Humidified High Flow Nasal Cannula Therapy ADULTS Procedure

Effective: 17 April 2018

1. Guiding Principles

Humidified High Flow Nasal Cannula (HHFNC) therapy is a simple to use system that delivers warm, moist gas from room air to variable oxygen concentrations at high flow rates that generate positive airway pressure. When used at flow rates of 1-2L/kg/min[1] it acts as a bridge between low flow oxygen therapies and Continuous Positive Airways Pressure (CPAP) and potentially reducing the need for further and more invasive therapies such as intubation.

The benefits of use of HHFNC include pharyngeal dead space washout, decreased resistance leading to improvement of pulmonary compliance and subsequently decrease in work of breathing. In addition, humidification also helps to assist in increased patient comfort, and may reduce bronchoconstriction from cold dry air and prevent epithelial injury.

In respiratory failure, high flow nasal cannula (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).

HHFNC 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_20. 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 Sats > 92%.

Indications for HHFNC therapy in Adult Patients

Any adult patient in respiratory distress that is not responding to regular oxygen therapy, and when humidification and a FiO_2 >40% are required to keep saturations >92% (use of Hudson mask at 6-8L/min delivers approximately FiO_2 35-40%).
Patients that are considered suitable for HHFNC include:

- Pneumonia (community acquired/viral/interstitial)
- Acute asthma/acute exacerbation of COPD
  - CO2 retainers will need vigilant monitoring of pCO_2
- Cardiogenic pulmonary oedema
- Hypoxemia from Pulmonary embolism
- Carbon monoxide poisoning
- Acute lung injury Including when pneumothorax is excluded:-
  - Lung contusions
  - Chest trauma including a flail chest
  - Fractured ribs
  - ARDS

Contraindications for HHFNC therapy in Adult Patients:

- Life threatening hypoxia/apnoeas/haemodynamic instability.
- Foreign body aspirations.
- Epistaxis.
- Base of skull fracture/ Significant mid maxillary facial trauma.
- Surgery to the nose or upper aero-digestive tract.
- Nasal obstruction; e.g. nasal fracture, tenacious secretions, tumour.
- pCO2 >48 mmHg on an ABG or > 55 mmHg on VBG.
- Confirmed/ suspected pneumothorax.

Possible Complications for HHFNC therapy in Adult Patients:

- Gastric distension.
- Pressures areas to the nostrils.
- Blocked HHFC due to secretions.
- Pneumothorax.

2. Procedure

Prior to the prescription and commencing HHFNC oxygen therapy, the following needs to be taken into consideration:

- Patient status and potential for deterioration.
- Nickol Bay Hospital has no High Dependency Unit on site.
- Distances to the nearest regional hospital and to metropolitan tertiary hospital and time frame for transfer to occur due to availability of RFDS.

HHFNC oxygen therapy can be administered either on the general ward or in the emergency department, dependant on the patient's clinical condition.

2.1 Prescribing Principles

The following must be adhered to when prescribing HHFNC oxygen therapy to adult patients:

- The Duty Medical Officer (DMO) must be familiar with the prescribing and treatment of adult patients requiring HHFNC oxygen therapy.
- The DMO must be present within the department when commencing a patient on HHFNC oxygen therapy.
- HHFNC can either be commenced in ED or in General Ward, it is compulsory for MO to review the patient prior to the commencement of HHFNC and that commencement of HHFNC cannot be made by phone-order.
- Perform baseline blood gas prior to commencing HHFNC, ideally ABG*:
- If **pCO_2 > 48mmHg on ABG or pCO_2 > 55 mmHg on VBG**, patient is **NOT FOR HHFNC,** consider NIV.
- If initial pCO2 (ABG) is 45-48mmHg or pCO2 (VBG) 50-55mmHg, then repeat blood gas in 30 mins post commencing HHFNC and followed by 4 hourly blood gas for the first 24 hours.
- If initial pCO2 < 45mmHg (ABG) / < 50mmHg (VBG), repeat blood gas only once in 4 hours.
- Minimal flow rate for adult is 15L/min, if patient needs less than 15L/min, consider ceasing HHFNC and commence Hudson mask regular flow oxygen.

Commencement of HHFNC in the ward:

- Ideally HHFNC should only be commenced in the ward during the normal hours when Ward MO is on duty.
- Use of HHFNC in the ward is strictly restricted to 15L- 40L/min, and with maximum FiO2 50%.
- Any patient who requires flow rates > 40L/min or FiO2 > 50%, patient should therefore be transferred to ED for stabilisation and close observation.

Commencement of HHFNC in ED:

- Flow rate 15L - 60L/min, FiO2 21-100%.
- If patient required FiO2 > 60% to keep Sats > 92% then consider discussing case with tertiary hospital and aims for early transfer.
- Transfer of patient on HHFNC to ward could only be made possible when the patient requires flow rates of ≤ 40L/min and with FiO2 ≤ 50%.

HHFNC is to be prescribed on WACHS Humidified High Flow Nasal Cannula Therapy Order & Observation Chart (Adult version)

- Document the Flow rate in L/min and FiO2 % required.
- Ward range: 15L – 40L/min; FiO2 21% to 50%.
- Document target Sats.
- Aims to maintain Sats > 92% in Non-CO2 retainers; Sats 88-92% for known CO2 retainers.

2.2 Monitoring and Frequency of Observations

Clinical improvement is usually observed within one hour of initiating HHFNC therapy. Close observation, frequent reassessment and documentation of response to treatment are required by a registered nurse.

The following observations are to be recorded on the WACHS MR 140 Adult observation and response chart.

- Continuous Sp02 monitoring, documented 15 minutely.
- 15 minutely Pulse rate, Respiratory rate and Blood Pressure on commencement of therapy; hourly once stable .
- Hourly documentation of Fi02, flow rate and circuit observations.
- Respiratory observations hourly (MR 142).
- Temperature 4 hourly unless indicated more frequently by ORC.
- Humidifier water level/bag check per shift.
- Blood gas either ABG or VBG before the commencement and after treatment as per flow chart (CO2 retainer should have blood gas done minimum 4 hourly to monitor the trends of pCO2.

2.3 Nursing Care and Management

- Check nasal prong position hourly as dislodgement may result in reduced respiratory support.
- Ensure that a leak is present, as obstruction of nasal passages will create high pressure and may lead to barotrauma.

- Check pressure areas to nasal nares.
- Check that oxygen is flowing freely and that the tubing/nasal cannula is not blocked at least hourly.
- Replace the nasal cannula if it becomes blocked with secretions.
- Check for condensation in tubing/nasal cannula at least hourly to two hourly and empty as necessary by draining back into the humidifier- water in tubing/nasal cannula may lead to aspiration.
- Food and drinks may be consumed, however if flow rate is > 50L/min, oral intakes may need to be decreased to avoid possible aspiration.

2.4 Medical Care and Management

Medical review is indicated routinely one hour after commencement of HHFNC or sooner if there is:

- Increase in respiratory distress.
- A rapid deterioration of SpO2 or marked increase in work of breathing. (consider Barotrauma/Pneumothorax).
- Frequent apnoea's or bradycardia.
- Persisting hypoxemia with oxygen saturations < 92% despite high gas flows.
- Repeated blood gas shows pCO2 outside the desire ranges.
- No response to treatment as evidenced by decrease in FiO2 and work of breathing.

Routine medical review:

- 6 to 8 hourly review for stable patient with blood gas showing pCO2 (ABG) < 45mmHg or pCO2 (VBG) < 50mmHg.
- 4 to 6 hourly review for known CO2 retainer or blood gas showing pCO2 (ABG) 40-45mm Hg or pCO2 (VBG) 50-55mmHg.

In addition, medical review is indicated prior to the changes of the HHFNC setting either in flow rates or FiO2 or both, or prior to cessation of HHFNC.

2.5 Assessing patient's response to HHFNC oxygen therapy

Responder: Patient who demonstrates a reduction in either RR or HR or both by 20% of the initial worst recorded observation within one hour of commencing HHFNC (1-2L/kg/min) to maintain Sats>92%

Non-responder: Patient who does not demonstrates a reduction in either RR or HR or both by 20% of the initial worst recorded observation within one hour of commencing maximum 60L/min of HHFNC.

2.6 Weaning the adult patient from HHFNC oxygen therapy

On demonstration of clinical recovery, HHFNC should not be set, or recorded as being delivered, at flow rates < 15L/min. Patients who are in low levels of blended oxygen with minimal work of breathing on HHFNC should be given a trial **off** HHFNC and on normal low flow oxygen therapy. If unsuccessful, then HFNC can be reinstituted.

Cessation of HHFNC has to be ordered by MO after physically reviewing the patient.

3. Definitions

HHFNC	Humidified High Flow Nasal Cannula
CPAP	Continuous Positive Airways Pressure
RFDS	Royal Flying Doctor Service
DMO	Duty Medical Officer
FiO2	Fraction of inspired Oxygen
NIV	Non-invasive ventilation

4. Roles and Responsibilities

The **DMO** is responsible for assessment, diagnosis and ongoing management of the paediatric patient requiring HHFNC oxygen as outlined within this procedure.

The **Registered Nurse** is responsible for the Nursing Care and Management of the paediatric patient requiring HHFNC oxygen as outlined within this procedure.

5. Compliance

Failure to comply with this policy document may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the Employment Policy Framework issued pursuant to section 26 of the *Health Services Act 2016* (HSA) and is binding on all WACHS staff which for this purpose includes trainees, students, volunteers, researchers, contractors for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies is mandatory.

6. Evaluation

Monitoring of compliance with this procedure will occur via the Clinical Incident Management system.

7. Standards

National Safety and Quality Healthcare Standards (First edition 2012): 1,3,4 and 9
National Safety and Quality Healthcare Standards (Second edition 2017) : 1, 3, 4 and 8

8. References

1. Arora B., Mahajan P., Zidan M., Sethuraman U., 2012, Nasopharyngeal Airway pressures in Bronchiolitis Patients Treated with High Flow Nasal Cannula Oxygen Therapy, Paediatric Emergency Care, Vol 28, No 11, November 2012.

2. High Flow Humidified Oxygen (HFHO) via the Airvo, WACHS South West Intensive Care Unit, Bunbury Hospital

3. Humidified High Flow Nasal Cannula Oxygen Guideline for Metropolitan Paediatric Wards and EDs 1st edition, NSW Health Guidelines, 29 JAN 2016

4. Humidified High Flow Nasal Cannula (HHFNC) Guideline, Health Northern Sydney Local Health Network, NSW, August 2013

9. WA Health Policy Framework

Public Health Policy Framework.

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

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