Humidified High Flow Nasal Cannula Therapy ADULTS Procedure

Effective: 23 November 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 15L - 60L/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_2O. 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 HHFNC 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%.

Adult patients requiring HHFNC at Kununurra Hospital will usually require transfer for ongoing management and treatment. If possible, the patient should be discussed with the regional physician or Intensive Care Unit (ICU) consultant.

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
  - CO_2 retainers will need vigilant monitoring of pCO_2
- cardiogenic pulmonary oedema
- hypoxemia from Pulmonary embolism
- carbon monoxide poisoning

- When pneumothorax is excluded, acute lung injury including:
  - 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
- pCO_2 >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 HHFNC 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.
- Kununurra 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 the Royal Flying Doctor Service (RFDS).
- Check hospital oxygen supplies are adequate for requirements with HHFNC

HHFNC oxygen therapy can only be administered in the Emergency Department unless the DMO and CNM are satisfied there are appropriately trained nursing staff & resources to care for the patient on the ward. The patient must be specialled 1:1 by nursing staff. **The medical officer must remain in the hospital**.

This procedure can be read in conjunction with the WACHS Oxygen Therapy and Respiratory Devices- Adults Clinical Practice Standard.

2.1 Prescribing Principles

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

- If HHFNC is being considered, if possible this decision should be made in conjunction with the Regional Physician or Royal Darwin Hospital ED / ICU Consultant and RFDS. If urgent commencement is needed, treatment should be commenced and appropriate further management/transfer discussed thereafter.

- The Duty Medical Officer (DMO) must be familiar with the prescribing and treatment of adult patients requiring HHFNC oxygen therapy.
- Obtain informed verbal consent from patient / guardian. Document verbal consent has been obtained in the medical record.
- The DMO must be present within the department when commencing a patient on HHFNC oxygen therapy. **DMO must remain in the hospital**.
- HHFNC can only be commenced in ED, it is compulsory for medical officer 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 unlikely to benefit from HHFNC so consider escalation to NIV or intubation if necessary.
    - initial pCO_2 (ABG) is 45-48mmHg or pCO_2 (VBG) 50-55mmHg, then repeat blood gas in 30 mins post commencing HHFNC and followed by hourly blood gas for the first 24 hours.
    - initial pCO_2 < 45mmHg (ABG) / < 50mmHg (VBG), repeat blood gas hourly until stable
    - Minimum flow rate for adults is 15L/min, if patient needs less than 15L/min, consider ceasing HHFNC and commence Hudson mask regular flow oxygen.

Commencement of HHFNC in ED:

- Flow rate 15L - 60L/min, FiO_2 21-100%.
- If patient required FiO_2 > 60% to keep Sats > 92% then escalate urgency for RFDS transfer.

HHFNC is to be prescribed using an Oxygen Therapy label affixing it to the MR170A WA Hospital Medication Chart - Adult Short Stay.

- Document the Flow rate in L/min and FiO_2 % required.
- Document target Sats.
- Aims to maintain Sats > 92% in Non-CO_2 retainers; Sats 88-92% for known CO_2 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 MR140A WACHS Adult Observation and Response Chart and MR142 WACHS Paediatric Respiratory Observation Chart (pending Adult version).

- Continuous SpO_2, Heart Rate, Respiratory Rate monitoring, documented 15 minutely.
- Blood Pressure on commencement of therapy; hourly once stable.

- Hourly documentation of FiO_2, flow rate and circuit observations and if altered.
- Respiratory observations; air-entry auscultation, work of breathing, hourly documented on the MR142 WACHS Paediatric Respiratory Observation Chart (pending Adult version)
- Temperature hourly unless indicated more frequently by ORC.
- Humidifier water level / bag check hourly.
- Blood gas either ABG or VBG before the commencement and after treatment as per flow chart (CO_2 retainer should have blood gas done minimum hourly to monitor the trends of pCO_2.

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.
- Nasal Cannula should not occlude more than 50% of each nare.
- 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 and empty as necessary by draining back into the humidifier- water in tubing/nasal cannula may lead to aspiration.
- Food and drinks not to be consumed in first hour and then only in consultation with DMO in case of deterioration.
- All components are single patient use and the Airvo 2 thermal disinfection must be completed after use as per manual instructions. Leave red thermal hose attached to unit after use to indicate machine has been cleaned.

2.4 Medical Care and Management

Medical review is indicated routinely after commencement of HHFNC, especially if there is:

- increase in respiratory distress.
- a rapid deterioration of SpO_2 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 pCO_2 outside the desire ranges.
- no response to treatment as evidenced by decrease in SpO_2 and increased work of breathing.

Routine medical review:

- Hourly review for stable patient with blood gas showing pCO_2 (ABG) < 45mmHg or pCO_2 (VBG) < 50mmHg.
- Hourly review for known CO_2 retainer or blood gas showing pCO_2 (ABG) 40-45mm Hg or pCO_2 (VBG) 50-55mmHg.

In addition, medical review is indicated prior to the changes of the HHFNC setting either in flow rates or FiO_2 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 to maintain Sats>92%.

Non-responder: Patient who does not demonstrate 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, HHFNC can be reinstituted.

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

3. Definitions

CPAP	Continuous Positive Airways Pressure
DMO	Duty Medical Officer
FiO_2	Fraction of inspired Oxygen
HHFNC	Humidified High Flow Nasal Cannula
NIV	Non-invasive ventilation
RDH	Royal Darwin Hospital
RFDS	Royal Flying Doctor Service

4. Roles and Responsibilities

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

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

5. Compliance

Failure to comply with this procedure 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 (Second edition 2017) - 1, 4, 5, 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. Humidified High Flow Nasal Cannula Oxygen Guideline for Metropolitan Paediatric Wards and EDs 1st edition, NSW Health Guidelines, 29 Jan 2016
3. Humidified High Flow Nasal Cannula (HHFNC) Guideline, Health Northern Sydney Local Health Network, NSW, August 2013
4. WACHS Oxygen Therapy and Respiratory Devices- Adults Clinical Practice Standard

9. Related WACHS Documents

MR140A WACHS Adult Observation and Response Chart

MR142 WACHS Neonatal/Paediatric Respiratory Observation Chart

MR170A WA Hospital Medication Chart - Adult Short Stay

WACHS Oxygen Therapy and Respiratory Devices- Adults Clinical Practice Standard

10. WA Health Policy Framework

Public Health Policy Framework.

11. Appendices

Appendix 1 - Oxygen Therapy Sticker

Appendix 2 - Education Resources

Appendix 3 - Fisher and Paykel Airvo 2 Humidify/Nasal Cannula flow rate/ min

Appendix 4 - Airvo Table taken from RFDS Guide dated 11.01.2018

Appendix 5 - HHFNC Flowchart

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

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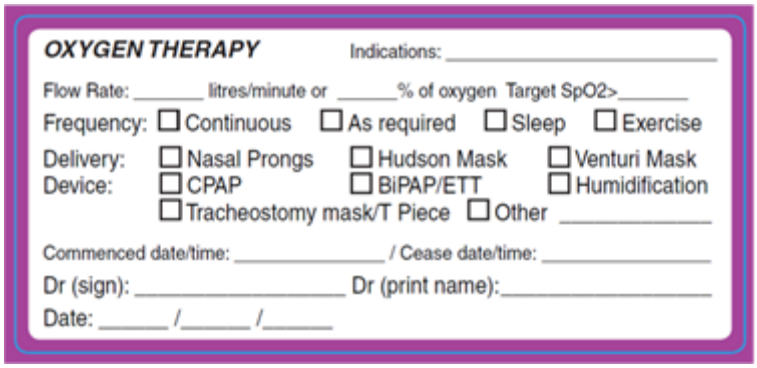
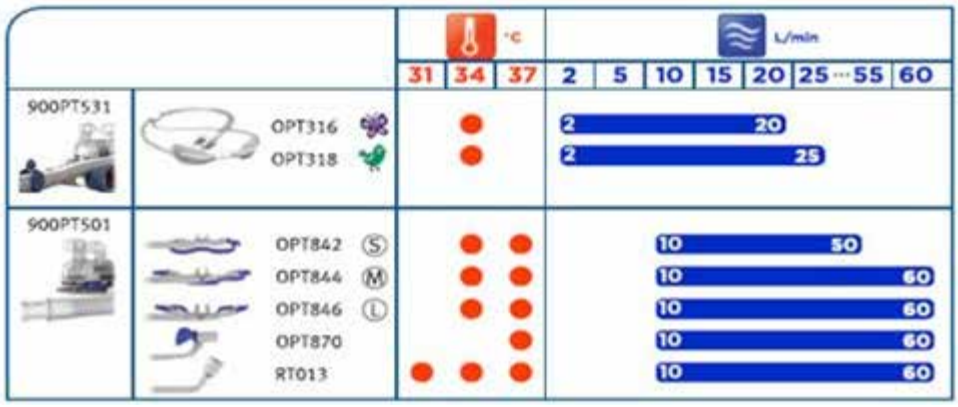
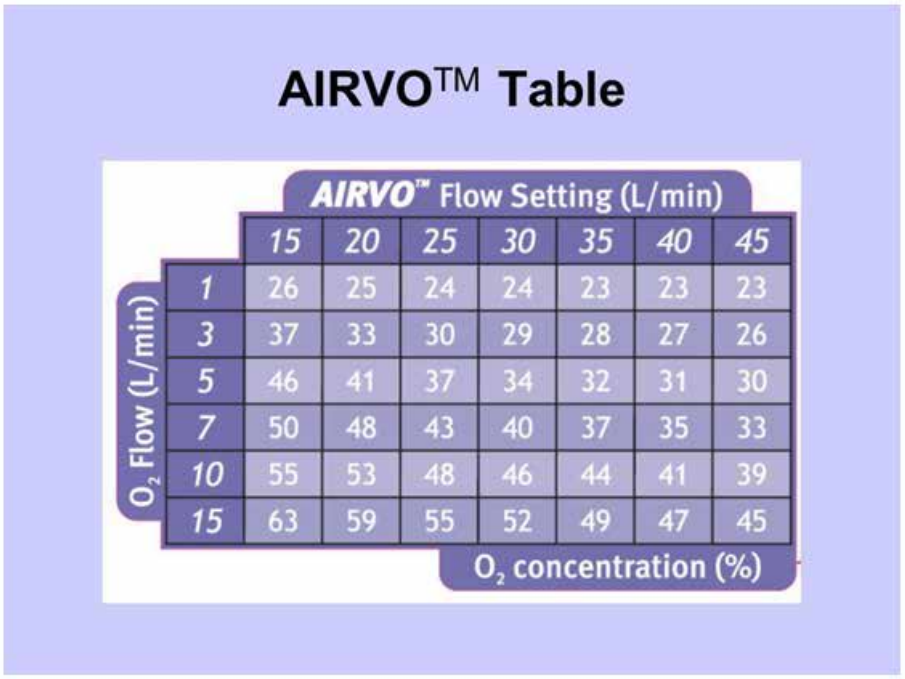
Appendix 1 - Oxygen Therapy Sticker



Appendix 3 - Fisher and Paykel Airvo 2 Humidify/Nasal Cannula flow rate/ min



Appendix 4 - Airvo Table taken from RFDS Guide dated 11.01.2018



Appendix 5 - HHFNC Flowchart