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<th>NAME OF DOCUMENT</th>
<th>Infants and children Humidified High-Flow Nasal Cannula Oxygen</th>
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<tbody>
<tr>
<td>TYPE OF DOCUMENT</td>
<td>GUIDELINE</td>
</tr>
<tr>
<td>DOCUMENT NUMBER</td>
<td>ISLHD CLIN GL 17</td>
</tr>
<tr>
<td>DATE OF PUBLICATION</td>
<td>March 2016</td>
</tr>
<tr>
<td>RISK RATING</td>
<td>Medium</td>
</tr>
<tr>
<td>REVIEW DATE</td>
<td>March 2018</td>
</tr>
<tr>
<td>FORMER REFERENCE(S)</td>
<td>ISLHD OPS BR 20 - Administration of High Flow Humidified Nasal Prong Oxygen in Children (April 2012)</td>
</tr>
<tr>
<td>EXECUTIVE SPONSOR or EXECUTIVE CLINICAL SPONSOR</td>
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<tr>
<td>KEY TERMS</td>
<td>Infant, children, paediatric, high flow nasal, cannula</td>
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<tr>
<td>SUMMARY</td>
<td>Guideline for the criteria for use of Paediatric High Flow nasal prong oxygen</td>
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Section 1 - Background

Humidified High Flow Nasal Cannula (HHFNC) therapy is a simple to use system that delivers warm, moist gas and provides some positive distending pressure. When used at flow rates of 1-2 L/kg/min it acts a bridge between low flow oxygen therapies and Continuous Positive Airways Pressure, reducing the need for intubation. 1,2
Section 2 – Indications for use

2.1 Inclusion Criteria

- Moderate to severe respiratory distress in **infants with bronchiolitis** who have failed to respond to low flow oxygen
- May have a role in moderate to severe respiratory distress in **children** who have failed to respond to low flow oxygen however there is limited evidence to support this.
- Use for indications other than bronchiolitis may have some merit but should only be considered after **senior medical consultation** and implementation of appropriate disease specific treatments.

2.2 Exclusion criteria

- Neonates in special care nurseries
- Children who do not have bronchiolitis but have respiratory distress should be discussed with the Paediatrician prior to considering HHFNC.
Section 3 - Contraindications

- Nasal Obstruction
- Ingestion/toxins
- Life threatening hypoxia / apnoea’s / haemodynamically unstable
- Trauma (maxillofacial / suspected base of skull / chest)
- Pneumothorax
- Foreign body aspiration

Proceed with caution in those with:
- Decreased level of consciousness (LOC)
- Congenital heart disease
- Asthma
- Chronic respiratory disease
Section 4 – Prescription for Care

- In emergency departments senior ED Medical Officer to review patient prior to HHFNC oxygen commencement
- In paediatric wards when HHFNC oxygen is considered the Paediatric Registrar (Paediatric JMO SDMH), must review the patient prior to its initiation. The Admitting Paediatrician or Paediatrician on call should be informed by the Paediatric Registrar/JMO at an appropriate time as clinically indicated.
- At Milton and Shellharbour Emergency departments HHFNC can only be used as a rescue therapy whilst awaiting NETS retrieval and must only be commenced on advice from either Paediatrician or NETS.
- The prescription documentation for the HHFNC oxygen requires inclusion of Fraction of inspired oxygen (FiO₂) and flow rate L/kg/min
- Escalate care as required according to local Clinical Emergency Response System Policy (CERS) and the Standard Paediatric Observation Charts/Paediatric Emergency Observation Charts (SPOC/PEDOC)
- Medical review must occur again within 1 hour following commencement of HHFNC therapy and 2-4 hourly at a minimum if patient stable following initial review. (SDMH the child can be reviewed by the medical registrar when nil paediatric cover overnight. But must only be commenced with paediatric involvement)
- Ideally the patient should be nursed with a patient ratio of 1:2 in a High Observation Area (Near the nurses’ station) by a registered nurse who is experienced and educated in paediatric nursing care.
Section 5 - Equipment

- Oxygen and air source
- Oxygen blender
- Oxygen analyser if blender not being used
- Flow meter 0-30 L/min
- Humidifier base
- Humidifier circuit
- Nasal cannula – see nasal prong size guide section 5.1 below (or small adult if requires over 25 litres /minute)
- Sterile 2 Litre Water bag
- Nasogastric / orogastric tube
- +/- Nebuliser attachment for patients with asthma

5.1 Nasal prong size guide

The following codes should be used as per the current manufacturer’s instructions and should be utilised as a rough guide when selecting nasal cannula.

5.2 Set up equipment

- See Appendices for set up instructions for Airvo 2® and Fisher & Paykel Healthcare® Humidifier (MR850).
5.3 Starting Parameters

Note: Consider IV access and obtain a VBG before commencing high flow oxygen

**Start the HHFNC system:**
- 1L/kg/min
- In general, improvement is defined by a reduction in heart rate by 20% which equates to a trend from red to yellow or yellow to blue zones on SPOC/PEDOC’s. A decrease in respiratory distress and rate should follow
- If no improvement to work of breathing (WOB), heart rate (HR) and respiratory rate (RR) after 15 mins, titrate up to 2 L/kg/min
- If no improvement within the next 60 minutes, the patient requires senior medical review and local escalation procedures.

**Start the FiO₂:**
- 30% FiO₂
- Titrate up or down to maintain oxygen saturations between 92-98% (except in cyanotic heart disease)
- If unable to maintain saturations above 92% at a maximum of 60% FiO₂, patient requires senior medical review and NETS Consultation and probable transfer.

In general the guide to titrating is:
- Increased work of breathing = increase flow
- Decreased oxygenation = increase FiO₂
Section 6 – Ongoing Care

The use of “high flow” means the patient is unwell and requires more and not less nursing care and clinical monitoring. The child should be cared for in a close observation area until improvement, following medical review and discussion with the nurse in charge.

**Monitoring:**
- Continuous cardio-respiratory monitoring
- Continuous oxygen saturation monitoring
- Hourly check & documentation of FiO₂, flow, circuit observations
- Temperature 4th hourly
- Blood pressure once per shift unless abnormal or clinically indicated
- 6th hourly blood glucose level for fasting infants

**Documentation:**
Initially every 15 mins then hourly if stable:
- Heart rate, respiratory rate, respiratory distress, oxygen saturation
- Flow rate, FiO₂, & humidifier temperature
- Humidifier water level/bag check

**Nursing care:**
- Check nasal prong position hourly (at a minimum):
- Dislodgement may result in reduced respiratory support
- Ensure that a leak is present, as obstruction of the nasal passages will inadvertently create high pressure and may lead to barotrauma
- Check for pressure areas to nares
- Saturation probe site change 2-4 hourly
- All infants on HHFNC should have a gastric tube insitu. Once stable it may be used for feeds, otherwise it should be vented
- Perform nasal hygiene to prevent crusting of secretions with nursing cares and perform effective nasopharyngeal suction as clinically indicated.

6.1 Feeding
- Infants on HHFNC therapy may continue to be fed depending on their respiratory status and the clinical situation
- Some infants may be able to continue breast feeding if work of breathing allows
- If the infant is too tired to feed nutrition can be given via a naso/oro gastric tube 5
- If the infant is not tolerating gastric feeds give intravenous fluids. Two thirds maintenance is usually adequate due to respiratory humidification and risk of SIADH. A gastric tube should be left insitu for venting.
6.2 Escalation & Transfer
If no improvement after 60-90 minutes of 2 L/kg/min or if the patient is requiring ≥ 60% FiO₂, escalate as per local CERS policy and SPOC/PEDOC charts and contact paediatrician and NETS. The patient will likely need to have a blood gas drawn, a chest x-ray and intravenous fluids if not already done.

If the patient requires transfer between areas they should be accompanied by an RN, monitored and if possible high flow must not be disconnected for transfer.

Transfer on Airvo2 system
- Can be transferred from ED to ward by using Fisher and Paykel high flow connector which allows nasal prong oxygen to be delivered but not as high flow.

6.3 Acute deterioration/complications
- If acute deterioration, escalate as per local CERS to a rapid review
- Ensure appropriate size Bag-Valve Mask +/- Neopuff at bedside which can be used with nasal prongs in-situ to provide respiratory support if needed. An effective seal can generally be maintained although sometimes this may be difficult
- Consider pneumothorax and increase FiO₂
- Consider nasal trauma
- Check for condensation of tubing and empty as required back into the humidifier chamber.
Section 7 - Weaning

Senior medical review of the patient is required before commencing weaning. If there is clinical improvement, the order to wean must be documented in the clinical notes.

**Indications for weaning:**
- Mild or no increased work of breathing
- Normal parameters (HR & RR in white & blue zones of SPOC)
- Saturations > 92%

**Order of weaning:**
- First wean FiO₂ to maintain SpO₂ > 92%
  - Once needing less than 30% FiO2 with minimal increased work of breathing
- Then decrease flow rate to 1L/kg/min. If child remains stable for 2-4 hours then reduce again to 0.5L/kg/min and then cease
  - System can be ceased once child is in air on ≤ 4L/min
- If flow rate is under 2L/min and there is still an oxygen requirement, swap to low flow oxygen to prevent rain out in the high flow circuit.

Generally there is no need for a prolonged weaning process, better to be on high flow, standard low flow or off oxygen therapy.

If patient develops respiratory distress while weaning is in progress return to the previous settings.
Section 8

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Infants and children Humidified High flow Cannula Oxygen , Standards for Metropolitan Paediatric Level 4 Units, NSW Kids+Families 2015


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## Revision and Approval History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision no:</th>
<th>Author and approval</th>
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<td>0</td>
<td>Tracey Couttie, Paediatric Ed CNC of ISLHD</td>
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<td>Endorsed and approved for release by the ISLHD women and children division leadership group meeting.</td>
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<td>March 2016</td>
<td>1</td>
<td>Revised as a guideline.</td>
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<td>Tracey Couttie, Paediatric ED CNC of ISLHD</td>
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<td>Paediatric Practice Review Committee - July 2015</td>
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<td>Wollongong Paediatricians Meeting - June 2015</td>
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<td>ISLHD Policy and Practice Committee - October 2015</td>
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<td>Draft for comment - January 2016</td>
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<td>Approved for publishing Vicki Biro Manager CGU</td>
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Appendix A: HHFNC Oxygen Therapy Flow Chart

HHFNC Oxygen Therapy Flow Chart

HHFNC Oxygen Therapy Commenced in infants with bronchiolitis or children with moderate to severe respiratory distress
1. who have failed to respond to low flow oxygen and
2. AFTER Senior ED Medical Officer or Paediatric Registrar / review

Comence at 1L/kg/min Flow and 30% FiO₂

15 mins

AFTER 15mins if no clinical improvement
Discuss with Paediatric Registrar

60 mins

Review by Paediatric Registrar

Clinically stable or improving
continue to monitor and document observations hourly
4 hrly review by Paediatric Registrar or Resident

Clinically Unstable
If unable to maintain saturations above 92% at a maximum of 60% FiO₂ progress to Paediatric Fellow/Paediatrician review and local escalation procedures

If clinical state is improving consider weaning
1. First decrease FiO₂ to maintain SpO₂ > 92%
2. Second decrease flow rate by half

If clinical state is deteriorating escalate to NETS 1300 362500 for transfer to Tertiary Facility and consider intubation

HHFNC Oxygen Therapy should not exceed 2L/kg/min

Unless indicated by Paediatrician / NETS whilst awaiting transfer

Inform the Paediatric Consultant as clinically required.
Appendix B: RESOURCE AIRVO 2 ® SET UP

Follow instructions in the AIRVO 2 User Manual.

AIRVO 2 Humidifier has two modes:

- Junior Mode
  - Suitable for patients using Optiflow Junior Infant and Paediatric Nasal Prongs

- Standard Mode
  - Suitable for patients using:
    - Optiflow adult nasal prongs
    - Nebuliser mask (via Mask Interface Adaptor)
    - Tracheostomy mask (via Mask Interface Adaptor)
    - Tracheostomy direct connection

The AIRVO 2 Humidifier requires cleaning and disinfec
Appendix C: RESOURCE NASAL CANNULA SELECTION & APPLICATION

### FAP OPTIFLOW JUNIOR

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<th>OPTIFLOW JUNIOR NASAL CANNULA</th>
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<td>OPT010</td>
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<td>Max flow 20 L/min</td>
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<tr>
<td>Pediatric Size</td>
<td>OPT318</td>
<td>Max flow 25 L/min</td>
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1. Apply Cannula