



GUIDELINE	
Humidified High Flow Nasal Cannula Therapy	
Scope (Staff):	Medical, Nursing
Scope (Area):	PMH / PCH Emergency Department & Inpatient Wards

This document should be read in conjunction with this [DISCLAIMER](#)

Aim

This guideline describes the indications, management and procedure for the use of Humidified High Flow Nasal Cannula therapy (HHFNC) at PMH / PCH.

Definition

HHFNC: Humidified High Flow Nasal Cannula therapy is the delivery of heated humidified air and / or oxygen via nasal prongs at a flow rate of 2L/kg/min for children up to 25kg. Maximum flows for children above 25kg are titrated according to age and weight (see table on [page 4](#)).

Background

HHFNC is a mode of non-invasive respiratory support for children with acute respiratory distress. The physiological effects of HHFNC are thought to include:^{1,2,3}

- Improved pulmonary compliance and decrease work of breathing with high gas flows which aids pharyngeal dead space washout and decreased nasopharyngeal resistance.
- Improved gas exchange and ventilation by assisting the opening of distal airways and alveoli.
- Reduced mucosal resistance and increased tolerance to therapy through delivery of warmed humidified air / oxygen.

Note: Children who are palliative or have chronic respiratory conditions may have management plans that differ from these guidelines. Refer to individual medical management plan for these patients.

Risk

Inappropriate use of HHFNC therapy and inadequate monitoring, management and equipment use can compromise patient safety and result in serious adverse outcomes.

Key Points

- HHFNC requires a medical order and should only be initiated by clinicians with knowledge and experience in its use.
- The decision to commence HHFNC must be made in consultation with the child's treating Consultant.

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- The Hospital Clinical Manager (HCM) and ward nursing team must be consulted prior to ward allocation to ensure nursing staff with appropriate knowledge and skills are available to provide safe care.
- Outside normal business hours, the STARs team should also be notified of HHFNC therapy initiation.
- The medical order must be documented in the patient medical record and include parameters for:
 - Gas flow rate
 - Fraction of Inspired Oxygen(FiO_2)
 - Target oxygen saturation (SpO_2)
 - If modifications are required this must be documented on the CEWT chart by the treating Consultant or delegate and reviewed daily.
- **The medical team / STARs team (after-hours) must review the patient within 2 hours of initiating HHFNC therapy.**⁴
- PCC consult / review should be sought for any patient who:
 - Has severe respiratory distress and / or are rapidly deteriorating
 - Is requiring $FiO_2 \geq 50\%$ oxygen to maintain $SpO_2 > 92\%$
 - Does not exhibit signs of achieving clinical goals within 2 hours of commencement of HHFNC therapy.
- All patients commenced on HHFNC require continuous pulse-oximetry and hourly respiratory observations at a minimum.

Indications for HHFNC

- Acute respiratory distress from bronchiolitis: consider use if hypoxaemia and moderate to severe respiratory distress despite standard flow oxygen via nasal prongs or Hudson oxygen mask.^{3, 5, 6}
- Acute respiratory failure: In addition to bronchiolitis, HHFNC may be considered in infants and children with acute respiratory failure from other causes; however there is currently little data to make evidence based recommendations for its use in conditions other than bronchiolitis.^{7, 8}
- Weaning therapy from mask non-invasive ventilation, or bubble CPAP in neonates / infants.

Contraindications

- Blocked nasal airway e.g. choanal atresia
- Trauma or surgery to nasopharynx
- Pneumothorax
- Base of skull fractures

Precautions

- The widespread usage of HHFNC has occurred in the absence of a strong evidence base. This therapy should be used with caution and with an awareness of potential side effects.⁹
- Flows >2 L/min may cause unpredictable positive end expiratory pressure (PEEP) and should be used with caution in neonates.¹⁰⁻¹²

Complications

- Gastric distension
- Pressure injury / mucosal injury
- Blocked nasal cannula due to secretions
- Air leak resulting in pneumothorax and / or pneumomediastinum¹³

Equipment required for delivering HHFNC

- **Nasal Cannula:**
 - Optiflow[®] *Junior 2* for neonates, infants and children up to 12kg and flows 2-25L/min.
 - Optiflow[®] nasal cannula for flows greater than 25L/min, up to maximum of 60L/min.
 - Nasal cannula should not fill more than 50% of the patients' nostrils – *under no circumstances should they create a seal or occlude more than 80% of the nostrils.*
- **Humidifier:** F&P MR850 Humidifier and blender system:
 - Refer to the Clinical Practice Manual for [HHFNC MR850 and Air / Oxygen Blender Equipment Set Up Procedure](#).
 - MR850 requires connection to a power source therefore humidification cannot be delivered during transport. High flow air / oxygen can be maintained by use of portable oxygen cylinder/s. See transport information below and the equipment set up procedure.

Commencing HHFNC Therapy

- Capillary blood gases are not routinely required but may be considered at commencement and after two hours of treatment.
- Nasogastric tubes do not need to be inserted routinely but may be considered for gastric decompression in:
 - Infants and children less than 3 years prior to initiation and for the duration of therapy. NG tube should be aspirated 4 hourly for air.

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- Children > 3 years - if distension is an issue whilst on HHFNC therapy or child is not responding to treatment.

- **Flow rate: Recommended as follows:**

Child's weight	Recommended Flow rate	Max Flow rate	Circuit required
0-12 kg	2 L/kg/min	Max 25 L/min	Paediatric circuit
13-15 kg	2 L/kg/min*	Max 30L/min	Adult circuit
16-30 kg	35 L/min*	Max 40 L/min	Adult circuit
31-50 kg	40 L/min*	Max 50 L/min	Adult circuit
>50 kg	50 L/min*	Max 50 L/min	Adult circuit

* To improve tolerance, increase flow to this rate over 2 minutes

- FiO₂: Adjust FiO₂ to maintain target oxygen saturations (SpO₂ >92%).
- Humidification: the humidifier should be set to invasive mode – see [HHFNC MR850 and Air / Oxygen Blender Equipment Set Up Procedure](#).

Patient Monitoring & Documentation

- Continuous pulse oximetry for the duration of therapy.
 - Consider cardiorespiratory / apnoea monitoring if patient has increased risk factors and / or severe respiratory distress – on medical direction.
- Hourly vital signs (at a minimum) recorded on CEWT chart:
 - Respiratory rate
 - Respiratory effort
 - Heart rate
 - SpO₂
 - FiO₂ as follows:

Age ≥ 5years	Score = 3	O ₂ ≥ 60%
All ages	Score = 2	O ₂ ≥ 50%
	Score = 1	O ₂ ≥ 40%
	Score = 0	O ₂ < 40%

- Temperature 4 hourly and PRN
- Perform hourly system checks of the following and record on Ventilation Chart MR824.04:
 - Gas flow rate

- Humidifier temperature
- Water level in humidifier chamber
- Circuit tubing and nasal cannula for signs of blockage / condensation
- Skin integrity at nares
- Abdominal distension: aspirate NG tube, if in situ, 4 hourly or as clinically indicated.
- Gentle nasal suctioning as required ¹⁰
- **The patient must have a medical review by primary team or STARS team within two hours of initiating therapy.**

Feeding

- The decision to feed should be based on the severity of respiratory distress rather than the need for HHFNC.
- If stable/improved / respiratory effort/ work of breathing within normal limits after two hours on HHFNC assess child / infant's ability to feed orally or via NG tube.
- If the child / infant remains unstable or too unwell to tolerate oral intake consider continuous NG feeds or IV hydration after medical review.
- Consider reducing flow to 1L/kg/min during oral or bolus NG feeding.

Inhaled Medications

- Delivery of inhaled medications to the lungs is significantly reduced whilst nasal cannula and therapy in progress, therefore HHFNC should be temporarily ceased for administration of nebulisers or MDI inhalers.
- There is insufficient evidence to recommend the administration of nebulised medication via the HHFNC circuit and is not recommended.

Escalation

- If there is no clinical improvement within two hours of commencing HHFNC^{4, 5} further escalation of treatment may be required.
- Initiate earlier medical review and PCC consult if there is:
 - No response to treatment as evidenced by no improvement in work of breathing and persistently high FiO₂ requirement
 - Persisting hypoxaemia despite high FiO₂ and gas flow
 - Increasing respiratory distress
 - Frequent apnoea or bradycardia

- A rapid deterioration of SpO₂ or marked increase in work of breathing (need to exclude pneumothorax)
- Increasing CEWT scores

Transferring patients

Caution: Ceasing HHFNC for transfer, places the patient at risk for clinical deterioration during the transfer

- HHFNC must not be ceased during procedures (e.g. medical imaging) without prior consultation with the treating consultant and a medical officer in attendance.
- A Registered Nurse must accompany patients between clinical areas. The need for a medical escort will be determined by the treating physician according to patient's clinical status and ventilation requirements during transfer.
- Patient must remain fully monitored.
- High flows without humidification are usually tolerated for short periods. Where possible, transfer patient with equipment in situ (minus the blender), with humidifier connected to portable oxygen. Please refer to the equipment set up procedure.
 - Consider reducing the oxygen flow to 1L/kg/min up to a maximum of 30L/min during transfer.
 - A spare oxygen cylinder (> 75% full) will be required for the transfer.
- Ensure the receiving ward has all the required equipment ready for use immediately upon arrival.
- A full ISOBAR clinical handover must be provided when transferring patients between clinical areas in accordance with PMH [Clinical Handover](#) policies and procedures.
- Refer also to the [Intrahospital and Interhospital transfer policies](#).

Weaning HHFNC

As patients improve, their oxygen requirement decreases. Oxygen is potentially harmful, especially if the inspired concentration is inappropriately high. **Oxygen is not a treatment for increased work of breathing.** Every effort should be made to adjust to the lowest possible FiO₂ to achieve target oxygen saturations.

- It is not necessary to wean flow rate.
- With every set of observations, attempt to wean FiO₂ as follows:
 1. If SpO₂ ≥ 92% decrease FiO₂ by 10 percent and observe closely for 10 mins to ensure SpO₂ remains ≥92%.
 2. If SpO₂ falls below 92% return to previous FiO₂.
 3. With the following set of hourly observations, attempt further wean and reassess.
 4. Once the patient has been stable in FiO₂ of 21% for one hour i.e. no respiratory distress / CEWT score <4, discontinue HHFNC.

5. Observe for 30 mins, if work of breathing increases significantly or SpO₂ falls below 92%, consult with patient's medical team or STARS registrar to decide on further action (re-initiation of HHFNC versus low flow nasal prong oxygen).

Related internal policies, procedures and guidelines
Bronchiolitis (Clinical Practice Manual)
Children's Early Warning Tool (CEWT) (Clinical Practice Manual)
Clinical Handover (PMH)
HHFNC MR850 and Air / Oxygen Blender Equipment Set Up Procedure.
Intrahospital Transfer (PMH Policy)
Interhospital Transfer (PMH Policy)
Resuscitation. MET Call and CODE BLUE (Clinical Practice Manual)
STARS - Safety Team After-hours Response Service (PMH Operational Manual)

References
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12. de Klerk A, . Humidified High-Flow Nasal cannula: Is It the New and Improved CPAP? *Advances in Neonatal Care*. 2008;8(2):98-106.

13. Hegde S, Prodhan P. Serious air leak syndrome complicating high-flow nasal cannula therapy: a report of 3 cases. *Pediatrics*. 2013 Mar;131(3):e939-44. PubMed PMID: 23382446. Epub 2013/02/06. eng.

Useful resources

Fisher & Paykel Healthcare. [Infant Care Therapy Overview: Optiflow™ Junior](#)

Lady Cilento Children’s Hospital. Guideline. High Flow Nasal Cannula Therapy. Management of the paediatric patient receiving high flow therapy. 2016

This document can be made available in alternative formats on request for a person with a disability.

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Standards Applicable:

NSQHS Standards:



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