Humidified High Flow Nasal Cannula (HHFNC) Guideline

In respiratory failure, high flow nasal prong (HHFNC) oxygen delivery system is an alternative to low flow mask oxygen therapy and may well diminish the need to progress therapy to non-invasive ventilation (NIV). HFNP is a system that has the ability to provide humidified high flow mix of air and oxygen via a specialised nasal cannula system. It is able to deliver PEEP of approximately 4-8 cm H\textsubscript{2}O.

Unlike conventional oxygen administration or NIV the inspired gas is warmed and humidified, and is often better tolerated than NIV via an occlusive mask. It is worth noting that initiation of HHNC may well relieve hypoxemia but does not improve ventilation or treat the underlying cause for the hypoxemia. The aim of HHFNC is to reduce the work of breathing to a RR <25 and SaO\textsubscript{2} >90%.

Indications of HFNP

Any adult patient in respiratory distress that is not responding to regular oxygen therapy eg a Hudson mask and when humidification and a Fio\textsubscript{2} >40% may be required to keep saturations above >94% ie Hudson Mask 6-8 Litres per minute delivering Fio\textsubscript{2} 35%-40%. Patient's that are considered suitable for HHNC include:

- exacerbation COPD
- Pneumonia
- Pulmonary oedema
- Asthma
- Acute lung injury Including:-
  - Lung contusions
  - Chest trauma including a flail chest
  - Fractured ribs
  - ARDS

Contraindications to HHFNC are patients with:

- CO\textsubscript{2} >48 mmHg on an arterial blood gas
- Significant mid maxillary facial trauma
- Suspected pneumothorax

Clinical Assessment and investigations before application of HHFNC

- A Chest x-ray is to be obtained routine bloods and an arterial blood gas sample analysed
- In the first instance commence oxygen therapy on a Hudson mask at six litres per minute
- If the PCO\textsubscript{2} is above > 48mmHg the patient is NOT to be placed on HHFNC
If the PCO$_2$ is below 48mmHg commence HHFNC at a Fio$_2$ 40% titrate flow up to 40 litres per minute. Increase Fio$_2$ to desired clinical response. If initial ABG 45 – 48 mmHg then repeat ABG after 30mins of commencing therapy. If the ABG is PCO$_2$ <48mmHg then repeat ABG fourth hourly. If there is no improvement then consider BiPap.

Medical staff to consult with respiratory consultant re admission to High Dependency Unit

**Potential benefits of HFN oxygen**

- Ability for patient to talk, communicate and sleep without interruption of therapy
- Patient will be able to eat and drink during therapy
- Prevention of invasive ventilation
- Improve patient comfort and compliance with treatment by offering an alternative way of delivering humidified oxygen therapy
- Creates a small amount of positive airway pressure
- Lower levels of device related pressure ulcers when compared with NIPPV

**Nursing considerations**

**Pre procedure**

- Nurse the patient in an upright position the head well supported with pillows
- Trauma patients are to remain in cervical collar until cleared
- Explain to the patient that this apparatus will deliver high flows of warmed oxygen in to their nose and they will experience a “full” feeling in their lungs

**During this procedure these patient's may be managed in the RR or Adult Acute Area**

**Flow**

- For patients who are acutely short of breath they can be commenced on 40-60L flow depending on patient requirements
- Encourage the patient to breathe in and out through their nose if possible. This will slow their inspiratory and expiratory time and maintain the pressure
- As the system is not a closed system, when the patient opens their mouth some of the pressure will be lost. Depending on the size of the patient and if they have their mouth open or closed this will determine the pressure the system delivers

**Oxygen Concentration**

- The system is able to deliver an oxygen concentration of 21%-100%
- This should titrated according the patient’s oxygen saturations to be >90%
- Observe patient for signs of respiratory distress, increased respiratory effort, airway obstruction, anxiety and discomfort
- Document settings – Flow
- Monitor and Document patient’s respiratory rate and SaO$_2$
- Monitor Arterial Blood Gas as indicated
- Support the ventilator tubing to minimize pulling on the nasal cannula.
- Provide mouth care as per protocol
- Food and drink may be consumed whilst this is in situ; however, when high flow rates are delivered, these may need to be decreased to avoid possible aspiration.
- Should this system be required for humidified nasal prongs at lower flows, the minimum flow rate to overcome the tubing length and resistance is 15 L/min.
- Nebuliser Spacers or a “T” piece can be used in conjunction with HHNC
Procedure

- Slot the ‘Adult Breathing Circuit Inspiratory Heated Circuit with auto-feed chamber into the Fisher Paykel Heater base
- Hang a bag of sterile water and spike bag with connector from the reservoir
- Turn on the heater unit (this allows heating to commence earlier)
- Ensure the amber light is indicating that the ETT mode of heating is activated. This mode will heat the coil wire in the blue tubing to 40°C then cut off and deliver in to the nares a temperature of 37°C
- Attach short blue ventilation tubing from high flow meter to water reservoir
- Attach long blue ventilation tubing to remaining port on water reservoir
- Connect heater wire and three-pronged blue temperature wire to humidifier base and blue tubing
- Attach the long heater detection wire to the proximal port and the distal ports on the blue tubing
- Attach high flow nasal prongs to blue tubing
- Dial up FIO₂ setting on blender
- Dial up flow as per medical order – usual flow rates start at 40 L/min, but may increase to 60 L/min, depending on level of patient’s comfort and need for CPAP.
- Explain the procedure and benefits of high flow nasal prong oxygen to the patient
- Place the blue lanyard (attached to the nasal prongs) over the patient’s head, this will support the weight of the prongs
- Insert the prongs into nasal nares and secure with elastic draw strings
- Assess patient’s response, provide reassurance, and make necessary adjustments to nasal interface
- Document settings and patients baseline
There are three HHNC in the emergency department. These are to be stored in the EMU storeroom.

**Management of HHFNC on Respiratory Ward**

- Patients requiring HHFNC can only be managed in the monitored unit within ward 8C – a ReSCU bed needs to be arranged by the accepting Respiratory team prior to transfer.
- The ReSCU can accommodate flows <45L/min and FiO2 <50% unless otherwise indicated by the treating Physician.
- Medical orders are to be documented on the medication chart or progress notes as per current practice. Orders should include:
  - Specific FiO₂ or “Titrate” to specified SpO₂ range.
  - Flow 35-45L/min or as otherwise specified by MO.

**Patient Transfer to the Ward**

- Ensure a monitored Respiratory Special Care Unit bed is available as per bed manager.
- Assess patient for safe transfer, if the patient will not tolerate the decrease in flow then NIV may need to be considered.
- On transfer to the Respiratory Special Care Unit (ReSCU), the patient is to be placed on the original mask for transfer or a prescribed FiO₂ by a medical officer.
- They should be on the mask, maintain saturations and not have a significant increase in their work of breathing for 10minutes prior to transfer.
- Inform ward staff that HHNC consumables will accompany patient to ward, only device set-up and the three-pronged blue temperature wire is required on arrival.
- Collect the existing HHNC consumables and send to the ward with the patient:
  - Nasal Prongs
  - Blue humidification tubing
  - Water reservoir
  - Sterile water
- Ensure the three-pronged blue temperature wire remains in ED.
- Send the “blue” temperature feedback wire with the patient to ReSCU
- Obtain a replacement “blue” temperature feedback wire from ReSCU
- Monitor work of respiratory rate and SpO₂ on transfer to the ward.
- Include prescribed FiO₂ and Flow in bedside clinical handover.
- Provide HHNC consumables to ward staff so that HHFNC can be recommenced as per prescription.

**Ward Management**

- Management of HHFNC in the ReSCU is according to the specific ReSCU procedure.
Humidified High Flow Nasal Cannula – Flow Chart

RESPIRATORY ASSESSMENT  
CXR BLOODS ABG  

If pCO2 < 48mmHg  
Commence HHFNC  

If pCO2 > 48mmHg  
NOT for HHFNC  

- AIM FOR RR <25 - O2 SATS >90%  
- TIRATE FLOW UP TO 40L AND FIO2 TO CLINICAL RESPONSE  
SEE FULL GUIDELINE FOR SETUP AND PARAMETERS  

If 1st ABG pCO2 <45mmHg  
Clinical assessment only  

If 1st ABG pCO2 45-48 mmHg repeat after 30 MINS of HHFNC  

If 1st ABG pCO2 > 48mmHg  
Consider NIV  

If pCO2 ≤ 48mmHg  
consider 4/24 ABG  

Continue HHFNC and T/F to ReSCU as per Consulting AMO