

UHL Neonatal Unit Guideline: High Flow Nasal Cannula (HFNC) oxygen

1. Introduction and Who Guideline applies to

This guideline is aimed at all healthcare professionals involved in the care of infants within the neonatal service.

Aim

This guideline aims to provide a clear and consistent approach to the use of high flow nasal cannula (HFNC) in babies cared for within the Leicester Neonatal Service

Background

HFNC therapy has been increasing in use and popularity throughout the world in recent years. However, there is still controversy about its use; including when to initiate this therapy, which patients benefit, how to wean and when to stop the therapy.

Compared with low flow nasal cannula oxygen, HFNC allows heated and humidified oxygen to be delivered at higher flow rates; which in turn confers delivery of a positive end expiratory pressure (PEEP), similar to that seen when using conventional CPAP (continuous positive airway pressure) [1].

HFNC therapy is similar to CPAP in that it pushes a mix of air and oxygen into the nasopharynx, but unlike CPAP it provides no measure of the PEEP (positive end expiratory pressure) it is delivering. This has led to concerns regarding excessive pressure delivery causing barotrauma, pneumothorax or other air leaks (pneumocephalus, emphysema) [2], mucosal irritation and gastric distension [3].

HFNC has a number of perceived benefits including; reduced nasal trauma, infant comfort, ease of use, parental and nursing preference and the potential to establish oral feeding faster than using CPAP [4].

There has been a welcome increase in research into the use of HFNC in the preterm population to try and address some of the controversies surrounding its use, culminating in more recent meta-analysis [3,5] and consensus statements [6] to aid clinicians in deciding when and how to implement the use of HFNC therapy.

Studies have reported no difference in the rates of bronchopulmonary dysplasia (BPD) or death when comparing HFNC to CPAP [7,8].

Studies have shown that the use of HFNC is not associated with any higher risks of pneumothorax, air leaks, mucosal irritation or abdominal complications, assuming it is used correctly and is heated and humidified [3,5,7].

Literature suggests that the PEEP generated by HFNC changes depending on flow rates and patient demographics/characteristics. Higher flow rates generate a higher PEEP, and higher

PEEP is generated in lower birth weights and gestations. PEEP generation is also influenced by the infant having mouth closed or open and the nare:prong ratio^[1,6].

When considering the appropriate situations to use high flow, 2 scenarios have been postulated:

1. Primary respiratory support at birth
2. Respiratory support following extubation

These studies tend to concentrate on infants between 26-32 weeks of gestation, with very few studies looking at those born at the extremes of prematurity.

For primary support at birth, the majority of evidence suggests that CPAP remains superior to HFNC in all scenarios; with infants commenced on HFNC having high rates of treatment failure (needing rescue CPAP or intubation) compared with those commenced on CPAP at birth^[3-6,8-10].

For the scenario of post-extubation respiratory support the recent data from meta-analysis suggests that HFNC is non-inferior to CPAP for babies born at or above 28 weeks of gestation, meaning it is not worse than CPAP, but has not been proven to be better^[3,5,9]. Therefore, some centres may choose to utilise HFNC post-extubation in those babies >28weeks if they feel the extra benefits outweigh the potential associated risks of not knowing how much PEEP is being generated.

HFNC use in extremely preterm babies (<28 weeks) has not been studied in detail, and those studies which have included extremely preterm babies suggest that CPAP is the superior mode of non-invasive support both primarily and post-extubation^[9].

Meta-analysis suggests that the use of HFNC is associated with significantly less nasal trauma compared to CPAP^[3,9], and studies suggest it is more acceptable to parents and nursing staff with regard to skin-to-skin care, infant comfort and increased parent-child interaction, particularly in older and more stable infants^[4]. However, the data around oral feeding is less clear with conflicting outcomes as to whether feeding is established quicker when using HFNC^[11,12].

There is little evidence to guide the weaning of patients from CPAP onto HFNC, or indeed how to wean the HFNC therapy^[6, 13]. However, evidence suggests that babies on HFNC are weaned more slowly from their support and oxygen compared to those on CPAP. There does not appear to be an increase in rates of BPD despite this^[9].

Taking all recent evidence into account, this guideline supports the safe use of HFNC, whilst acknowledging the ongoing need for more conclusive evidence, particularly surrounding extremely preterm babies and post-extubation use.

Who does this guideline apply to?

HFNC may be used in babies >28 weeks of gestation AND >1kg weight who are ready to wean from established nCPAP.

HFNC should *not* be used in babies below this gestation or weight unless this decision is taken by the attending consultant.

HFNC should not be used as primary support at birth or as post-extubation support.

Related documents:

[Continuous Positive Airway Pressure CPAP, BIPAP, SIPPV in Neonates UHL Neonatal Guideline](#) Trust ref: C17/2023

[Continuous Positive Airway Pressure \(NCPAP\) Nursing care UHL Neonatal Guideline](#) Trust ref: C35/2015

2. Putting a baby on high flow nasal cannula

Before a baby can be put on HFNC suggested criteria should be routinely met:

The baby should be established on CPAP in less than 40% oxygen with acceptable blood gas and not having apnoeas.

The reason for changing to HFNC must be clearly documented and may include:

Baby is deemed ready to wean from nCPAP, but still requires some respiratory support greater than that offered by low flow nasal cannula oxygen
Problems related to CPAP such as significant nasal trauma, discomfort.

Nasal cannulae should fit comfortably in the nares and not occlude them by more than 50%.

A maximum initial flow rate of 6-8L/min can be used with an oxygen concentration equivalent to that used whilst on CPAP.

2.1 Care of patients on HFNC

It is essential to record the patient's clinical condition whilst on HFNC and continued consideration should be given to the adequacy of respiratory support. The following are indicators that support is adequate:

- Work of breathing and frequency of desaturation / bradycardias have not increased
- Oxygen concentration has not increased by more than 20% compared to the oxygen requirement on CPAP, or when first commenced on HFNC.
- Respiratory parameters of blood gases remain in an acceptable range
- Metabolic compensation of any respiratory acidosis is sustained

These factors should be considered in all patients on HFNC, but in patients who have recently been put on HFNC or are having the flow rates weaned they are of particular importance. Deviation from the above requires medical assessment.

2.2 Weaning of HFNC

If clinical assessment shows that the patient's respiratory function is adequately supported, HFNC can be weaned, and should be in 1L increments every 12-48 hours depending on the baby's clinical condition. Occasionally, smaller increments may be needed.

Consider weaning to low flow nasal cannula when flow is 4L/min.

If a decision is taken to continue weaning below this, convert to low flow nasal cannula when flow reaches 2L/min.

3. Education and Training

None

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Criteria for HFNC are met (100%)	Audit of records	Neonatal Consultant		Local audit group
The reason for changing to HFNC is documented (100%)	Audit of records	Neonatal Consultant		Local audit group
The appropriate size of nasal cannulae is documented (100%)	Audit of records	Neonatal Consultant		Local audit group

5. Supporting References

1. Liew Z, et al. Physiological effects of high-flow nasal cannula therapy in preterm infants. *Arch Dis Child Fetal Neonatal Ed* 2019;0:F1–F7. doi:10.1136/archdischild-2018-316773
2. Hegde S, Prodhan P. Serious air leak syndrome complicating high-flow nasal cannula therapy: a report of 3 cases. *Pediatrics* 2013;131(3):e939-44.
3. Wilkinson D, Andersen C, O'Donnell CPF, De Paoli AG, Manley BJ. High flow nasal cannula for respiratory support in preterm infants. *Cochrane Database of Systematic Reviews* 2016, Issue 2. Art. No.: CD006405. DOI:10.1002/14651858.CD006405.pub3.
4. Roberts C, Manley B, Dawson J, Davis P. Nursing perceptions of high-flow nasal cannulae treatment for very preterm infants. *Journal of Paediatrics and Child Health* 2014, doi:10.1111/jpc.12636.
5. Kotecha SJ, Adappa R, Gupta N, Watkins J, Kotecha S, Chakraborty M. Safety and Efficacy of High-Flow Nasal Cannula Therapy in Preterm Infants: A Meta-analysis. *Pediatrics* 2015; 136(3):542-553. DOI: 10.1542/peds.2015-0738
6. Yoder BA, Manley B, Collins C, Ives K, Kugelman A, Lavizzari A, McQueen M. Consensus approach to nasal high-flow therapy in neonates. *Journal of Perinatology* (2017) 00, 1–5
7. Manley B. Nasal High-Flow Therapy for Preterm Infants Review of Neonatal Trial Data. *Clin Perinatol* 43 (2016) 673–691 <http://dx.doi.org/10.1016/j.clp.2016.07.005>
8. Roberts C, Owen L, Manley B *et al.* Nasal High-Flow Therapy for Primary Respiratory Support in Preterm Infants. *N Engl J Med* 2016;375:1142-51. DOI: 10.1056/NEJMoa1603694
9. Hodgson K, Manley B. Is Nasal High Flow Inferior to Continuous Positive Airway Pressure for Neonates? *Clin Perinatol* 46 (2019) 537–551 <https://doi.org/10.1016/j.clp.2019.05.005>

10. Demirel G, Vatansever B, Tastekin A. High Flow Nasal Cannula versus Nasal Continuous Positive Airway Pressure for Primary Respiratory Support in Preterm Infants: A Prospective Randomized Study. *Am J Perinatol*. DOI <https://doi.org/10.1055/s-0039-1696673>.

11. Leibel S, Castro M, McBride T, Hassall K, Sarmiento K, Ye X, Shah V. Comparison of Continuous positive airway pressure versus High flow nasal cannula for Oral feeding Preterm infants (CHOMP): randomized pilot study. *The Journal of Maternal-Fetal & Neonatal Medicine* 2020, DOI: 10.1080/14767058.2020.1735339

12. Glackin SJ, et al. High flow nasal cannula versus NCPAP, duration to full oral feeds in preterm infants: a randomised controlled trial. *Arch Dis Child Fetal Neonatal Ed* 2016;0:F1–F4. doi:10.1136/archdischild-2016-311388

13. Soonsawad S, Tongsaewang N, Nuntnarumit P. Heated Humidified High-Flow Nasal Cannula for Weaning from Continuous Positive Airway Pressure in Preterm Infants: A Randomized Controlled Trial. *Neonatology* 2016;110:204–209 DOI: 10.1159/000446063

6. Key Words

Positive end expiratory pressure (PEEP), Continuous positive airway pressure (CPAP), Post Extubation, Respiratory

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs. As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS			
Guideline Lead (Name and Title) Original authors; Andrea Warnock, Gareth Penman, Elaine Boyle Guideline lead: S Mittal - Consultant		Executive Lead Chief Medical Officer	
Details of Changes made during review:			
Date	Issue Number	Reviewed By	Description Of Changes (If Any)
5/5/2015 2/6/2015	1	Neonatal Guidelines Meeting Neonatal Governance Meeting	new guideline approved
Sept 2015	1	REM - guidelines lead	Minor editorial changes
Aug 2018	2	Neonatal Guidelines and Governance Meetings	1 year extension
July 2020	3	Neonatal Guidelines Meeting Neonatal Governance Meeting	

<p>May – July 2023</p>	<p>4</p>	<p>Neonatal Guidelines Meeting Neonatal Governance Meeting Women’s Quality & Safety Board</p>	<p>Amended criteria from- The baby should be established on CPAP in less than 40% oxygen with blood gas showing a pH above 7.25, a pCO₂ below 10kPa and not having apnoeas to – ‘The baby should be established on CPAP in less than 40% oxygen with acceptable blood gas and not having apnoeas.’</p> <p>Removed pH and pCO₂ range specification as indicators that HFNC is providing adequate support.</p>
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