NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Health and social care directorate

Quality standards and indicators

Briefing paper

**Quality standard topic:** Specialist neonatal respiratory care for babies born preterm

**Output:** Prioritised quality improvement areas for development.

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1. Introduction

This briefing paper presents a structured overview of potential quality improvement areas for specialist neonatal respiratory care for babies born preterm. It provides the committee with a basis for discussing and prioritising quality improvement areas for development into draft quality statements and measures for public consultation.

* 1. Structure

This briefing paper includes a brief description of the topic, a summary of each of the suggested quality improvement areas and supporting information.

If relevant, recommendations selected from the key development source below are included to help the committee in considering potential statements and measures.

* 1. Development source

The key development source referenced in this briefing paper is:

[Specialist neonatal respiratory care for babies born preterm](https://www.nice.org.uk/guidance/NG124) (2019) NICE guideline NG124

1. Overview
   1. Focus of quality standard

This quality standard will cover neonatal respiratory support in hospital for babies born preterm.

* 1. Definition

A baby born before 37 weeks of pregnancy is classed as preterm. This can be sub-divided further:

* babies born less than 28 weeks – extremely preterm
* babies born 28 - 31+6 weeks – very preterm
* babies born 32 – 36+6 – moderate to late preterm.

Primary respiratory support is usually initiated after stabilisation in a preterm baby, which could be invasive ventilation, non-invasive ventilation or oxygen therapy.

* 1. Incidence and prevalence

In 2018, a national neonatal audit[[1]](#footnote-1) found that approximately 14% (105,000) of babies born in the UK need specialist neonatal care, either because they are born preterm (at less than 37 weeks) or because of an illness or condition.

Preterm babies are at risk of respiratory disorders, including newborn respiratory distress syndrome (NRDS) and bronchopulmonary dysplasia (BPD). High-quality respiratory care can reduce the length of hospital stay and risk of long-term disability.

NRDS happens when a baby's lungs aren't fully developed and can't provide enough oxygen, causing breathing difficulties. It usually occurs when the baby's lungs haven't produced enough surfactant. This substance, made up of proteins and fats, helps keep the lungs inflated and prevents them from collapsing. A baby normally begins producing surfactant between weeks 24 and 28 of pregnancy. Most babies produce enough to breathe normally by week 34[[2]](#footnote-2).

BPD is a chronic lung disease that develops in preterm babies and is particularly common in preterm babies who require assisted ventilation. Babies with BPD need prolonged specialist care and respiratory support.

* 1. Management

When babies are born preterm they often need extra help with breathing as their lungs may not be developed enough for them to breathe well on their own. There are different ways to give breathing support depending on each baby’s needs. Good care and treatment help their lungs to develop well so that they can get stronger and leave hospital sooner.

When babies are born preterm they are stabilised following birth. This involves careful assessment of their heart rate, colour (oxygenation) and breathing, with provision of appropriate interventions where indicated. Interventions can include:

* non-invasive ventilation: the administration of respiratory support using a ventilator or flow driver, but not via an endotracheal tube or tracheostomy
* invasive ventilation: the administration of respiratory support via an endotracheal tube or tracheostomy, using a mechanical ventilator
* surfactant: administered with or without insertion of an endotracheal tube or invasive ventilation.

Appendix 2 shows a timeline of specialist neonatal respiratory care interventions and support.

Specialist neonatal respiratory care services are commissioned by NHS England. Neonatal critical care services are managed within Operational Delivery Networks. For healthy babies and babies with minor problems, most care is provided by the hospital they are born in. Neonatal intensive care units are responsible for babies who have more complex problems. Neonatal intensive care, and the service specifications for Neonatal Critical Care and Neonatal Intensive Care Transport[[3]](#footnote-3), are within the scope of the NHS England Neonatal Critical Care Clinical Reference Group.

* 1. Resource impact

We do not expect this quality standard to have a significant impact on resources. When the [Specialist neonatal respiratory care for babies born preterm](https://www.nice.org.uk/guidance/NG124) guideline was developed a resource impact statement was produced which noted that:

* the resource impact of implementing any single guideline recommendation will be less than £1 million per year in England (or £1,800 per 100,000 population) and
* the resource impact of implementing the whole guideline in England will be less than £5 million per year (or £9,100 per 100,000 population).

This is because practice is not expected to change substantially as a result of the guideline, and the majority of recommendations that are a change to current practice affect only a small number of people. Therefore we would not expect any quality improvement initiatives around these identified areas to have significant resource implications at a national level.

1. Summary of suggestions
   1. Responses

In total 11 registered stakeholders responded to the 2-week engagement exercise 16/05/19 – 31/05/19. Nine of these registered stakeholders provided areas for quality improvement and 2 advised they had no comment to make. We also received comments from 5 specialist committee members. The responses have been merged and summarised in table 1 for further consideration by the Committee.

Full details of all the suggestions provided are given in appendix 3 for information.

Table 1 Summary of suggested quality improvement areas

| Suggested area for improvement | Stakeholders |
| --- | --- |
| **Respiratory support**   * Stabilisation * Surfactant * Invasive ventilation * Nitric oxide * Temperature on admission to the neonatal unit | BAPM, NHSE, NNA, NNNI, RC, SCM1, SCM2, SCM3, SCM4 |
| **Managing and monitoring respiratory disorders**   * Postnatal dexamethasone * Caffeine citrate * Patent Ductus Arteriosus (PDA) * Oxygen saturations | BAPM, RCPCH, SCM1, SCM2, SCM3, SCM5 |
| **Supporting parents and carers during admission**   * Parental involvement in care * Supporting and communicating with parents * Neonatal environment * Discharge planning | Bl, BAPM, NHSE, NNA, NNNI, RC, RCSLT, SCM1, SCM2, SCM4, SCM5 |
| **Discharge planning**   * Parental support in discharge planning * Services following discharge | BAPM, NHSE, NNA, SCM3, SCM5 |
| **Additional areas**   * Delivery units and staffing levels * Training * Perinatal care * Reducing infection * 2 year follow up * New guidance and research | SCM1  RC  RC, RCPCH, SCM1, SCM4  SCM4  SCM4  APCP, NNNI, RCSLT |
| APCP, Association of Paediatric Chartered Physiotherapists, Neonatal Special Interest Group  Bl, Bliss  BAPM, British Association of Perinatal Medicine  NHSE, NHS England Neonatal Critical Care Clinical Reference Group  NNA, Neonatal Nurses Association  NNNI, Neonatal Network Northern Ireland  RC, Resuscitation Council (UK)  RCPCH, Royal College of Paediatrics and Child Health  RCSLT, Royal College of Speech and Language Therapists  SCM, Specialist Committee Member | |

* 1. Identification of current practice evidence

Bibliographic databases were searched to identify examples of current practice in UK health and social care settings; 4095 papers were identified. In addition, 39 papers were suggested by stakeholders at topic engagement and 14 papers internally at project scoping.

Of these papers, 11 have been included in this report and are included in the current practice sections where relevant. Appendix 1 outlines the search process.

1. Suggested improvement areas
   1. Respiratory support
      1. Summary of suggestions

### Stabilisation

Stakeholders highlighted the importance of stabilising preterm babies at birth using continuous positive airways pressure (CPAP) where clinically appropriate, rather than invasive ventilation. This leads to a reduction in death and bronchopulmonary dysplasia (BPD).

Stakeholders also noted that keeping babies warm during stabilisation is important but is often not achieved.

### Surfactant

Stakeholders stated that a minimally invasive administration technique (either MIST (minimally invasive surfactant therapy) or LISA (less invasive surfactant administration)) should be used when administering surfactant to preterm babies who do not need invasive ventilation. They stated that minimally invasive surfactant administration techniques reduce the incidence of BPD, the number of days on invasive ventilation, and the incidence of pneumothorax, compared with endotracheal administration.

A stakeholder suggested the use of a pain management tool and administration of sucrose during LISA.

Stakeholders stated that if it is not possible to use minimally invasive administration, endotracheal intubation should be used to give surfactant with early extubation afterwards. Early extubation is associated with a reduction in BPD.

### Invasive ventilation

Stakeholders noted that volume-targeted ventilation (VTV), combined with synchronised ventilation should be the primary mode of respiratory support in preterm babies needing invasive ventilation. If this is not effective, high-frequency oscillatory ventilation (HFOV) should be used. They felt that synchronised pressure-limited ventilation should not be used as this is associated with significantly poorer outcomes.

### Nitric oxide

Stakeholders commented that inhaled nitric oxide should not be given to preterm babies requiring respiratory support for respiratory distress syndrome (RDS) unless they have pulmonary hypoplasia or pulmonary hypertension.

* + 1. Selected recommendations from development source

Table 2 below highlights recommendations that have been provisionally selected from the development source that may support potential statement development. These are presented in full after table 2 to help inform the committee’s discussion.

Table 2 Specific areas for quality improvement

|  |  |
| --- | --- |
| Suggested quality improvement area | Suggested source guidance recommendations |
| Stabilisation | NICE NG124 Recommendation 1.2.1 |
| Surfactant | NICE NG124 Recommendations 1.2.2 and 1.2.3  No recommendations were identified regarding pain management during administration of surfactant |
| Invasive ventilation | NICE NG124 Recommendations 1.2.7 and 1.2.9 |
| Nitric oxide | NICE NG124 Recommendation 1.2.10 |

### Stabilisation

NICE NG124 Recommendation 1.2.1

When stabilising preterm babies who need respiratory support soon after birth

and before admission to the neonatal unit, use continuous positive airways

pressure (CPAP) where clinically appropriate, rather than invasive ventilation.

### Surfactant

NICE NG124 Recommendations 1.2.2 and 1.2.3

1.2.2 Give surfactant to preterm babies who need invasive ventilation for stabilisation in the early postnatal period.

1.2.3 When giving surfactant[[4]](#footnote-4) to a preterm baby who does not need invasive ventilation, use a minimally invasive administration technique. If this is not possible, for example, in units without the facilities or trained staff to carry out these techniques, use endotracheal intubation to give surfactant, with early extubation afterwards.

**Invasive ventilation**

NICE NG124 Recommendations 1.2.7 and 1.2.9

1.2.7 For preterm babies who need invasive ventilation, use volume-targeted ventilation (VTV) in combination with synchronised ventilation as the primary mode of respiratory support. If this is not effective, consider high-frequency oscillatory ventilation (HFOV).

1.2.9 Do not use synchronised pressure-limited ventilation such as assist control (AC), synchronised intermittent positive pressure ventilation (SIPPV), patient triggered ventilation (PTV), pressure support ventilation (PSV) or synchronised time-cycled pressure-limited ventilation (STCPLV).

**Nitric oxide**

NICE NG124 Recommendation 1.2.10

Do not routinely use inhaled nitric oxide for preterm babies who need respiratory support for respiratory distress syndrome (RDS), unless there are other indications such as pulmonary hypoplasia[[5]](#footnote-5) or pulmonary hypertension[[6]](#footnote-6).

* + 1. Current UK practice

**Stabilisation**

The National Neonatal Audit Programme[[7]](#footnote-7) looks at how successful neonatal units are at achieving a normal first temperature (36.5°C to 37.5°C inclusive) within an hour of birth in babies less than 32 weeks gestational age. In 2017 it reported that 64% of these babies had a normal first temperature measured within an hour of birth. This is an increase from 58.1% in 2015. It noted that temperature was measured and recorded for 99.7% of these babies.

In 2017, 5.6% babies born before 32 weeks gestational age had a temperature of less than 36.0°C on admission to the neonatal unit, a decrease from 8.3% of babies in 2015.

In 2015 a survey[[8]](#footnote-8) was sent to 55 neonatal intensive care units (NICUs) across the UK, 44 (80%) responded. Among babies born less than 26 weeks gestation, 35 (80%) of NICUs practiced intubation and ventilation as the primary mode of support at birth; in babies greater than 26 weeks gestation, 9 (20%) units used intubation and ventilation at birth whilst 28 (64%) units used CPAP as primary mode of support. Another 2015 survey[[9]](#footnote-9) of NICUs in the UK and Northern Ireland found that 25 units (58% of responders) used CPAP and non-invasive ventilation was started in the delivery suite in 28 units (65% of responders).

In 2011 a survey[[10]](#footnote-10) was conducted on usual delivery room management following very preterm birth at 199 delivery centres across the UK, including tertiary (defined as neonatal intensive care units) and non-tertiary units (defined as local neonatal units and special care units). 60% of units used CPAP routinely during stabilisation following very preterm birth.

**Surfactant**

An online questionnaire[[11]](#footnote-11) was sent to all 196 UK neonatal units between May and July in 2018. This included questions about the use of less invasive surfactant administration (LISA) in the labour suite and the neonatal unit. There was a 95% response rate.

* LISA was used regularly in 35 (18.7%) neonatal units;
  + 20 (34.5%) neonatal intensive care units
  + 9 (10.7%) local neonatal units
  + 6 (13.3%) special care baby units.
* 4 (2%) performed LISA in the labour suite.

Responses to the questionnaire showed that the following medication was used with LISA:

|  |  |
| --- | --- |
| **Medication type** | **Number of respondents (%)** |
| None | 17 (49%) |
| Atropine | 10 (29%) |
| Opiods (including fentanyl) | 11 (31%) |
| Ketamine | 1 (3%) |
| Caffeine | 3 (9%) |
| Sucrose | 7 (20%) |

**Invasive ventilation**

In 2015 a survey[[12]](#footnote-12) was sent to 55 NICUs across the UK. Responses were obtained from 44 NICUs (80%). When mechanical ventilation is needed in babies born less than 26 weeks gestation, 70% of units used volume-targeted ventilation (VTV).

**Nitric oxide**

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder’s knowledge and experience.

* 1. Managing respiratory disorders and monitoring
     1. Summary of suggestions

### Postnatal dexamethasone

A stakeholder commented that consideration of postnatal dexamethasone for babies remaining ventilator-dependent after 7 days of age, and actions such as early use of caffeine citrate and minimally invasive surfactant administration can help to reduce the instance of BDP.

### Caffeine citrate

Stakeholders felt that babies born at 30 weeks or less should be given caffeine citrate as early as possible to reduce the incidence of BPD, cerebral palsy and blindness.

### Patent Ductus Arteriosus (PDA)

Stakeholders felt that PDA should not be treated in preterm babies unless it is causing a significant clinical difficulty. This is a common condition in preterm babies who need respiratory support and will close spontaneously in the majority of cases. Surgical and pharmalogical treatment for this can potentially cause harm to the baby.

### Oxygen saturations

Stakeholders highlighted that babies born preterm should have targeted oxygen saturation rates of 91-95% if they need oxygen support as this can reduce mortality.

A stakeholder commented that it is beneficial to target higher oxygen levels in babies born preterm by automatic control.

* + 1. Selected recommendations from development source

Table 3 below highlights recommendations that have been provisionally selected from the development source that may support potential statement development. These are presented in full after table 3 to help inform the committee’s discussion.

Table 3 Specific areas for quality improvement

|  |  |
| --- | --- |
| Suggested quality improvement area | Selected source guidance recommendations |
| Postnatal dexamethasone | NICE NG124 Recommendation 1.3.1 |
| Caffeine citrate | NICE NG124 Recommendation 1.3.5 |
| Patent Ductus Arteriosus (PDA) | NICE NG124 Recommendation 1.3.10 |
| Oxygen saturations | NICE NG124 Recommendation 1.4.2  No recommendations on automatic control were identified. |

**Postnatal dexamethasone**

NICE NG124 Recommendation 1.3.1

Consider dexamethasone[[13]](#footnote-13) to reduce the risk of BPD for preterm babies who are 8 days or older and still need invasive ventilation for respiratory disease. When considering whether to use dexamethasone in these babies:

* take into account the risk factors for BPD in [table 1](https://www.nice.org.uk/guidance/ng124/chapter/recommendations#table-1-identified-risk-factors-for-bpda) **and**
* discuss the possible benefits and harms with the parents or carers. Topics to discuss include those in [table 2](https://www.nice.org.uk/guidance/ng124/chapter/recommendations#table-2-benefits-and-harms-of-dexamethasone-in-preterm-babies-8-days-or-older).

**Caffeine citrate**

NICE NG124 Recommendation 1.3.5

Use caffeine citrate routinely in preterm babies born at or before 30 weeks, starting it as early as possible and ideally before 3 days of age.

**Patent Ductus Arteriosus (PDA)**

NICE NG124 Recommendation 1.3.10

Do not treat a PDA in a preterm baby unless the PDA causes a significant clinical problem, for example, difficulty weaning the baby from a ventilator.

**Oxygen saturations**

NICE NG124 Recommendation 1.4.2

After initial stabilisation, aim for an oxygen saturation of 91% to 95% in preterm babies.

* + 1. Current UK practice

**Postnatal dexamethasone**

In 2014 a national survey[[14]](#footnote-14) was conducted which received responses from all 55 neonatal intensive care units. This found that, after the first week, almost all used systemic steroids to treat evolving or established chronic lung disease to help with the extubation of ventilator-dependent babies, and to prevent reintubation. 92% used dexamethasone. One unit had not used postnatal steroids for chronic lung disease treatment in last decade.

**Caffeine citrate**

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder’s knowledge and experience.

**Patent Ductus Arteriosus (PDA)**

In 2012 a survey[[15]](#footnote-15) of consultant neonatologists working in tertiary neonatal units in England was conducted, with a response rate of 75%. Of the responses received, 68% of neonatologists felt that a symptomatic strategy best described their practice for treating PDA and 25% felt that they practised a presymptomatic /echo-directed targeted strategy. Two neonatologists, working at the same unit, practiced a prophylactic treatment strategy and 2 neonatologists felt that their practice did not fit any of these categories. Significant variation (7%–75%) was observed when the percentage of preterm babies treated for PDA per year was compared within different units practising the same symptomatic strategy.

**Oxygen saturations**

In 2014 the results of a telephone survey[[16]](#footnote-16) of level 3 NICUs, caring for babies of less than 28 weeks gestation in the UK were published. All 59 units were contacted and had a 100% response rate.

This showed wide variation in the oxygen target limits for babies born at less than 32 weeks gestation.

* 28 (47%) units had lower limits less than 89%
* 19 (33%) units had upper limits set below 95%
* 7 (12%) units had upper limits more than 95%.
  1. Supporting parents and carers during admission
     1. Summary of suggestions

### Parental involvement in care

Stakeholders highlighted that babies receiving respiratory support have improved outcomes when their parents or carers are supported to interact with their baby and are partners in all aspects of their baby’s care.

A stakeholder felt that, because individualised care is important for babies and families, consideration should be given to using the newborn individualized developmental care and assessment program (NIDCAP®) to improve cognitive development in babies born at less than 27 weeks.

### Supporting and communicating with parents

Stakeholders noted that preterm babies receive a range of interventions, some which may have been anticipated and others which may be unexpected, from healthcare professionals. Parents need clear information, explanation and support in coping with these challenges and uncertainties.

Stakeholders noted that parents and carers should be provided with the necessary information to understand their baby’s condition and management and make informed decisions about their care. It was noted that parents should be supported to feel confident with communication and early language strategies with their baby.

Stakeholders felt that parents should have access to psychological support when their baby is on a neonatal unit, noting that poor psychological health can negatively impact bonding between parents and their baby.

### Neonatal environment

A stakeholder noted that neonatal care is an unexpected experience for most parents so they should be supported to familiarise themselves with the neonatal environment.

* + 1. Selected recommendations from development source

Table 4 below highlights recommendations that have been provisionally selected from the development source that may support potential statement development. These are presented in full after table 4 to help inform the committee’s discussion.

Table 4 Specific areas for quality improvement

|  |  |
| --- | --- |
| Suggested quality improvement area | Selected source guidance recommendations |
| Parental involvement in care | NICE NG124 Recommendations 1.6.2, 1.6.3, 1.6.4 and 1.6.6 |
| Supporting and communicating with parents | NICE NG124 Recommendations 1.6.7, 1.6.8, 1.6.11, 1.6.12 and 1.6.13 |
| Neonatal environment | NICE NG124 Recommendations 1.6.14 |

**Parental involvement in care**

NICE NG124 Recommendations 1.6.2, 1.6.3, 1.6.4 and 1.6.6

1.6.2 Tell parents and carers about the benefits of using touch, for example, through skin-to-skin contact, to communicate with their baby.

1.6.3 Consider providing the Newborn individualized developmental care and assessment program (NIDCAP®) to improve cognitive development in babies born at less than 27 weeks.

1.6.4 Recognise parents and carers as partners in their baby's care, and support them in this role.

1.6.6 Provide regular opportunities and time for parents and carers to discuss their baby's care, ask questions about the information they have been given, and discuss concerns.

**Supporting and communicating with parents**

NICE NG124 Recommendations 1.6.7, 1.6.8, 1.6.11, 1.6.12 and 1.6.13

1.6.7 Give parents and carers the time, support and encouragement they need to become confident in caring effectively for their baby.

1.6.8 Offer parents and carers psychological support from a professional who is trained to deliver this type of help and advice.

1.6.11 Ensure that information for parents and carers is delivered by an appropriate healthcare professional, and information for hospitalised mothers who cannot visit their baby is delivered by a senior healthcare professional, for example, a neonatologist or specialist registrar, face-to-face whenever possible.

1.6.12 Be sensitive about the timing of discussions with parents and carers. In particular, discuss significant perinatal events without delay, providing the mother has sufficiently recovered from the birth.

1.6.13 Provide information for parents and carers that includes:

* explanations and regular updates about their baby's condition and treatment, especially if there are any changes
* what happens in the neonatal unit, and the equipment being used to support their baby
* what respiratory support is being provided for their baby
* how to get involved in their baby's day-to-day care, interact with their baby and interpret the baby's neurobehavioural cues
* the roles and responsibilities of different members of their baby's healthcare team, and key contacts
* information about caring for a premature baby to share with family and friends, and practical suggestions about how to get help and support from family and friends
* opportunities for peer support from neonatal unit graduate parents or parent buddies
* details of local support groups, online forums and national charities, and how to get in touch with them.

**Neonatal environment**

NICE NG124 Recommendation 1.6.14

Those responsible for planning and delivering neonatal services should ensure that neonatal units:

* are welcoming and friendly
* foster positive and supportive relationships by providing parents and carers with
* 24-hour access to their baby
* provide privacy for skin-to-skin contact and feeding
* have private areas for difficult conversations
* have comfortable furniture and provide a relaxing environment for families.
  + 1. Current UK practice

**Parental involvement in care**

The National Neonatal Audit Programme[[17]](#footnote-17) measures whether parents have been spoken to by a senior member of the neonatal team within the first 24 hours of their baby being admitted. This applies for all babies who require care on a neonatal unit. It noted that in 2017 there was a documented consultation with parents within 24 hours of admission in 94.6% of cases, up from 91.9% in 2015. 2% (3/179) of neonatal units had consultation rates below 80%.

For 74.3% of neonatal stays parents were documented as having attended a consultant ward round at least once. This figure was 87.5% for neonatal admissions longer than 28 days.

**Supporting and communicating with parents**

In 2018 a survey[[18]](#footnote-18) of 589 parents whose babies were admitted into neonatal care found that 62% had no access to formal psychological support such as counselling or talking therapies when they needed it whilst their baby was on the neonatal unit. 8% of parents surveyed felt like they received the right amount of formal psychological support whilst on the neonatal unit. 45% of parents said they had no access to formal psychological support when they needed it after leaving the neonatal unit.

A 2015 report[[19]](#footnote-19) was published based on the responses from 101 neonatal units in England, representing 63% of the neonatal units providing care. 41% of units that responded said that parents had no access to a trained mental health worker (such as a clinical psychologist, psychotherapist, trained counsellor or another professional with mental health training) either on the unit or via referral to services outside of the unit. At 30% of units, parents had no access to psychological support at all.

**Neonatal environment**

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder’s knowledge and experience.

* + 1. Resource impact

The recommendation to consider providing the Newborn individualized developmental care and assessment program (NIDCAP®), to improve cognitive development in babies born at less than 27 weeks, is a change to current practice. Where implemented, the cost of training is estimated to be around £10,900 to train 1 member of staff and around £12,000 to train 2 members of staff, over 2 years. However, because there are currently limits to the number of people who can be trained in NIDCAP® each year, the recommendation is not at present expected to result in a significant resource impact.

* 1. Discharge planning
     1. Summary of suggestions

### Parental support in discharge planning

Stakeholders felt that parents and carers of preterm babies on respiratory support should be supported to be fully involved in the discharge planning process.

A stakeholder felt that a neonatal discharge planning coordinator is valuable as discharge is a stressful situation for parents.

A stakeholder felt that parents and carers should have infant basic life support training before their preterm baby is discharged.

### Services following discharge

A stakeholder suggested specialist respiratory services and long-term children’s ventilation services for babies needing higher levels of respiratory support after hospital discharge or transition to hospital-based children’s services, with early referral at 40-44 weeks corrected gestational age.

A stakeholder suggested neonatal transitional care to support transition from the neonatal unit to home. Another stakeholder suggested the provision of a neonatal outreach service 7 days per week.

* + 1. Selected recommendations from development source

Table 5 below highlights recommendations that have been provisionally selected from the development source that may support potential statement development. These are presented in full after table 5 to help inform the committee’s discussion.

Table 5 Specific areas for quality improvement

|  |  |
| --- | --- |
| Suggested quality improvement area | Suggested source guidance recommendations |
| Parental support in discharge planning | NICE NG124 Recommendations 1.7.1, 1.7.2 1.7.3, 1.7.4, 1.7.6, 1.7.7 and 1.7.8 |
| Services following discharge | Not directly covered in NICE NG124 and no recommendations are presented |

**Parental support in discharge planning**

NICE NG124 Recommendations 1.7.1, 1.7.2 1.7.3, 1.7.4, 1.7.6, 1.7.7 and 1.7.8

1.7.1 Neonatal units should consider appointing a member of staff as a designated neonatal discharge coordinator to discuss the following with parents and carers:

* ongoing support and follow‑up after discharge (also see the NICE guideline on developmental follow-up of children and young people born preterm)
* how to care for their baby at home
* how to use specialist equipment safely
* how to travel with their baby and specialist equipment.

1.7.2 When planning to discharge a preterm baby on respiratory support from the neonatal unit:

* follow the principles in the NICE guideline on postnatal care
* consider early referral to, and regular contact with, community and continuing healthcare teams
* consider an interim discharge placement to, for example, a hospice, alternative family member's home, step-down unit, transitional care unit, or alternative suitable accommodation, where appropriate.

1.7.3 Recognise parents and carers as partners in the discharge planning process. Answer their questions and concerns as they arise, and support them in making joint decisions with the discharge team.

1.7.4 Throughout the baby's neonatal admission, provide support and guidance for parents and carers with constructive and supportive feedback about how to care for their baby and how to use specialist equipment. Use a formal competency-based assessment tool to evaluate the safe use of specialist equipment.

1.7.6 Educate parents and carers about possible emergencies that may arise, how to deal with them and who to contact for help and advice. This should include how to carry out cardiopulmonary resuscitation, and what to do if there are problems with any specialist equipment.

1.7.7 Provide parents and carers with opportunities to care for their baby overnight.

1.7.8 Provide information for parents and carers to help them care for their baby safely and confidently after discharge. Follow the principles on communication and information-giving in section 1.6 of this guideline, and also see the NICE guideline on postnatal care. Information should include:

* how to recognise signs of illness in their baby, and what to do
* how to adapt routines such as feeding and sleeping after discharge, and information about safe sleep guidance
* how to make follow‑up appointments and timing of immunisations
* who to contact after discharge, as well as a list of useful medical contacts.
  + 1. Current UK practice

**Parental support in discharge planning**

A 2015 report[[20]](#footnote-20) was published based on the responses from 101 neonatal units in England, representing 63% of the neonatal units providing care. It noted that 75/86 units (87%) who responded had some accommodation for parents, a large proportion of which was designated for ‘rooming-in’, where parents can stay overnight with their baby before they are discharged. This helps them adjust to caring for their baby without the support of nurses and doctors.

No other published studies on current practice were highlighted for this suggested area for quality improvement.

**Services following discharge**

The 2015 report referred to above found that 61% of units that had responded could provide a community outreach service. The majority of the units who did not provide this service stated that some community support was available for babies after they were discharged, for example from a children’s community nursing team, community midwives or health visitors. However, some of these units advised that the outreach staff did not have neonatal training.

* 1. Additional areas
     1. Summary of suggestions

### Summary of suggestions

The improvement areas below were suggested as part of the stakeholder engagement exercise. However, they were felt to be either unsuitable for development as quality statements, outside the remit of this particular quality standard referral or need further discussion by the committee to establish potential for statement development.

There will be an opportunity for the committee to discuss these areas at the end of the session on 17 July 2019.

### Delivery units and staffing levels

A stakeholder comments that babies should be delivered in the correct unit with appropriate staffing levels.

This suggestion has not been progressed. Place of delivery is outside the scope of this quality standard and staffing levels are not within the remit of quality standards.

### Training

Training healthcare providers in newborn life support was suggested as an area of quality improvement.

This suggestion has not been progressed. Quality statements focus on actions that demonstrate high quality care or support, not the training that enables the actions to take place. The committee should consider which parts of care and support would be improved by increased training. Training may be referred to in the audience descriptors.

### Perinatal package for preterm babies

Stakeholders suggested a package of care for babies born preterm that includes antenatal steroids, delayed cord clamping, temperature monitoring, caffeine administration and breast milk in first 24 hours.

This suggestion has not been progressed. The guideline does not contain recommendations on a care package but several of the elements are addressed individually in sections 1 and 2 of the briefing paper. Antenatal steroids are addressed in QS135 [Preterm labour and birth](https://www.nice.org.uk/guidance/qs135), delayed cord clamping is addressed for all babies in statement 6 of QS105 [Intrapartum care](https://www.nice.org.uk/guidance/qs105) and breast feeding is addressed in QS37 [Postnatal care](https://www.nice.org.uk/guidance/qs37).

### Reducing infection

A stakeholder suggested reducing infection as an area for quality improvement.

This area has not been progressed in this quality standard because it is addressed in QS61 [Infection prevention and control](https://www.nice.org.uk/guidance/qs61).

### 2 year follow up

A stakeholder noted that there is inconsistency in how robustly this assessment is carried out and reported.

This area has not been progressed in this quality standard because it is addressed in QS169 [Developmental follow-up of children and young people born preterm](https://www.nice.org.uk/guidance/qs169).

### New guidance and research

Stakeholders suggested a number of areas for further guidance or research.

These areas have not been progressed because additional guidance and research is outside of the remit of quality standards. The suggestions will be passed on to the NICE centre for guidelines.

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# Appendix 1: Review flowchart

Records identified through topic engagement  
[39]

Records identified through IS scoping search  
[14]

Records identified through ViP searching  
[4095]

Records excluded  
[4139]

Records screened  
[4148]

Full-text papers excluded  
[9]

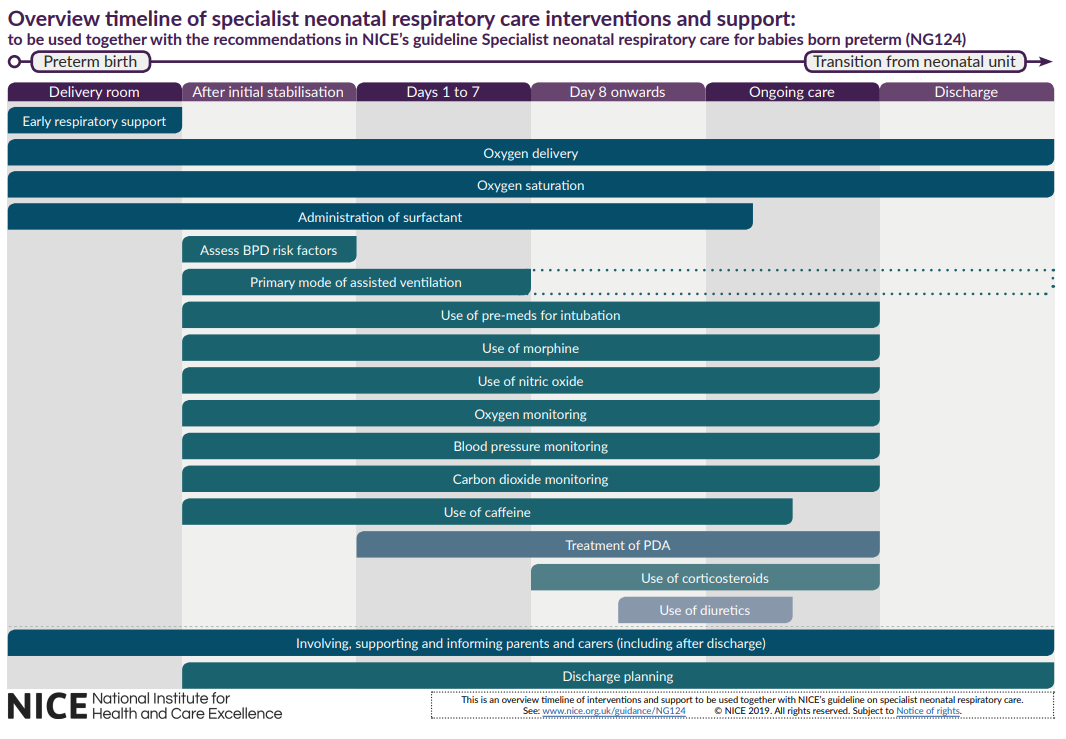
Citation searching or snowballing

[9]

Full-text papers assessed   
[20]

Current practice examples included in the briefing paper  
[11]

# Appendix 2: Overview timeline of specialist neonatal respiratory care interventions and support



# Appendix 3: Suggestions from stakeholder engagement exercise – registered stakeholders

| **ID** | **Stakeholder** | **Suggested key area for quality improvement** | **Why is this important?** | **Why is this a key area for quality improvement?** | **Supporting information** |
| --- | --- | --- | --- | --- | --- |
| **1. Respiratory support** | | | | | |
| 1 | BAPM | Key area for quality improvement 1  Reduction in the incidence of Broncho-pulmonary dysplasia (BPD) | BPD occurs in ~30% of babies born before 32 weeks of gestation and has substantial adverse implications for the growth, respiratory health and neurodevelopmental outcomes of affected infants. Moreover, BPD prolongs hospital stay, increases healthcare resource utilisation during and after initial hospitalisation. It also interferes with parental bonding and causes substantial stress for families. | Data from the National Neonatal Audit Programme (NNAP) shows substantial variation in the rates of BPD among neonatal units and neonatal networks. This variation might reflect differences in management and variable use of preventative strategies for BPD.  NICE guidance has identified the risk profile for BPD as well as a number evidence-based preventative strategies for BPD in such high risk infants. These measures include -   1. Use of CPAP for respiratory support after birth and subsequently as primary respiratory support modality in neonatal units 2. Use of minimally invasive surfactant administration for babies receiving non-invasive respiratory support 3. Volume-targeted ventilation (or high frequency oscillation if VTV fails) for babies requiting invasive ventilatory support 4. Routine and early (before 3 days of age) use of Caffeine citrate 5. Consideration of postnatal dexamethasone for babies remaining ventilator-dependent after 7 days of age   There is evidence that many of these measures are variably applied in clinical practice in the UK, especially the use of VTV, minimally invasive surfactant administration and dexamethasone use. A quality improvement programme based on a care bundle incorporating these evidence-based (but variably practiced) measures has the potential to reduce the incidence of BPD. | NNAP collects data on the rates of BPD in babies born at less than 32 weeks of gestation across England, Wales and Scotland, and reports the rates of BPD or death for individual units as well as networks with outlier analysis (https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme-nnap/about#\_019-audit-measures). This readily available source can be used for monitoring the QI project. |
| 2 | NHSE NCC CRG | Key area for quality improvement 1 | When stabilising preterm babies who need respiratory support soon after birth and before admission to the neonatal unit, use continuous positive airways pressure (CPAP) or another non-invasive respiratory support where clinically appropriate, rather than invasive ventilation. | There is evidence that non-invasive respiratory support, when feasible, is likely to reduce the incidence of BPD, but that use of non-invasive support is variable, as is the incidence of BPD | See NNAP data for variation in BPD outcomes (GF) |
| 3 | NHSE NCC CRG | Key area for quality improvement 2 | When giving surfactant to a preterm baby who does not need invasive ventilation, use a minimally invasive administration technique (e.g. LISA/MIST). | There is evidence supporting LISA/MIST v INSURE or prolonged invasive ventilation, but that LISA is not well established in the UK compared to other European countries (GF) |  |
| 4 | NHSE NCC CRG | Key area for quality improvement 3 | For preterm babies who need invasive ventilation, use volume-targeted ventilation (VTV) in combination with synchronised ventilation as the primary mode of respiratory support | There is good evidence to support VTV v pressure-limited ventilation but practice varies (GF) |  |
| 5 | Neonatal Nurses Association (NNA) | Key area for quality improvement 1  Use of pain management tool and administration of Sucrose 24% (0.1ml) in conjunction with containment / human factors for management of pain during LISA | Intubation/use of laryngoscope is a stressful procedure for the neonate. Strategies to reduce that stress including pain relief and a team approach to the procedure using a human factors model will ensure support a successful procedure. | To standardise pain management and prevent the sequale of painful procedures for the preterm population | Stevens B, Yamada J, Ohlsson A (2005) Sucrose for analgesia in newborn infants undergoing painful procedures (Cochrane Review) in *The Cochrane Library*, Issue 2, 2005  Stevens, B., et al. (2018) ‘The minimally effective dose of sucrose for procedural pain relief in neonates: a randomized controlled trial’, *BMC Pediatrics*, 18  Anand, K.J.S, Stevens, B.J, McGrath (2007) Pain research and clinical management- pain in neonates and infants, Third Edition, Elsevier |
| 6 | Neonatal Network Northern Ireland | When giving surfactant[1] to a preterm baby who does not need invasive ventilation, use a minimally invasive administration technique. If this is not possible, for example, in units without the facilities or trained staff to carry out these techniques, use endotracheal intubation to give surfactant, with early extubation afterwards. | Improve care and respiratory support of preterm babies |  |  |
| 7 | Neonatal Network Northern Ireland | For preterm babies who need invasive ventilation, use volume-targeted ventilation (VTV) in combination with synchronised ventilation as the primary mode of respiratory support. If this is not effective, consider high-frequency oscillatory ventilation (HFOV). | Available evidence suggests this mode of ventilation is associated with improved outcomes | As a region this is what we should be aiming to do. There are however difficulties with this. The number of babies and number of ventilation days has fallen dramatically in most units outside of the main tertiary centre. Trying to achieve this will be difficult |  |
| 8 | Neonatal Network Northern Ireland | Do not routinely use inhaled nitric oxide for preterm babies who need respiratory support for respiratory distress syndrome (RDS), unless there are other indications such as pulmonary hypoplasia[2] or pulmonary hypertension |  | This is something that will need to be taken forward by RJMH |  |
| 9 | Resuscitation Council (UK) | Stabilisation of preterm babies with CPAP prior to admission to the neonatal unit  (CPAP =continuous positive airway pressure) | Delivery room stabilisation with CPAP is associated with a reduction in use of invasive ventilation and may be associated with reduced mortality and bronchopulmonary dysplasia | 1. This guideline recommends that when giving surfactant to a preterm baby who does not need invasive ventilation, a minimally invasive administration technique should be used. This requires hospitals to ensure that staff are proficient in the use of delivery room CPAP.  2. This guideline states that it is unclear whether preterm babies born very early, e.g. <25 weeks are suitable for delivery room CPAP because of poor respiratory drive and high failure rates of non-invasive ventilation. Quality improvement / training in managing preterm babies on CPAP may improve CPAP success rates for the extremely preterm. | The Resuscitation Council (UK) [[www.resus.org.uk](http://www.resus.org.uk)] Newborn Life Support course (NLS) [<https://www.resus.org.uk/information-on-courses/newborn-life-support>] recommends the use of positive end expiratory pressure to stabilise spontaneously breathing preterm babies.  The 2019 European Consensus guidelines on managing respiratory distress [Sweet et al. European Consensus Guidelines on the Management of Respiratory Distress Syndrome – 2019 Update. Neonatology DOI: 10.1159/000499361]recommend that a CPAP of at least 6 cm water, delivered via mask or nasal prongs, is used to stabilise spontaneously breathing preterm babies. |
| 10 | Resuscitation Council (UK) | Minimally Invasive surfactant Treatment (MIST) / Less Invasive Surfactant Treatment (LISA) | There is evidence that minimally invasive surfactant administration techniques (compared with tracheal administration) reduce:   1. bronchopulmonary dysplasia 2. days on a ventilator and pneumothoraces | This guideline recommends use of a minimally invasive administration technique when giving surfactant to a preterm baby who does not need invasive ventilation. However, many clinicians are currently not familiar with this technique. The guideline highlights differences in training as a reason why minimally invasive administration techniques are not used. Standardised delivery room stabilisation and early care can be systematically taught through national, quality-assured, RCPCH-endorsed, evidence-based courses e.g. the RC(UK) NLS and Advanced Resuscitation of the Newborn Infant (ARNI) courses. | The 2019 European Consensus guidelines on managing respiratory distress recommend LISA as a preferred mode of surfactant administration as long as clinicians are experienced in this technique. [Sweet et al. European Consensus Guidelines on the Management of Respiratory Distress Syndrome – 2019 Update. Neonatology DOI: 10.1159/000499361]  Resuscitation Council (UK). ARNI – Advanced Resuscitation of the Newborn Infant. at:  <https://www.resus.org.uk/information-on-courses/advanced-resuscitation-of-the-newborn-infant/>. |
| 11 | Resuscitation Council (UK) | Measurement and documentation of core body temperature on admission to the neonatal unit | 1. The International Liaison Committee on Resuscitation (ILCOR) in their 2015 guidelines highlighted and reinforced that a core temperature below 36.5-37.5 degrees in newly born non-asphyxiated infants is strongly associated with mortality and morbidity. They recommended that admission temperature should be recorded as a predictor of outcomes as well as a quality indicator  2. A core body temperature of less than 35°C on admission to neonatal unit is one of the risk factors for bronchopulmonary dysplasia identified in this guideline. | Newly born babies get cold easily and a combination of measures may be required to maintain a temperature of 36.5-37.5 degrees after delivery, through stabilisation and admission.  A number of measures have been shown to be effective in reducing hypothermia including warmed humidified respiratory gases, increased room temperature plus plastic wrapping of body and head, plus thermal mattress or a thermal mattress alone. Despite this the national Neonatal Audit Project 2018 report showed that only 64% of babies had an admission temperature between 36.5-37.5 degrees. | The National Neonatal Audit Project 2018 report  [<https://www.rcpch.ac.uk/resources/national-neonatal-audit-programme-annual-report-2018-2017-data>] showed that only 64% of babies had an admission temperature between 36.5-37.5 degrees.  ILCOR and European Resuscitation Council consensus guidelines2015 [Wyllie J, Bruinenberg J, Roehr CC, Rüdiger M, Trevisanuto D, Urlesberger B. European Resuscitation Council Guidelines for Resuscitation 2015: Section 7. Resuscitation and support of transition of babies at birth. Resuscitation 2015; 95: 249–63. Available at: <http://ercguidelines.elsevierresource.com/european-resuscitation-council-guidelines-resuscitation-2015-section-7-resuscitation-and-support>] and the NICE-accredited Resuscitation Council (UK) guidelines [<https://www.resus.org.uk/resuscitation-guidelines/resuscitation-and-support-of-transition-of-babies-at-birth/>] highlight the importance of early thermal care and preventing hypothermia as a way of reducing mortality. |
| 12 | SCM1 | Key area for quality improvement 1  Stabilise preterm infants at birth using continuous positive airways  pressure (CPAP) where clinically appropriate, rather than invasive ventilation. This could be extended to encompass other sensible and measurable delivery room strategies eg temp control, birth in a neonatal intensive care unit centre, correct staffing. | Stabilise preterm infants at birth (Transitioning) using CPAP is recommended within the NICE guidance. There is good evidence that it leads to a reduction in death and Bronchopulmonary dysplasia (BPD). In infants < 30 weeks gestation it reduces death or BPD by 2.9 %, number needed to treat 34. Half of all infants who avoid intubation in the delivery room are never ventilated. | There is evidence that stabilisation practices vary widely throughout the UK, specifically that rates of delivery room CPAP, provision of PEEP vary significantly depending on if the infant is born at a tertiary or non tertiary unit. This is therefore a critical measure to concentrate on to improve equitable care for infants throughout the UK. Also clear that delivery room intubation rates vary significantly throughout the UK. | See: Audit of delivery room practice throughout the UK: Marked variation in delivery room management in very preterm infants, Resuscitation 84 (2013) 1558–1561.  <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3828483/>  See also Marked variation in newborn resuscitation practice: A national survey in the UK. Resuscitation 83 (2012) 607– 611  <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3350052/>  National neonatal Audit Programme:  <https://nnap.rcpch.ac.uk/network-data.aspx>  <https://www.rcpch.ac.uk/sites/default/files/2018-10/2018_nnap_report_on_2017_data_final_v8.pdf>  Avoiding endotracheal ventilation to prevent bronchopulmonary dysplasia a meta-analysis  <https://www.ncbi.nlm.nih.gov/pubmed/24144716> |
| 13 | SCM1 | Key area for quality improvement 2  When giving surfactant to a preterm baby who does not need invasive  ventilation, use a minimally invasive administration technique.  If this is not possible, for example, in units without the facilities or trained staff to carry out these techniques, use endotracheal intubation to give surfactant, with early extubation afterwards. | This was recommended in the NICE guidance.  Minimally invasive surfactant administration results in a lesser need for mechanical ventilation in infants with RDS, reduction in the composite outcome of death or BPD at 36 weeks, and BPD or IVH among survivors. There was good evidence that it lead to a reduction in Bronchopulmonary dysplasia of 6.2 %, number needed to treat 16 to avoid one further case of BPD.  Intubation to give surfactant and Early extubation was also associated with a reduction in BPD by 8.2 %, number needed to treat 12. | There is evidence that the use of minimally invasive administration of surfactant is uncommon in the UK compared to European units. The practice is also not equitably supplied varying from 34.5 % in Tertiary neonatal units to 10.7 % in local NICU’s. Likewise the practice/provision of Insure varies between units. There is therefore good evidence that improving equitable provision of either of these techniques throughout the UK has the scope to significantly improve the respiratory outcomes of infants. | Please see letter and included refs: Eleanor Jeffreys,Katie Hunt, Theodore Dassios, Anne Greenough UK survey of less invasive surfactant administration. Arch Dis Child Fetal Neonatal Ed 2019;0:F1. [link](https://fn.bmj.com/content/fetalneonatal/early/2019/02/11/archdischild-2018-316466.full.pdf)  Aldana-Aguirre JC, Pinto M, Featherstone RM, et al. Less invasive surfactant administration versus intubation for surfactant delivery in preterm infants with respiratory distress syndrome: a systematic review and meta-analysis. Arch Dis Child Fetal Neonatal Ed 2017;102:F17–23. <https://www.ncbi.nlm.nih.gov/pubmed/27852668>  Respiratory Management of Extremely Preterm Infants: An International Survey; Marc Beltempo, Tetsuya Isayama, Máximo Vento. Neonatology 2018;114:28–36 <https://www.ncbi.nlm.nih.gov/pubmed/29656287>  Association of Noninvasive Ventilation Strategies With Mortality and Bronchopulmonary Dysplasia Among Preterm Infants  <https://www.ncbi.nlm.nih.gov/pubmed/27532916> |
| 14 | SCM1 | Key area for quality improvement 3  For preterm babies who need invasive ventilation, use volume-targeted  ventilation (VTV) in combination with synchronised ventilation as the primary  mode of respiratory support. If this is not effective, consider high-frequency oscillatory ventilation (HFOV).  Do not use synchronised pressure-limited ventilation such as assist control (AC), synchronised intermittent positive pressure ventilation (SIPPV), patient triggered ventilation (PTV), pressure support ventilation (PSV) or synchronised  time-cycled pressure-limited ventilation (STCPLV). | The NICE guideline recommended the use of volume-targeted ventilation (VTV) in combination with synchronised ventilation as the primary mode of respiratory support. If this is not effective, consider high-frequency oscillatory ventilation (HFOV).  There was evidence that VTV reduced mortality (OR 0.44 vs synchronised pressure limited, NNT ~20), days ventilated, pneumothorax and Brochopulmonary dysplasia (OR 0.5 vs synchronised pressure limited, NNT ~8) when compared to other modes invasive of ventilation. | There is evidence that volume-targeted ventilation is still not the commonest form of ventilation in neonatal units, as well as lack of equitable use this mode of ventilation between NICU’s (26 % use) and Local neonatal units (10% use).  It is likely that improving equitable provision of this mode of ventilation throughout the UK has the scope to significantly improve survival and respiratory outcomes of infants. | Survey of neonatal respiratory support strategies  <https://www.ncbi.nlm.nih.gov/pubmed/17590191>  Respiratory Management of Extremely Preterm Infants: An International Survey- <https://www.karger.com/Article/Pdf/487987>  Respiratory support practices in infants born at term in the United Kingdom (latest evidence but in term infants) <https://link.springer.com/content/pdf/10.1007%2Fs00431-012-1784-7.pdf>  Ventilation practices in the neonatal intensive care unit: a cross-sectional study <https://www.ncbi.nlm.nih.gov/pubmed/20619854>  Ventilatory practices in extremely low birth weight infants in a level III neonatal intensive care unit-Portuguese data  <https://www.ncbi.nlm.nih.gov/pubmed/29627403>  Survey of Ventilation Practices in the Neonatal Intensive Care Units of the United States and Canada: Use of Volume-Targeted Ventilation and Barriers to Its Use  <https://www.ncbi.nlm.nih.gov/pubmed/30189441> |
| 15 | SCM2 | Key area for quality improvement 1: Surfactant administration in pre-term babies. For, babies born pre-term who do not require invasive ventilation, surfactant administration should be administered via a minimally invasive technique; MIST (Minimally Invasive Surfactant Therapy) or LISA (Less Invasive Surfactant Administration) | NICE guideline recommends a minimally invasive approach to administration for pre-term babies who do not require invasive ventilation. Benefits included reduced the incidence of BPD (Bronchopulmonary Dysplasia), number of days on invasive ventilation, and incidence of pneumothorax compared to Endotracheal (ET) administration.  However, if this is not feasible, recommendation is to extubate early after ET administration. | A recent survey of Neonatal units identified variation in practice regarding use of MIST/LISA.  A 95% response rate to the survey identified that 58 responders were Neonatal intensive care units (NICU n=62), 84 local neonatal units (LNU n =88) and 45 special care baby units (SCBU n=46). On average only 18.7% (35) units used LISA regularly. Twenty (34.5%) were in NICUs, 9 (10.7%) were LNUs and 6 (13.3%) were SCBUs. | Please see link to survey carried out across UK neonatal units highlighting variation in practice  <https://fn.bmj.com/content/fetalneonatal/early/2019/02/11/archdischild-2018-316466.full.pdf>  NICE Guideline NG124  <https://www.nice.org.uk/guidance/ng124> |
| 16 | SCM2 | Key area for quality improvement 2: Inhaled Nitric Oxide,  Pre-term babies requiring respiratory support for Respiratory Distress Syndrome (RDS) should not receive inhaled Nitric Oxide unless suffering from pulmonary hypoplasia or pulmonary hypertension. | There was lacking evidence to support the use of inhaled Nitric Oxide (iNO) in pre-term babies suffering from RDS. Furthermore, there was evidence of adverse effects in addition it was not cost-effective as iNO has great cost implications. | There is great variation in practice and known that units use iNO despite lack of evidence. Data from studies suggest and increased use in recent use.  A current study is ongoing to explore use and trends across England, Scotland and Wales (see link in next column) | NICE guideline NG124  <https://www.nice.org.uk/guidance/ng124> Ongoing study to explore use of iNO  <https://www.hra.nhs.uk/planning-and-improving-research/application-summaries/research-summaries/use-of-inhaled-nitric-oxide-in-neonatal-intensive-care-units> |
| 17 | SCM3 | Key area for quality improvement 1  In preterm babies who do not require invasive ventilation, when surfactant is administered a minimally invasive surfactant administration technique is used | This is in the NICE guideline.  In preterm babies who do not require invasive ventilation, there is evidence that minimally invasive surfactant administration techniques reduce the incidence of BPD, the number of days on invasive ventilation, and the incidence of pneumothorax, compared with endotracheal administration. | Less time spent on invasive ventilation is a reduction in cost. BPD in infants is associated with poorer neurodevelopmental outcomes and more frequent hospitalisations / hospital or GP encounters in the first 2 years of life |  |
| 18 | SCM3 | Key area for quality improvement 3  Invasive ventilation on the neonatal unit | There is good evidence that volume targeted ventilation, if suitable, is associated with better outcomes. Furthermore, patient triggered pressure limited ventilation modes are associated with significantly poorer outcomes | There is significant heterogeneity in practice in England currently, and the synchronised modes of pressure limited ventilation are still widely used |  |
| 19 | SCM3 | Key area for quality improvement 5  Avoiding invasive ventilation before admission to the neonatal unit if safe to do so | Avoiding invasive ventilation if clinically safe and appropriate means avoiding the risks of invasive ventilation (pneumothorax, BPD) | There is variation in practice |  |
| 20 | SCM4 | Key area for quality improvement 1 Temperature on admission | Evidence shows that temperature on admission is an independent risk factor for morbidity and mortality in preterm infants | Despite tried and tested simple and straightforward methods of keeping babies warm during stabilisation NNAP and other data show this is still not achieved on a high number of occasions | NNAP data  Laptook A et al admission temperature of LBW infants, predictors and associated morbidities paediatrics 2007 |
| 21 | SCM4 | Key area for quality improvement 3 Reduction of BPD | BPD is a significant morbidity as impacts on family, NHS resources, long term neuro developmental outcome | The NICE guideline for respiratory care identified a number of risk factors for BPD of which some could be negated with a quality improvement programme eg breast milk, infection | [Specialist neonatal respiratory care for babies born preterm](https://www.nice.org.uk/guidance/NG124) (2019) NICE guideline NG124 |
| **2. Managing and monitoring respiratory disorders** | | | | | |
| 22 | BAPM | Key area for quality improvement 1  Reduction in the incidence of Broncho-pulmonary dysplasia (BPD) | BPD occurs in ~30% of babies born before 32 weeks of gestation and has substantial adverse implications for the growth, respiratory health and neurodevelopmental outcomes of affected infants. Moreover, BPD prolongs hospital stay, increases healthcare resource utilisation during and after initial hospitalisation. It also interferes with parental bonding and causes substantial stress for families. | Data from the National Neonatal Audit Programme (NNAP) shows substantial variation in the rates of BPD among neonatal units and neonatal networks. This variation might reflect differences in management and variable use of preventative strategies for BPD.  NICE guidance has identified the risk profile for BPD as well as a number evidence-based preventative strategies for BPD in such high risk infants. These measures include -   1. Use of CPAP for respiratory support after birth and subsequently as primary respiratory support modality in neonatal units 2. Use of minimally invasive surfactant administration for babies receiving non-invasive respiratory support 3. Volume-targeted ventilation (or high frequency oscillation if VTV fails) for babies requiting invasive ventilatory support 4. Routine and early (before 3 days of age) use of Caffeine citrate 5. Consideration of postnatal dexamethasone for babies remaining ventilator-dependent after 7 days of age   There is evidence that many of these measures are variably applied in clinical practice in the UK, especially the use of VTV, minimally invasive surfactant administration and dexamethasone use. A quality improvement programme based on a care bundle incorporating these evidence-based (but variably practiced) measures has the potential to reduce the incidence of BPD. | NNAP collects data on the rates of BPD in babies born at less than 32 weeks of gestation across England, Wales and Scotland, and reports the rates of BPD or death for individual units as well as networks with outlier analysis (https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme-nnap/about#\_019-audit-measures). This readily available source can be used for monitoring the QI project. |
| 23 | Royal College of Paediatrics and Child Health | Documentation of target oxygen saturations | The BOOST studies showed that survival in extremely preterm infants (<28/40) is superior if oxygen saturations are targeted at 91-95% rather than 85-89%. These are lower than would be targeted for term infants, or ex-premature infants, and so appropriate oxygen saturations targets may prevent death and disability. | Documentation of target saturations is easy to measure and accomplish. As the infant progresses through their neonatal course, changing targets would be anticipated. There may also be clinical scenarios (such as congenital cardiac disease) where a degree of hypoxia is expected, and so higher oxygen targets would not be appropriate, regardless of gestational age. | BOOST and BOOST II trials available from <https://www.nejm.org/doi/full/10.1056/NEJMoa1514212>  East of England ODN available from <https://www.networks.nhs.uk/nhs-networks/eoe-neonatal-odn/guidelines/current-guidelines/saturation-targetting>  British Thoracic Society Guidelines for home oxygen in Children available from <https://thorax.bmj.com/content/thoraxjnl/64/Suppl_2/ii1.full.pdf> |
| 24 | SCM1 | Additional developmental areas of emergent practice: Target higher oxygen levels in preterm infants by automatic control |  |  |  |
| 25 | SCM2 | Key area for quality improvement 3: Caffeine Citrate  Babies born at 30 weeks or less should receive caffeine citrate as early as possible and ideally before 3 days of age | Evidence that caffeine citrate administered to pre-term babies of 30 weeks or less resulted in a reduced incidence of BPD, cerebral palsy (at 18- & 21-months follow-up) and blindness at 11 years compared to placebo. | Caffeine Citrate is one of the most commonly used drugs in the neonatal unit. It is a key area for QI to ensure consistent and standardised practice with an overall aim to improve outcomes for babies born pre-term. | NICE Guideline NG124  <https://www.nice.org.uk/guidance/ng124> |
| 26 | SCM2 | Key area for quality improvement 4: Patent Ductus Arteriosus (PDA).  Pre-term babies suffering from PDA should only receive treatment if the PDA causes a significant clinical problem such as difficulty weaning off the ventilator | There is no evidence of benefit from treating the PDA, on the contrary there was evidence of harm and this resulted from either pharmacological or surgical treatment.  Recommendation is to treat if significant clinical problem | Pre-term babies may be treated unnecessarily and exposed to the toxic effects of drugs which can cause GI perforation or renal impairment or undergo surgical intervention that may carry its own risk of complications | NICE Guideline NG124  <https://www.nice.org.uk/guidance/ng124> |
| 27 | SCM3 | Key area for quality improvement 2  Preterm neonates less than 36 weeks corrected gestation, and who require oxygen support, have targeted oxygen saturations in the range 91-95% | There is evidence that higher target oxygen saturation levels reduce mortality. Although a higher target is associated with an increase in retinopathy of prematurity and an increased risk of BPD, the evidence suggested no increase in severe visual impairment at 18months, and the reduction in mortality was considered to offset the increased risk of BPD (NICE guideline) | Improved survival with no increased long-term morbidity as an outcome  I believe not all neonatal units target their oxygen saturation ranges in the higher range (91-95%) | It is worth reviewing the recommendation in the European consensus guideline on the management of respiratory distress syndrome, which recommends different a range  <https://www.karger.com/Article/FullText/499361> |
| 28 | SCM5 | Key area for quality improvement 2  Do not treat Patent Ductus Arteriosus, unless it causes significant clinical difficulty | The NICE Guideline found that there was no evidence of benefit from treating PDA, except in exceptional clinical circumstances.  The evidential and committee consensus was that closure of PDA had more likely harms from treating the PDA – particularly through surgical means – than if left untreated | PDA is a common condition in the population group of babies born premature and requiring respiratory support. In over 80% of cases, the PDA will close spontaneously, though it may take longer in babies born extremely premature (NICE Guideline (2019)). Closure of PDA is a relatively common procedure, with most babies treated pharmaceutically (such as with Ibruprofen or Paracetamol) and some babies (around 260) treated surgically each year. The NICE Guideline found no evidence of improved outcomes, but did show an increased likelihood for harms, including renal impairment with ibuprofen and intestinal perforation after surgery.  Additionally, the committee were concerned to hear that referral and decision-making processes between neonatologists, cardiologists and surgeons could lead to surgical intervention when it is not needed. Additionally, with surgical intervention, there is always an increased risk of serious harm, such as mortality. Surgery also requires babies to be transferred to a specialist centre for the treatment, often resulting in separation of babies and their families, and limiting opportunities for parents and carers to be actively involved in their baby’s care. | I am unaware of data collection or audit for this particular area.  However, there is a [Specialised Surgery in Children Clinical Reference Group](https://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-e/e02/), who have a [service specification for Paediatric Surgery in Neonates](https://www.england.nhs.uk/wp-content/uploads/2013/06/e02-paedi-surg-neon.pdf) who may be useful to liaise with. |
| **3. Supporting parents and carers during admission** | | | | | |
| 29 | Bliss | Recognise parents and carers as partners in their baby's care, and support them in this role. | Parents should not be considered as visitors during their baby’s care on a neonatal unit. This should be established at the start of the neonatal journey.  The neonatal environment is not always conducive to allow parents to be fully involved in all aspects of their baby’s care. The layout, practice and facilities available at neonatal units differs throughout the UK. | Evidence from the Bliss Baby Charter\* has shown that this area of practice is not consistent throughout the UK in neonatal units. Units differ in their level of involvement for parents in practice, from little to high levels of involvement.  *\*The Bliss Baby Charter is a national audit tool for neonatal units to assess the level of family-centred care they deliver.*  [NNAP](https://www.rcpch.ac.uk/sites/default/files/2018-10/2018_nnap_report_on_2017_data_final_v8.pdf) states that parents should have a consultation by a senior healthcare professional **within 24 hours** of admission onto a neonatal unit so parents are able to understand plans for the care of their baby.  Parental presence and involvement at consultant ward rounds (e.g. parents presenting their baby) is also highlighted as part of this NNAP report.  Results from NNAP highlight that parents should have **regular** consultation with doctors on their baby’s progress. Parents that do not have regular consultations with a senior clinician will not be fully informed so unable to be full partners in decision making for their baby. Inconsistences in this practice across the UK means that some parents are unable to be as involved in their baby’s care. Evidence shows that bonding such as skin-to-skin can improve outcomes for babies in neonatal care, including their mental development. <https://www.ncbi.nlm.nih.gov/pubmed/12093942> | National Neonatal Audit Programme (NNAP)  [Bliss Baby Charter](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) audit tool  [POPPY report](https://s3.eu-west-2.amazonaws.com/files.bliss.org.uk/documents/PoppyreportforPRINT.pdf?mtime=20180412160449) – family centred care in neonatal units  [Parents and neonatal decisions study](https://www.ucl.ac.uk/parental-neonatal-decisions/)  [Evaluation of the Family and Infant Neurodevelopmental Education (FINE) programme in the UK](https://www.sciencedirect.com/science/article/abs/pii/S1355184118301583) |
| 30 | Bliss | Give parents and carers the time, support and encouragement they need to become confident in caring effectively for their baby. | Neonatal care is an unexpected experience for most parents, and neonatal units are a unique and unfamiliar environment for parents. Parents must be supported to familiarise themselves with the neonatal environment to help them give the best care to their baby. Parents should feel confident and equipped when preparing for discharge to take their baby home. | Practice across the UK differs amongst neonatal units on the time health professionals spend guiding and offering practical support to parents to be involved in their baby’s care as much as possible.  Not all neonatal units across the country have dedicated health professionals in post for key cares of neonatal care. (e.g. breastfeeding lead, developmental care lead) | [Toolkit for high quality neonatal services](http://www.londonneonatalnetwork.org.uk/wp-content/uploads/2015/09/Toolkit-2009.pdf) (Department of Health) – see ‘care of the baby and family experience’  [Evaluation of the Family and Infant Neurodevelopmental Education (FINE) programme in the UK](https://www.sciencedirect.com/science/article/abs/pii/S1355184118301583)  [Bliss Baby Charter](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) audit evidence |
| 31 | Bliss | Offer parents and carers psychological support from a professional who is trained to deliver this type of help and advice. | Poor psychological health can negatively impact bonding between parents and their baby. | Parents should have access to psychological support during their time on a neonatal unit to support their mental health and wellbeing.  There is a lack of dedicated specialist psychological support services in a number of neonatal units across the UK. This means some parents are unable to timely access this support if they require it. A survey conducted in 2018 by Bliss found that 80 per cent of parents whose babies were admitted into neonatal care think that their mental health suffered after their experience. The POPPY report also highlighted a lack of psychological support services run by counsellors, psychologists, psychiatrists or social workers to provide psycho-social support for parents.  41% of neonatal units had no access to a mental health worker for parents (Hanging in the Balance) | POPPY (above)  [Hanging in the balance](https://s3.eu-west-2.amazonaws.com/files.bliss.org.uk/images/Bliss-baby-report-2015-Hanging-in-the-balance-England.pdf?mtime=20180404114235) (Bliss)  [Bliss mental health survey](https://www.bliss.org.uk/news/bliss-releases-new-research-on-mental-health)  [Bliss Baby Charter](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) The provision of psychosocial support is one of only two mandatory aspects of the audit tool. A neonatal unit must provide this support in order to be accredited by Bliss as a unit delivering family-centred care. |
| 32 | Bliss | Ensure that the neonatal environment is conducive to parents being present | A comfortable, welcoming neonatal environment encourages parents to be present and to spend as much time as possible with their baby. Parental confidence and involvement in their baby’s care increases when parents feel comfortable and familiar with their neonatal unit surroundings. The inclusion of 24 hour access for parents, private rooms and comfortable facilities removes barriers that can prevent parents being present and involved in their baby’s care. | Neonatal units across the UK vary in their availability of space (e.g. by the cot side) and facilities available to parents (e.g. rooming-in rooms, rooms for parents to have private time with their baby).  NNAP data shows variation exists in average number of separation days of mothers and late preterm babies, which needs to be minimised for consistency. | Hanging in the balance – support and facilities for parents (above)  [Families kept apart](https://s3.eu-west-2.amazonaws.com/files.bliss.org.uk/documents/Research-and-campaigns/Campaigns/Families-kept-apart.pdf?mtime=20180411131112) (Bliss)  [It’s not a game](https://s3.eu-west-2.amazonaws.com/files.bliss.org.uk/images/Its-not-a-game.pdf?mtime=20180409143209) (Bliss)  [NNAP](https://www.rcpch.ac.uk/sites/default/files/2018-10/2018_nnap_report_on_2017_data_final_v8.pdf)  [Evaluation of the Family and Infant Neurodevelopmental Education (FINE) programme in the UK](https://www.sciencedirect.com/science/article/abs/pii/S1355184118301583)  [Bliss Baby Charter audit tool](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) 24 hour access is one of two mandatory standards within the Bliss Baby Charter. A neonatal unit must provide this in order to be accredited by Bliss as a unit delivering family-centred care. |
| 33 | BAPM | Key area for quality improvement 2  Recognise, involve and support parents as partners in their babies’ care, decision making and discharge planning. | The importance and value of parental involvement in their babies’ care is increasingly recognised and initiatives such as Family Integrated Care are increasingly practised in many units. There has been a paradigm shift in information disclosure and decision making following recent UK Court case (Montgomery vs Lanarkshire Health Board). In addition to the general guidance from the General Medical Council, British Medical Association, the British Association of Perinatal Medicine (BAPM) has produced detailed specific guidance on Shared Decision making which should facilitate parental involvement in decision making. This is especially important where certain therapeutic decisions are likely to have adverse consequences and decisions balancing the benefits and harms need to be made in the best interest of babies. Examples include possible adverse effects of postnatal dexamethasone on gut perforation, uncertainty about adverse neurodevelopmental outcomes and likely increased risk of BPD and need for treatment-requiring retinopathy of prematurity with use of recommended oxygen saturation targets. | Data from the NNAP show significant variation in the rates of parental-involvement focussed audit measures such as documented consultation with parents by a senior member of the neonatal team within 24 hours of a baby’s first admission (only 40% of 179 neonatal units achieving such consultation in >98% of admissions in 2017), and presence of a parent on at least 1 consultant ward round during baby’s stay on the Unit of more than 24 hours – where care giving decisions are usually made. Even among babies staying for more than 28 days, these rates varied from 76 to 98% among the networks implying that the model of parental partnership in care and decision making may yet be differentially adopted in the UK neonatal practice.  A number of Standards for enhancing parental involvement in their babies’ care have been developed jointly by the BAPM and BLISS (the leading UK Charity for babies born sick or premature) in the Neonatal Service Quality Indicators (NSQI 6 -10) and are already being used by many neonatal services. | 1. NNAP Annual Report 2018 on 2017 data available at <https://www.rcpch.ac.uk/sites/default/files/2018-10/2018_nnap_report_on_2017_data_final_v8.pdf> 2. Neonatal Service Quality Indicators: Standards relating to structures and processes supporting quality and patient safety in neonatal services (2017). British Association of Perinatal Medicine available at https://www.bapm.org/NSQI. 3. Enhancing shared decision making in neonatal care: A framework for practice (2019). British Association of Perinatal Medicine, available at https://www.bapm.org/sites/default/files/files/BAPM\_Shared%20Decision%20Making\_for%20consultation.pdf. |
| 34 | NHSE NCC CRG | Additional developmental areas of emergent practice | Provision of psychological support for parents with BPD |  |  |
| 35 | Neonatal Nurses Association (NNA) | Key area for quality improvement 2  FICARE (Family Integrated Care) including facilities for parental accommodation | Parental involvement in all aspects of their baby’s care throughout the neonatal hospital admission supports attachment, reduces adverse maternal mental health and reduces length of stay on NICU. Support the family to understand and manage their ex-preterm baby on discharge from hospital | FICARE is not standard in all hospital trusts and family support/facilities are variable as described in the BLISS report ‘Families Kept Apart’ | <http://familyintegratedcare.com/>  <https://s3.eu-west-2.amazonaws.com/files.bliss.org.uk/images/Families-kept-apart.pdf?mtime=20180404114251> |
| 36 | Neonatal Network Northern Ireland | Consider providing the Newborn individualized developmental care and assessment program (NIDCAP®) to improve cognitive development in babies born at less than 27 weeks. | Individualised care is important for both babies and families. This has been further highlighted given recommendations from enquiries such as O’Hara |  |  |
| 37 | Resuscitation Council (UK) | Effective communication with parents and families | Stabilisation at birth is a worrying time for parents. Their preterm baby receives a range of interventions from healthcare professionals. Some of these interventions may have been anticipated and some unexpected. This early stabilisation may have a profound effect on early stability and influence ongoing respiratory and general prognosis. Parents need clear information, explanation and support in coping with these challenges and uncertainties. | Effective communication with parents underpins good clinical care. This guideline says “Be sensitive about the timing of discussions with parents and carers. In particular discuss significant perinatal events without delay, providing the mother has sufficiently recovered from the birth.”  These can be difficult, emotional conversations at times. The RC (UK) places similar emphasis to NICE on communication with parents. Its NLS course covers communication with parents following stabilisation at birth and appropriate documentation. The RC (UK) ARNI course covers communication with parents around stabilisation and ongoing care as well as documentation. Both courses teach the value of clinical team debriefing. This is an important quality improvement area as senior updates do not always occur in the first 24 hours and, if they do, are not always documented. | A senior update for parents in the first 24 hours after their baby’s admission has been has been used as a neonatal care quality indicator (CQUIN).  It has been monitored by the National Neonatal Audit Project (NNAP) [National Neonatal Audit Project 2018 Report <https://www.rcpch.ac.uk/resources/national-neonatal-audit-programme-annual-report-2018-2017-data>], which found that not all parents received a senior update in the first 24 hours and when this did occur it was not always documented. An NNAP case study on how parenteral consultation rates in the first 24 hours of admission can be improved can be seen at <https://www.rcpch.ac.uk/resources/improving-parental-consultation-within-24-hours-admission-case-study-nnap> |
| 38 | Royal College of Speech and Language Therapists | **Key area for quality improvement 1:** Improving & enabling early interaction and communication opportunities for parents with their preterm infants on the neonatal intensive care unit | Parents report that ventilator support can impact on interaction and communication with their infants. Being on high flow nasal cannula can improve the ability to observe infant facial expression, and is perceived to support better infant – parent interaction, the building blocks of early communication skills. It is well known that infants born preterm are at high risk of developing speech, language and communication problems *(Rabie et al, 2015; Serenius et al, 2013; Wolke et al, 2008).* In light of this, it is crucial that parents are supported to feel confident with, and develop high quality communication and early language strategies with their infants. | The NICE Guidelines for Developmental Follow Up of Infants Born Pre-Term highlights the risk of speech, language and communication problems infants have. |  |
| 39 | SCM1 | Additional developmental areas of emergent practice: Supporting parental involvement in care |  |  |  |
| 40 | SCM2 | Key area for quality improvement 5: Information and support  Provide suitable and timely information to parents/ carers whilst their pre-term baby is on respiratory support | Good evidence that parents/ carers value high quality, relevant and consistent information regarding their baby’s progress.  The information valued is suitable for their needs and tailored to their understanding. | It’s very important to engage with parents/ carers and ensure they are provided with all the necessary information to help them understand the condition and management of their baby and to make informed decisions when it comes to the care of the baby.  Parents value this information and support and it should be consistent across all units. Parents should be empowered to become partners in care. | NICE Guideline NG124  <https://www.nice.org.uk/guidance/ng124> |
| 41 | SCM4 | Additional developmental areas of emergent practice: Routine access to allied health professionals and psychological support for parents and staff shown to improve outcome |  | Current guidelines and toolkit stipulate ‘access to’ which means a clinician needs to refer and this usually happens when problems have occurred rather than preventative strategies being put in place | Toolkit  NICE standards  NHS England (2015) [E08. Neonatal Critical Care - service specifications](https://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-e/e08/) |
| 42 | SCM5 | Key area for quality improvement 1  Neonatal units to involve parents and carers in the care of their preterm baby who is receiving respiratory support, by adopting a family-centred and developmental care approach. | Evidence demonstrates that babies requiring neonatal care have improved outcomes when their parents or carers are supported to interact with their baby, and are empowered to be partners in providing their baby’s care. The NICE Guideline provides good evidence to demonstrate that benefits of facilitation close interaction promotes bonding, which is key to successful emotional and behavioural development. Key to achieving this is through Family-centred care, where neonatal units work to centre the baby firmly within the context of the family and enables parents to be partners in their baby’s care.  Additionally, the NICE Guideline identifies that developmental care, provided by practitioners who are NIDCAP (Newborn individualised developmental care and assessment program) trained improved cognitive development in babies born at less than 27 weeks – a particularly vulnerable group of babies with generally poorer developmental outcomes compared to babies born at later-pre-term gestations (see EPICURE and NICE Developmental follow-up of children and young people born preterm) | Despite it long being recognised in key neonatal standards that parental involvement is a central tenant to providing high-quality neonatal care (See NHS & DH (2009) Toolkit for high quality neonatal services) the delivery of family-centred and developmental care is patchy and inconsistent across the country (See Bliss (2017) Families kept apart: barriers to parents’ involvement in their baby’s hospital care).  Additionally, the importance of embedding Family-centred care and partnership working with families has been recognised as a national priority within the NHS Long-Term Plan with section 3.21 stating as a recommendation that ‘’we will enhance the experience of families during the worrying period of neonatal critical care. From 2021/2022, care co-ordinators will with families…to support families to become more involved in the care of their baby.(NHS (2019) The NHS Long Term Plan) | Please see the following as examples of audit and quality indicators:  [Bliss Baby Charter](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) – an audit whereby neonatal units are supported to self-assess the levels of family-centred care they provide, and supported to implement changes to improve the quality of this care. Once units are achieving the highest standards of family-centred care, they can obtain accreditation.  [BAPM (2017) Neonatal Service Quality Indicators Standards relating to Structures and Processes support Quality and Patient Safety in Neonatal Services](https://www.bapm.org/sites/default/files/files/NSQI%20FINAL_0.pdf) – extensive set of indicators, including NSQI6-NSQI10 dedicated to parental partnership in care.  [NNAP](https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme) – annual neonatal audit programme. While mainly clinical, does include some data collection on areas which indicate good family centred care including:   * Minimising inappropriate separation of mother and term and late pre-term babies * Speaking with parent within 24 hours of admission   [UNICEF Baby Friendly Initiative Standards](https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/implementing-standards-resources/neonatal-guide-to-the-standards/) |
| 43 | SCM5 | Key area for quality improvement 4  Parents and carers of preterm babies receiving respiratory support to have access to psychological support, delivered by a trained mental health professional. | There is strong evidence that the neonatal environment can have a detrimental impact on the mental health and well-being of parents. Having a baby who is born needing neonatal care is incredibly stressful, and can take a significant toll on parents and carers, both emotionally and practically. A [recent Bliss survey](https://www.bliss.org.uk/news/bliss-releases-new-research-on-mental-health) found 80 per cent of parents felt a neonatal experience had a negative impact on their mental health, and similar findings were echoed by the charity [Leo’s](https://www.leosneonatal.org/neonatal-mental-health-awareness-week/our-findings-survey-results/report-findings/) during Neonatal Mental Health Awareness Week. Academic research has also found a link between a neonatal experience and an increase negative mental health outcomes (See Vigod et al (2010) Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: a systematic review *BJOG)*  Additionally, various national standards for neonatal care recognise the need for parents to have access to a trained mental health professional including the Toolkit (2009) BAPM Service Standards (2011) BAPM Quality Standards (2017) British Psychological Society, Perinatal Service Provision (2016)  Good evidence was also found in the NICE Guideline that parents valued psychological support, and a recommendation was subsequently added that this should be available. | While it has long been recognised that mental health support should be available to parents and carers who have a neonatal experience, access is patchy and inconsistent (See Bliss (2015) Bliss baby report 2015: hanging in the balance) The British Psychological Society (2016) highlights the significant long term societal impact of poor perinatal mental health. The long-term costs of PND, anxiety and psychosis is predicted to be in excess of £8bn a year in the UK, with the majority of the cost being due to adverse impacts on the child.  Perinatal mental health has been identified as a priority within the NHS LTP, including recommendations to extend the availability of specialist perinatal mental health, and introduce support through Maternity Outreach Clinics for women and their partners who experience mental health difficulties, including those that arise due to difficult maternity experiences, including neonatal admission. | [Bliss Baby Charter](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) – provision of psychological support is a mandatory element which units must be achieving to be accredited.  [BAPM (2017) Neonatal Service Quality Indicators Standards relating to Structures and Processes support Quality and Patient Safety in Neonatal Services](https://www.bapm.org/sites/default/files/files/NSQI%20FINAL_0.pdf) |
| 1. **Discharge planning** | | | | | |
| 44 | BAPM | Key area for quality improvement 3  Coordinated Discharge Planning | Discharge of premature babies, especially if they have BPD and are being discharged home on oxygen is a stressful and demanding situation for parents. There is evidence from parent surveys that this aspect of care can be further improved. | The provision of designated Neonatal Discharge Planning Coordinator is variable among neonatal services as highlighted by the recent Neonatal Peer Reviews in England. BAPM’s Neonatal Quality Indicator (NSQI 5) highlights the need for coordinated multidisciplinary discharge planning with parents. This QI has the potential for better preparing parents for care of their baby at home and reduce the risk of readmissions. | Neonatal Service Quality Indicators: Standards relating to structures and processes supporting quality and patient safety in neonatal services (2017). British Association of Perinatal Medicine available at https://www.bapm.org/NSQI. |
| 45 | NHSE NCC CRG | Key area for quality improvement 4 | Parents and carers of babies requiring ongoing respiratory support after hospital discharge should be provided with written information to help them care for their baby safely and confidently at home | Parents and carers of babies requiring ongoing respiratory support after hospital discharge need all the support they can get and often tell us that they wish they were provided with more information leading up to discharge home (GF) |  |
| 46 | NHSE NCC CRG | Key area for quality improvement 5 | Neonatal units should consider appointing a member of staff as a designated neonatal discharge coordinator | As above, but also this provides an opportunity for parents to have a key contact professional who may also continue community-based outreach support, ensuring a seamless discharge pathway (GF) |  |
| 47 | NHSE NCC CRG | Additional developmental areas of emergent practice | Use of specialist respiratory services and long-term children’s ventilation services for those requiring higher levels of respiratory support after hospital discharge or transition to hospital-based children’s services from NICU, with early referral at 40-44 weeks corrected gestational age |  |  |
| 48 | Neonatal Nurses Association (NNA) | Key area for quality improvement 4  Infant basic life support training (IBLS) for parents/carers/families of babies pre discharge from | To support the parents / families of ex-NICU babies to gain a skill to resuscitate their baby, increase parental confidence and reduce anxiety following discharge from hospital | IBLS is not standard across all hospital trusts and may prevent mortality if parents are taught this skill. | <http://www.infantjournal.co.uk/pdf/inf_027_tpr.pdf> |
| 49 | Neonatal Nurses Association (NNA) | Key area for quality improvement 3  Neonatal Transitional Care to support transition from the neonatal unit to home | The transition from hospital to home is a challenge for parents of extreme preterm babies, often including complex medications and oxygen therapy. | Transitional Care facilities are not standard in the UK. Evidence from Badger.net date demonstrates that having a dedicated transitional care reduces the numbers of special care day in NNUs | <https://www.bapm.org/sites/default/files/files/TC%20Framework-20.10.17.pdf> |
| 50 | Neonatal Nurses Association (NNA) | Key area for quality improvement 5  Neonatal Outreach Service 7 days per week | To support transition from hospital to home, facilitate early discharge from hospital and prevent readmission following discharge. | Neonatal outreach is not standard across all hospital trusts and therefore services are not equitable. | <https://www.bapm.org/sites/default/files/files/TC%20Framework-20.10.17.pdf> |
| 51 | SCM3 | Key area for quality improvement 4  Preparing parents / carers for discharge of babies born preterm who will be discharged on respiratory support | As per Professor Baker’s CQC report, this can be variable, and can lead to morbidity | The safe discharge of these babies is dependent on appropriately educated and trained carers. |  |
| 52 | SCM5 | Key area for quality improvement 3  Support parents and carers of preterm babies on respiratory support to be partners in the discharge planning process, and enable them to be with their baby through use of interim discharge placements. | Going home is an incredibly exciting, and scary, time for families. In order for them to feel prepared and confident, it is important that they are fully involved in the discharge planning process – which should begin from admission. This includes parents being involved in development of the discharge plan, and fully involved in any decision making regarding their baby’s discharge. The NICE Guideline showed that parents valued being involved in discharge planning, and having frequent, clear communication and information from clinicians involved in their baby’s care.  For babies who are ready for neonatal discharge while still dependent on respiratory support, the process to discharge home can be lengthy. Some babies will have such complex ongoing care needs that their residences will need extensive modification, and an appropriate care package agreed and in place before it is safe for a baby to be discharged home. This can cause extensive delays, which are disruptive and challenging for babies and their families. In these instances, parents and carers may be unable to stay with the baby for as long as they would like to for extended periods of time – for example, if there is no accommodation on or near the neonatal unit. This also prevents parents and carers from being full-involved in the day-to-day care of their baby which may help them feel more prepared for discharge.  The NICE Guideline, based on research and committee evidence, recommends that services consider ‘’an interim discharge placement to …a hospice, alternative family member’s home…or alternative suitable accommodation where appropriate,’’ if implemented would allow more families to be living together in a more natural, homely environment than the neonatal unit, while the parent or carers usual residence is not ready for the baby to move into. | The evidence, both research based and from committee experience, which informed the NICE recommendations found a lack of standardisation or clear guidelines for discharge planning.  In particular, it was noted that discharge is a key area for equalities considerations. Inequality in social housing and available finances are frequently determining factors in whether a baby is discharged home, as opposed to clinical. This can prolong significantly the length of time parents are unable to be with their baby as much as they want to be, particularly in light of the financial and practical barriers which prevent parents from staying at the neonatal unit (See Bliss (2017) Families kept apart: barriers to parents’ involvement in their baby’s hospital care). | [Bliss Baby Charter](https://www.bliss.org.uk/health-professionals/bliss-baby-charter) – Audits neonatal units on the quality of their discharge planning process. |
| **Additional areas – Delivery units and staffing levels** | | | | | |
| 53 | SCM1 | Key area for quality improvement 5  Delivery at correct unit with correct staffing. | In order to offer the above measures in an equitable way it is imperative that infants are born in the appropriate unit staffed to appropriate staffing levels.  There is clear evidence that high volume (number of infants) units have reduced rates of mortality and BPD. Staffing levels have also been linked to mortality and morbidities in neonatal care. | Delivery of infants in the correct unit and nursing ratio’s are still not optimal see evidence in next column and NNAP report. | The effects of a one-to-one nurse-to-patient ratio on the mortality rate in neonatal intensive care: a retrospective, longitudinal, population-based study-  <https://fn.bmj.com/content/fetalneonatal/101/3/F195.full.pdf>  The effects of designation and volume of neonatal care on mortality and morbidity outcomes of very preterm infants in England: retrospective population-based cohort study <https://bmjopen.bmj.com/content/4/7/e004856>  National neonatal Audit Programme: <https://nnap.rcpch.ac.uk/network-data.aspx>  <https://www.rcpch.ac.uk/sites/default/files/2018-10/2018_nnap_report_on_2017_data_final_v8.pdf> |
| **Additional areas – training** | | | | | |
| 54 | Resuscitation Council (UK) | Healthcare providers trained in Newborn Life Support | Effective early stabilisation including labour ward stabilisation reduces mortality and morbidity.  Many of the risk factors for bronchopulmonary dysplasia overlap with characteristics of babies who have a greater need for stabilisation at birth and skilled early care (e.g. lower gestational age / birthweight, small for gestational age, need for ventilation, need for cardiopulmonary resuscitation)  Recognition of the need for appropriate early respiratory support underpins good early respiratory care and influences later respiratory outcomes. Newborn Life Support training teaches healthcare providers the necessary skills to achieve this. | Most preterm babies do not require resuscitation (which was outside this guideline’s scope) but do require stabilisation at birth (included in this guidelines scope).  Many clinical staff (medical, nursing, midwifery) who attend deliveries have either never had formal, quality-assured neonatal resuscitation training or assessment, or their previous neonatal resuscitation accreditation has lapsed.  Neonatal Life Support (NLS) Courses teach stabilisation as well as resuscitation skills. This guideline states in Evidence Review B (page 22) "The committee also highlighted that the Newborn Life Support guidelines should also be followed in the minutes after birth". Formal NLS training is the optimal way of ensuring that this happens. | The Scottish Chief Medical Officer and Chief Nursing Officer recommended in December 2018 that all obstetricians and clinically practising midwives should complete the Resuscitation Council (UK) Newborn Life Support course or the Scottish neonatal resuscitation course every 4 years and have annual local updates [McQueen F, Calderwood C CMO (2018) 18 - Core mandatory update training for midwives and obstetricians. Edinburgh, Chief Medical Officer Directorate, Scottish Government, 2018: at: <https://www.sehd.scot.nhs.uk/cmo/CMO(2018)18.pdf>.]  The Resuscitation Council (UK) is writing to the Chief Medical and Nursing officers of England, Wales and Northern Ireland to seek similar recommendations. The Royal College of Obstetrics and Gynaecology (RCOG) has agreed to include basic neonatal resuscitation training in their mandatory core training.  The RC (UK) has corresponded with the Nursing and Midwifery Council over their Future Midwife consultation to seek to have neonatal resuscitation training included.  The RC (UK) is aware of issues with Trusts not funding training and will be seeking data on the proportion of staff attending deliveries who have current NLS training accreditation.  This quality improvement area would support other national quality improvement drives such as the:   * RCOG Each Baby Counts [Royal College of Obstetricians & Gynaecologists. Each Baby Counts. 2015. at: <https://www.rcog.org.uk/en/guidelines-research-services/audit-quality-improvement/each-baby-counts/ebc-2015-report/>). P. 74.National Maternity Review.] * NHS Better Births [Better Births: Improving outcomes of maternity services in England: A Five Year Forward View for maternity care. 2016. (Accessed 8 April 2019, at <https://www.england.nhs.uk/wp-content/uploads/2016/02/national-maternity-review-report.pdf>). PP. 10, 42-43, 48. NHS England.] * Maternal and Neonatal safety collaborative [NHS Improvement. Maternal and neonatal health safety collaborative. 2019. at:   <https://improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/>). And NHS Improvement. Driver diagram and change package. Improve the early recognition and management of deterioration of either mother or baby during or soon after birth. at: <https://improvement.nhs.uk/documents/3598/20190308_Deterioration_v1.2.pdf> Slide 9.]   * the NHS long term plan [NHS England. NHS Long Term Plan. 2019. at: <https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/>. pp 47, 49.]   There is evidence that structured resuscitation training through national, quality-assured, evidence-based training saves lives in other areas of Resuscitation science [Lockey A, Lin Y, Cheng A. Impact of adult cardiac life support course participation on patient outcomes – A systematic review and meta-analysis. Resuscitation <https://doi.org/10.1016/j.resuscitation.2018.05.034>], so it is logical to conclude that NLS training may deliver similar quality improvements. |
| **Additional areas – perinatal care** | | | | | |
| 55 | Resuscitation Council (UK) | Additional developmental areas of emergent practice | Delayed cord clamping (DCC) for at least 60 seconds is an evolving area of practice.  This is important as evidence  [Fogarty M et al. Delayed vs early umbilical cord clamping for preterm infants: a systematic review and meta-analysis. AM J Obstet Gynecol 2018 Jan;218(1):1-18. doi: 10.1016/j.ajog.2017.10.231. Epub 2017 Oct 30.] shows that DCC results in better cardiovascular stability, higher blood pressure and higher haemoglobin at birth, and reduced need for blood transfusions. Some evidence shows reduced intraventricular haemorrhage and periventricular leucomalacia. Improved early stability may reduce the need for respiratory support and impact on longer term respiratory outcomes. | Delayed cord clamping is variably practised around the UK. Well, term babies commonly receive delayed cord clamping but among preterm babies it is less common, especially for extremely preterm or extremely low-birth-weight babies. The evidence supports DCC for babies needing stabilisation at birth but it less clear where a baby needs resuscitation. Studies have demonstrated that DCC can be feasible for extremely preterm babies requiring stabilisation.  There is scope for quality improvement in the delivery of DCC for preterm babies needing stabilisation.  However, other factors such as maintenance of normothermia should be monitored if introduced nationally in preterm deliveries. | The 2019 European consensus guidelines on the management of respiratory distress syndrome say “Delay clamping the umbilical cord for at least 60s to promote placento-fetal transfusion.”  International Resuscitation guidelines5 say delaying umbilical cord clamping for at least 1 min is recommended for newborn infants not requiring resuscitation. A similar delay should be applied to preterm babies not requiring immediate resuscitation after birth. |
| 56 | Royal College of Paediatrics and Child Health | Delivering two doses of antenatal steroids to all mothers with threatened preterm labour, who are in hospital for 24 hours of more prior to delivery. | The benefits of antenatal steroids to the extremely preterm infants are well known, and so if there is an opportunity to give steroids, then that opportunity should be taken; especially in instances of Caesarean section, not in labour. | Would require multidisciplinary working and balancing of priorities to be achieved in all cases. This would be a straightforward outcome to measure. | NICE Guideline 25: Preterm Labour and Birth |
| 57 | SCM1 | Additional developmental areas of emergent practice  Perinatal package for preterm infants <34 weeks gestation (Infants less than 27 weeks should be born in level 3 unit, MgPO4 should be given to mothers delivering infants <30 weeks gestation, antenatal steroids to mothers delivering infants < 34 weeks gestation, Delayed cord clamping, Temperature (36.5-37.5), Caffeine, breast milk before 24 hours of life). |  |  |  |
| 58 | SCM1 | Key area for quality improvement 4  Breast Milk expression support, use of promotion package to support early breast milk expression and reduce the use of Formula milk. | The NICE guideline identified Feeding with formula milk (exclusively or in addition to breast milk) as a risk factor for BPD, therefore promoting breast milk expression could be used as a key driver to improve preterm infants respiratory outcome. | Rates of breast milk expression and use of formula milk differ substantially throughout the uk-see National Neonatal Audit Programme data. Provision of Support for breast feeding expression and promotion packages/Quality improvement programmes have been shown to improve milk volumes obtained, increase rates of exclusive breast milk use and rates of discharging babies exclusively breast milk feeding, this will in turn promote better respiratory outcomes. | See Promoting expression leaflets:  Top tips for expressing, Expressing log, Golden Drops poster.  A Quality Improvement Project to Increase Breast Milk Use in Very Low Birth Weight Infants  <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3507251/>  A quality initiative to improve exclusive breast milk feeding in preterm neonates.  <https://www.ncbi.nlm.nih.gov/pubmed/28233253>  Human milk for the premature infant <https://www.ncbi.nlm.nih.gov/pubmed/23178065>  A Systematic Review and Meta-Analysis of Human Milk Feeding and Morbidity in Very Low Birth Weight Infants  <https://www.ncbi.nlm.nih.gov/pubmed/29857555>  National neonatal Audit Programme:  <https://nnap.rcpch.ac.uk/network-data.aspx>  <https://www.rcpch.ac.uk/sites/default/files/2018-10/2018_nnap_report_on_2017_data_final_v8.pdf> |
| 59 | SCM4 | Key area for quality improvement 4 breast milk at discharge | Breast milk improves outcome at all stages of childhood and reduces incidence of NEC which although relatively rare has a high mortality rate | Despite numerous programmes and strategies, improvements can still be made | UNICEF baby friendly  NHS long term plan |
| **Additional areas – reducing infection** | | | | | |
| 60 | SCM4 | Key area for quality improvement 2 reducing infection | Preterm infants are at risk of HAI due to number of lines, interventions etc  Confirmed infection increases risk of mortality and morbidity | There is variance across the country in methods of reporting. There has been a significant reduction in neonatal infection since implementation of sepsis bundles however still room for improvement through more consistency of standards | NNAP data  VON data |
| **Additional areas – 2 year follow up** | | | | | |
| 61 | SCM4 | Key area for quality improvement 5 2 year follow up | To assess outcome and inform future practice; to enable early intervention if required | There is still inconsistency in how robust this assessment is carried out and reported | NNAP report |
| **Additional areas – New guidance / research** | | | | | |
| 62 | Association of Paediatric Chartered Physiotherapists (APCP) Neonatal Special Interest Group | Key area for quality improvement 1  Reducing the risk of Ventilator Associated Pneumonia (VAP) | There is increasing evidence that VAP contributes to significant morbidity in NNUs. The issue of antibiotic stewardship is also very topical in this arena.  The use of bundles to reduce the risk are becoming more common place, although their implementation is inconsistent. | At present there is a lack of consistency to our approach nationally to firstly recognise the impact VAP has and secondly put in place mechanisms to reduce the risk. | A literature search on VAP reveals much interest in this area, historically in adults and paediatrics, but in recent years an interest in Neonatal units too. There is some evidence that suggests implementing bundles to reduce the risk of VAP can reduce ventilator-days and antibiotic use. It has the potential not only to improve the outcome of individuals, but also to reduce the financial burden of treating a health-care acquired infection. Unfortunately data is hard to collect as diagnostic criteria are variable. I do not have access to data but this would make for an important study to benchmark the incidence of VAP on NICUs in England. The following are helpful: Ventilator-Associated Pneumonia. Thomas A. Hooven, Richard A. Polin, in The Newborn Lung (Third Edition), 2019 <https://www.sciencedirect.com/topics/medicine-and-dentistry/ventilator-associated-pneumonia>  Adv Neonatal Care. 2016 Jun;16(3):178-90. doi: 10.1097/ANC.0000000000000276. Applying Adult Ventilator-associated Pneumonia Bundle Evidence to the Ventilated Neonate. Weber CD1.<https://www.ncbi.nlm.nih.gov/pubmed/27195470> |
| 63 | Neonatal Network Northern Ireland | Further guidance on eligible gestational age (both upper and lower limit) for minimally invasive ventilation. |  |  |  |
| 64 | Royal College of Speech and Language Therapists | **Key area for quality improvement 2:** Improving the oral feeding experience of preterm infants who need respiratory support (either nCPAP or HFNC). | Both nCPAP (nasal continuous positive airway pressure) and HFNC (high flow nasal cannula oxygen) can impact on aerodigestive reflexes, specifically sensory motor learning and characteristics, which can delay the introduction of oral feeding, and reduce oral feeding efficiency later *(Jadcherla et al, 2016).* There is limited research that recognises the most supportive early oral feeding pathway for preterm infants who have respiratory problems, and consequently, different methodologies in clinical practice have emerged *(Murphy et al, 2019).* | The NICE Guidelines for Developmental Follow Up of Infants Born Pre-Term highlight that feeding problems can persist into early development.  In addition, practitioners have concerns that nCPAP, unlike HFNC may force open the epiglottis and increases the possible risk of aspiration during swallowing *(Diblasi et al, 2009).*  We are aware that the evidence comparing preterm infant development towards full oral feeding when on nasal CPAP compared with HFNC is variable, with controlled studies reporting no significant differences between the two methods when introducing oral feeding (Glakin et al, 2017; Kugelman et al, 2015; Collins et al, 2013; Campbell et al, 2006). It remains essential that introducing oral feeding for infants who require different forms of respiratory support is researched further, with moves towards better oral feeding protocols. |  |
| **No comments** | | | | | |
| 65 | Neonatal and Paediatric Pharmacists Group | The NPPG Committee did not have any comments on the quality standard to submit. We agreed that we would comment on the published QS during the consultation phase in the Autumn. |  |  |  |
| 66 | Royal College of Nursing | This is to inform you that the Royal College of Nursing have no comments to submit to inform on the above topic engagement at this present time. We look forward to participating in the next stage of development. |  |  |  |

1. [National Neonatal Audit Programme](https://nnap.rcpch.ac.uk/default.aspx) 2018, Royal College of Paediatrics and Child Health [↑](#footnote-ref-1)
2. [NHS Website](https://www.nhs.uk/conditions/neonatal-respiratory-distress-syndrome/) [↑](#footnote-ref-2)
3. [Neonatal Critical Care service specifications](https://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-e/e08/), NHS England [↑](#footnote-ref-3)
4. At the time of publication (April 2019), some brands of surfactant did not have a UK marketing

   authorisation for minimally invasive administration. The prescriber should follow relevant

   professional guidance, taking full responsibility for the decision. Informed consent should be

   obtained and documented. See the General Medical Council's Prescribing guidance: prescribing

   unlicensed medicines for further information. [↑](#footnote-ref-4)
5. At the time of publication (April 2019), inhaled nitric oxide did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information. [↑](#footnote-ref-5)
6. At the time of publication (April 2019), inhaled nitric oxide did not have a UK marketing authorisation for this indication in babies less than 34 weeks' gestation. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information. [↑](#footnote-ref-6)
7. [National Neonatal Audit Programme](https://nnap.rcpch.ac.uk/default.aspx) (2018), Royal College of Paediatrics and Child Health [↑](#footnote-ref-7)
8. Early management of neonatal respiratory distress syndrome – a survey among UK neonatal intensive care units (2016) G. Hendriks, R. Stephenson, P.K. Yajamanyam [↑](#footnote-ref-8)
9. [Survey on the use and weaning of non-invasive ventilation among UK tertiary neonatal units](https://erj.ersjournals.com/content/48/suppl_60/PA1295) (2016), Sanja Zivanovic, Ilia Bresesti, Charles Roehr [↑](#footnote-ref-9)
10. [Marked variation in delivery room management in very preterm infants](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3828483/) (2013), Yoginder Singh and Sam Oddie [↑](#footnote-ref-10)
11. UK survey of less invasive surfactant administration (2019), Jeffreys E, Hunt K, Dassios T, et al. *Arch Dis Child Fetal Neonatal Ed Epub doi:10.1136/archdischild-2018-316466* [↑](#footnote-ref-11)
12. Early management of neonatal respiratory distress syndrome – a survey among UK neonatal intensive care units (2016) G. Hendriks, R. Stephenson, P.K. Yajamanyam [↑](#footnote-ref-12)
13. Although this use is common in UK clinical practice, at the time of publication (April 2019), dexamethasone did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information [↑](#footnote-ref-13)
14. Current UK practices in steroid treatment of chronic lung disease (2015), Job S, Clarke P. *Arch Dis Child Fetal Neonatal Ed 2015;100:F371.* [↑](#footnote-ref-14)
15. Survey of management of patent ductus arteriosus in neonatal units across England (2013), Kulkarni A, Richards J, Duffy D. *Arch Dis Child Fetal Neonatal Ed 2013;98:F465–F466.* [↑](#footnote-ref-15)
16. Oxygen saturation target monitoring in preterm babies: a survey of level 3 units in United Kingdom (2014), R Sutton, M Raptaki, E Wilby, A Mahaveer *10.1136/archdischild-2014-306237.125* [↑](#footnote-ref-16)
17. [National Neonatal Audit Programme](https://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme) (2018), Royal College of Paediatrics and Child Health [↑](#footnote-ref-17)
18. [Mental health survey](https://www.bliss.org.uk/news/bliss-releases-new-research-on-mental-health#_ftn2) (2018), Bliss [↑](#footnote-ref-18)
19. [Bliss baby report 2015: hanging in the balance – England](https://www.bliss.org.uk/research-campaigns/campaigns/reports-and-publications) (2015), Bliss [↑](#footnote-ref-19)
20. [Bliss baby report 2015: hanging in the balance – England](https://www.bliss.org.uk/research-campaigns/campaigns/reports-and-publications), 2015 Bliss [↑](#footnote-ref-20)