



DEPARTMENT OF PAEDIATRICS
RIPAS HOSPITAL
Policy and Procedures

SOP No: SOP-PAEDS-007	Effective Date: July 2017
SOP Title: GUIDELINE FOR USE OF HUMIDIFIED HIGH FLOW NASAL CANNULA THERAPY (HHFNCT) IN CHILDREN WITH ACUTE RESPIRATORY ILLNESS	

1. Objective

- 1.1. This guideline provides an evidence based framework for the use of humidified high flow nasal cannula therapy (HHFNCT) in children presenting with different acute respiratory illnesses
- 1.2. To standardize the use of HHFNCT

2. Scope

This policy is applicable for health care personnel who are taking care clinically for paediatric patients presenting with acute respiratory illnesses.

3. Definition of HHFNCT

Humidified High Flow Nasal Cannula Therapy (HHFNCT) is a simple system that delivers warm, moist gas at high flow rates that generate positive airway 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 (CPAP), reducing the need for intubation.

4. Background

The use of nasal cannula adapted to the infant's nares size to deliver heated and humidified gas at high flow rates has been associated with improvements in washout of nasopharyngeal dead space, lung mucociliary clearance, and oxygen delivery compared with other oxygen delivery systems. HHFNCT also creates positive pharyngeal pressure to reduce the work of breathing.

4.1. Symptoms and signs of acute respiratory illness

- Mild to moderate respiratory distress
- Tachypnoea
- Hypoxemia
- Tachycardia
- Grunting
- Nasal flaring
- Accessory muscle use

(NB: Apnoea and bradycardia are the late signs of respiratory failure)

5. Indications and contraindications

5.1. Indications for HHFNCT^[6]

- Acute viral bronchiolitis
- Pneumonia
- Acute severe asthma
- Weaning from mechanical ventilation

- Mild to moderate ARDS (Acute Respiratory Distress Syndrome)
- Persistent pulmonary hypertension
- Bronchopulmonary dysplasia (BPD)
- Congenital heart defect (CHD)

5.2. Contraindications ^[2, 6]

- Upper airway abnormalities (e.g. choanal atresia, cleft palate or tracheoesophageal fistula)
- Air leak: Pneumomediastinum or Pneumothorax (if not drained)
- Multi-organ compromise
- Respiratory acidosis ($\text{pH} < 7.2$)
- Severe apnoea
- Severe cardiovascular instability and impending arrest
- Ingestion/toxins
- Trauma (maxillofacial/suspected base of skull fracture/chest)
- Foreign body aspiration

Proceed with caution in those with:

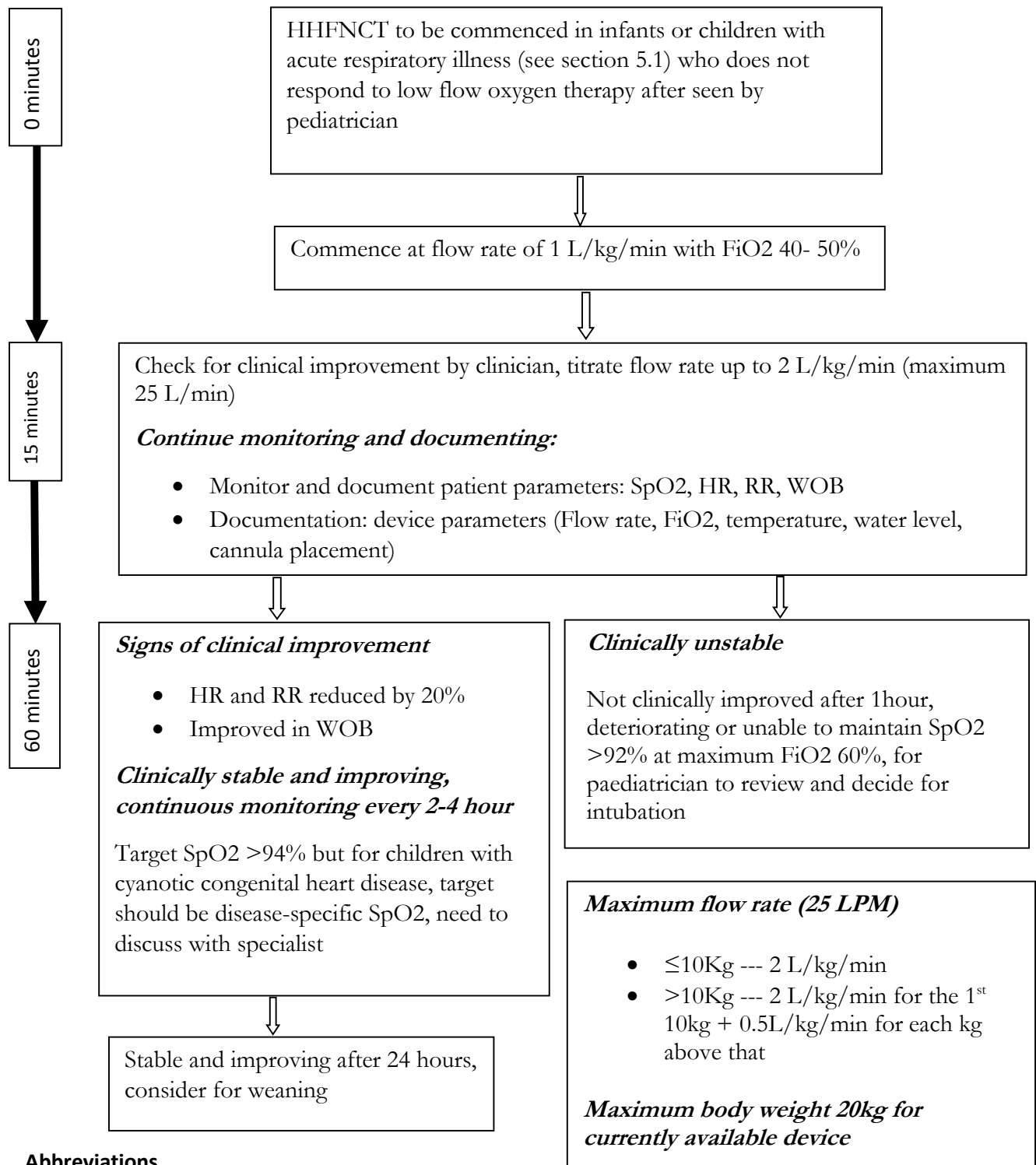
- Decreased level of consciousness (LOC)^[2]
- Congenital heart disease
- Asthma (when use nebulization during HHFNCT, the efficacy of bronchodilator is reduced, the pulmonary drug delivery is only 1% to 4%)^[3,9,10]

Note: There isn't sufficient robust evidence to make recommendation for or against aerosol delivery during HHFNCT.

6. Complications of HHFNC

- Potential barotrauma leading to surgical emphysema / pneumothoraces, especially if cannulae occupy more than 50% of the diameter of the nares.
- Gastric distension and diaphragmatic splinting
- Blocked HHFNC due to secretions

7. HHFNCT flow chart [1, 2]



8. Equipment

- Oxygen and air source
- Blender
- Flow meter
- Humidifier (Fisher and Paykel® MR850)
- Circuit tubing to attach to humidifier
- Nasal cannula (prongs) to attach to humidifier circuit tubing (size to fit nares comfortably)
- Nasogastric tube

8.1. Nasal cannula sizes ^[4]

<https://www.fphcare.com.au/products/optiflow-junior-nasal-cannula/>

Size of Nasal Cannula	Types and Color of Nasal Cannula	Item Code	Maximum Flow Rate (L/min)
Premature size	Red 	OPT312	8
Neonatal size	Yellow 	OPT314	8
Infant size	Purple 	OPT316	20
Pediatric size	Green 	OPT318	25

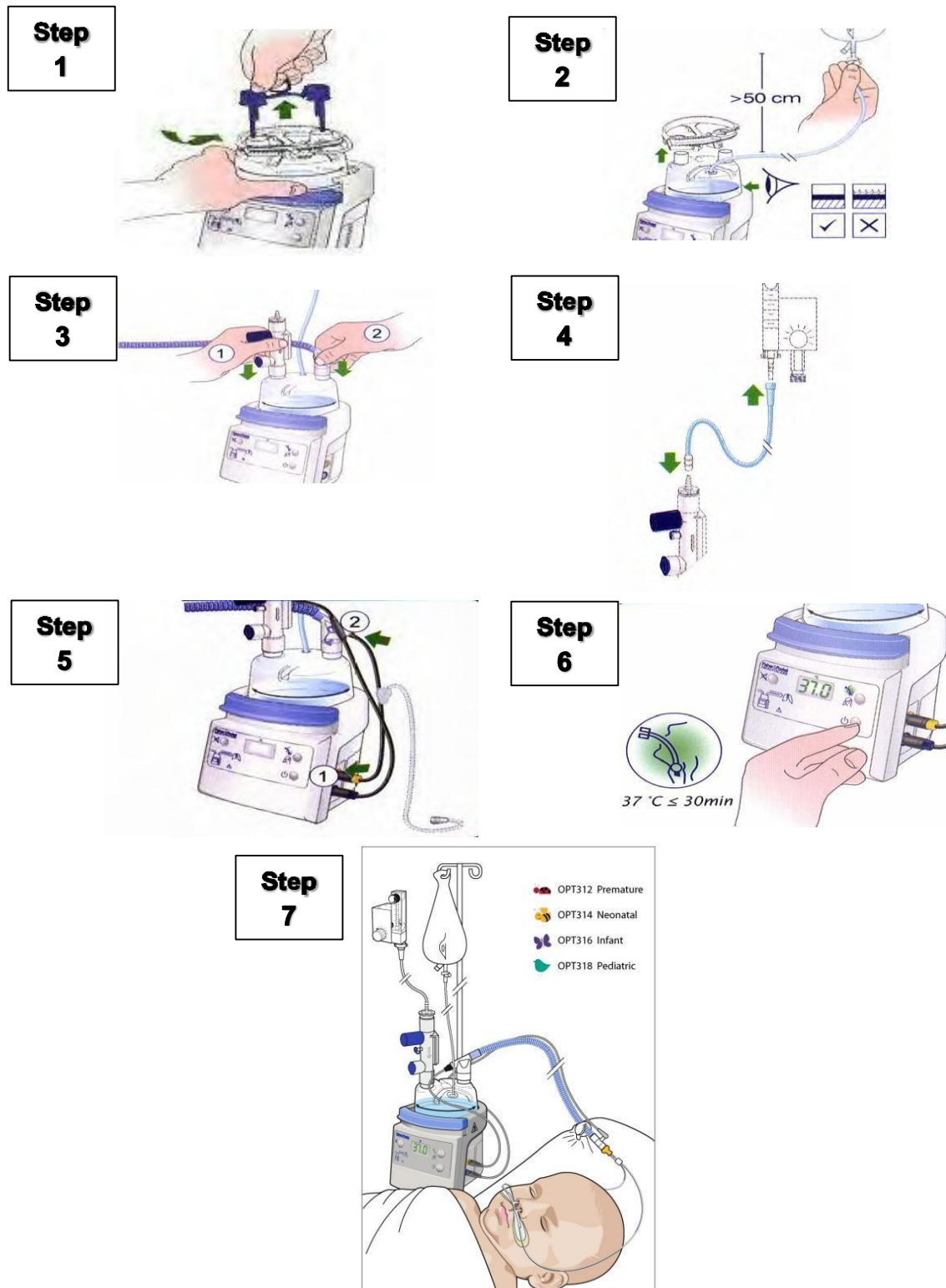
8.2. Humidification

- Because flows used are high, heated water humidification is necessary to avoid drying of respiratory secretions and for maintaining nasal cilia function.
- Set humidifier on 37° C invasive setting (length from temperature probe to nares will result in temperature drop to comfortable level whilst maintaining optimal humidity)

8.3. Set Up of Equipment

- Select appropriate size nasal cannula and circuit tubing for patient size
- Connect nasal cannula to adaptor on circuit tubing, and connect circuit tubing to humidifier
- Attach air and oxygen hoses from blender to air and oxygen supply
- Connect oxygen tubing from blender to humidifier
- Attach water bag to humidifier and turn on to 37°C. The water bag must run freely and be placed as high as possible above the humidifier to achieve flow of water into the humidifier chamber. The system is then ready for use.(see the image below)

Set-up diagram (Image taken from Fisher and Paykel Healthcare MR850 User Manual) ⁽⁵⁾



9. Starting parameters on HHFNC

9.1. Flow rate

- Commence at 1L/kg/min
- In general, improvement is defined by a reduction in heart rate by 20%, a decrease in respiratory distress and work of breathing in 15 minutes of starting HHFNC
- If no improvement to work of breathing, heart rate and respiratory rate after 15 minutes, titrate up to 2L/kg/min to a maximum of 25 L/min
- If no improvement within the next 60 minutes, the patient requires invasive ventilation

9.2. FiO2

- Commence with 40% FiO2
- Titrate up or down to maintain oxygen saturations > 94% (except in cyanotic heart disease)
- If unable to maintain saturations above 92% at a maximum of 60% FiO2, patient requires review for escalation of therapy.

In general the guide to titrating is:

Increased work of breathing = Increase Flow

Decreased oxygenation = Increase FiO2

10. Ongoing care

10.1. Monitoring/ documentation

- Continuous cardio-respiratory monitoring
- Continuous oxygen saturation monitoring
- Check and documentation of FiO2, flow, circuit observations every 1 to 2 hours
- Temperature every 4 hours
- Document blood pressure once per shift unless abnormal

- Document heart rate, respiratory rate, respiratory distress, oxygen saturation every 2 hours
- Document flow rate, FiO₂, and humidifier temperature every 1 to 2 hours
- Document humidifier water level/ water bag every 1 to 2 hours

10.2. Nursing care

- Check nasal prong position every 2 hours (at a minimum) as 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 once per shift (at least 3 times per day)
- All infants on HHFNCT should have a gastric tube in situ. The gastric tube should be vented initially to decompress the stomach which may cause respiratory compromise
- Once the child is stable, it may be used for feeds
- Perform nasal hygiene to prevent crusting of secretions with nursing cares and perform effective nasopharyngeal suction as clinically indicated

10.3. 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/ orogastric tube every 2 to 3 hours
- If the infant is not tolerating gastric feeds give intravenous fluids starting at two-thirds of daily requirement (or full maintenance depending on level of hydration)

11. Weaning of HHFNCT

11.1. Indications for weaning

- Mild or no increased work of breathing
- Normal parameters (HR and RR)
- Saturations > 94%

11.2. Order of weaning^[2]

- First gradually wean FiO₂ by 10% increments, ideally aiming for 21% to maintain SpO₂>94%
- Once needing less than 40% 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.
- Generally there is no need for a prolonged weaning process, as it is better to be on either high flow oxygen therapy, standard low flow oxygen therapy or off oxygen therapy.
- If patient develops respiratory distress while weaning is in progress, return to the previous setting.

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