take part in this audit.



Established in 2006, 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.

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 2019 report looks at care provided to babies with a final discharge from neonatal care between 1 January 2018 and 31 December 2018.

Conclusion and future developments in the NNAP

UK neonatal professionals, together with the NNAP team, have demonstrated that aspects of neonatal care continue to improve. Working with parents and other stakeholders, neonatal professionals need to use their demonstrated ability to deliver improvement to address the marked variations in care that this report make obvious. The recommendations this report makes are designed to support networks and hospitals in planning and delivering improvements to their care. Some recommendations may not be applicable or helpful to every service, but all networks and units should consider each recommendation against their own priorities and their audit results.

This report includes network level reporting of mortality until discharge from the neonatal unit, and adherence to neonatal nurse staffing standards, for the first time. The NNAP continues to develop and adapt in response to quality improvement priorities. For the forthcoming year, the NNAP is introducing a new measure of breastmilk feeding at 14 days of life. Looking forward to 2020, we intend to introduce a measure of deferred cord clamping in very preterm infants.

Recommendations and action planning for neonatal services

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. Continue to revisit the recommendations checklist and your unit's action plan throughout the year.

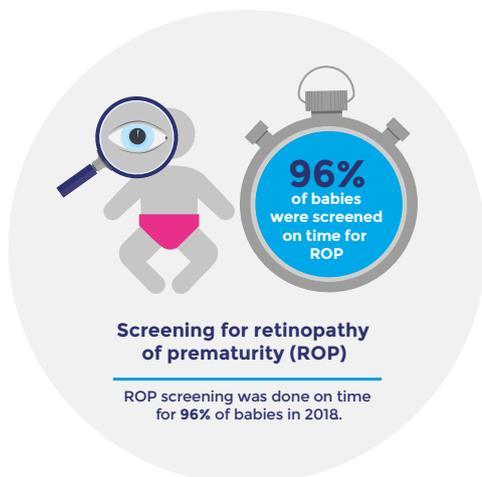
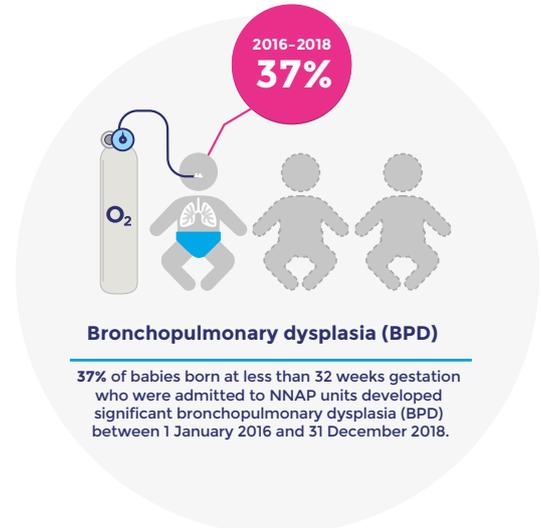
Key messages

Mortality until discharge home in very preterm babies

Rates of mortality in very preterm babies (less than 32 weeks' gestational age) until discharge home, or 44 weeks' post menstrual age, whichever occurs sooner, vary widely by network of care, from 4.9% to 9.8% adjusted rates (unadjusted rates range from 4.9% to 10.2%). Adjustment for background characteristics does little to explain variation.

Neonatal outcomes

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

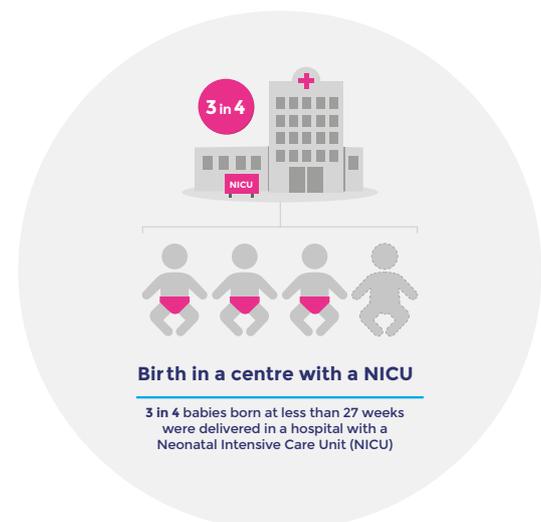


Care process measures

Many care processes in neonatal units are implemented with high rates of precision. However, processes such as administration of antenatal magnesium, screening for retinopathy of prematurity, and measures of parental partnership in care show widely divergent practices between neonatal units and networks.

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

There is evidence that outcomes for very preterm babies are better when they are cared for in a NICU from birth. 74.3% of babies born at less than 27 weeks' gestational age were delivered in a hospital with a NICU on site; no notable change since 2017 when the rate was 73.9%. 3 of the 15 networks are achieving the standard of 85% which may reflect network structure as much as clinical practice.



Neonatal nurse staffing levels

Nurse staffing levels on neonatal units are below national recommendations. Overall, 64% of shifts (80,643 of 126,302) are numerically staffed according to national guidelines. 32% (27,942 of 86,200) of shifts have sufficient staff qualified in specialty. Only 11 of 53 NICUs had half or more of their shifts with sufficient staff qualified in specialty.

The NNAP recommends:

- (1) To optimise preterm perinatal wellbeing, base local quality improvement activity on reviews of cases:

- where evidence-based strategies were not used in patient care
- where shared learning from networks is available.

Use the following methodologies to guide improvement:

- The Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) programme,
- The Maternity and Neonatal Health Safety Collaborative and
- The Scottish Patient Safety Programme.

Action: Perinatal teams, neonatal networks and maternity systems

- (2) Review local thermoregulation data to drive quality improvement goals. Use the [British Association of Perinatal Medicine Quality Improvement toolkit for Improving Normothermia in Very Preterm Infants](#) to support action in response.

Action: Neonatal units

- (3) Review practice and documentation processes where rates of parental consultation and parental presence on the ward round need to be increased. Use the [Bliss Baby Charter](#) for guidance on improving parental partnership in care.

Action: Neonatal units

- (4) Ensure that staff:

- understand the importance of welcoming parents to the neonatal unit
- communicate to parents the value of their presence on the ward round
- involve them directly in the ward round
- record their presence.

Action: Neonatal units

- (5) Use evidence-based strategies to lower rates of infection or necrotising enterocolitis (NEC). Consider comparing practice with units with 'complete' data who have lower rates of infection or NEC to drive improvement in local rates.

Action: Neonatal units

- (6) Develop processes to ensure that NEC and blood culture data are complete, using NNAP quarterly reports, to provide assurance at the end of the year.

Action: Neonatal units with incomplete NEC and blood culture data

- (7) Neonatal networks should work with units that do not validate their NEC or Bloodstream infection NNAP data in order to ensure full participation in the audit, and maximise compliance with the NHS neonatal service specification in England and other appropriate structures within the devolved administrations and crown dependencies.

Action: Neonatal networks

- (8) Assess practice in the management of early respiratory disease in very preterm infants against NICE guidelines for respiratory care for preterm babies. Consider comparing practice with units with a lower rate of bronchopulmonary dysplasia to identify quality improvement opportunities.

Action: Neonatal networks and units with a 'positive' treatment effect for BPD where the 95% confidence interval excludes zero.

- (9) Use local knowledge of the rates of admission of term and near-term babies, case review (as used in the ATAIN programme), process mapping and Pareto charts to identify and action modifiable factors to address prolonged mother infant separation.

Action: Neonatal units

- (10) NNAP and the National Maternity and Perinatal Audit (NMPA) should work with NHS Digital to maximise opportunities to report measures of rates and duration of mother and baby separation in a way that is most useful to audit users.

- (11) Identify barriers to breastfeeding across the patient pathways using:

- parent feedback
- a review of breastmilk feeding rate at discharge
- the early breastmilk feeding measure in the NNAP quarterly reports.

Use tools such as the [UNICEF Neonatal Unit Baby Friendly Initiative](#) and [Bliss Baby Charter](#) to overcome barriers identified and to drive improvement.

Action: Neonatal units

- (12) Produce detailed plans to provide or organise follow up of care for babies in accordance with NICE guidance: [Developmental follow-up of children and young people born preterm](#). 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.

Action: Neonatal units

(13) To reduce mortality, neonatal networks 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 the extent of the implementation of evidence-based strategies in the following areas to reduce mortality:
 - antenatal steroids
 - deferred cord clamping
 - avoidance of hypothermia
 - management of respiratory disease
- ensure that shared learning from multi-disciplinary reviews of deaths (including data from the local use of the Perinatal Mortality Review Tool) informs:
 - network governance
 - unit level clinical practice.

Action: Neonatal networks

(14) Use NNAP quarterly reports to ensure that a mortality outcome is clearly recorded for every baby admitted. For babies discharged to a non NNAP unit before 44 weeks' post menstrual age, units should capture outcome using the 'final neonatal outcome' field.

Action: Neonatal units and networks

(15) Ensure that sufficient numbers of neonatal unit nurse staff and nurses with specialist qualifications are trained and retained to reduce current variations in staffing and improve staffing levels.

Action: National governments, neonatal networks and individual health trusts or boards

(16) Consider the impact of nurse staffing guidelines while taking into account capacity to admit babies to neonatal units.

When optimal nurse : baby ratios cannot be met consider:

- the staffing situation in other neonatal units
- the balance of risks of admitting more babies against the potential risks and inconveniences of intra-network or inter-network transfer.

Action: Neonatal units

(17) Maintain oversight of neonatal unit capacity on a regular basis to support and assist units in balancing capacity against demand.

Action: Neonatal networks

- (18)** Using the [NNAP measures guide](#), ensure that data entry regarding nurse staffing is complete and entered considering relevant published guidance such as [Safe, sustainable and productive staffing: An improvement resource for neonatal care](#).

Action: Neonatal units and networks

Full unit, network and national level results are available on NNAP Online at: www.nnap.rcpch.ac.uk/

National results, key findings and recommendations for all NNAP audit measures are available in the full report, at: www.rcpch.ac.uk/national-neonatal-audit-programme.

1. Introduction

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 one in seven 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.

This report relates to the care provided to 104,577 babies discharged from neonatal care during the calendar year 1 January 2018 to 31 December 2018 in the 181 participating neonatal units in England, Wales, Scotland and the Isle of Man. The Programme started in 2006. This is the 12th annual NNAP report published by the Royal College of Paediatrics and Child Health (RCPCH). Previous reports can be downloaded from: www.rcpch.ac.uk/national-neonatal-audit-programme.

1.1. Aims

The key aims of the NNAP are to:

- assess whether babies admitted to neonatal units receive consistent high-quality care in relation to the NNAP audit measures that are aligned to a set of professionally agreed guidelines and standards
- identify areas for quality improvement in neonatal units in relation to the delivery and outcomes of care.

The overarching quality improvement objectives of the NNAP are to:

- reduce unit and network level variation through benchmarking, outlier identification and management, sharing best practice and quality improvement examples, and signposting to resources available in the wider neonatal care system
- nationally, to seek to reach agreed standards for process measures where care currently falls below those standards
- report outcome measures e.g. mortality, necrotising enterocolitis, bronchopulmonary dysplasia, infection and brain injury in very preterm infants, and their variation between units and networks
- collaborate with other audits in developing and delivering the NNAP to improve neonatal care and adapt to new quality improvement priorities.

1.2. Scope

Since starting in 2006, the scope of the audit has widened and 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. Table 4.1 (Page 8) summarises the set of measures included in the 2018 data year, alongside associated guidelines. A full guide to the audit measures for the 2018 data year is available at: <https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme-nnap/about>

1.3. NNAP governance

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

The 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 Director of Research and Policy for the RCPCH. The Neonatal Data Analysis Unit (NDAU) provide data analysis, statistical expertise, data management and data storage.

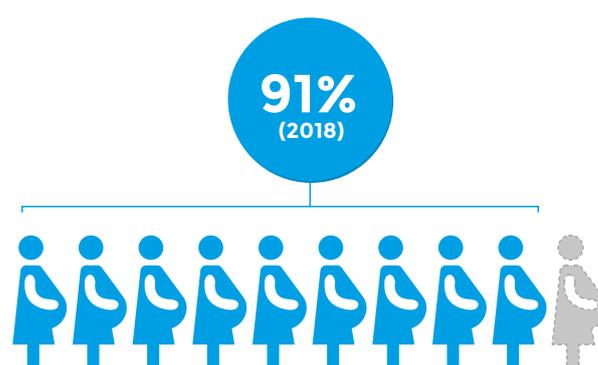
Appendix D includes more information about governance of the NNAP and a list of Project Board and Methodology and Dataset members.

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 make other serious complications, such as bleeding into the brain, less likely. The NNAP developmental standard is that eighty-five percent (85%) of eligible mothers should receive at least one dose of antenatal steroids.



Results

12,878 eligible mothers were identified from data submitted for 14,703 babies by 180 neonatal units and 20 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. Records for 38 babies were excluded because their data lacked sufficient detail to identify their mother.

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*	307	300	148 (49.3%)	152 (50.7%)	7 (2.3%)
SCU	1,048	1,035	915 (88.4%)	120 (11.6%)	13 (1.3%)
LNU	4,943	4,921	4,505 (91.5%)	416 (8.5%)	22 (0.4%)
NICU	6,580	6,557	6,022 (91.8%)	535 (8.2%)	23 (0.4%)
Total	12,878	12,813	11,590 (90.5%)	1,223 (9.5%)	65 (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.

Rates of administration of antenatal steroids are presented by black dots and the 95% confidence intervals are indicated by vertical bars. Neonatal units are presented in the ascending order of the rates and can be identified on [NNAP Online](#).

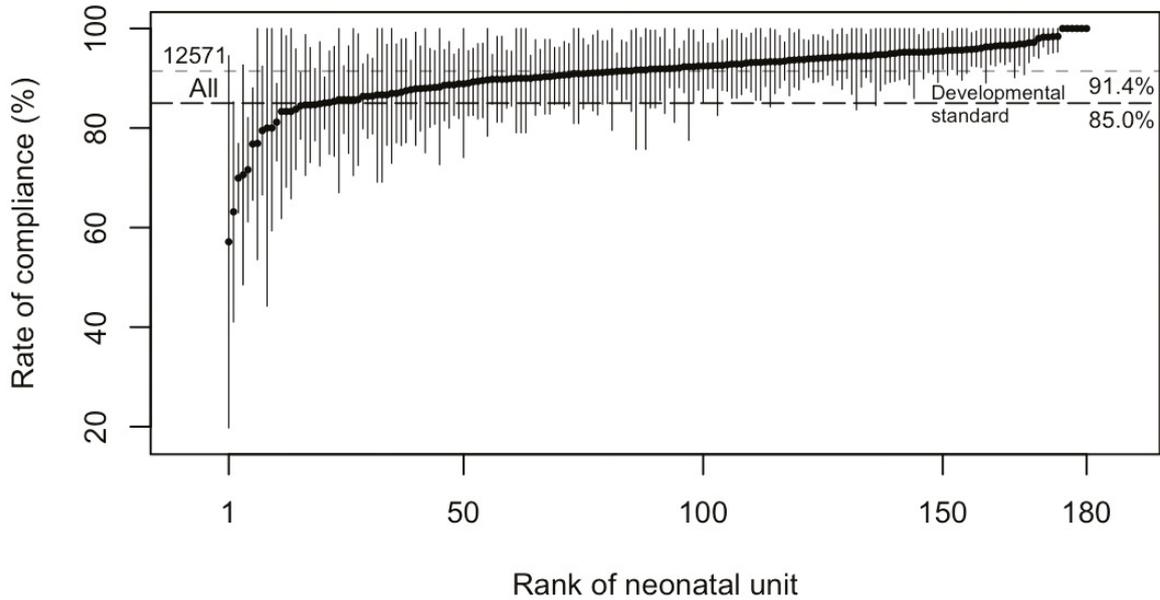


Figure 2. Caterpillar plot of the rates of administration of antenatal steroids: neonatal networks.

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 dotted line and the developmental standard is represented by the dashed line.

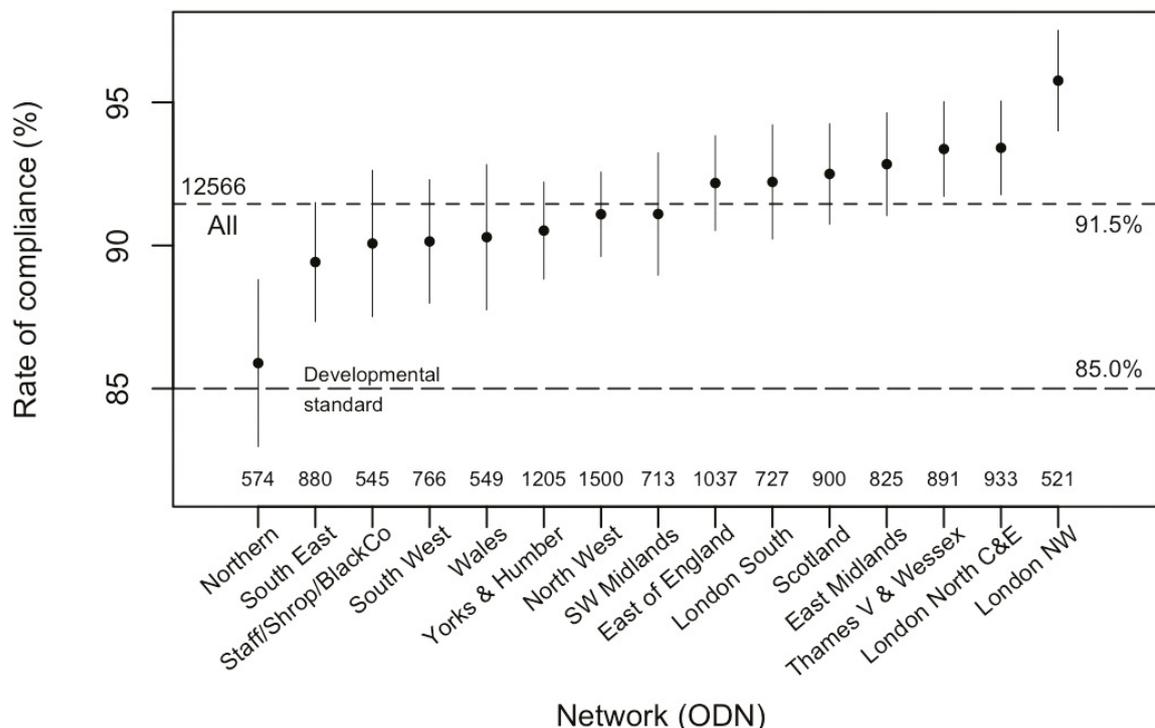
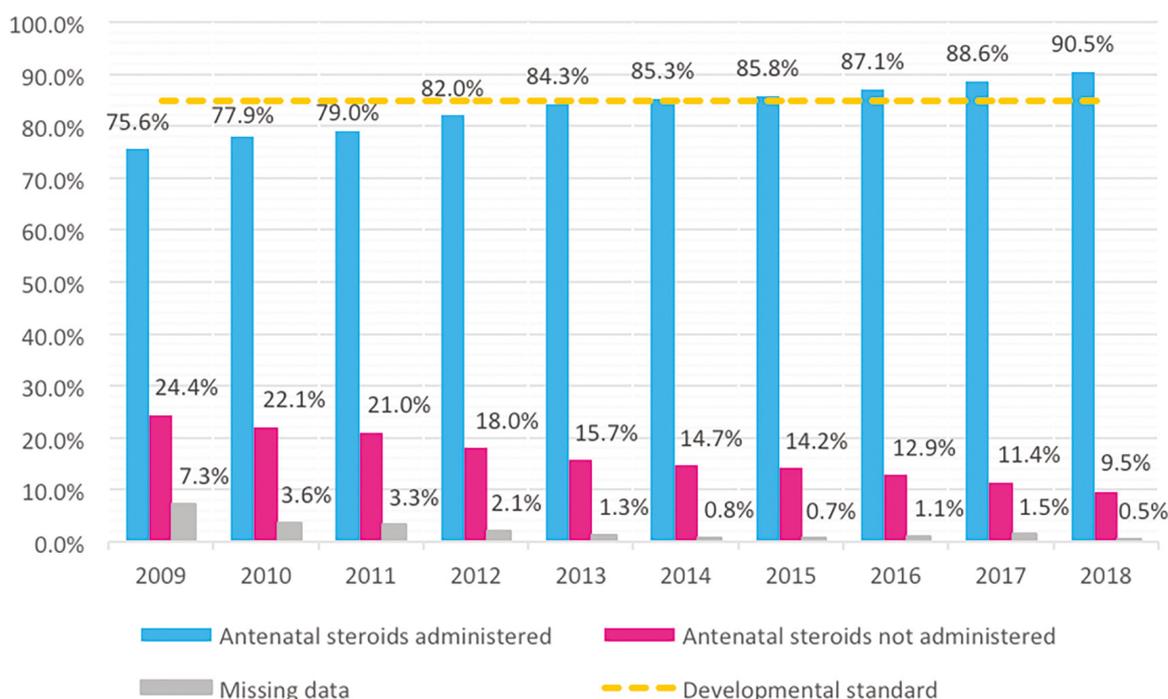


Figure 3. Administration of antenatal steroids, by NNAP reporting year (2009 to 2018).



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

Key findings

- 90.5% (11,590 of 12,813) of women whose baby born between 23 and 33 weeks' gestational age received at least one dose of antenatal steroids. This is above the NNAP developmental standard of 85%.
- All neonatal networks and 89.4% (161 of 180) of units are meeting the NNAP standard of 85%. Most networks with lower rates of antenatal steroids administration in 2017 have improved their performance.
- Since 2009, the recorded rate of administration of antenatal steroids has risen from 75.6% to 90.5%.

Recommendations

(I) To optimise preterm perinatal wellbeing, base local quality improvement activity on reviews of cases:

- where evidence-based strategies were not used in patient care
- where shared learning from networks is available.

Use the following methodologies to guide improvement:

- The Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) programme,
- The Maternity and Neonatal Health Safety Collaborative and
- The Scottish Patient Safety Programme.

Action: Perinatal teams, neonatal networks and maternity systems

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year, to help check and assure 2019 results.
- **Maternity and Children Quality Improvement Collaborative (MCQIC), Scottish Patient Safety Programme** quality improvement resources: www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/
- **Maternal and neonatal health safety collaborative, NHS Improvement** quality and safety resources: www.improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/#resources

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%.¹ 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.² The NNAP developmental standard is that eighty-five percent (85%) of eligible mothers should receive antenatal magnesium sulphate.



Results

4,148 eligible mothers were identified from data submitted for 4,589 babies by 178 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 or in a maternity unit not allied to an NNAP participating unit, these results are not included in Figure 4 and Figure 5.

Records for 23 babies were excluded because their data lacked sufficient detail to identify the mother.

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

Unit level	Eligible mothers	With data entered	Magnesium given	Magnesium not given	Missing
Other*	143	114	31 (27.2%)	83 (72.8%)	29 (20.3%)
SCU	172	159	81 (50.9%)	78 (49.1%)	13 (7.6%)
LNU	1,196	1,159	784 (67.6%)	375 (32.4%)	37 (3.1%)
NICU	2,637	2,575	1,990 (77.3%)	585 (22.7%)	62 (2.4%)
Total	4,148	4,007	2,886 (72%)	1,121 (28%)	141 (3.4%)

*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.

Rates of administration of magnesium sulphate are presented by black dots and the 95% confidence intervals by vertical bars. The units are presented in ascending order of the rates and can be identified on [NNAP Online](#). The national rate is represented by the dotted line and the developmental standard is represented by the dashed line.

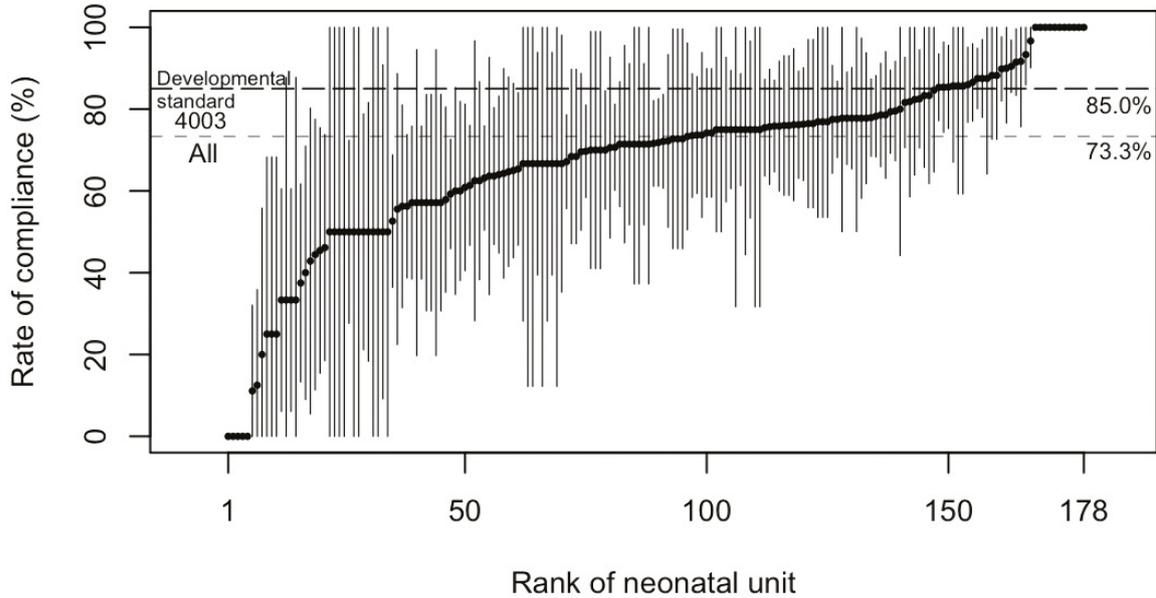


Figure 5. Caterpillar plot of the rates of compliance for administration of magnesium sulphate: neonatal networks.

Rates of administration of magnesium sulphate are presented by black dots and the 95% confidence intervals by vertical bars. The networks are presented in ascending order of the rates. The national rate is represented by the dotted line, and the developmental standard by the dashed line.

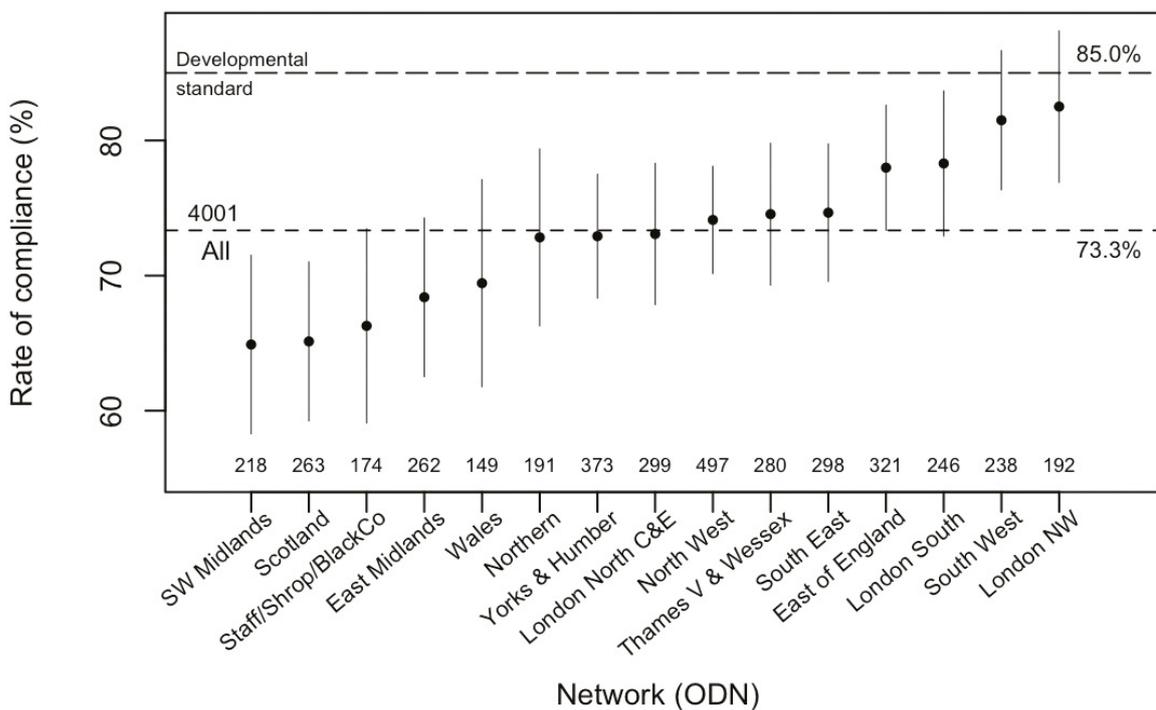
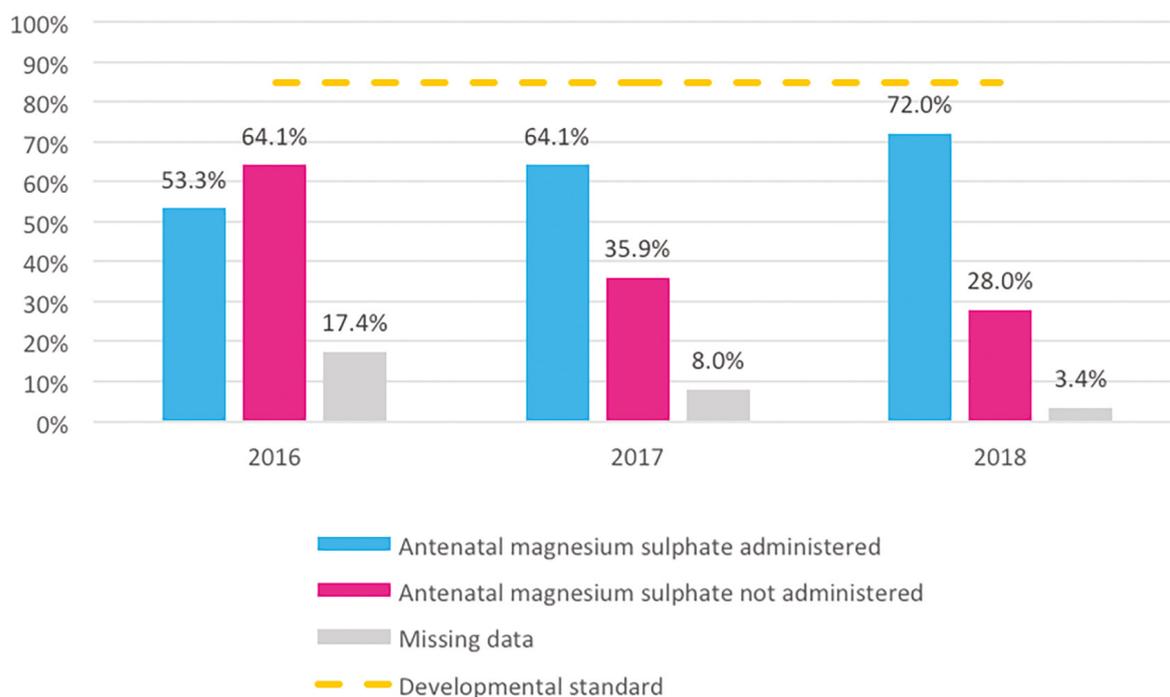


Figure 6. Administration of magnesium sulphate, by NNAP reporting year (2016-2018).

Key findings

- The rate of magnesium administration to women who deliver a baby at less than 30 weeks gestational age has risen again to 72% (2,886 of 4,007), from 64.1% in 2017 and 53.3% in 2016.
- Networks vary greatly in their recorded success in administering magnesium to women delivering babies born at less than 30 weeks gestation in accordance with NICE guidance (65 to 82%). All networks improved on this measure when compared to their 2017 results.
- There is marked inter-unit variation in recorded magnesium sulphate administration, but four units are identified as positive outliers at two standard deviations (see [NNAP Online](#)).
- Twenty-two units had over 10% of cases with missing data. However, the rate of missing data is 3.4% (141 of 4,148), a marked decrease on previous years (8% in 2017 and 17.4% in 2016). This demonstrates the ability of the clinical and audit community to deliver a rapid change in practice (see [NNAP Online](#)).

Recommendations:

- (I)** To optimise preterm perinatal wellbeing, base local quality improvement activity on reviews of cases:
- where evidence-based strategies were not used in patient care
 - where shared learning from networks is available.

Use the following methodologies to guide improvement:

- The Prevention of Cerebral Palsy in PreTerm Labour (PReCePT) programme,
- The Maternity and Neonatal Health Safety Collaborative and
- The Scottish Patient Safety Programme.

Action: Perinatal teams, neonatal networks and maternity systems

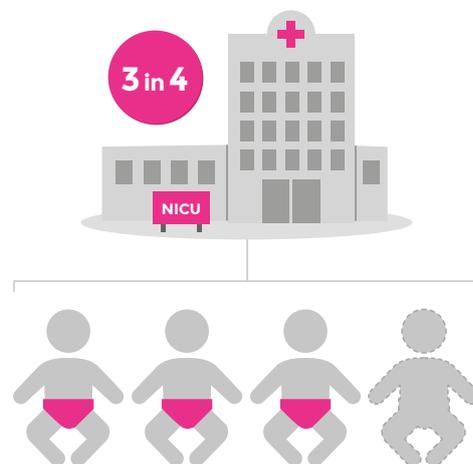
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- The **PReCePT programme** is an England-wide initiative to reduce the incidence of cerebral palsy by offering magnesium sulphate to eligible women during preterm labour. Access their quality improvement resources here: www.weahsn.net/our-work/transforming-services-and-systems/precept/
- **Maternity and Children Quality Improvement Collaborative (MCQIC), Scottish Patient Safety Programme** quality improvement resources: www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/
- **Maternal and neonatal health safety collaborative, NHS Improvement** quality and safety resources: www.improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/#resources

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^{3,4} 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. Eighty-five percent (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.



Results

Figure 7. Caterpillar plot of the rates of birth in a centre with a NICU: neonatal networks.

Rates are presented by black dots and the 95% confidence intervals by vertical bars. The networks are presented in ascending order of the rates. The national rate is represented by the dotted line, and the developmental standard by the dashed line.

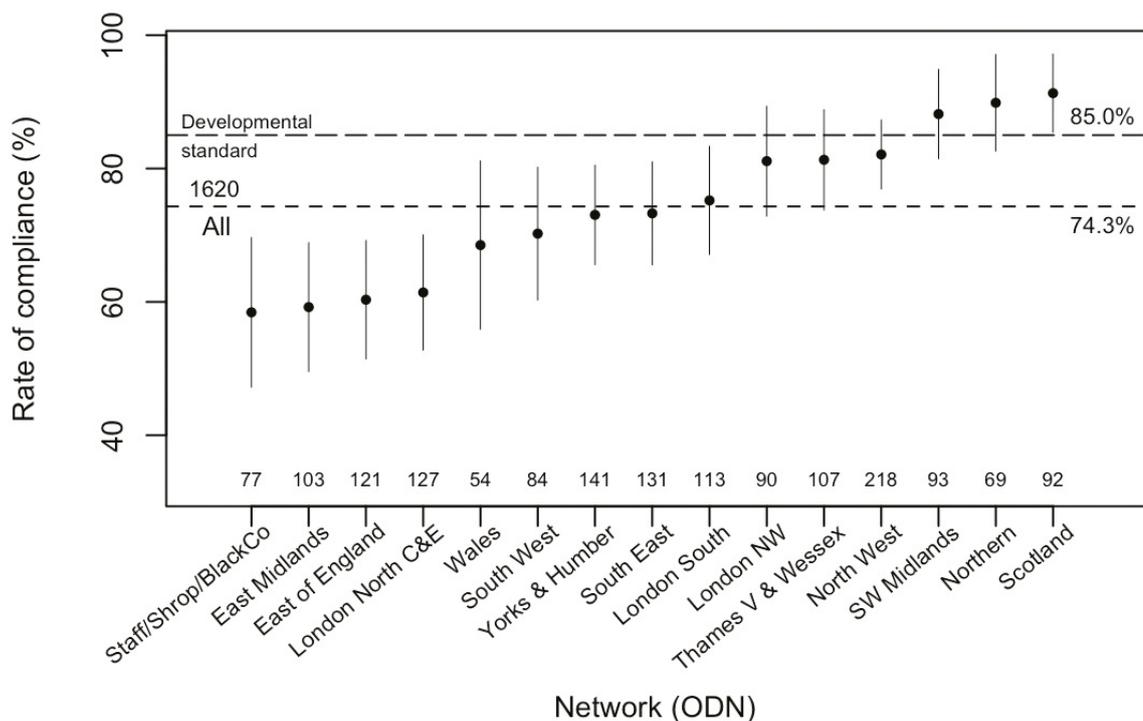


Table 3. Birth in a centre with a NICU by NNAP reporting year, 2017-2018.

Year	Babies	Delivery location	
		Hospital with a designated NICU (%)	Other (%)
2017	1,621	1,198 (73.9%)	423 (26.1%)
2018	1,620	1,204 (74.3%)	416 (25.7%)

Key findings

- 1,620 babies were born at less than 27 weeks' gestation across NNAP participating units. Of these, 74.3% (1,204) were delivered in a hospital with a NICU on site; no notable change since 2017, when the rate was 73.9% (1,198 of 1,621).
- 3 of the 15 networks are achieving the standard of 85%, which may reflect network structure as much as clinical practice. The network with the lowest performance in 2017 showed a large improvement in 2018. However, important variation between networks' performance persists, with high and low outliers compared to the national rate, which may mean there is inequality of access to intensive care (see [NNAP Online](#)).

Recommendations

(1) To optimise preterm perinatal wellbeing, base local quality improvement activity on reviews of cases:

- where evidence-based strategies were not used in patient care
- where shared learning from networks is available.

Use the following methodologies to guide improvement:

- The Prevention of Cerebral Palsy in PreTerm Labour (PRECePT) programme,
- The Maternity and Neonatal Health Safety Collaborative and
- The Scottish Patient Safety Programme.

Action: Perinatal teams, neonatal networks and maternity systems

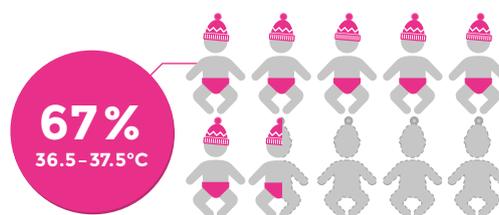
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- **Maternity and Children Quality Improvement Collaborative (MCQIC), Scottish Patient Safety Programme** quality improvement resources: www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/
- **Maternal and neonatal health safety collaborative, NHS Improvement** quality and safety resources: www.improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/#resources
- Case study: *Improving the rate of babies born at less than 27 weeks gestation in a maternity unit with a NICU on site*. East of England ODN. Chapter 3, page 71.

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 which 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 looks at how successful neonatal units are at 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 and measuring within the normal range.

Results

7,657 babies were born very preterm (gestation less than 32 weeks) in 180 NNAP units and nine 'other' places of birth not associated with an NNAP participating unit. For 21 (0.3%) babies, temperature 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.

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

Unit level	Eligible babies	With data entered	Temperature measurement							Missing data
			On time					After hour	Not taken	
			< 32°C	32 to 35.9°C	36 to 36.4°C	36.5 to 37.5°C	>37.5°C			
Other*	150	147	0	48 (32.7%)	17 (11.6%)	55 (37.4%)	14 (9.5%)	13	1	3 (1.3%)
SCU	423	421	0	30 (7.1%)	69 (16.4%)	267 (63.4%)	36 (8.6%)	17	2	2 (0.5%)
LNU	2,588	2,582	0	121 (4.7%)	361 (14%)	1,723 (66.7%)	315 (12.2%)	58	4	6 (0.2%)
NICU	4,497	4,486	0	140 (3.1%)	524 (11.7%)	3,104 (69.2%)	599 (13.4%)	114	5	11 (0.2%)
Total	7,658	7,636	0	339 (4.4%)	971 (12.7%)	5,149 (67.4%)	964 (12.6%)	202	12	22 (0.3%)

*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 temperature on admission: neonatal units.

Rates of compliance with the standard for temperature on admission (on time and within a normal range). Estimated rates of compliance with the standard are marked by black dots and the 95% confidence intervals by vertical bars. Units are presented in ascending order of the rates and can be identified on [NNAP Online](#).

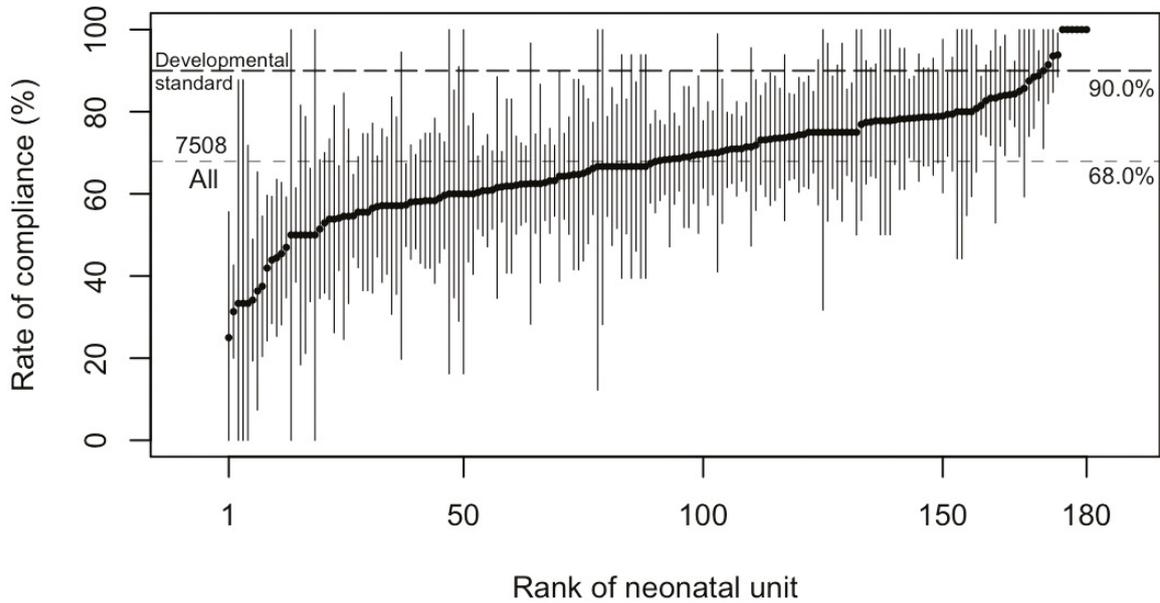


Figure 9. Caterpillar plot of the rates of compliance for temperature on admission: neonatal networks.

Rates of compliance with the standard for temperature on admission (on time and within a normal range). Estimated rates of compliance with the standard are marked by black dots and the 95% confidence intervals by vertical bars. Networks are presented in ascending order of the rates.

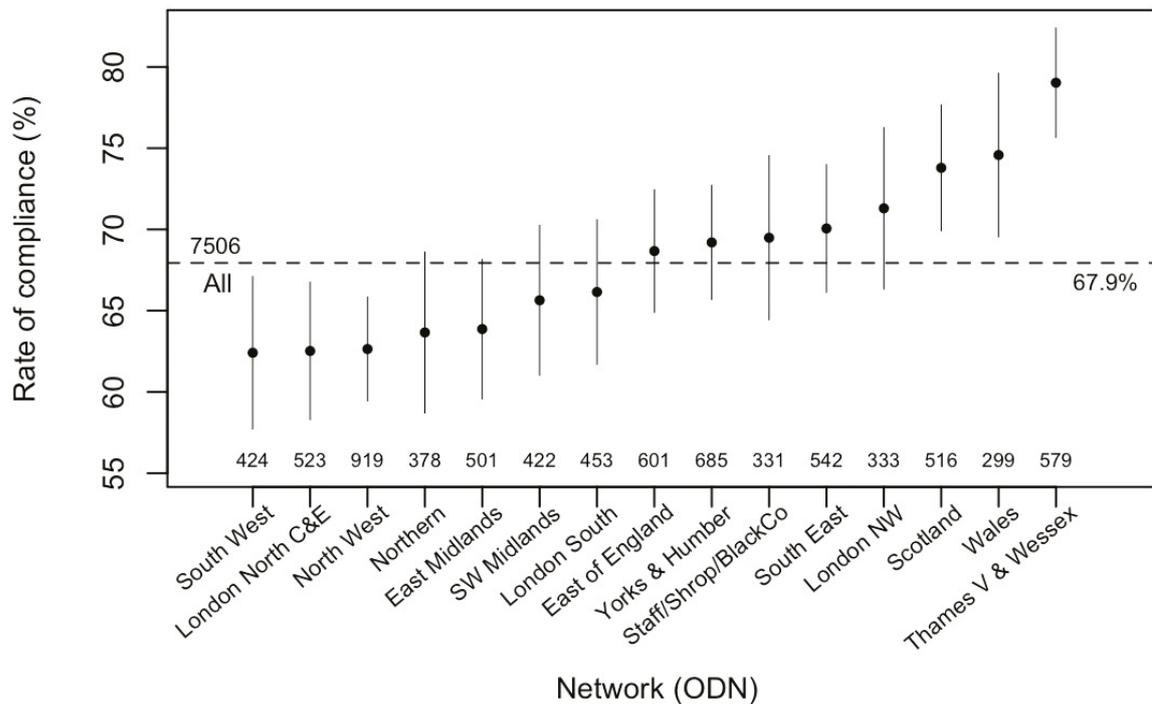
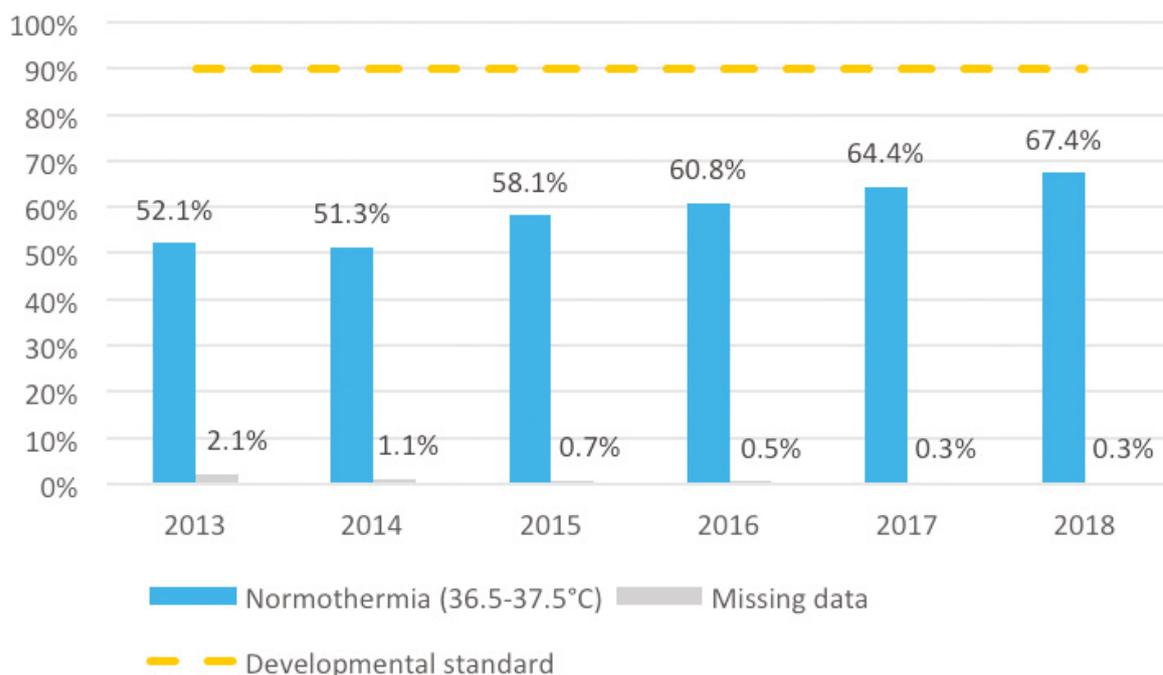


Figure 10. Temperature on time and within normal range, by NNAP reporting year (2013-2018).



Note: For 2015-2018 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

- 67.4% (5,149 of 7,636) of very preterm babies had a normal temperature taken and recorded within an hour of birth. This is an improvement on 2017 and previous years (2017 – 64.4%, 2016 – 60.8%, 2015 – 58.1%). More very preterm babies in England, Scotland and Wales are admitted with a normal temperature than reported for other nations in the international literature^{5,6,7}.
- 4.4% (338 of 7,636) of very preterm babies were markedly hypothermic (temperature less than 36.0°C). There has been a reduction in marked hypothermia since 2017 (5.4% to 4.4%). 12.6% of babies had a temperature over 37.5°C (2017 figure 12.2%).
- There is striking variation between units' performance. Larger hospitals (those with more than 50 very preterm babies per year) admitted from 30% to 100% of eligible babies with normal temperature. There is little difference between unit levels (63% SCU, 69% NICU) in the proportion of babies admitted with a normal temperature (see [NNAP Online](#)).

Recommendations

- Review local thermoregulation data to drive quality improvement goals. Use the [British Association of Perinatal Medicine Quality Improvement toolkit for Improving Normothermia in Very Preterm Infants](#) to support action in response.

Action: Neonatal units

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- *BAPM Quality Improvement Toolkit for Improving Normothermia in Very Preterm Infants*: www.bapm.org/pages/105-normothermia-toolkit
- **Maternity and Children Quality Improvement Collaborative (MCQIC), Scottish Patient Safety Programme** quality improvement resources: www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/
- **Maternal and neonatal health safety collaborative, NHS Improvement** quality and safety resources: www.improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/#resources
- Case study: *Improving early thermal care for preterm infants*. Oxford University Hospitals. Chapter 3, page 73.

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?*^{8,9,10}**

It is important that families understand and are involved in the care of their baby. This first consultation provides an opportunity for the 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 looks at 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 for all babies who require care on a neonatal unit. A consultation should take place with 24 hours of first admission for every baby.



Results

There were 94,212 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 57,221 first episodes eligible for the audit measure. Data were missing or “unknown” for 1,080 episodes (1.9%).

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

Unit level	Eligible episodes	With data entered	Time of first consultation				Missing/unknown
			Within 24 hours	Before admission	After 24 hours	No consultation	
SCU	6,704	6,474	6,078 (93.9%)	185	120	91	230
LNU	24,024	23,631	22,794 (96.5%)	336	260	241	393
NICU	26,493	26,036	24,961 (95.9%)	296	356	423	457
Total	57,221	56,141	53,833 (95.9%)	817	736	755	1,080 (1.9%)

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

Rates of compliance with the standard for first consultation within 24 hours of admission. The estimated rates of compliance with the standard are marked by black dots and the 95% confidence intervals are indicated by vertical bars. Units are presented in ascending order of the rates and units can be identified on [NNAP Online](#).

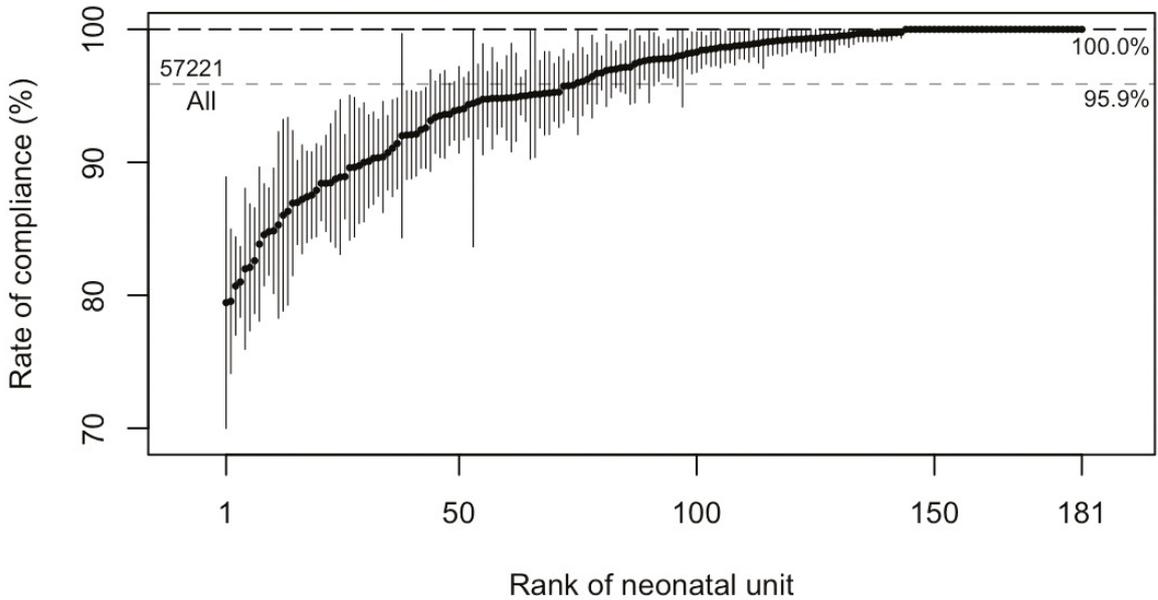


Figure 12. Caterpillar plot of the rates of compliance for first consultation within 24 hours of admission: neonatal networks.

Rates of compliance with the standard for first consultation within 24 hours of admission. The rates of compliance with the standard are marked by black dots and the 95% confidence intervals are indicated by vertical bars. Networks are presented in ascending order of rates.

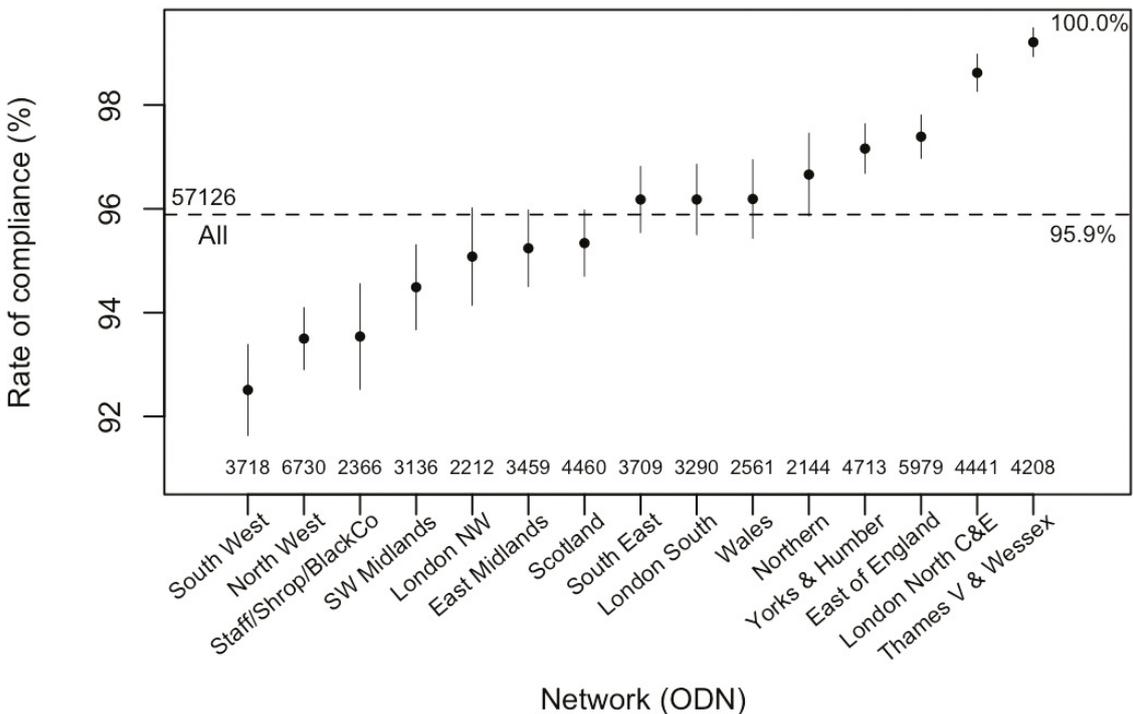
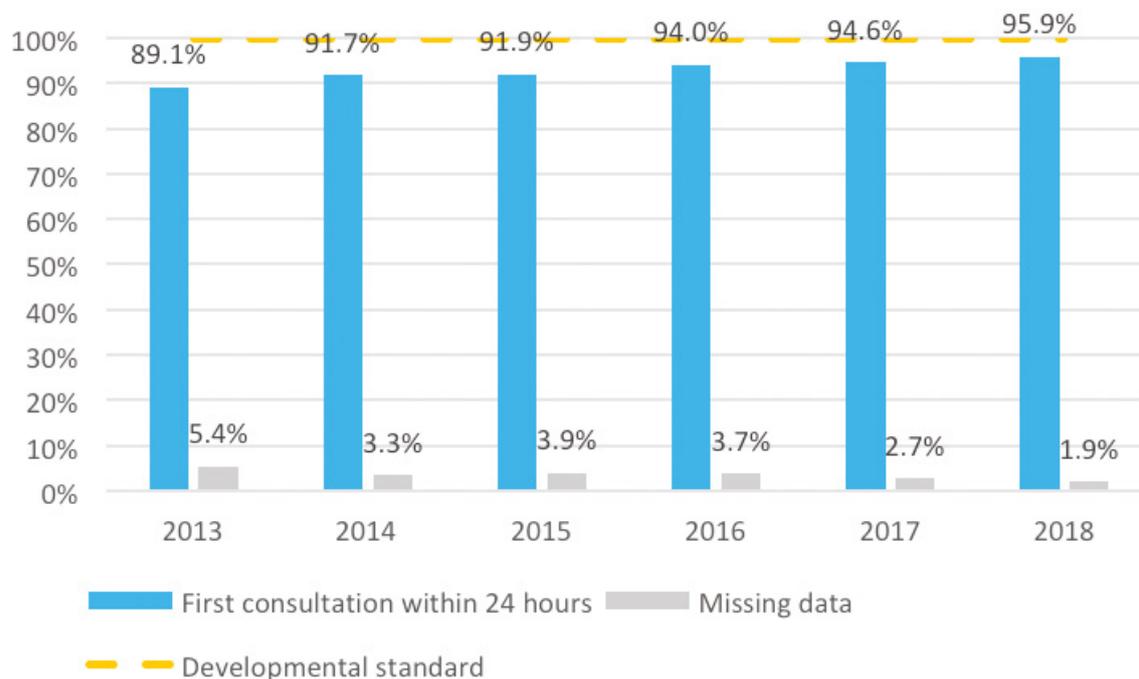


Figure 13. Time of first consultation, by NNAP reporting year (2013 to 2018).



Key findings

- For 95.9% (53,833 of 56,141) of eligible babies, a senior member of the neonatal team consulted parents or carers within 24 hours of admission. This figure is a further improvement on 2017 performance (94.6%).
- 38 units (21%) achieved the developmental standard of 100% of babies receiving a documented consultation within 24 hours of first admission.
- Networks varied in the performance of their units on this measure, with network level performance varying from 92 to 99%. All but three neonatal networks improved on their 2017 performance.
- Performance at unit level varied similarly (80 to 100%), with 42 units identified as having low outlying performance (at two and three standard deviations). Lower rates may result from poorer documentation or from differences in practice (See [NNAP Online](#)).

Recommendations

- (3)** Review practice and documentation processes where rates of parental consultation and parental presence on the ward round need to be increased. Use the *Bliss Baby Charter* for guidance on improving parental partnership in care.

Action: Neonatal units

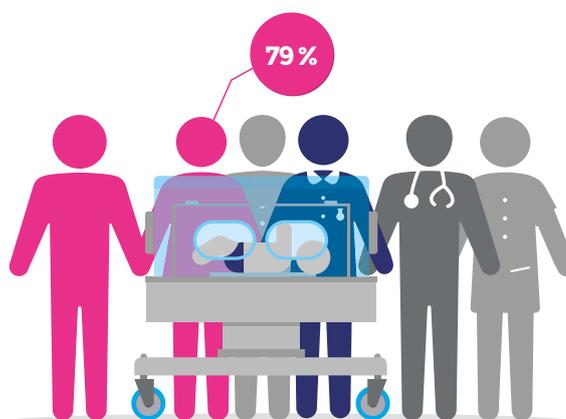
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- The *Bliss Baby Charter* is a practical framework that neonatal units can use to ensure families are at the centre of their baby's care. Find out more about the Charter and access useful resources here: www.bliss.org.uk/health-professionals/bliss-baby-charter

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?^{9,9,11}

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.



Results

There were 69,060 admissions for babies of more than 24 hours. Of these admissions, 7,977 (11.6%) had missing data, leaving 61,083 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 consultant ward rounds			Missing data
			"No ward round" recorded for all days	Parent not present on any ward round	Parent present	
≤7	36,831	30,137	3,780 (12.5%)	4,690 (15.6%)	21,667 (71.9%)	6,694 (18.2%)
8-14	12,854	12,114	1,031 (8.5%)	1,081 (8.9%)	10,002 (82.6%)	740 (5.8%)
15-21	6,722	6,481	514 (7.9%)	487 (7.5%)	5,480 (84.6%)	241 (3.6%)
22-28	3,803	3,695	244 (6.6%)	258 (7.0%)	3,193 (86.4%)	108 (2.8%)
>28 days	8,850	8,656	360 (4.2%)	341 (3.9%)	7,955 (91.9%)	194 (2.2%)
Total	69,060	61,083	5,929 (9.7%)	6,857 (11.2%)	48,297 (79.1%)	7,977 (11.6%)

Key findings

- Parents were documented as having attended a consultant ward round at least once during their baby's stay for only 79.1% (48,297 of 61,083) of admissions. For stays of seven days or less, attendance at a consultant ward round occurred during 71.9% of admissions.
- There has been an increase in documented parent attendance on ward rounds since 2017 (74.3%). The missing data rate has reduced from 18.8% in 2017 to 11.6% in 2018. The current NNAP measure only reports on parental attendance at one ward round per stay in the neonatal unit.

Recommendations

- (3)** Review practice and documentation processes where rates of parental consultation and parental presence on the ward round need to be increased. Use the [Bliss Baby Charter](#) for guidance on improving parental partnership in care.

Action: Neonatal units

- (4)** Ensure that staff:

- understand the importance of welcoming parents to the neonatal unit
- communicate to parents the value of their presence on the ward round
- involve them directly in the ward round
- record their presence.

Action: Neonatal units

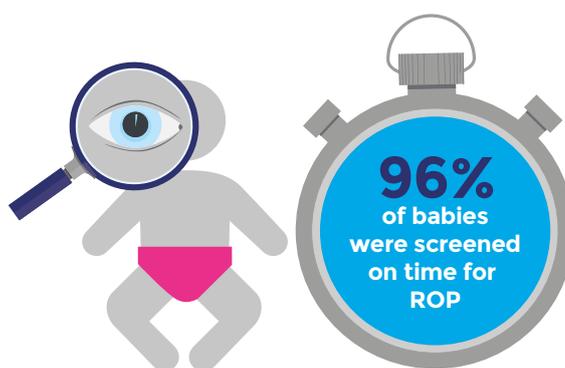
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- The *Bliss Baby Charter* is a practical framework that neonatal units can use to make sure families are at the centre of their baby's care. Find out more about the Charter and access useful resources here: www.bliss.org.uk/health-professionals/bliss-baby-charter
- Case study: *Integrated Family Delivered Neonatal Care: From Quality Improvement Project to Standard of Care*. Imperial College Healthcare NHS Trust. See: www.rcpch.ac.uk/sites/default/files/2019-04/anikod1_0.pdf

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?¹²

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. A national guideline indicates when screening should be done, and this measure reports on how successful neonatal services are in achieving 'on time' screening.¹² By 'on time' we mean within a three-week period centred on the target week. All eligible babies should be screened 'on time'.



Results

There were 9,365 babies born with a birth weight less than 1501g or with a gestational age at birth less than 32 weeks in an NNAP contributing unit. Of these babies, 10 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. 32 babies were removed as a responsible unit could not be assigned. A further 28 babies were excluded because they were transferred to non-neonatal units before, or during, the ROP screening window. Finally, 585 babies were excluded because they died before the closure of the screening window. This left 8,710 babies eligible for ROP screening in 180 neonatal units.

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	754	726 (96.3%)	19 (2.5%)	565	116	681 (90.3%)	26 (3.4%)	28 (3.7%)
LNU	3,403	3,368 (99%)	18 (0.5%)	2,722	548	3,270 (96.1%)	80 (2.4%)	35 (1%)
NICU	4,553	4,503 (98.9%)	14 (0.3%)	3,862	516	4,378 (96.2%)	111 (2.4%)	50 (1.1%)
Total	8,710	8,597 (98.7%)	51 (0.6%)	7,149	1,180	8,329 (95.6%)	217 (2.5%)	113 (1.3%)

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

Rates of compliance with the standard for on-time ROP screening. The estimated rates of compliance with the standard are marked by black dots and the 95% confidence intervals are indicated by vertical bars. Units are presented in ascending order of the rates and units can be identified on [NNAP Online](#).

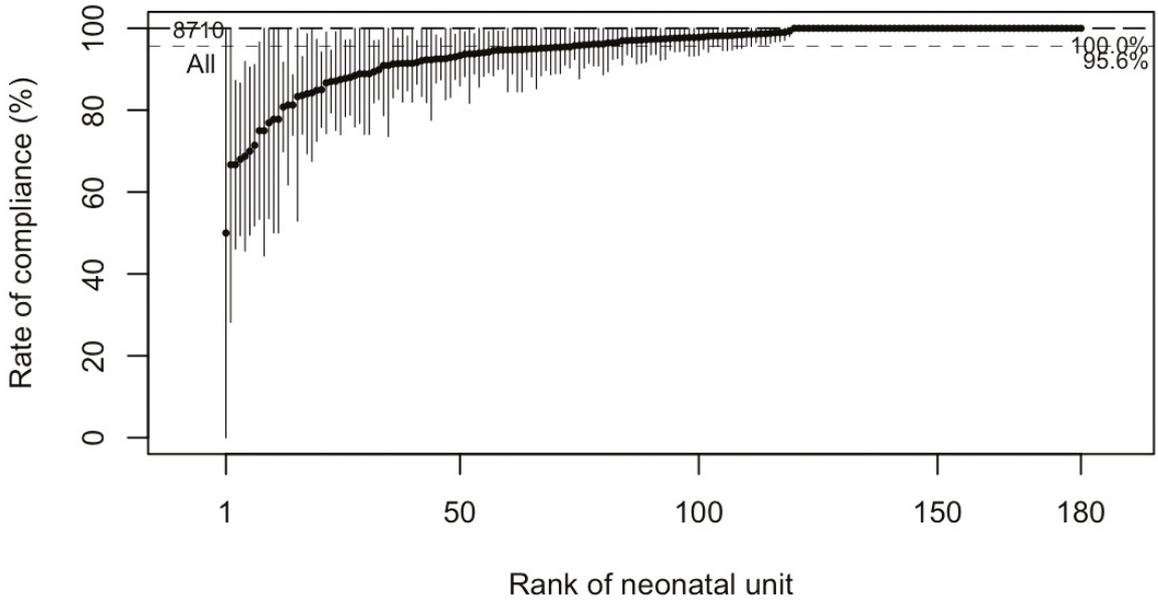


Figure 15. Caterpillar plot of the rates of compliance with on-time ROP screening: neonatal networks.

Rates of compliance with the standard for on-time ROP screening. The rates of compliance with the standard are marked by black dots and the 95% confidence intervals are indicated by vertical bars. Networks are presented in ascending order of the rates.

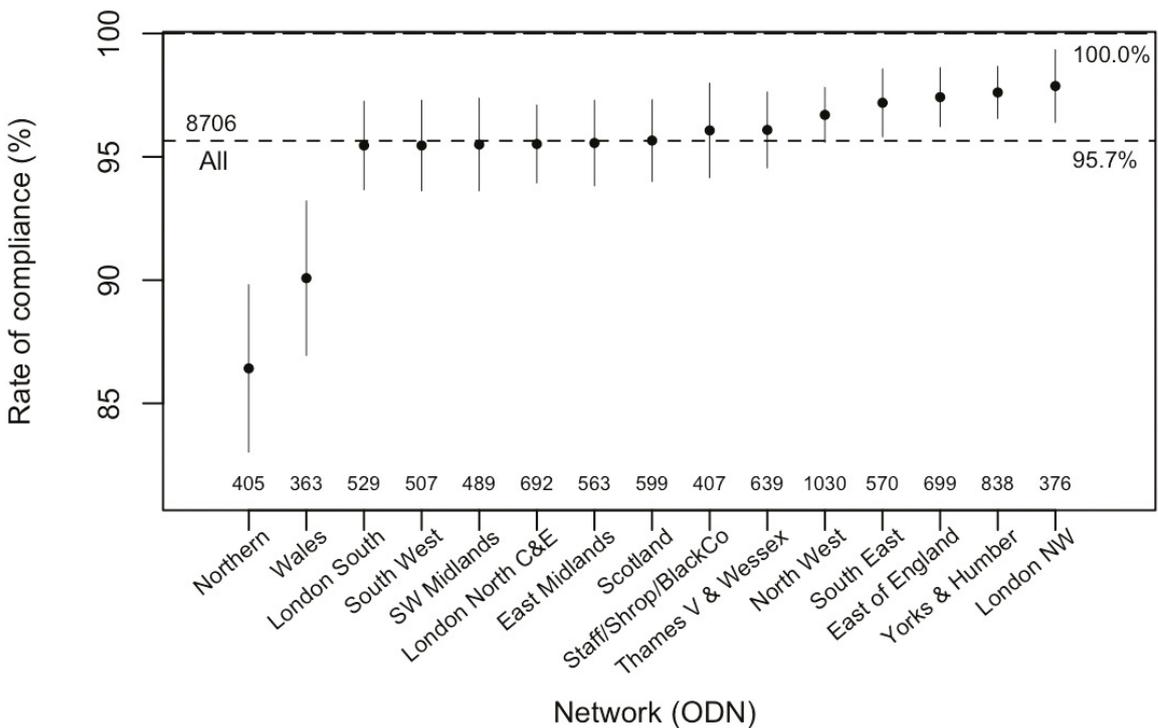
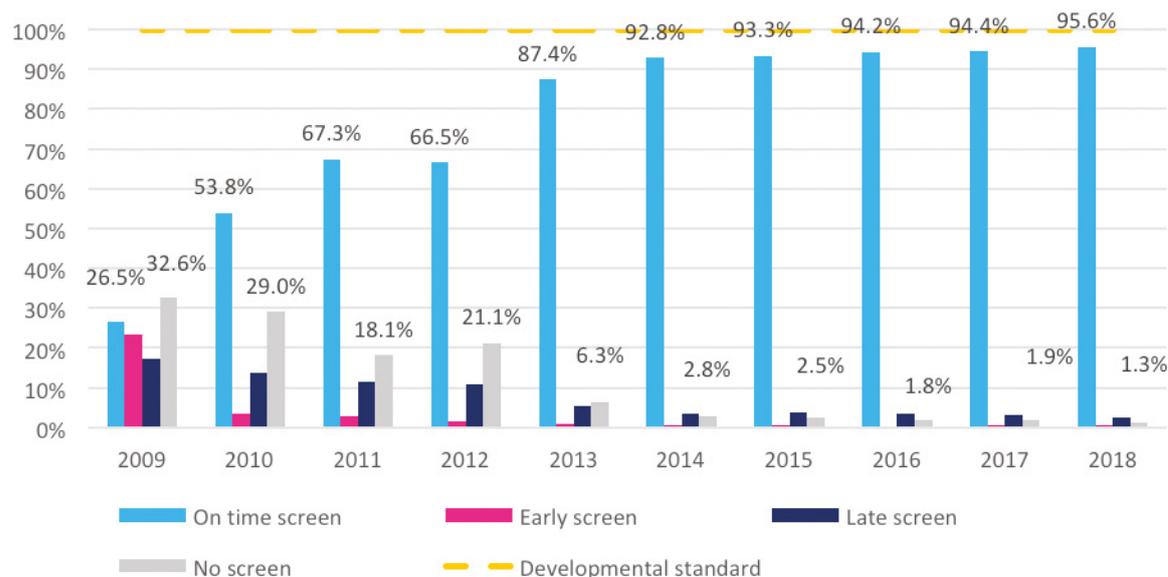


Figure 16. Timing of ROP screening, by NNAP reporting year (2009-2018).

Key findings

- 95.6% (8,329 of 8,710) of eligible babies were screened on time within the NNAP interpretation of the screening window. In 2017, the proportion screened on time was 94.4%. Including post-discharge screenings and late screens, 98.7% (8,597 of 8,710) of eligible babies had at least one screening for ROP recorded.
- 61 units (33.9%) reported screening all their eligible babies on time; an improvement on 2017 when 47 units achieved the standard. 33 units (18.3%) screened less than 90% of eligible babies on time. Inter-unit variation remains obvious, with screening rates varying from 50% to 100%. Three units could be identified as low outliers at two standard deviations or more (see [NNAP Online](#)).
- Most, but not all, unscreened babies were close to the weight or gestation thresholds for screening. It is possible that units are interpreting screening guidelines differently.
- Most neonatal networks screened more than 95% of their babies, but two networks were low outliers at three standard deviations (see [NNAP Online](#)).
- The rate of on time screening in SCUs is lower (90.3%, 681 of 754) than in LNUs (96.1%, 3,270 of 3,403) and NICUs (96.2%, 4,378 of 4,553).

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.

2.8. Encephalopathy

Does an admitted baby born at 35 weeks gestational age or above have an encephalopathy within the first three full calendar days after birth?

Babies with encephalopathy have impaired consciousness and often have seizures. Encephalopathy in newborn babies has a variety of causes, but most commonly occurs in babies who are born at or near-term and who appear to have got into difficulty during late pregnancy, labour or delivery. It is important that hospitals gain understanding of their rates of encephalopathy in newborn babies, to identify opportunities to improve midwifery and obstetric practice.

Results

The NNAP presents rates of encephalopathy by trust or health board for the years 2015-2017 inclusive, using number of live births as a denominator. The rates of encephalopathy presented are not risk adjusted according to maternal or obstetric characteristics.

Table 8. Encephalopathy rates per 1000 births, by birth year (2015-2017 and 2014-2016).

Reporting period	All live births	Live births \geq 35 weeks	Babies with encephalopathy	Encephalopathy rate per 1000 births (95% CI)	Missing data (%)
2014-2016	2,181,353	2,060,531	3,372	1.64 (1.69-1.58)	657 (0.03%)
2015-2017	2,080,547	1,949,188	3,083	1.58 (1.64-1.53)	140 (0.01%)

Key findings

- There were 1,949,188 babies born at greater than or equal to 35 weeks gestation between 1 January 2015 and 31 December 2017. Of these, 3,083 were recorded as having an encephalopathy within three days of birth. Encephalopathy occurred in 1.58 babies per 1000 births (95% confidence intervals: 1.64 – 1.53).

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- **Each Baby Counts**, run by the **Royal College of Obstetricians and Gynaecology (RCOG)**, is a national quality improvement programme to reduce the number of babies who die or have a serious brain injury because of incidents that occur during term labour. For more information go to: www.rcog.org.uk/eachbabycounts.
- The **Avoiding Term Admissions to Neonatal Units (ATAIN) programme**, run by **NHS Improvement**, focussed on perinatal hypoxia-ischaemia as one of four clinical areas. Access the ATAIN e-learning package at: www.e-lfh.org.uk/programmes/avoiding-term-admissions-into-neonatal-units/

2.9. 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?

Sick and premature babies are prone to infection by 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.¹³ Neonatal unit staff and parents can reduce the risk of infection by following good infection prevention and control practice.

The NNAP reports 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. The NNAP reports rates of blood cultures positive for bacteria, fungi or yeasts, and a measure of bloodstream infection that occurs on the same day as a central line is present.

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 for whom any 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 indicated significant infection with or without the presence of clinical confirmation (a true infection). A list of such organisms is presented in Appendix E. Babies contribute to the denominator for this measure for all units to which they were admitted.

Overall, 69,760 blood cultures were reported from 63,804 babies who stayed for more than 72 hours in 181 neonatal units. Of these blood cultures, 88.7% have a result entered. For very preterm babies, 15,565 blood cultures were reported from 7,749 babies; for moderate and late preterm and term babies, 54,195 blood cultures were reported from 56,055 babies.

Table 9. Positive blood cultures, by gestational age group (<32 weeks and ≥32 weeks).

Gestational age group	Eligible babies	Number (%) of babies with any positive blood culture	Number (%) of babies with growth of any clearly pathogenic organism
< 32 weeks	7,749	1,208 (15.5%)	819 (10.6%)
≥ 32 weeks	56,055	338 (0.6%)	200 (0.4%)
Total	63,804	1,546 (2.4%)	1,019 (1.6%)

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 72 hours of age.

Key findings

- 119 neonatal units (65.7%) have provided assurance that 100% of positive blood cultures reported in their unit have been submitted to the audit. As a result, they can compare their unit's infection rates with some other units. These units can be identified on [NNAP Online](#). This is a major improvement on 2017, when 74 neonatal units (41%) were able to provide assurance.
- 10.6% of very preterm babies had a positive blood culture for a clearly pathogenic organism. Overall, for admitted babies of all gestations, 1.6% had such an infection. This reflects the known higher incidence of infections in less mature babies.
- The proportion of very preterm babies experiencing a true infection varied by ODN (range 5% to 16.6%) (see [NNAP Online](#)).
- The proportion of very preterm babies experiencing a true infection varies from 0% to 22.7% in different neonatal units. This is likely true variation, because some units with very low rates have certified that they report every positive blood culture (see [NNAP Online](#)).

Recommendations

- (5)** Use evidence-based strategies to lower rates of infection or necrotising enterocolitis (NEC). Consider comparing practice with units with 'complete' data who have lower rates of infection or NEC to drive improvement in local rates.

Action: Neonatal units

- (6)** Develop processes to ensure that NEC and blood culture data are complete, using NNAP quarterly reports, to provide assurance at the end of the year.

Action: Neonatal units with incomplete NEC and blood culture data

- (7)** Neonatal networks should work with units that do not validate their NEC or bloodstream infection NNAP data in order to ensure full participation in the audit, and maximise compliance with the NHS neonatal service specification in England and other appropriate structures within the devolved administrations and crown dependencies.

Action: Neonatal networks

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- The **Infection in Critical Care Quality Improvement Programme (ICCQIP)** is a voluntary national surveillance programme designed to provide information about infections in adult, paediatric and neonatal critical care units (CCUs) in England. For more information, go to: www.ficm.ac.uk/ICCQIP.
- The **Maternity and Children Quality Improvement Collaborative (MCQIC)** has a number of webinars related to reducing infection rates: www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/neonatal-care/.

2.10. 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

63,804 babies who stayed for more than 72 hours in 181 neonatal units received 1,061,522 days of care. In total, 14% of all care days included a central line and 762 bloodstream infections were reported for these central line days.

Table 10. Babies with central line associated bloodstream infections, by gestational age group.

Gestational age group	Babies	Babies with central line associated bloodstream infections	Line days	Babies with central line associated bloodstream infection per 1000 central line days
< 32 weeks	7,749	637	101,326	6.29
≥ 32 weeks	56,055	125	47,116	2.65
Total	63,804	762	148,442	5.13

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

Key findings

- 119 neonatal units (65.7%) have provided assurance that 100% of positive blood cultures reported in their unit have been submitted to the audit. This is an improvement on 2017, when 74 neonatal units were able to provide assurance.
- 6.29 very preterm babies experienced bloodstream infection per 1000 central line days (5.13 over all gestations).
- Inter-NICU variation (0 to 19.9) in the number of very preterm babies with bloodstream infection per 1000 central line days cannot wholly be explained by variable reporting of positive blood cultures (see [NNAP Online](#)).

Recommendations

- (5) Use evidence-based strategies to lower rates of infection or necrotising enterocolitis (NEC). Consider comparing practice with units with 'complete' data who have lower rates of infection or NEC to drive improvement in local rates.

Action: Neonatal units

- (6)** Develop processes to ensure that NEC and blood culture data are complete, using NNAP quarterly reports, to provide assurance at the end of the year.

Action: Neonatal units with incomplete NEC and blood culture data

- (7)** Neonatal networks should work with units that do not validate their NEC or Bloodstream infection NNAP data in order to ensure full participation in the audit, and maximise compliance with the NHS neonatal service specification in England and other appropriate structures within the devolved administrations and crown dependencies.

Action: Neonatal networks

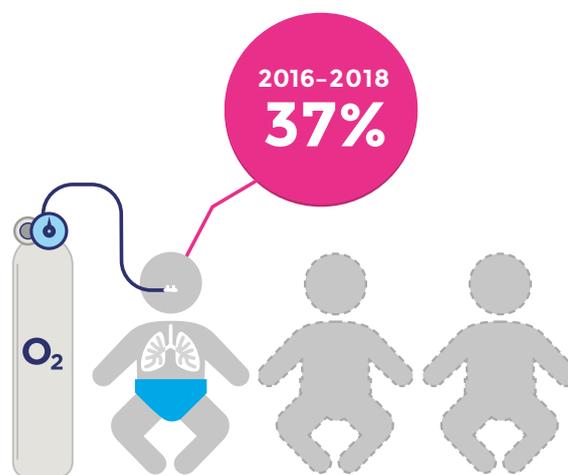
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- The **Infection in Critical Care Quality Improvement Programme (ICCQIP)** is a voluntary national surveillance programme designed to provide information about infections in adult, paediatric and neonatal critical care units (CCUs) in England. For more information, go to: www.ficm.ac.uk/ICCQIP.
- The **Maternity and Children Quality Improvement Collaborative (MCQIC)** has a number of webinars relating to reducing infection rates: www.ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/neonatal-care/.

2.11. Bronchopulmonary dysplasia (BPD)

Does an admitted baby born at less than 32 weeks 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 other device. Simply being born early can cause some ongoing breathing difficulty. Being on a ventilator can cause damage to the lungs, exacerbate breathing problems later in life and put babies at risk of chest infections. This condition is known as bronchopulmonary dysplasia (BPD) and is sometimes called chronic lung disease. NNAP reports on the proportion of babies born very preterm who are still receiving help with their breathing or extra oxygen four weeks before their due date.



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

Where rates of BPD differ, it may 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. Where the 95% confidence interval for this effect does not include zero, the treatment effect is unlikely to be a chance finding.

Results

25,052 babies born at less than 32 weeks gestational age, discharged between 1 January 2016 and 31 December 2018 as reported by 183 neonatal units, and 34 other places of birth not associated with an NNAP participating unit. Of these babies, 1,131 were excluded as the complete data required for analysis of BPD was not available from units participating in the NNAP. In total, 23,921 babies were eligible for inclusion in the analysis. Babies were assigned to their recorded place of birth for this analysis. In Table 11, responses are assigned 'other' if the mother was recorded as delivering the baby 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. 'Other' responses are not included in Figure 17 and Figure 18.

Table 11. Rates of BPD or death, by neonatal network.

Network	Babies	Death before 36 weeks' corrected gestational age (%)	Babies alive at 36 weeks with sufficient data to attribute BPD outcome	BPD status		Significant BPD (BPD or death %)	Missing data (%)
				No BPD	BPD		
East Midlands Neonatal ODN	1,486	114 (7.7%)	1,367	995	372	486 (32.8%)	5 (0.4%)
East of England Neonatal ODN	1,903	91 (4.8%)	1,804	1,285	519	610 (32.2%)	8 (0.4%)
North Central & North East London Neonatal ODN	1,719	79 (4.6%)	1,630	1,093	537	616 (36%)	10 (0.6%)
North West London Neonatal ODN	1,098	82 (7.5%)	1,015	691	324	406 (37%)	1 (0.1%)
North West Neonatal ODN	2,930	273 (9.3%)	2,651	1,798	853	1,126 (38.5%)	6 (0.2%)
Northern Neonatal ODN	1,085	76 (7%)	1,003	629	374	450 (41.7%)	6 (0.6%)
Scotland	1,479	122 (8.2%)	1,352	903	449	571 (38.7%)	5 (0.4%)
South East Coast Neonatal ODN	1,674	114 (6.8%)	1,556	1,082	474	588 (35.2%)	4 (0.3%)
South London Neonatal ODN	1,504	103 (6.8%)	1,399	882	517	620 (41.3%)	2 (0.1%)
South West Neonatal ODN	1,426	83 (5.8%)	1,337	884	453	536 (37.7%)	6 (0.4%)
Southern West Midlands Neonatal ODN	1,372	140 (10.2%)	1,225	819	406	546 (40%)	7 (0.6%)
Staffordshire, Shropshire & Black Country Neonatal ODN	1,033	108 (10.5%)	919	644	275	383 (37.3%)	6 (0.6%)
Thames Valley & Wessex ODN	1,966	117 (6%)	1,845	1,303	542	659 (33.6%)	4 (0.2%)
Wales	956	58 (6.1%)	897	627	270	328 (34.3%)	1 (0.1%)
Yorkshire & Humber Neonatal ODN	2,218	180 (8.1%)	2,033	1,467	566	746 (33.7%)	5 (0.2%)
Total	23,849	1,740 (7.3%)	22,033	15,102	6,931	8,671 (36.5%)	76 (0.3%)
Other*	72	6 (8.3%)	52	30	22	28 (48.3%)	14 (19.4%)

*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 significant BPD or death (2016-2018): neonatal units (TOP) and 'treatment effect' on rates of significant BPD or death (BOTTOM). (Level two and level three only).

Rates of the combined outcome of significant BPD or death. Rates are marked with black (level three units) and grey dots (level two units) and the 95% confidence intervals are indicated by vertical bars. Neonatal units are presented in ascending order of the rates.

Rates of treatment effect are marked with black or grey dots and the 95% confidence intervals are indicated by vertical bars. 'Treatment effect' is the difference between the rate of BPD or death in babies cared for in a neonatal 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 network of interest than for a comparable group of babies cared for in all neonatal units. Where the 95% confidence interval for this effect does not include zero, the treatment effect is unlikely to be a chance finding.

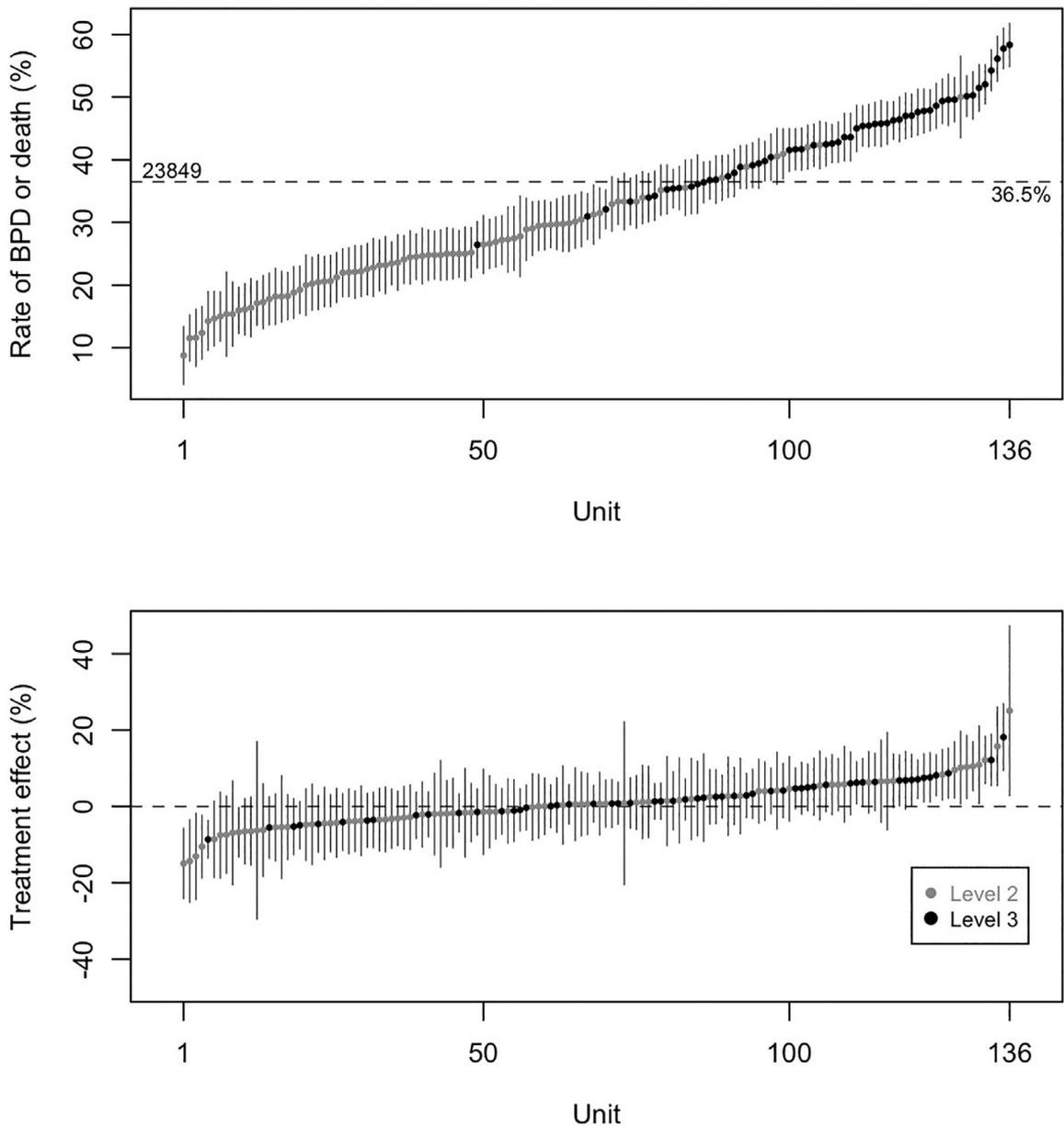


Figure 18. Caterpillar plot of the rates of significant BPD or death (2016-2018): neonatal networks (TOP) and 'treatment effect' on rates of significant BPD or death (BOTTOM).

Rates of the combined outcome of significant BPD or death. Rates are marked with black dots and the 95% confidence intervals are indicated by vertical bars. Networks are presented in ascending order of the rates.

Rates of treatment effect are marked with black dots and the 95% confidence intervals are indicated by vertical bars. 'Treatment effect' is the difference between the rate of BPD or death in babies cared for in a neonatal 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 network of interest than for a comparable group of babies cared for in all neonatal units. Where the 95% confidence interval for this effect does not include zero, the treatment effect is unlikely to be a chance finding.

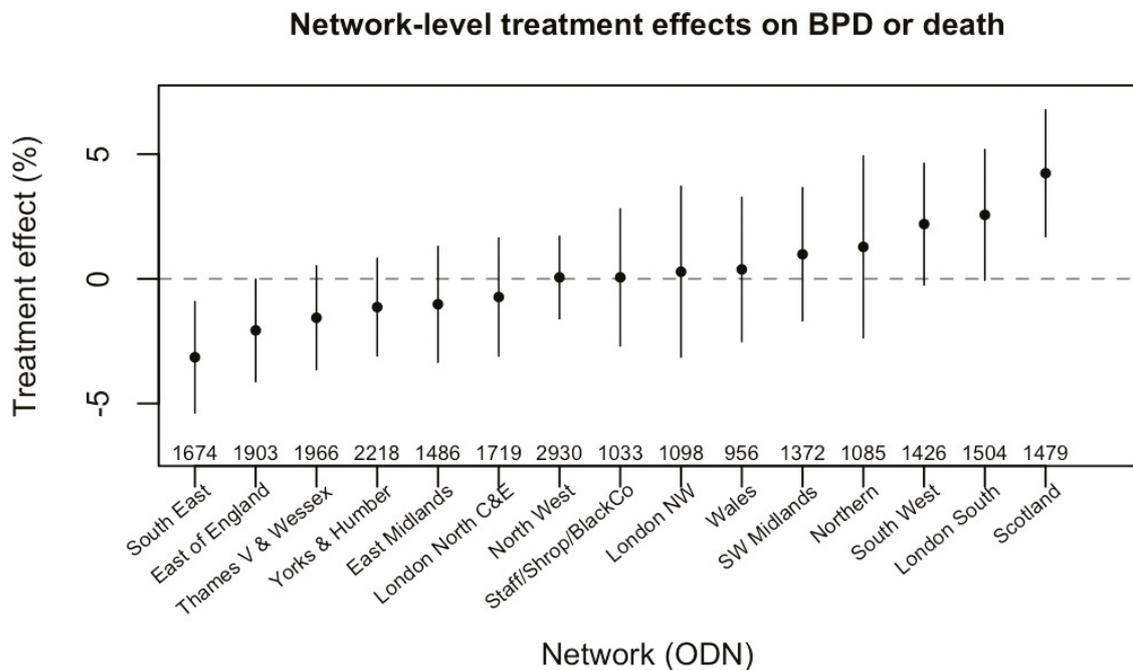
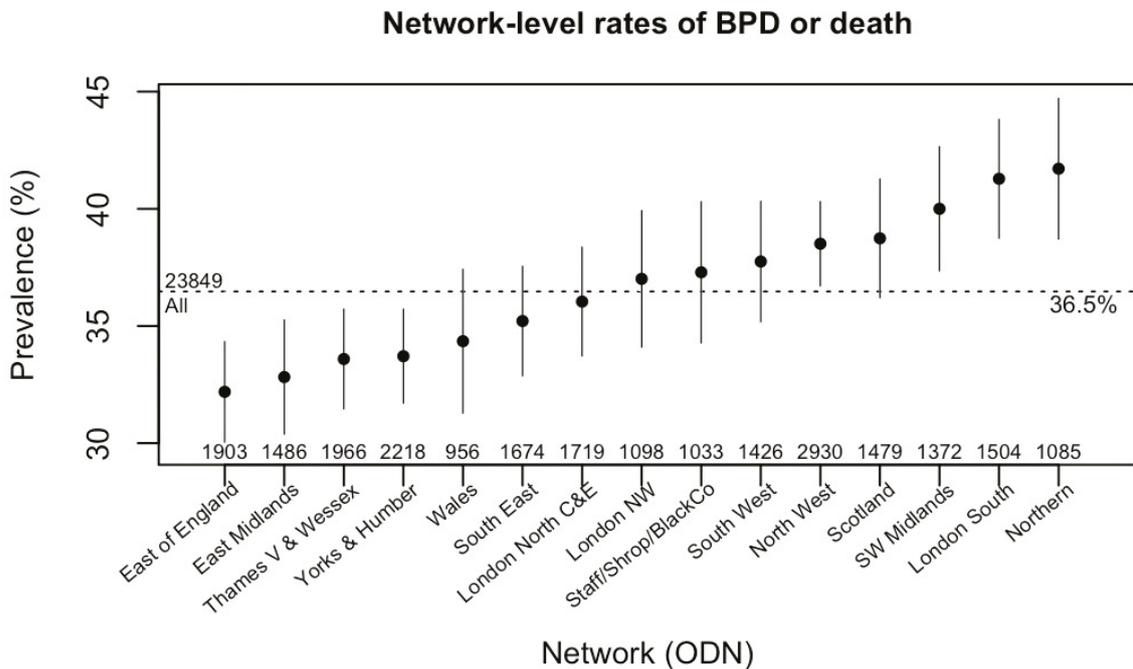


Table 12. Rates of BPD only, and the combined outcome of BPD and death, by NNAP reporting period (2013-2018).

NNAP year	Babies	With data entered	Significant BPD (%)	Significant 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 (36.2%)	42 (0.2%)
2016-2018	23,849	23,773	6,931 (31.5%)	8,671 (36.5%)	76 (0.3%)

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

Key findings

- Between 2016 and 2018, 36.5% (8,671 of 22,773) of very preterm babies had significant BPD or died before they reached 36 weeks corrected gestational age.
- BPD rates attributed to neonatal unit of birth vary importantly, but review of the variation in treatment effect is more meaningful. Treatment effect describes the difference between the rate of BPD seen in a unit or network and that seen in a comparable group of babies cared for in the whole country.
- The treatment provided in some ODNs resulted in a wider range of rates of BPD than that expected by chance alone. Two networks were identified as alert or alarm outliers for treatment effect, and two other networks were identified as excellent or outstanding outliers for treatment effect.

Recommendations

- (8)** Assess practice in the management of early respiratory disease in very preterm infants against NICE guidelines for respiratory care for preterm babies. Consider comparing practice with units with a lower rate of bronchopulmonary dysplasia (BPD) to identify quality improvement opportunities.

Action: Neonatal networks and units with a 'positive' treatment effect for BPD where the 95% confidence interval excludes zero.

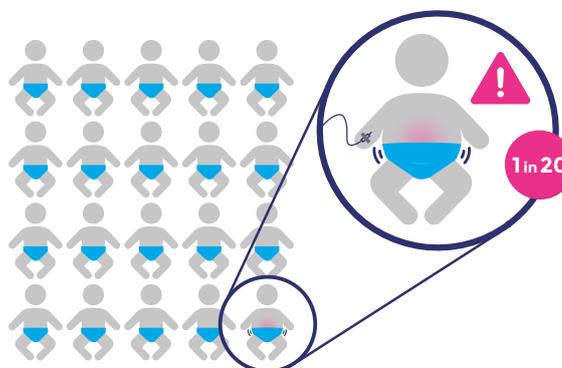
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- Refer to the new *NICE guideline; Specialist neonatal respiratory care for babies born preterm*, available at: www.nice.org.uk/guidance/ng124.

2.12. 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 occasion?

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.



Results

There were 7,810 babies who were born very preterm and survived to 48 hours after birth. For 421 babies it was not possible to determine whether the baby had NEC at any point in their neonatal care.

Table 13. NEC status, by neonatal unit level – all units.

Unit level	Babies	With data entered	NEC status			Missing data		
			Died prior to discharge home, but no NEC	No NEC	NEC	Death before discharge	Alive at discharge	Total missing
Other	13	12	0	12	0 (0%)	0 (0.0%)	1 (7.7%)	1 (7.7%)
SCU	153	138	0	136	2 (1.4%)	0 (0.0%)	15 (9.8%)	15 (9.8%)
LNU	2,334	2,188	8	2,114	66 (3%)	4 (0.2%)	142 (6.1%)	146 (6.3%)
NICU	5,310	5,051	290	4,419	342 (6.8%)	76 (1.4%)	183 (3.4%)	259 (4.9%)
Total	7,810	7,389	298	6,681	410 (5.5%)	80 (1%)	341 (4.4%)	421 (5.4%)

Table 14. NEC status, units who provided assurance that their NEC diagnosis data was complete.

Units	Babies	With data entered	NEC status			Missing data		
			Died prior to discharge home, but no NEC	No NEC	NEC (%)	Death before discharge (%)	Alive at discharge (%)	Total missing (%)
121	5,227	5,054	212	4,573	269 (5.3%)	30 (0.6%)	143 (2.7%)	173 (3.3%)

Table 15. 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 (%)	Death before discharge (%)	Alive at discharge (%)	Total missing (%)
East Midlands Neonatal ODN	481	440	18	395	27 (6.1%)	7 (1.5%)	34 (7.1%)	41 (8.5%)
East of England Neonatal ODN	579	560	15	513	32 (5.7%)	2 (0.3%)	17 (2.9%)	19 (3.3%)
North Central & North East London Neonatal ODN	570	542	12	493	37 (6.8%)	4 (0.7%)	24 (4.2%)	28 (4.9%)
North West London Neonatal ODN	380	371	24	323	24 (6.5%)	3 (0.8%)	6 (1.6%)	9 (2.4%)
North West Neonatal ODN	973	916	42	819	55 (6%)	19 (2%)	38 (3.9%)	57 (5.9%)
Northern Neonatal ODN	381	315	8	293	14 (4.4%)	10 (2.6%)	56 (14.7%)	66 (17.3%)
Scotland	538	508	20	465	23 (4.5%)	5 (0.9%)	25 (4.6%)	30 (5.6%)
South East Coast Neonatal ODN	549	515	23	461	31 (6%)	8 (1.5%)	26 (4.7%)	34 (6.2%)
South London Neonatal ODN	456	430	23	377	30 (7%)	4 (0.9%)	22 (4.8%)	26 (5.7%)
South West Neonatal ODN	460	431	17	396	18 (4.2%)	1 (0.2%)	28 (6.1%)	29 (6.3%)
Southern West Midlands Neonatal ODN	434	414	23	365	26 (6.3%)	7 (1.6%)	13 (3%)	20 (4.6%)
Staffordshire, Shropshire and Black Country Neonatal ODN	377	351	18	305	28 (8%)	4 (1.1%)	22 (5.8%)	26 (6.9%)
Thames Valley & Wessex ODN	590	573	20	537	16 (2.8%)	1 (0.2%)	16 (2.7%)	17 (2.9%)
Wales	297	290	6	279	5 (1.7%)	3 (1%)	4 (1.3%)	7 (2.4%)
Yorkshire & Humber Neonatal ODN	730	719	29	646	44 (6.1%)	2 (0.3%)	9 (1.2%)	11 (1.5%)
Other	15	14	0	14	0 (0.0%)	0 (0.0%)	1 (6.7%)	1 (6.7%)
Total	7,810	7,389	298	6,681	410 (5.5%)	80 (1%)	341 (4.4%)	421 (5.4%)

Key findings

- Approximately 1 in 20 (5.5%, 410 of 7,389) very preterm babies developed necrotising enterocolitis (NEC). This rate is unchanged from 2017 (5.6%, 428 of 7,628).
- 129 neonatal units (71.3%) have provided assurance that 100% of their NEC diagnosis data were submitted to the audit. This is an improvement on 2017, when 78 neonatal units were able to provide assurance.
- Among the 129 units providing assurance that all their diagnosis data were submitted to the audit, 5.3% (269 of 5,054) of very preterm babies developed NEC.
- 81 neonatal units reported no cases on NEC at all, 17 of which cared for 30 or more eligible babies. There were a similar number of units reporting no cases in 2017. However, the median NEC rate among units reporting one or more cases was 5.8%.
- Data are known to be missing for 5.4% (421 of 7,810) of eligible babies. Of these, 80 are known to have died.
- Reported levels of NEC by neonatal network vary from 1.7% to 8.0%.

Recommendations

- (5)** Use evidence-based strategies to lower rates of infection or necrotising enterocolitis (NEC). Consider comparing practice with units with 'complete' data who have lower rates of infection or NEC to drive improvement in local rates.

Action: Neonatal units

- (6)** Develop processes to ensure that NEC and blood culture data are complete, using NNAP quarterly reports, to provide assurance at the end of the year.

Action: Neonatal units with incomplete NEC and blood culture data

- (7)** Neonatal networks should work with units that do not validate their NEC or Bloodstream infection NNAP data in order to ensure full participation in the audit, and maximise compliance with the NHS neonatal service specification in England and other appropriate structures within the devolved administrations and crown dependencies.

Action: Neonatal networks

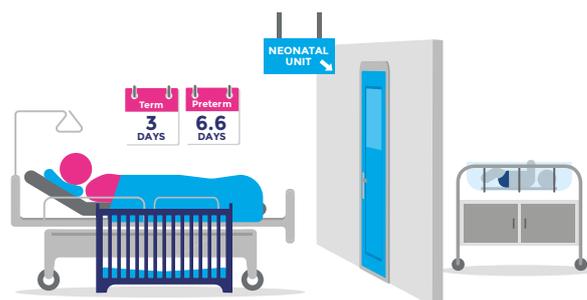
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- Access information and resources produced by the **Special Interest Group in Necrotising Enterocolitis, (SIGNEC)**: www.signec.org/
- Case study: *Reducing necrotising enterocolitis (NEC): A quality improvement initiative*, West Hertfordshire NHS Trust, Chapter 3, page 65.

2.13. 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 did not have any surgery or a transfer 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 did not have any surgery or a transfer 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 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.¹⁴



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 where breathing support was not needed. For some babies, separation from their mother may be able to be avoided altogether, with all their neonatal care delivered in a transitional care setting, on a postnatal ward or the delivery suite. For other babies where a neonatal unit admission is unavoidable, there may still be opportunities to reduce separation care days during admission, particularly where separation days are high.

Results

88.9% (26,358 of 29,651) of admitted babies born at 37 weeks gestational age or greater, who did not have surgery and were not transferred, had some special or normal care days on which oxygen was not administered. 58,921 special care days and 29,837 normal care days (88,758 days in total) were provided to these 29,651 babies. 94.8% (13,919 of 14,685) of admitted babies born at 34 to 36 weeks gestation, who did not have surgery and were not transferred, had some special or normal care days on which oxygen was not administered. 75,025 special care and 21,539 normal care days (96,564 days in total) were provided to these 14,685 babies.

Table 16. Term babies spending one or more days in special or normal care, by neonatal unit level.

Unit level	Babies	Babies who received one or more eligible days in special or normal care (%)	Number of eligible care days			Average number of separation days per baby
			Special care	Normal care	Total days	
SCU	3,771	3,405 (90.3%)	7,268	3,816	11,084	2.9
LNU	12,412	11,089 (89.3%)	23,821	13,278	37,099	3
NICU	13,468	11,864 (88.1%)	27,832	12,743	40,575	3
Total	29,651	26,358 (88.9%)	58,921	29,837	88,758	3

Table 17. Late preterm babies spending one or more days in special or normal care, by neonatal unit level.

Unit level	Babies	Babies who received one or more eligible days in special or normal care (%)	Number of eligible care days			Average number of separation days per baby
			Special care	Normal care	Total days	
SCU	2,181	2,095 (96.1%)	12,489	3,934	16,423	7.5
LNU	6,740	6,471 (96%)	35,201	10,908	46,109	6.8
NICU	5,764	5,353 (92.9%)	27,335	6,697	34,032	5.9
Total	14,685	13,919 (94.8%)	75,025	21,539	96,564	6.6

Key findings

- On average, three special care or normal care days were given for each term (greater than or equal to 37 weeks gestational age) baby admitted to a neonatal unit. In 2017, an average of 3.2 days of special or normal care was given to these babies.
- On average 6.6 special care or normal care days for each late preterm (34-36 weeks gestational age) baby admitted to a neonatal unit (2017: 6.8 days). SCUs had longer separation times than NICUs for late preterm admissions (7.5 days vs 5.9 days). Measures of separation days should be interpreted alongside gestation-specific admission rates, which are presented by the National Maternity and Perinatal Audit (NMPA).
- Unit level variation in separation days is more striking than network level variation, both for late preterm and term babies admitted (late preterm 1.8 to 12.5; term 0.7 to 4.9). Units with longer separation days for term babies typically had longer separation times for preterm babies. This suggests that unit level practices may be an important determinant of mother and baby separation.

Recommendations

- (9) Use local knowledge of the rates of admission of term and near-term babies, case review (as used in the ATAIN programme), process mapping and Pareto charts to identify and action modifiable factors to address prolonged mother infant separation.

Action: Neonatal units

- (10) NNAP and NMPA should work with NHS Digital to maximise opportunities to report measures of rates and duration of mother and baby separation in a way that is most useful to audit users.

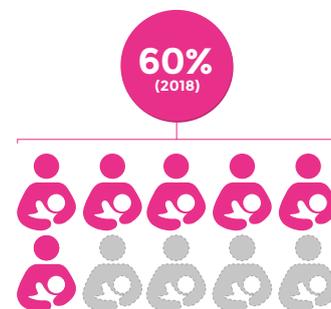
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- The **Avoiding Term Admissions to Neonatal Units (ATAIN) programme**, run by **NHS Improvement**, focusses on four key clinical areas and identified the impact of mother and baby separation. Access the ATAIN e-learning package at: www.e-lfh.org.uk/programmes/avoiding-term-admissions-into-neonatal-units/
- The *British Association for Perinatal Medicine (BAPM) Neonatal Transitional Care Framework for Practice* describes standards for the delivery of transitional care: www.bapm.org/sites/default/files/files/TC%20Framework-20.10.17.pdf.
- The *National Maternity and Perinatal Audit (NMPA) Organisational Report* provides information about the location of transitional care services in England, Scotland and Wales: www.maternityaudit.org.uk/audit/charting/organisational.
- Case study: *Destination TC! Reducing Mother/Infant Separation in Hospital*. West Hertfordshire Hospitals NHS Trust. See: www.rcpch.ac.uk/sites/default/files/2019-04/sankar1.pdf
- Case study: *Establishing a transitional care service across three units*. Betsi Cadwaladr University Health Board. See: www.rcpch.ac.uk/sites/default/files/2019-04/rhians1_0.pdf

2.14. Breastmilk feeding at discharge home

Does a baby born at less than 33 weeks gestational age receive any of their own mother's milk at discharge to home from a neonatal unit?"

Breastmilk feeding provides many health benefits to the baby and the mother. It helps to protect babies from 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 a relationship between the mother and baby. This measure describes, for babies who received all their care in one neonatal unit without being transferred, the proportion of babies receiving any of their own mother's milk when they were discharged home.



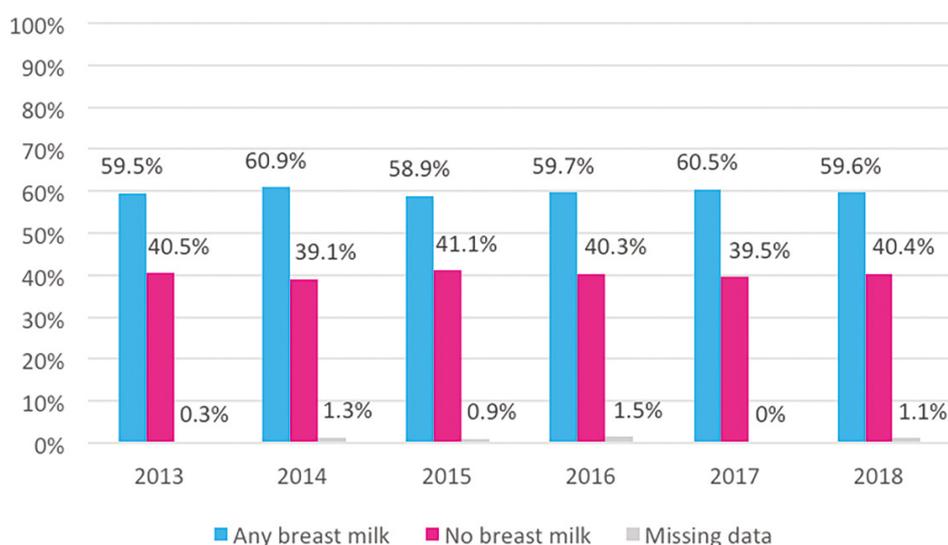
Results

Of the 10,893 babies born at less than 33 weeks, and admitted to a participating unit, there were 6,195 babies who met the criteria for inclusion in this question. It is restricted to non-transferred babies. Therefore, 3,916 otherwise eligible babies are excluded from the analysis, which remains a limitation to the utility of this measure. Data were missing for 67 (1.1%) eligible babies.

Table 18. 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	319	319	192 (60.2%)	127 (39.8%)	0 (0%)
LNU	2,729	2,724	1,697 (62.3%)	1,027 (37.7%)	5 (0.2%)
NICU	3,147	3,085	1,763 (57.1%)	1,322 (42.9%)	62 (2%)
Total	6,195	6,128	3,652 (59.6%)	2,476 (40.4%)	67 (1.1%)

Figure 19. Breastmilk feeding at discharge home, by NNAP reporting year (2013 to 2018)



Key findings

- 59.6% (3,652 of 6,128) of eligible babies were receiving their own mother's milk, either exclusively or with another form of feeding, at the time of their discharge from neonatal care. (2017 - 60.5%; 2016 – 59%; 2015 – 58%).

Recommendations

(11) Identify barriers to breastfeeding across the patient pathways using:

- parent feedback
- a review of breastmilk feeding rate at discharge
- the early breastmilk feeding measure in the NNAP quarterly reports.

Use tools such as the [UNICEF Neonatal Unit Baby Friendly Initiative](#) and [Bliss Baby Charter](#) to overcome barriers identified and to drive improvement.

Action: Neonatal units

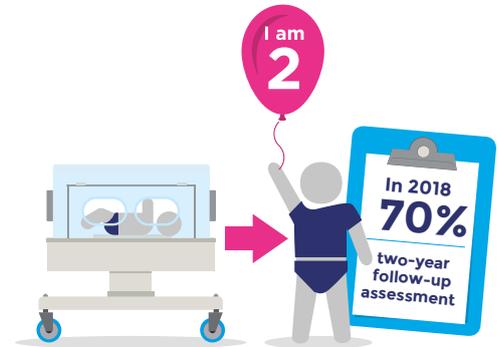
Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- Neonatal services can work towards *UNICEF Baby Friendly Initiative* accreditation to support their breastmilk feeding improvement activities: www.unicef.org.uk/babyfriendly/accreditation/
- Neonatal services can use the *Bliss Baby Charter* to support their breastmilk feeding improvement activities: www.bliss.org.uk/health-professionals/bliss-baby-charter.
- Case study: *Project to review the use of Expressed Breast Milk (EBM) in neonatal units across Yorkshire and the Humber ODN*. Yorkshire and Humber Neonatal ODN. See: www.rcpch.ac.uk/sites/default/files/2019-04/claire1_0.pdf

2.15. Follow-up at two years of age

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)?

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 2015 and June 2016 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 whether there are delays in 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. 90% of babies should have two-year follow-up data entered.

Results

There were 4,161 babies born at less than 30 weeks gestational age between July 2015 and June 2016 who survived and were discharged from a neonatal unit to home, to a ward or to foster care. Of these 69.9% (2,910 of 4,161) had at least some two-year follow-up health data entered.

Figure 20. Caterpillar plot of the rates of two-year follow-up assessment: neonatal units.

Rates of compliance with the standard for two-year follow-up assessment. The estimated rates of compliance with the standard are marked by black dots and the 95% confidence intervals are indicated by vertical bars. Units are presented in ascending order of the rates and units can be identified on [NNAP Online](#).

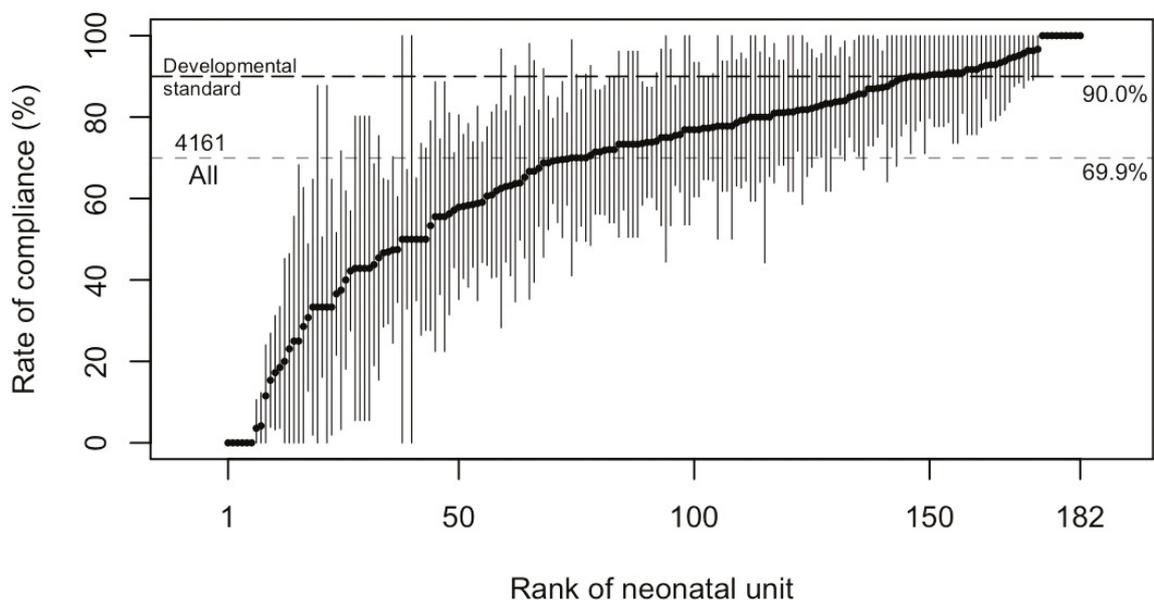


Figure 21. Caterpillar plot of the rates of two-year follow-up assessment: neonatal networks.

Rates of compliance with the standard for two-year follow-up assessment. The estimated rates of compliance with the standard are marked by black dots and the 95% confidence intervals are indicated by vertical bars. Network are presented in ascending order of the rates.

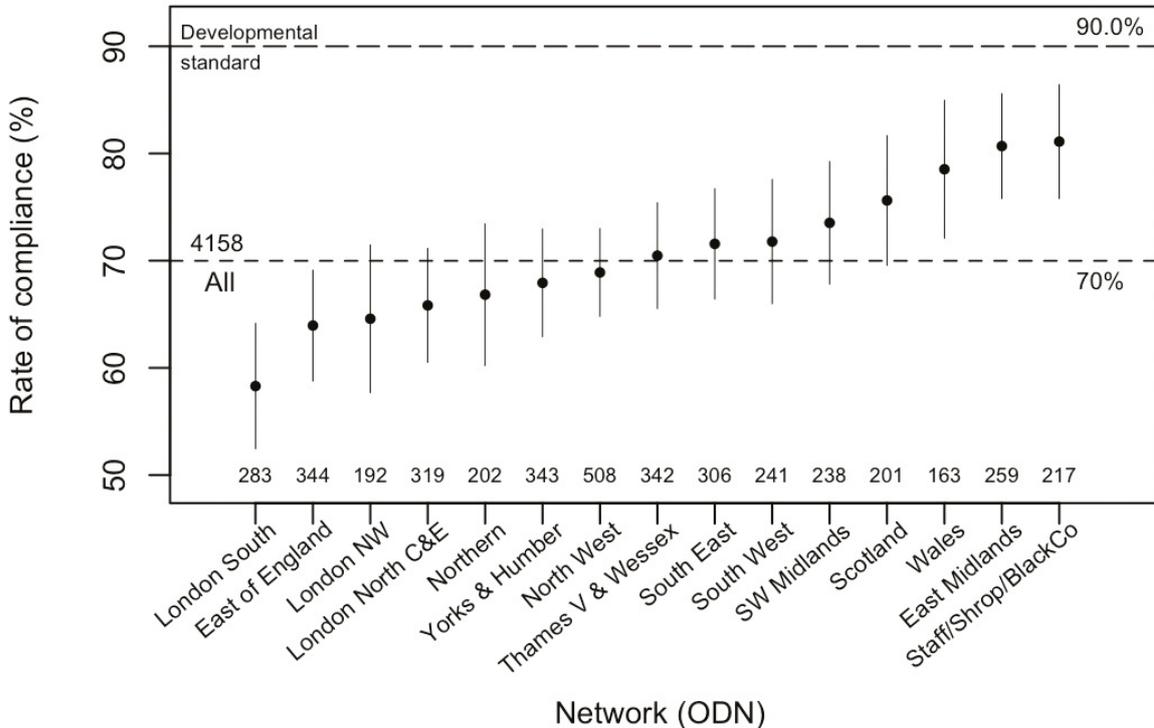
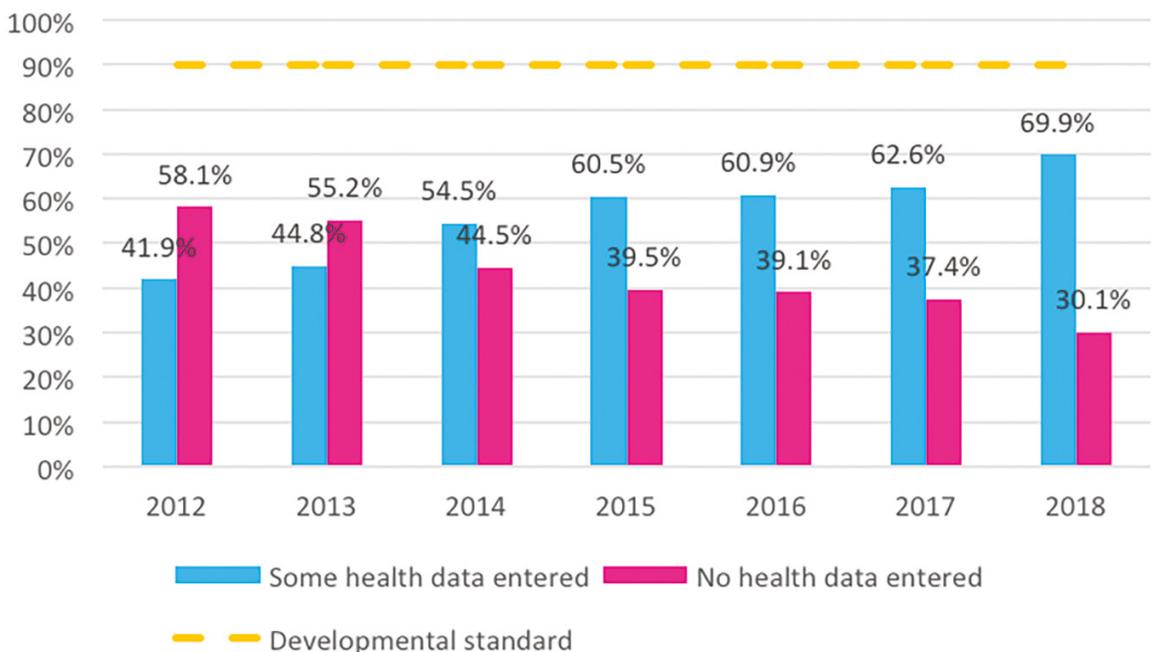


Figure 22. Two-year follow-up rates of compliance, by NNAP reporting year (2012-2018).



Key findings

- 69.9% (2,910 of 4,161) of eligible babies had documented clinical follow-up at two years of age, which is an important increase after years of insignificant growth (2017 - 62.6%, 2016 – 60.9%, 2015 – 60%).
- 37 units achieved the NNAP developmental standard of 90% of babies with two-year follow-up data entered; 34 of these units had 10 or more babies to follow up. 71 units had followed up 80% or more of their babies (2017 data – 42 units). There is important variation between units' performance on this measure (0-100%), although low numbers for a single year preclude the identification of high or low outlier performance at unit level.
- Network rates ranged between 58.3% and 81.1%. Since 2017, almost all networks have improved by important margins. Two networks were high outliers at three standard deviations (SD) and one at two SD. One network was an alarm-level low outlier at three SD and one network was an alert outlier at two SD. However, no neonatal network has met the NNAP developmental standard of 90% of babies with two-year follow-up clinical data entered.

Recommendations

(12) Produce detailed plans to provide or organise follow up of care for babies in accordance with NICE guidance: [Developmental follow-up of children and young people born preterm](#). 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.

Action: Neonatal units

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- Refer to the NICE guideline: *Developmental follow-up of children and young people born preterm*: www.nice.org.uk/guidance/ng72.
- Case study: *Neurodevelopmental follow-up: Multidisciplinary team working to standardise the delivery, uptake and recording of two-year neurodevelopmental assessments*. Royal Hospital for Children, Glasgow, Chapter 3, page 68.

2.16. Mortality until discharge in very preterm babies

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

Mortality is a tragic outcome of neonatal care, that is unlikely to be fully preventable. 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 2015 and 30 June 2018.

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 focusses only on very preterm babies (those born at less than 32 weeks gestation) because they experience higher mortality. MBRRACE-UK report all gestations' mortality. 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 important numbers of babies die after 28 days¹⁵. MBRRACE-UK have published data showing national rates of infant mortality (death before a year of age)¹⁶.

We have presented both actual rates of mortality, as well as rates of mortality that adjust for the characteristics (sex, gestation, birthweight, ethnicity, maternal age, multiple births) of the population cared for in each network. The adjusted mortality rate presents the mortality rate for a network if the babies it cared for had background characteristics like those of all networks' babies.

NNAP mortality reporting will facilitate mortality focussed quality improvement initiatives between neonatal networks. Mortality is not reported for Scotland because of incomplete participation and because units were not participating in NNAP during the period reported. Mortality is not reported for the Isle of Man as it is not part of a neonatal network.

Results

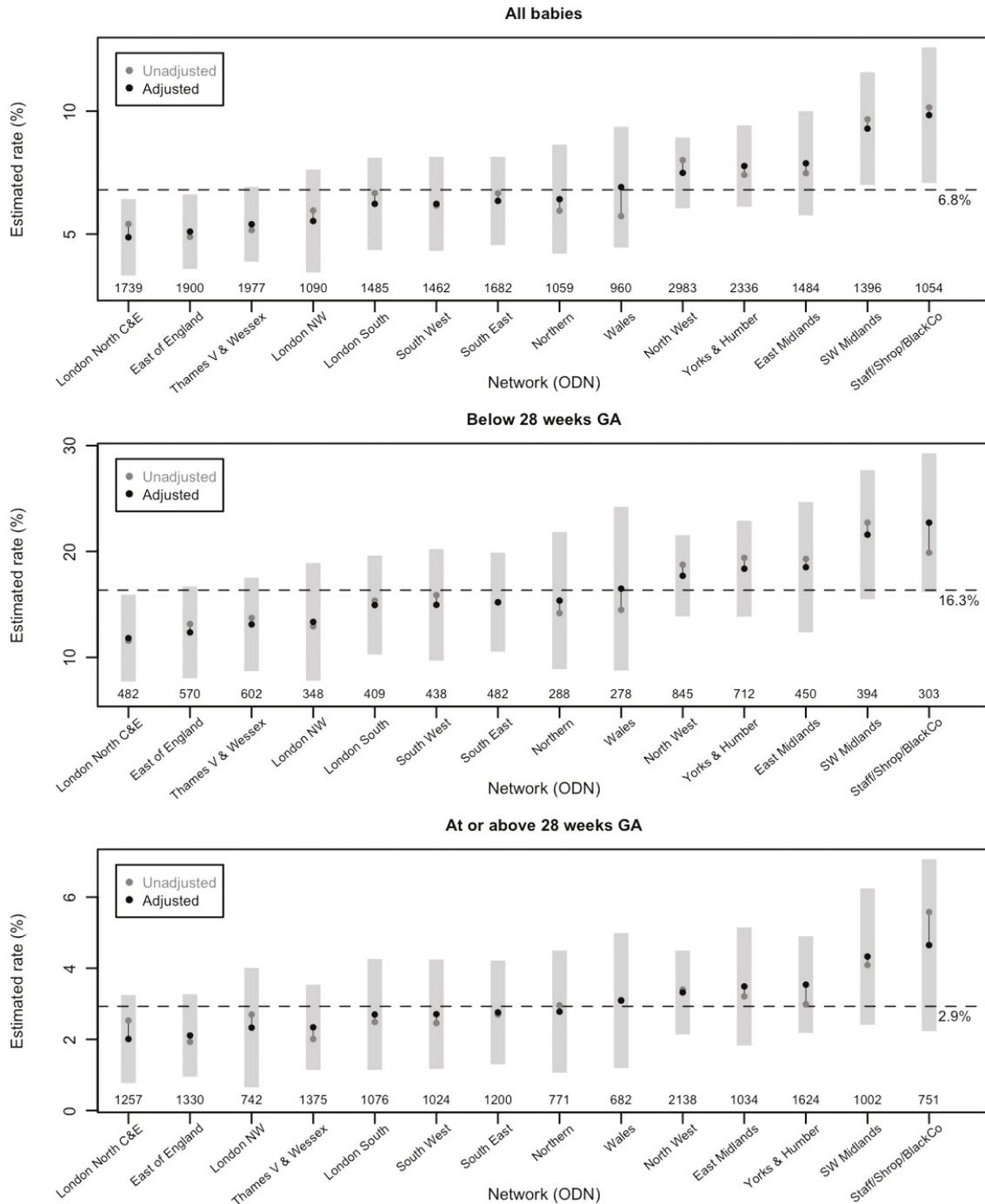
There were 22,980 babies eligible for inclusion in this measure. 21 babies we excluded from the analysis on the account of unknown gender, and a further 22 were excluded due to implausible birthweight, leaving 22,937 babies. Mortality outcome was unknown for 330 babies. The total number of babies included in the analysis was 22,607. 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 19. Rates of mortality until discharge, adjusted and unadjusted: neonatal networks.

Network	Total eligible babies	Missing survival status	Total included in the analysis	Died before discharge home or 44 weeks PMA	Survived to discharge home or 44 weeks PMA	Unadjusted mortality rate (%)	Adjusted mortality rate (%)	Standard error
East Midlands Neonatal ODN	1,504	20	1,484	111	1,373	7.5%	7.9%	1.06
East of England Neonatal ODN	1,930	30	1,900	93	1,807	4.9%	5.1%	0.76
North Central & North East London Neonatal ODN	1,761	22	1,739	94	1,645	5.4%	4.9%	0.78
North West London Neonatal ODN	1,112	22	1,090	65	1,025	6%	5.5%	1.05
North West Neonatal ODN	3,038	55	2,983	239	2,744	8%	7.5%	0.72
Northern Neonatal ODN	1,080	21	1,059	63	996	5.9%	6.4%	1.11
South East Coast Neonatal ODN	1,708	26	1,682	112	1,570	6.7%	6.4%	0.9
South London Neonatal ODN	1,512	27	1,485	99	1,386	6.7%	6.2%	0.94
South West Neonatal ODN	1,481	19	1,462	90	1,372	6.2%	6.2%	0.96
Southern West Midlands Neonatal ODN	1,404	8	1,396	135	1,261	9.7%	9.3%	1.15
Staffordshire, Shropshire and Black Country Neonatal ODN	1,082	28	1,054	107	947	10.2%	9.8%	1.38
Thames Valley & Wessex ODN	2,008	31	1,977	102	1,875	5.2%	5.4%	0.76
Wales	969	9	960	55	905	5.7%	6.9%	1.23
Yorkshire & Humber Neonatal ODN	2,348	12	2,336	173	2,163	7.4%	7.8%	0.83
England and Wales	22,937	330	22,607	1,538	21,069	6.8%		

Figure 23. Caterpillar plot of adjusted and unadjusted rates of mortality until discharge: neonatal networks.

Black dots indicate adjusted rates and grey dots indicate unadjusted rates. The grey strips mark the 95% confidence intervals for the adjusted rates.



Key findings

- Rates of mortality until discharge home, or 44 weeks post menstrual age, vary widely by network of care, from 4.9 to 9.8% (adjusted rates – unadjusted rates range from 4.9 to 10.2%). Adjustment for these background variables does little to explain the observed variation.
- 1.4% of babies (330 of 22,937) had an unknown survival status. Additional precision can be expected in future measures of mortality with lower rates of missing data.

Recommendations

(13) To reduce mortality, neonatal networks 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 the extent of the implementation of evidence-based strategies in the following areas to reduce mortality:
 - antenatal steroids
 - deferred cord clamping
 - avoidance of hypothermia
 - management of respiratory disease.
- ensure that shared learning from multi-disciplinary reviews of deaths (including data from the local use of the Perinatal Mortality Review Tool) informs:
 - network governance
 - unit level clinical practice.

Action: Neonatal networks

(14) Use NNAP quarterly reports to ensure that a mortality outcome is clearly recorded for every baby admitted. For babies discharged to a non NNAP unit before 44 weeks' post menstrual age, units should capture outcome using the 'final neonatal outcome' field.

Action: Neonatal units and networks

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- **Each Baby Counts**, run by the **Royal College of Obstetricians and Gynaecology (RCOG)**, is a national quality improvement programme to reduce the number of babies who die or have a serious brain injury because of incidents that occur during term labour. www.rcog.org.uk/eachbabycounts.
- The **MBRRACE-UK** programme of work conducts confidential enquiries into maternal deaths and national surveillance of late fetal losses, stillbirths and infant deaths: www.npeu.ox.ac.uk/mbrance-uk.
- The *Perinatal Mortality Review Tool* supports standardised perinatal reviews across England, Scotland and Wales: www.npeu.ox.ac.uk/pmrt.
- The **National Child Mortality Database** collects a minimum dataset from the Child Death Overview Panel (CDOP) reviews of all child deaths in England and will drive improvement in the quality of health and social care for children in England to help reduce potentially avoidable deaths. www.ncmd.info/

2.17. 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^{3,10,17}. Services in Scotland and Wales are commissioned on a comparable basis according to the British Association of Perinatal Medicine (BAPM) standards¹⁷. Higher nurse staffing levels are associated with improved outcomes¹⁸. 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 mandated. 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 random variation in demand. Appointing, retaining and providing career progression for a highly specialised nursing workforce also presents a challenge to neonatal services.

This new measure describes the proportion of nursing shifts which meet 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. Further, we report how many additional nurse shifts would be required to be worked to meet the service specification where there is a shortfall.

Results

181 units were eligible for inclusion in this measure; six units were excluded, as less than 25% of their shifts were recorded. 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; 57 units (37 SCU level, 20 LNU level) were excluded. This is because of the applicability of the QIS criteria to shifts with small numbers of nurses.

Table 20. Compliance with neonatal nurse staffing standards: neonatal unit level.

Unit level	Total shifts used to calculate total nurses element	Total shifts used to calculate QIS element	Number (%) of shifts with enough nurses to meet 'total nurses' element of service specification for the babies cared for on that shift	Number (%) of shifts meeting the 'qualified in speciality' element of the service specification	Additional number of nursing shifts which would need to be worked to staff all shifts to meet the 'total nurses' element of service specification	Average additional number of nurses per shift required to meet service specification on all shifts
SCU	29,390	3,650	21,450 (73%)	1,455 (39.9%)	7,303	0.2
LNU	58,038	43,676	39,270 (67.7%)	15,092 (34.6%)	24,955	0.4
NICU	38,874	38,874	19,923 (51.3%)	11,395 (29.3%)	46,843	1.2
Total	126,302	86,200	80,643 (63.8%)	27,942 (32.4%)	79,101	0.6

Table 21. Compliance with neonatal nurse staffing standards: neonatal networks.

Network	Total shifts used to calculate total nurses element	Total shifts used to calculate QIS element	Number (%) of shifts with enough 'total nurses' element of service specification for the babies cared for on that shift	Number (%) of shifts meeting the 'qualified in speciality' element of the service specification	Additional number of nursing shifts which would need to be worked to staff all shifts to meet the 'total nurses' element of service specification	Average additional number of nurses per shift required to meet service specification on all shifts
East Midlands Neonatal ODN	7,300	6,570	5,016 (68.7%)	898 (13.7%)	3,894	0.5
East of England Neonatal ODN	12,410	8,030	8,934 (72%)	2,037 (25.4%)	3,630	0.3
Isle of Man	730	0	591 (81%)	NA	61	0.1
North Central & North East London Neonatal ODN	3,952	3,526	2,368 (59.9%)	2,256 (64%)	3,389	0.9
North West London Neonatal ODN	4,320	3,590	2,455 (56.8%)	1,182 (32.9%)	8,880	2.1
North West Neonatal ODN	15,330	10,950	9,111 (59.4%)	5,771 (52.7%)	10,185	0.7
Northern Neonatal ODN	7,794	2,920	4,458 (57.2%)	1,383 (47.4%)	4,300	0.6
Scotland	8,454	7,300	6,440 (76.2%)	2,598 (35.6%)	3,252	0.4
South East Coast Neonatal ODN	9,490	5,840	6,540 (68.9%)	1,378 (23.6%)	3,727	0.4
South London Neonatal ODN	6,638	5,110	2,909 (43.8%)	1,489 (29.1%)	7,656	1.2
South West Neonatal ODN	8,820	6,630	5,604 (63.5%)	1,689 (25.5%)	7,117	0.8
Southern West Midlands Neonatal ODN	5,840	2,920	3,248 (55.6%)	863 (29.6%)	4,823	0.8
Staffordshire, Shropshire and Black Country Neonatal ODN	4,380	4,380	1,874 (42.8%)	1,076 (24.6%)	4,963	1.1
Thames Valley & Wessex ODN	10,220	5,840	6,322 (61.9%)	1,253 (21.5%)	5,507	0.5
Wales	8,030	5,110	6,239 (77.7%)	1,426 (27.9%)	2,012	0.3
Yorkshire & Humber Neonatal ODN	12,594	7,484	8,534 (67.8%)	2,643 (35.3%)	5,705	0.5
Total	126,302	86,200	80,643 (63.8%)	27,942 (32.4%)	79,101	

Key findings

- Nurse staffing on neonatal units across the UK is below nationally recommended levels. Overall, 63.8% of shifts (80,643 of 126,302) are numerically staffed according to national guidelines; and 32.4% (27,942 of 86,200) of all nursing shifts have sufficient staff qualified in specialty to care for the babies present.
- SCUs have the highest proportion of shifts with sufficient staff qualified in specialty (SCU – 39.9%, LNU – 34.6%, NICU – 29.3%). Only 11 of 53 NICUs had half or more of their shifts with sufficient staff qualified in specialty.
- At least 607 nurses (79,101 additional nursing shifts, 5.6 whole time equivalent (WTE) nurses required per nurse shift based on two shifts a day) would be needed to achieve full neonatal unit staffing. This would be in addition to existing bank and agency staff.
- There is clear network variation in adherence to neonatal nurse staffing guidelines. Among networks, the proportion of shifts numerically staffed to guidelines ranges from 42.8% to 77.7%, and the proportion of shifts with sufficient staff qualified in specialty ranges from 13.7% to 64%. The reasons for this variation are likely to be multifactorial.

Recommendations

- (15)** Ensure that sufficient numbers of neonatal unit nurse staff and nurses with specialist qualifications are trained and retained to reduce current variations in staffing and improve staffing levels.

Action: National governments, neonatal networks and individual health trusts or boards

- (16)** Consider the impact of nurse staffing guidelines while taking into account capacity to admit babies to neonatal units.

When optimal nurse : baby ratios cannot be met consider:

- the staffing situation in other neonatal units
- the balance of risks of admitting more babies against the potential risks and inconveniences of intra-network or inter-network transfer.

Action: Neonatal units

- (17)** Maintain oversight of neonatal unit capacity on a regular basis to support and assist units in balancing capacity against demand.

Action: Neonatal networks

- (18)** Using the [NNAP measures guide](#), ensure that data entry regarding nurse staffing is complete and entered considering relevant published guidance such as [Safe, sustainable and productive staffing: An improvement resource for neonatal care](#).

Action: Neonatal units and networks

Further information and resources

- Use [NNAP Online](#) to view results at unit, network and national level. Identify relevant quality improvement opportunities and identify partner units whose practices you wish to introduce.
- See the [NNAP 2019 Measures Guide](#) for a full description of this measure as it applies to the 2019 data year to help check and assure 2019 results.
- Refer to the recommendations made in *Safe, sustainable and productive staffing: An improvement resource for neonatal care*, National Quality Board, NHS Improvement: www.improvement.nhs.uk/documents/2978/Safe_Staffing_Neonatal_FINAL_PROOF_27_June_2018.pdf

3. Local quality improvement case studies

Reducing necrotising enterocolitis (NEC): A quality improvement initiative

S Narayanan, C Dawson, N Merchant, Department of Neonatology & Paediatrics, West Hertfordshire NHS Trust, Watford, UK.

Background

- Necrotising enterocolitis (NEC) is a neonatal emergency mainly seen in preterm infants. It can have devastating consequences including delayed feeding, surgery, short gut, poor growth, increased hospital stays, delayed neurodevelopment and death. In the UK, 1 in 20 preterm infants born at less than 32 weeks gestation are at risk of NEC with high mortality rates of more than 20%.
- In 2017, the neonatal unit at Watford General Hospital stood out as having a high rate of NEC compared to units of the same level, our network and nationally (Table 22).
- The study aim was to understand the risk factors linked to NEC and decrease the incidence of NEC at our unit by 50% within one year using structured quality improvement (QI) methodology.

Table 22. NEC results, NNAP 2018 report (2017 data)

Watford	LNU	Network	National
18.5% (5/27)	3% (68/2,305)	6.9% (42/607)	5.6% (428/7,628)

Measures

- External thematic review was sought in view of the high incidence of NEC.
- Modifiable contributing/causative factors and themes were identified.
- Extrinsic risk factors such as enteral feeding practices, compliance with network NEC bundle, relevant medication exposure (ibuprofen, anti-reflux medication), blood transfusion and sepsis were investigated.
- Appropriate QI tools were used to drive changes to decrease the NEC rate (Figure 24).
- Process changes were monitored by iterative plan, do, study, act (PDSA) cycles and NEC occurrences were tracked using statistical process control (SPC) charts - 'days between NEC' for the next 12 months.

Figure 24. Driver diagram to inform change in ideas.

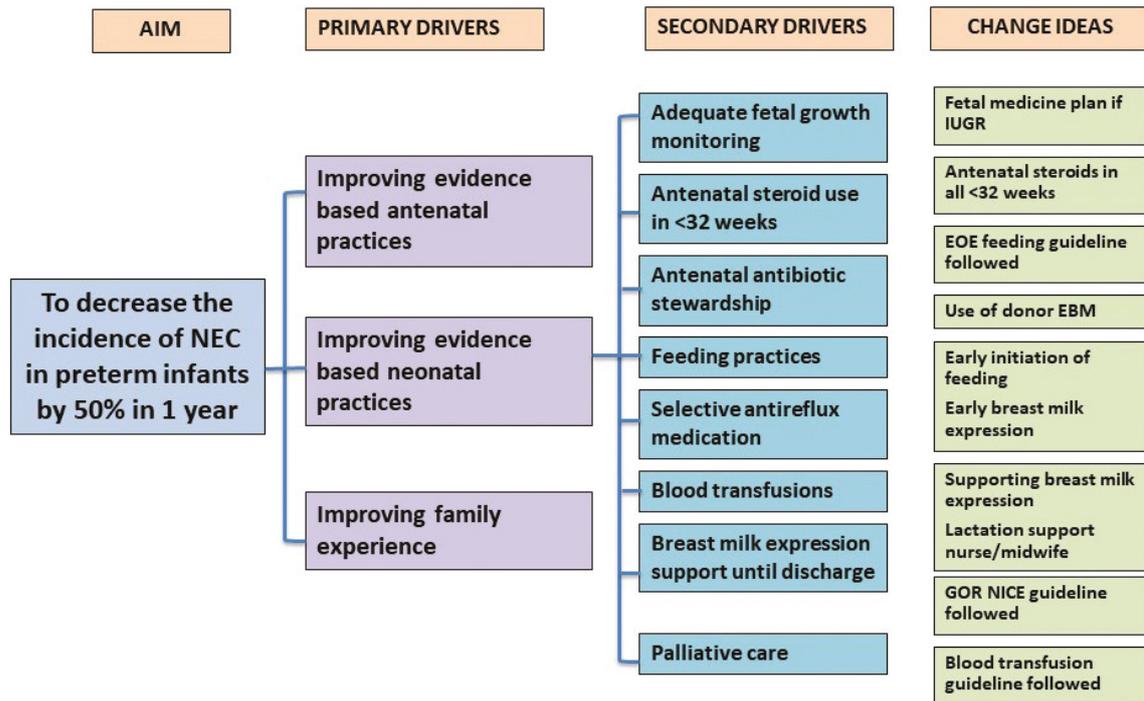
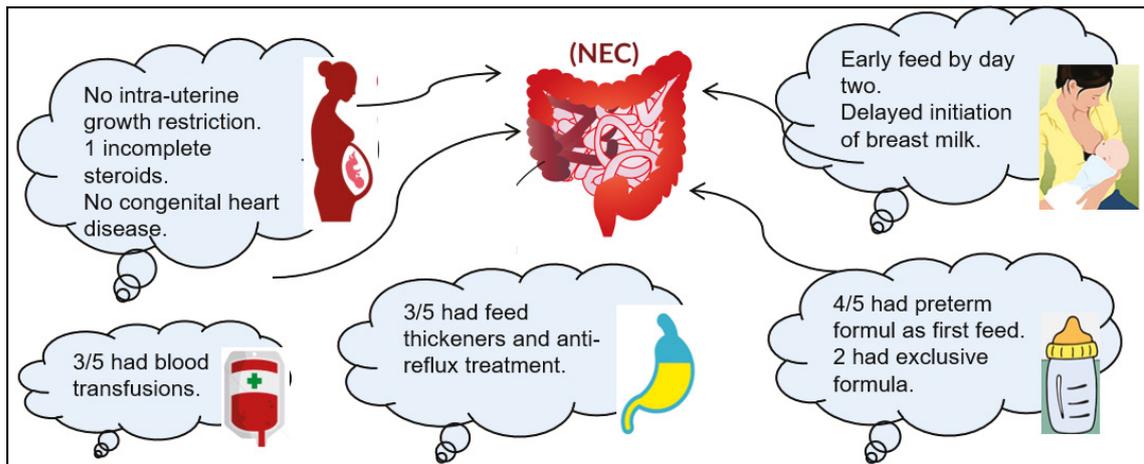


Figure 25. Factors related to NEC.



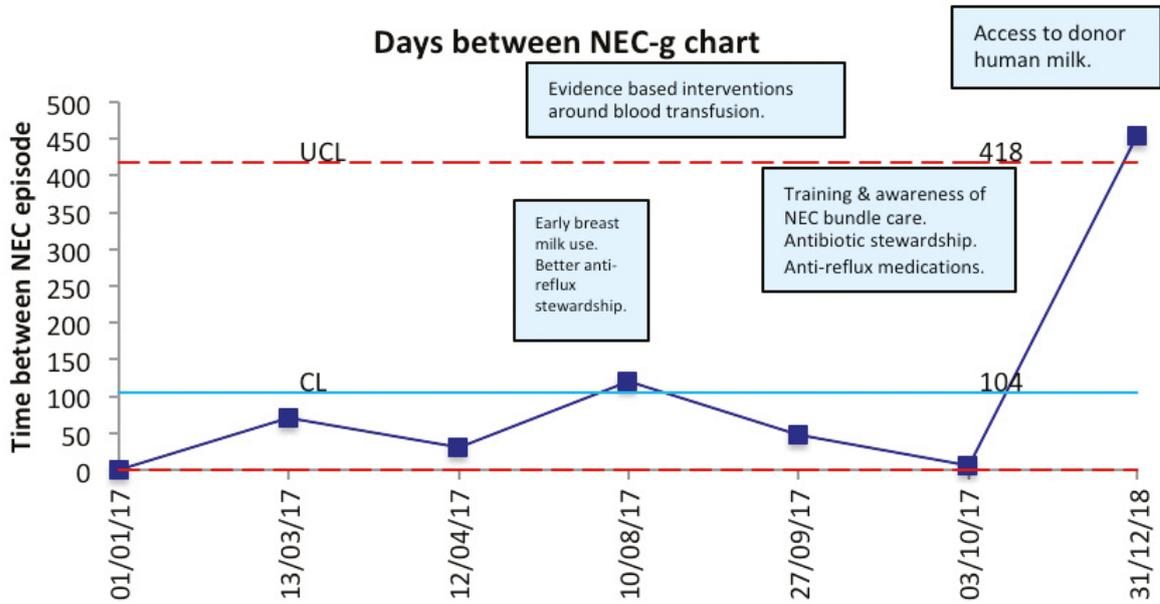
Our improvement plan:

- A pareto chart identified key risk factors for NEC and raised awareness of key issues (i.e. early initiation of formula feeds when mother’s own milk was not available, anti-reflux medication and blood transfusion).
- Awareness was raised about NEC related complications: antibiotic duration, prolonged parenteral nutrition, surgery, delayed discharge and poorer developmental outcome.
- All key stakeholders were engaged (including parents) in these discussions.

Outcomes

- Following QI initiatives in 2018, 0 of 29 eligible babies had NEC.
- The average number of NEC-free days increased from 55 to 350. The average number of patients between NEC events increased from 4 to 32 (Figure 26).

Figure 26. Days between NEC-g chart.



Top tips for implementation

- Engage all key stakeholders including parents when discussing NNAP report findings.
- Use statistical process control tools for real-time monitoring of adverse events.
- Scale-up and spread findings to the wider neonatal community.

Acknowledgements

Bhavani Sivakumar, Neonatal Data Administrator and the neonatal team, external reviewers, parents and families for their participation and engagement in this collaborative quality improvement initiative.

Neurodevelopmental follow-up: Multidisciplinary team working to standardise the delivery, uptake and recording of two-year assessments

Dr Louise Leven, Consultant Neonatologist, Alison Grant, Physiotherapy Service Lead, Sara Russell, Speech and Language Therapy Clinical Lead, Royal Hospital for Children, Glasgow.

Background

Our neurodevelopmental outpatient service has undergone redesign with reference to recently published guidance¹ and Scottish Government neonatal care strategic plans.² Prior to this we did not use a standardised assessment at two years corrected age and did not regularly report two-year outcome data. We used QI methodology to improve the delivery, uptake and recording of our two-year developmental assessments.

Improvement plan

Our improvement project is summarised in the driver diagram (Figure 27). The project team, comprised of professionals from neonatology, physiotherapy, speech and language therapy and neonatal liaison, met quarterly to review and refine our plan. In addition, we held a national meeting with neurodevelopmental teams from across Scotland to share knowledge and experience within varied clinic settings.

Outcomes

We have increased the number of two-year outcomes reported to NNAP, with over 94% of children in 2018 with health data entered (Table 23). Through collaborative working with neonatal units across Scotland we achieved high rates of follow-up reporting for children who had been discharged home from our neonatal unit that we had previously considered 'responsibility of another unit'.

The Parent Report of Children's Abilities Revised (PARCA-R) questionnaire and Schedule of Growing Skills II was introduced to our clinic during the 2018 data collection year which accounts for those children with incomplete assessments (12 and 6 children had been discharged prior to the introduction of SOGS and PARCA-R respectively). Since its introduction, 100% of families attending RHC clinic at two years corrected, have completed a PARCA-R questionnaire.

¹ Developmental follow up of children and young people born preterm. NICE Guideline (NG 72). August 2017

² The best start: five-year plan for maternity and neonatal care. January 2017

Figure 27. Driver diagram, neurodevelopmental follow-up improvement project.

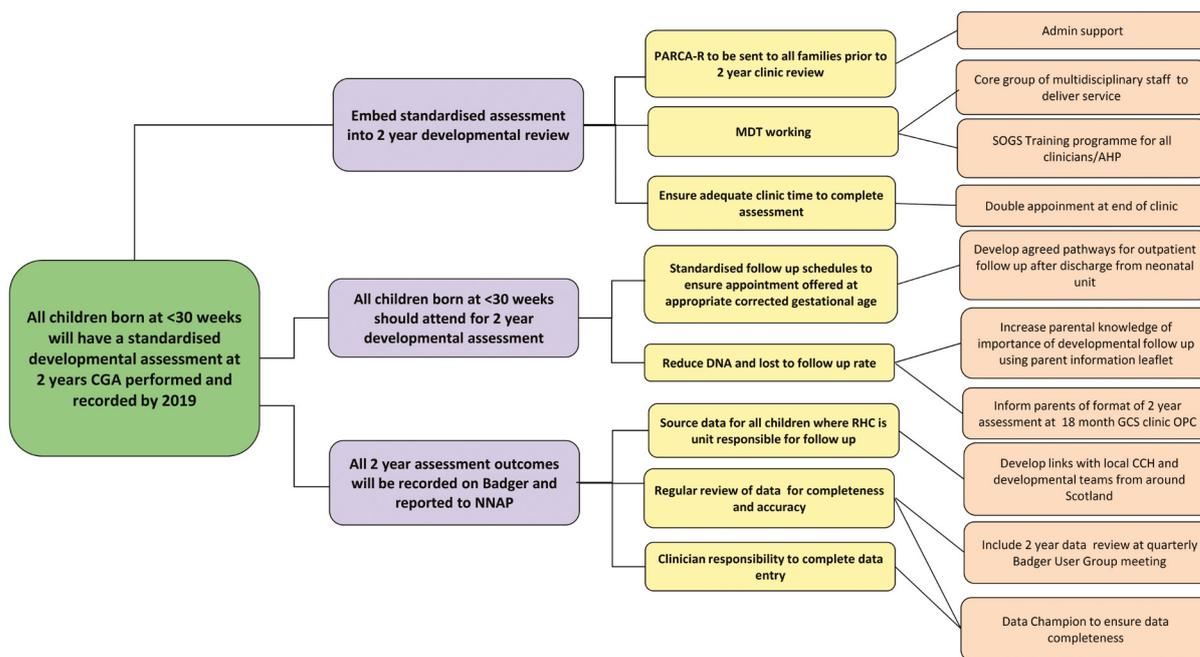


Table 23. NNAP follow-up and completion of standardised 2-year assessment rates.

YEAR	RHC UNIT RESPONSIBLE FOR F/U (n=)	HEATH DATA ENTERED %	RHC F/U AT 2 YEARS (n=)	PARCA-R COMPLETED %	SOGS COMPLETED %
2016	47	27.7 (13/47)	30	n/a	n/a
2017	41	67.4 (31/46)	31	n/a	n/a
2018	38	94.7 (36/38)	24	75 (18/24)	45 (11/24)

We have established a safe, equitable, efficient and cost-effective service that offers families a one stop clinic, delivered by a skilled multidisciplinary team. We aim to empower parents, recognising they play an integral role in their child achieving their developmental potential.

Hear from a family who attended our clinic;

“Once we left the NICU, it was so important to us to have that continuation of care with the follow-up appointments. It gave us a chance to chat with professionals who knew what to look out for health and development wise. We were all put at ease and we chatted through what Julian did at home and were asked about any concerns we had. I really can’t recommend the service enough”



Kirsty Haining - Julian’s Mum

Top tips for implementation

- Establish a core group of invested multidisciplinary professionals to deliver neurodevelopmental follow-up for your unit.
- Engage with families to provide feedback on and improve your neurodevelopmental follow-up service.
- Collaborate with other units in your network to achieve consistently high follow-up rates.
- Review your data throughout the year. If it is not what you anticipated, look more closely at the quality and accuracy of data input.

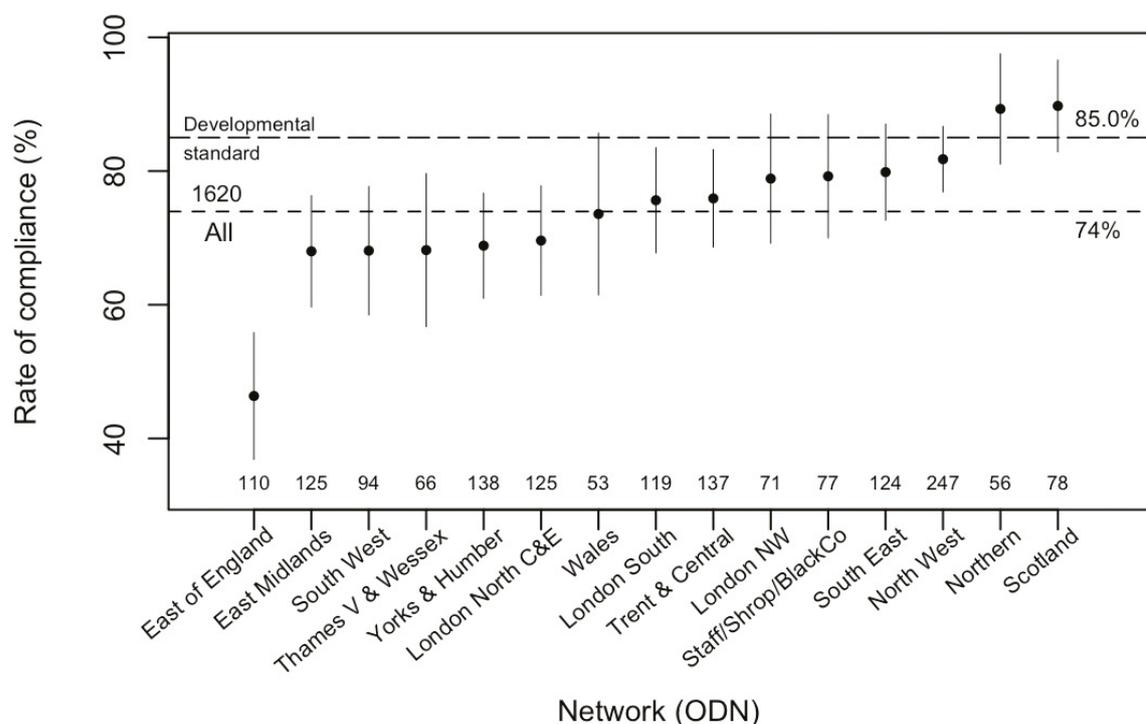
Improving the rate of babies born at less than 27 weeks gestation in a maternity unit with a NICU on site

Elizabeth Langham, Network Director, East of England Neonatal Operational Delivery Network (ODN).

Background

The NNAP report based on 2017 data was released in September 2018. The data showed a comparison with all neonatal networks for this measure. East of England (EOE) was shown to be the worst performing network in the audit. EOE achieved 46.4%, with the national average of 73.9% and the highest performing networks at 89.9%.

Figure 28. Rates of compliance for birth in a centre with a NICU: neonatal networks (2017).



What we did

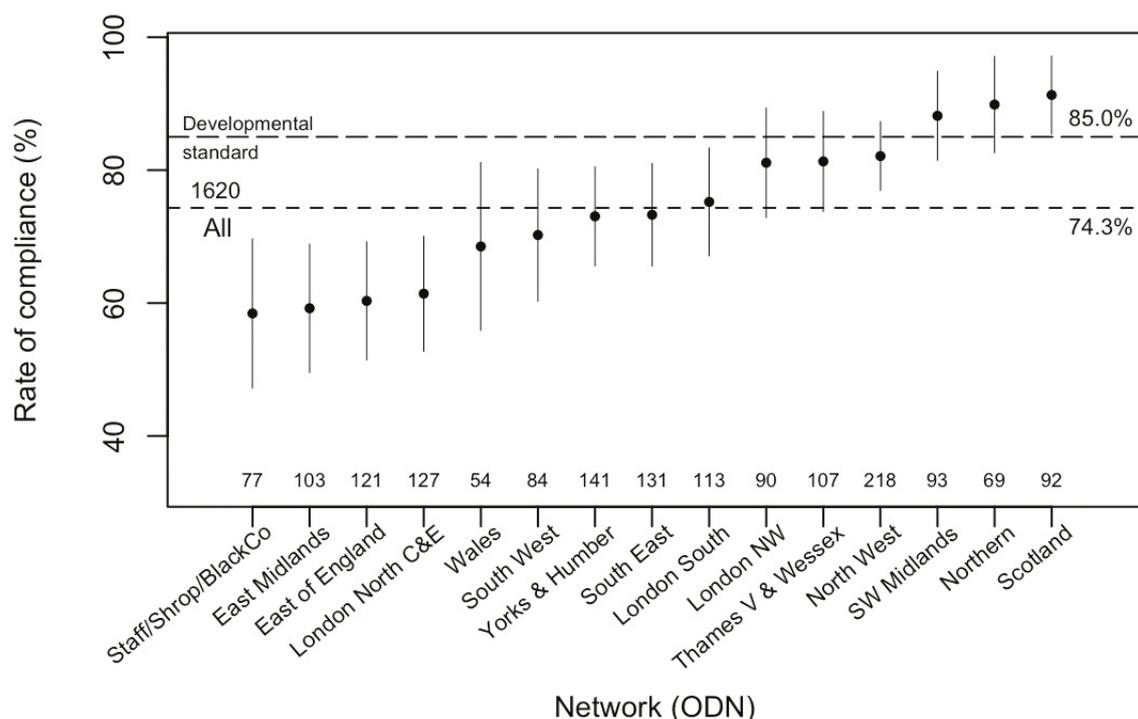
As an ODN team and network we were shocked at this information and started to look at reasons for why this was happening. On closer review of our data we identified one trust where there were a larger number of babies who were born and transferred ex-utero. It was highlighted at their local maternity systems (LMS) board that they were an outlier and the impact this has on outcomes for these babies and families was emphasised. The maternity team from this trust then agreed to undertake a thematic review of all cases over the previous two years (9). This was escalated to executive level within the trust and all members of the midwifery and obstetric teams were informed. The thematic review concluded that one third of the women could potentially have been transferred to a tertiary centre for delivery.

This data was shared with all LMS groups, at local learning systems (LLS) meetings, and discussed with the neonatal teams at all governance meetings. This brought together all groups of staff who could impact this process. As a network we have set up a right place of birth project group. With the support of the LLS teams, we are looking at all aspects of the process. This includes predicting preterm birth, ensuring that we move the right women, and optimising management of women in preterm labour (including magnesium sulphate and antenatal steroid administration). As a neonatal network, we are also looking at repatriations from NICU, to ensure there is capacity to keep women and babies who are booked in the EOE within the network for care where appropriate.

What we have achieved

The chart below (Figure 29) shows a huge improvement for EOE, with a compliance rate above 60% for 2018 data, with the improvement project only starting in September 2018. There is still work to do to continue to improve this. The network reviews this data regularly, it forms part of the ODN dashboard and exception reporting is now starting to become standard practice.

Figure 29: Rates of compliance for birth in a centre with a NICU: neonatal networks (2018).



Our next steps

Our aim is to be above 80% within the next 12 months. Our data is complicated by some pathways which go outside of the region, specifically for this group of infants. Having the NNAP report focussed our attention as a network, on things that were a significant issue, allowing us to focus efforts to implement change.

Acknowledgements

Our LLS colleagues have supported this change and all of our LLS teams within tertiary centres are involved in the project to look at right place of birth to ensure we continue to improve. This has been a true multidisciplinary team approach to improvement.

Improving early thermal care for preterm infants

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Background

Normothermia on admission for infants born at less than 32 weeks gestation as measured by NNAP had remained static at around the national NNAP average in 2014-16 (results 57%, 62% & 59% respectively). Therefore, we initiated a quality improvement project to address this in January 2017 and adopted this as a joint maternal-neonatal safety collaborative project from November 2017 onwards.

Aim: By end December 2018, 90% of preterm neonates of less than 32 weeks gestation born in the delivery suite would have a neonatal unit admission temperature 36.5°C to 37.5°C.

The key stakeholders for this project were neonatal unit medical and nursing staff, midwifery and obstetric staff (particularly delivery suite and theatre staff).

Measures

- BadgerNet data was reviewed, looking at temperature on admission for different gestational ages and weights, whether babies were too hot or too cold and where they were admitted from (theatres etc).
- Four stages were identified from birth to neonatal unit admission where temperature management could be compromised (Figure 30).

Figure 30. Thermal care journey.



- Thermal care guidance was issued covering each stage of the journey from birth to neonatal unit admission.
- A standardised case review template was used for any case where temperatures were outside the normal range.
- Monthly feedback to staff via newsletters and posters.

Plan, do, study, act (PDSA) cycles

1. New thermal care guideline including measurement of temperature in delivery suite and use of servo-control temperature for infants <32 weeks (February 2017).
2. Preterm infant resuscitation thermal care training (March 2017).
3. All hat sizes readily available on resuscitaires (November 2017).
4. Room thermometers in highest risk delivery suite rooms (Dec 2017).
5. Simulation of use of incubator shuttle for transfer from DS to NICU (Jan 2018) – rejected. Continue with transfer on resuscitaire.
6. Sterile plastic bags (NeoHelp, Vygon) introduced for caesarean section (Feb 2018).
7. Reduced use of transwarmers as overheating (Feb 2018).
8. Improving access to skin probes for servo-control on resuscitaire (Feb 2018).
9. Thermal Care Grab bags for delivery suite. Consists of: hat, skin temperature probe, plastic bag, small face mask, scissors (March 2018).
10. Education - Big 5 poster recirculation (July 2018).
11. Education of new staff members (September and January 2018).
12. How to use Servo mode temperature-guide added (January 2019).

Key changes associated with improvement

- Measure temperature in delivery suite and on arrival in neonatal unit.
- Servo-control temperature for babies less than 32 weeks gestation (training required) (Figure 31).

Figure 31. Servo-control temperature.

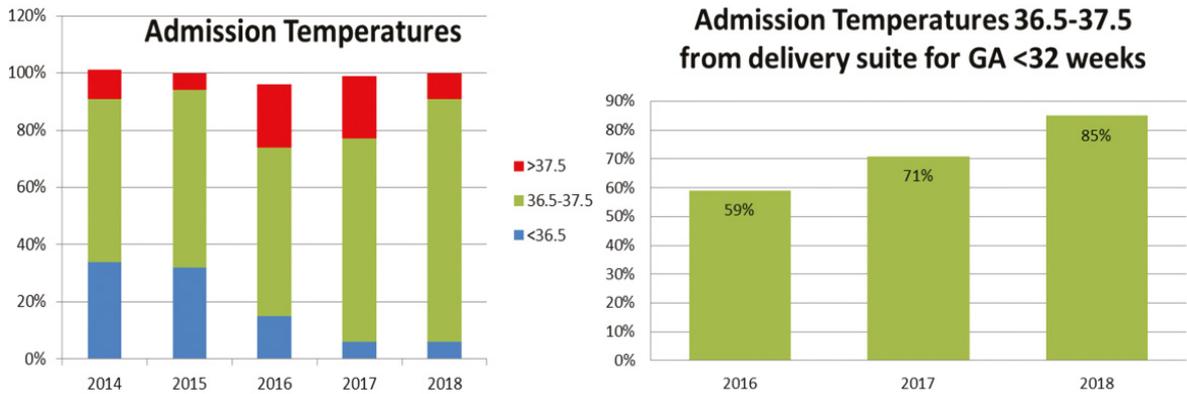


- Dry the head and use an appropriately sized hat.
- Use of plastic bags whilst delaying cord clamping (sterile for C-section).
- Thermal care grab bags are useful to ensure you have all the kit available.
- Avoid overuse of transwarmer.
- Regular staff training.
- Monthly feedback.

Perseverance with messages and training were key to overcoming barriers as well as regular feedback to staff on our improvements. This project improved working relationships between obstetric/ midwifery/ theatre and neonatal staff.

Outcomes

Figure 32. Administration temperatures over time.



Top tips for implementation

- Have clear goals.
- Make sure the required kit is always easily accessible and everyone knows how to use it.
- Involve midwives and obstetricians.
- Regular multidisciplinary meeting to review previous goals and to set new ones.
- Regular education and feedback to neonatal and maternity team on how we are doing.

4. Methods

4.1. Audit measures and measure development

The NNAP has developed the measures reported on 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 2018 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 agreement 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 born at 35 weeks gestational age or above have an encephalopathy within the first three full calendar days after birth?	2014-2016	Outcome	None, benchmarking only.	Not applicable, no outlier analysis.	
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.	

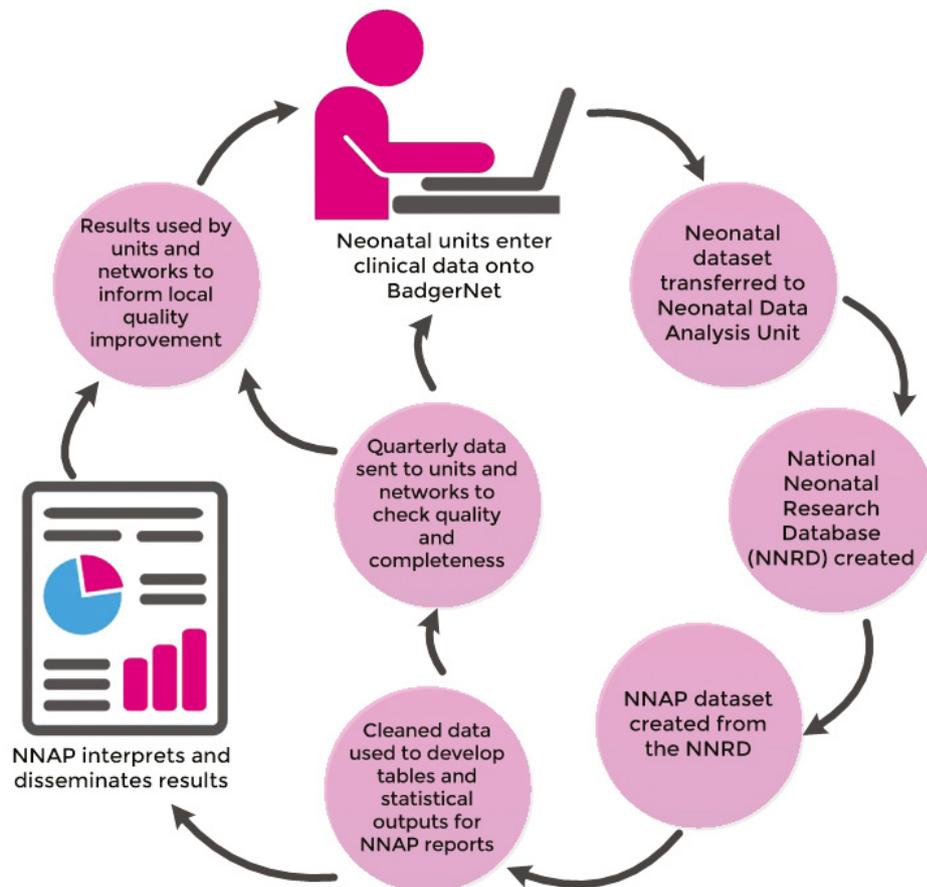
NNAP question	Start year	Measure type	Developmental standard	Comparison standard	Associated guidelines
For a baby born at gestational age greater than or equal to 37 weeks, who did not have any surgery or a transfer during any admission, how many special care(a) or normal care(b) days were provided when 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 33 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 33 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 33. Simplified NNAP data flow diagram



4.3. Case ascertainment and unit participation

In usual practice, every baby admitted to a participating neonatal unit 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 2018, 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 and Wales participated in the audit in 2018. In Scotland, 14 of the 15 eligible neonatal units participated in the audit in 2018.

Neonatal services across the UK are coordinated through networks. In March 2019, the three Scottish Managed Clinical Networks became a single national neonatal network. The NNAP already reports Scottish unit results as a single network.

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 2018, 2018 data will be presented as per the network configuration on 31 December 2018.

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 31 March. 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 die, during the NNAP reporting period of interest form the NNAP dataset. The exceptions to this are the datasets used for Encephalopathy, Bronchopulmonary dysplasia, Two-year follow-up and Mortality until discharge for very preterm babies. The Encephalopathy measure dataset is based on those babies with a birth year during the NNAP reporting year and is reported on a year in arrears due to the availability of live birth denominator data. Live birth denominator data for 2017 aggregated to trust or health board level was obtained from Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries in the UK (MBRRACE-UK) for England and Wales, and from the Scottish Birth Record (managed by the Information Services Division) for Scotland.

For each NNAP audit measure, there is an associated rate of missing entries. A summary measure of data completeness across all NNAP measures is shown in Appendix A, comprising the mean of each unit's rate of missing entries.

4.5. Outlier identification and management

Performance on audit measures are presented using descriptive statistics, and data are available to review on [NNAP Online](#). Outliers are identified with funnel plot analysis, using the national rate as the comparison standard. Table 4.1 describes the questions to which outlier identification applies. The full *NNAP statistical analysis plan for the 2018 data year* is available at: www.rcpch.ac.uk/national-neonatal-audit-programme.

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 2018 data year set out in [National Neonatal Audit Programme: Detection and management of outlier status for 2018 data](#). All neonatal services identified as outliers for one or more NNAP measure 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 from small numbers of cases. Given the frequent occurrence of small numbers in 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. Risk adjustment of bronchopulmonary dysplasia (BPD) or death

Risk adjustment for the combined outcome of bronchopulmonary dysplasia (BPD) or death is conducted by comparing the rate of BPD in a network or a unit to the rate of BPD in a subset of the babies in the NNAP cohort. This subset is selected carefully to be well matched on an extensive list of background variables with the babies from the network or unit.

BPD in a network is assessed by comparing its rate with the rate of BPD or death seen in a comparable set of babies cared for in the UK (or NNAP) as a whole.

The results (known as 'treatment effect') are suitable for comparing a network against the national result, but not for comparisons of two networks, because the background profiles of two networks differ.

'Treatment effect' is the difference between the rate of BPD or death in babies cared for in a neonatal network compared to the observed rate for a matched group of babies with a very similar case mix, cared for in all neonatal units. A positive treatment effect indicates that the rate of BPD or death is higher in the network of interest than for a comparable group of babies cared for in all neonatal units. Where the 95% confidence interval for this effect excludes zero, the treatment effect is unlikely to be a chance finding.

A detailed description of the risk adjustment method used is available in the Statistical Analysis Plan for the NNAP, available at www.rcpch.ac.uk/national-neonatal-audit-programme.

4.8 Risk adjustment of mortality to discharge in very preterm babies

The network level rates of mortality are estimated by direct standardisation. For each network it estimates the mortality rate it would have had if its babies had the same background profile as the NNAP overall. The following background variables are used in the logistic regression model: gestational age at birth, birthweight z score, sex, multiple birth, and ethnicity. Interactions of these variables are also included in the model. Ethnicity is classified in four groups: White, Asian and mixed, Black and mixed, and Other. A record (baby) is excluded from the analysis if it has a missing value on a covariate or its outcome is not recorded. Results are presented by network in tabular form and as caterpillar plots of the adjusted and unadjusted rates.

Three caterpillar plots are presented; for all babies between 24 to 31 weeks gestational age; babies 24 to 27 weeks gestational age, and babies 28 to 31 weeks gestational age.

4.9 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.

In March and April 2019, the NNAP conducted an audit of progress against recommendations made in the 2018 annual report on 2017 data. The aim of this audit was to assess progress made against recommendations for neonatal units, networks and others, and to ask units and networks whether the recommendations aligned with their priorities for quality improvement. Findings from this audit informed the development of new recommendations in this report.

5. Driving improvements in neonatal care

5.1. 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 antenatal steroids and magnesium, and improvements in thermal care of very preterm infants – which is as good or better than any nation in the world. Such improvements show 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 becoming clearer in outcomes such as infection, bronchopulmonary dysplasia, necrotising enterocolitis and death. Neonatal care needs to carry on improving, 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 consider each recommendation against their own priorities and their audit results. Unit and network level results are visible on NNAP Online.

5.2. 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. Continue to revisit the recommendations checklist and your unit's action plan throughout the year.

5.3. 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 unit and network 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.

5.4. 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: 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 which 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.

5.5. 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 impacts since it launched 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.

This report sees network level reporting of mortality until discharge from the neonatal unit for the first time. The audit will continue to strengthen its reporting of outcomes of neonatal care, through increased assurance of the quality of infection and necrotising enterocolitis reporting.

For the 2019 data year, a new measure of breastmilk feeding at 14 days of life will be reported, which is designed to assess the success of initiating breastmilk expression, and to be used alongside rates of breastmilk feeding at discharge and parent feedback to inform local quality improvement activities.

Following feedback from audit users, the NNAP intends to introduce 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.

The NNAP will continue to work closely with the wider neonatal community, through its participants, stakeholder groups and national programmes of work. Opportunities exist 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. With the launch of the National Child Mortality Database (NCMD) in April 2019, there will be opportunities for the themes emerging from child death reviews to inform the future direction of the audit.

Index of appendices

Appendix A: Data completeness and unit participation

Appendix B: NNAP recommendations by audience

Appendix C: Glossary and abbreviations

Appendix D: NNAP governance

Appendix E: Pathogens in the NNAP

Appendix F: Neonatal care system and QI map

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

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