Trust Policy

Plymouth Hospitals NHS
NHS Trust

HIGH FLOW NASAL CANNULA OXYGEN THERAPY IN CHILDREN (AIRVO 2 DEVICE)

Issue Date	Review Date	Version
JANUARY 2017	**JANUARY 2018**	**V.1**

Purpose

To provide an operational framework for all staff within PHNT in the management of High Flow Nasal Cannula Oxygen Therapy (HFNC) for Children under 16 years.

Who should read this document?

Nursing and Medical Staff in Acute Paediatrics, Anaesthetics, Emergency Department and Intensive Care.

Key Messages

1. Explain the rationale, indications and contraindications when using of HFNC in Children
2. Define the initiation, monitoring and observations required with HFNC
3. Define how and when to recognise treatment failure with appropriate escalation
4. Define nursing acuity required
5. Approach to Weaning
6. Transferring patients on HFNC
7. Set Up of Airvo 2 and disinfection

Core accountabilities	
Owner	Dr Simon Martin
Review	Paediatric Clinical Governance
Ratification	Director Of Nursing
Dissemination	All paediatric care staff, Anaesthetics, Emergency Department and Intensive Care.
Compliance	All paediatric care staff, Anaesthetics, Emergency Department and Intensive Care.

Links to other policies and procedures
PHNT Incident Management Policy Plymouth Healthcare Community Tracheostomy Care Guidelines PHNT Hand Hygiene Guidelines PHNT Guidelines for Aseptic Technique PHNT Tracheostomy Care for the Adult Patient –Competency. PHNT Medical Equipment Users Guide PHNT Medical Devices Training Policy PHNT The Management and Use of Medical Devices Policy

Version History	
January 2017	Approved by Paediatric Clinical Governance

The Trust is committed to creating a fully inclusive and accessible service. Making equality and diversity an integral part of the business will enable us to enhance the services we deliver and better meet the needs of patients and staff. We will treat people with dignity and respect, promote equality and diversity and eliminate all forms of discrimination, regardless of (but not limited to) age, disability, gender reassignment, race, religion or belief, sex, sexual orientation, marriage/civil partnership and pregnancy/maternity.

An electronic version of this document is available on Trust Documents on StaffNET. Larger text, Braille and Audio versions can be made available upon request.

1 Introduction & Background

It has been necessary to introduce this Standard Operating Procedure due to the introduction of High Flow Nasal Cannula (HFNC) therapy via AIRVO 2 /OPTIFLOW device, and in accordance with PHNT Medical Equipment Users Guide. Whilst the main body of this document was written by Dr Simon Martin, additional input and collaboration was gained from key nursing staff in PHNT Children's High Dependency Unit, and the Paediatric Clinical Educators. This document was also shared with staff across the Trust for their comment and feedback, prior to submission for approval at Child Health Clinical Governance.

External benchmarking has taken place with other Trusts that are already using HFNC therapy, as to its efficacy and the positive benefits to paediatric patients presenting to the acute setting with respiratory issues.

What is High Flow Nasal Cannula Therapy?

High Flow Nasal Cannula (HFNC) therapy delivers optimally heated and humidified oxygen via a specifically designed nasal cannula interface. This allows flows of 2 liters/kg/min to be delivered safely. For clarity, the term **High Flow** will be used to mean High Flow Nasal Cannula Therapy.

What is the difference between AIRVO 2, Optiflow and Vapotherm?

All devices deliver High Flow:

AIRVO 2 is the used to deliver High Flow to infants and children at PHNT

Optiflow is the device used when only the smallest cannula fit i.e. Neonates and Premature sizes

Vapotherm is used in the Neonatal intensive care unit at PHNT

2 How does High Flow Work?

How does High Flow work?

1. **Provides optimal humidity:** Lung compliance and mucociliary function are rapidly compromised by gas that is not heated and humidified. Bronchoconstriction associated with airway cooling is reduced.

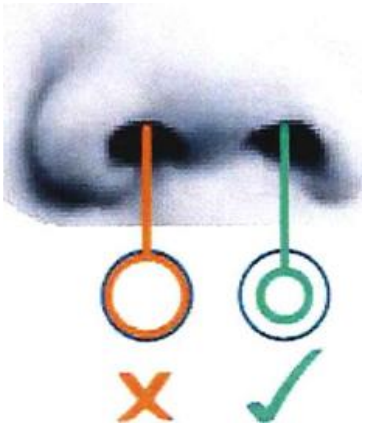
2. **Decreases energy expenditure:** The humidity also reduces the evaporative losses from the mucosa of the immature airway (<2 yrs), reducing the energy required for gas conditioning.

3. **Provides distending pressure:** A variable level of positive airway pressure is delivered improving lung compliance and gas exchange by lung recruitment. The amount of pressure delivered is dependent on the flow and size of the patient and the fit of the nasal cannula (See Figure 1). It is very important that the cannula fits and is checked hourly to ensure position in the nostril. In Bronchiolitic infants this has been measured at 4.7cm/H20 at flows of 2L/kg/min.

Figure 1: Sizing the Cannula

Choice of nasal cannula is based on the diameter of the child's nostril and not on age or weight of child. The nasal cannula chosen to administer high flow should cover no more than half the diameter of the nostril.

AIRV02 nasal cannula are appropriate only in children of weighing >3 kg.



4. **Reduces work of breathing:** Providing gas flows that are equal or greater than the patient's peak inspiratory flow decreases the resistive work of breathing.

5. **Improves alveolar ventilation:** The nasal passages and oropharynx are continuously flushed and replenished, removing exhaled gas to reduce re-breathing and increase the clearance of carbon dioxide. HFNC needs to remain an 'open system' in order for this to work, nasal cannula should cover no more than half the diameter of the nostril and there is no need to keep the patient's mouth closed.

3 Which Patients Might Benefit from High Flow & when should it be started?

Which patients might benefit from High Flow?

Most of the evidence supporting the use of High Flow in infants and children relates to bronchiolitis. Retrospective studies demonstrate a reduction in the need for invasive ventilation in infants with bronchiolitis and in children with acute respiratory insufficiency following introduction of High Flow. A large scale prospective randomized controlled trial is underway to determine its efficacy in bronchiolitis (PARIS I). Children with asthma and pneumonia may benefit from High Flow although there is a lack of trial evidence currently.

High Flow has advantages over other forms of oxygen delivery. It is more comfortable for the patient than low-flow oxygen therapy as the gases are heated and humidified. It allows greater access to the patient than head box oxygen therapy. It has been used as an alternative to Continuous Positive Airway Pressure (CPAP) in neonates. The equipment and tubing associated with High Flow is less bulky than that of CPAP. Compared to CPAP it does not require creation of a seal and is better tolerated by the patient.

When should High Flow be started?

Respiratory observations from the Paediatric Early Warning Score (PEWS) are used to decide when to start High Flow (see Figure 2). This is known as the Respiratory PEWS. A Respiratory PEWS **of three or more** should be considered for High Flow, see section 6 for location.

Figure 2: The Respiratory PEW score:

Parameter	Description	Possible Score
Respiratory Rate	Age-specific rates	0, 1, 2, 4
Oxygen Saturation (In Air)	≥95%,92-94%, ≤91%	0, 1, 4
Respiratory Distress	None, mild, moderate, severe	0, 1, 2, 4

Any patient with a Respiratory PEWS **of three or more** should be managed according to the flowchart in Section 9.

A senior doctor (ST3+ Registrar or a Consultant) should review the patient prior to initiating High Flow therapy. A clear plan should be documented in the notes.

4 Contraindications To High Flow

Absolute: Suspected pneumothorax or basal skull fracture

Relative:

Apnoea: the child should be managed on CHDU not on the ward. If there is any concern then request urgent review by ST3+ Registrar or Consultant.

Multi-organ compromise with respiratory failure: the Paediatric Escalation Plan must be followed. Whilst awaiting definitive support, High Flow may be used as a temporary measure to reduce work of breathing and provide distending pressure which may aid Cardiac output.

5 Potential Complications Of High Flow

There are isolated case reports of pneumothoraces in children receiving High Flow therapy. Pneumothorax should be considered if the child has an increasing requirement for respiratory support. Trauma to the nasal mucosa may occur but less common than with CPAP. Gastrointestinal distension may occur and an NG tube on free drainage may be appropriate.

6 Where is High Flow delivered at PHNT

High flow is only to be delivered on Woodcock and the Children's High Dependency Unit (CHDU). Other areas may be considered in due course. Please note the following requirements for each area:

Woodcock ward:

- Children with proven or suspected **viral bronchiolitis** only
- Nursing staffing on Woodcock should be at least 1 nurse for 4 patients.
- Children receiving High Flow should be nursed in cubicle 1, cubicle 2 and/or cohorted in the 4 bed D bay.

Children's High Dependency Unit (CHDU)

- Conditions other than bronchiolitis, such as Asthma, pneumonia, cardiac failure who meet the criteria for High Flow are managed on CHDU. The consultant paediatrician on for service shall review this decision prior to starting High Flow in these other conditions.

- Children with viral bronchiolitis who require more than 50% oxygen to maintain oxygen saturations more than 92%. Or, children on Woodcock where concerns are raised at nursing or medical review.

- Children with apnoea

7 Initiation of AIRVO 2/Neonatal Optiflow

How should AIRVO 2 / Neonatal Optiflow therapy be started?

1. **Select appropriate sized nasal prongs i.e. should be ≤ half diameter of nostril:**

   Ensure the child is monitored with continuous ECG and oxygen saturation recording.

Nasal Cannula Type	Tubing and equipment	Available Flow
Infant (37 weeks-3.5 years) *	Airvo 2 in Junior mode with Junior tube and chamber kit	2-20L/min
Paediatric Size	Airvo 2 in Junior mode with Junior tube and chamber kit	2-25L/min
Adult Size NB children requiring flow > 25L/min will require Adult cannula size. If too large revert to max Paediatric size and flows	Airvo 2 in Adult mode with Adult tube and chamber kit	> 25L/min Max 60L/min

*N.B. The Purple Infant Cannula may be too large for some small term babies (if > half diameter of the nares). In this case use the Neonatal cannula with the Optiflow device available from Children's High Dependency on Level 12. A set-up guide is included at the end of this document.

2. **Set the initial flow rate:**

Weight:	Suggested flow rate:	Flow range for age group:
3-12.5kg	**2L/Kg/Min**	Range 6-25L/min
Above 25L/min use Adult mode, interface and tubing required if size fits		
12.5-15kg	**2L/kg/min**	Maximum flow 30L/min
16-30kg	**2L/kg/min**	Maximum flow 35L/min
31-50kg	**40L/min**	Maximum flow 40L/min
>50kg	**50L/min**	Maximum flow 60L/min

3. **Set the initial Oxygen percentage (FiO2)**

   The initial amount of oxygen delivered (F_iO_2) should be 40%.

Aim for oxygen saturations of 92-94%.

- If after 5 minutes oxygen saturations remain less than 92%, increase the F_iO_2 to 50%.
- If oxygen saturations are **greater than 95%** in F_iO_2 40%, then wean the F_iO_2 to maintain SpO_2 between 92 and 95%.

Note: Alternative settings may be more appropriate in some cases e.g. child in a High Dependency bed. These settings, together with a plan for escalation, should be agreed with the responsible consultant and recorded in the medical notes.

8 Patient Monitoring, Management & Escalation

1. **Continuous oxygen saturation monitoring.**

2. **Observations:** Respiratory and Total PEW score should be taken at 0, 30 and 60 minutes. Hourly observations thereafter to include documented cannula position, and presence/absence of gastric distension. An NG tube on free drainage if distension occurs may be appropriate and in the first instance please discuss with ST3+ Paediatrician.

3. **Medical Review:** ST3+ Registrar or Consultant should review the child at 60 minutes to allow early identification of whether the child has responded.
   Patients usually respond by 90 minutes after starting high flow.

   Signs of a responder include:
   i) Improved Respiratory PEW score.
   ii) Heart rate: typically decreases within 60 minutes by 15-20% from baseline.

If there is deterioration or concerns from the nursing staff then arrange urgent review by an ST3+ Registrar or Consultant before 60 minutes.

4. **Escalation**:
   Ward: If the respiratory PEWS is still three or more and/or the oxygen saturations are less than 92% in F_iO_2 50% at 60 minutes then the child should be reviewed urgently by ST3+ Registrar or Consultant and cared for in CHDU. Notify ICU (0110).

   CHDU: Use 60 minute parameters as above. Oxygen may be increased to maintain oxygen saturations of at least 92%. If the ST3+ Paediatric Registrar or Consultant is not available for urgent review then follow the Paediatric Escalation plan to seek further help from Adult intensive care (0110) and the Paediatric Anaesthetist on-call. CPAP may be considered for those failing High Flow at 90 minutes. The Consultant Paediatrician should liaise with WATCH for those who fail treatment with High Flow in CHDU.

5. **Feeding:** If the child improves and is stable after 4 hours after starting High Flow then consider feeding to prevent fatigue.

6. **Weaning:** The daily medical review will include documenting a daily plan for weaning in children who have been on High Flow > 24 hours. The FiO2 is reduced in a stepwise manner over 24 hours (See section 9) until SpO2 is maintained at >92% in room air. The child can then be taken off High Flow onto low flow nasal cannula oxygen if required.
7. **Investigations:**
   Capillary blood gases are not routinely indicated.
   Chest x-ray: not routinely indicated unless concerns re severe pneumonia, foreign body or pneumothorax.

9 Summary of Response To A Child With A Respiratory PEW Score of ≥ 3

Nursing staff to contact Doctor (ST3+ Registrar or Consultant) to review the Child within 30 minutes and consider:

1. The need for increased respiratory support and/or organ support
2. Does the patient have any contraindications to High Flow? (pneumothorax, pneumomediastinum, facial trauma/surgery) – if yes then urgent review by Consultant

Decision made to Start High Flow

⬇

Notify Senior Nurse on Level 12

Choose correct size of cannula (< half diameter of nares)
Start with oxygen of 40% and at flows suggested:

Weight	Suggested flow	Flow range for age group
3-12.5kg	2L/Kg/Min	Range 2-25L/min
Above 25L/min adult mode, interface and tubing required		
12.5-15kg	2L/kg/min	Maximum flow 30L/min
16-30kg	2L/kg/min	Maximum flow 35L/min
31-50kg	40L/min	Maximum flow 50L/min
>50kg	50L/min	Maximum flow 60L/min

1) **Nursing Assessment of Child at 0, 30 and 60 minutes**
   - Continuous SpO2 monitoring
   - Respiratory and Total PEW score
   - Hourly cannula position check and presence of gastric distension
   - NG tube on free drainage if distension or concerns.

2) **Medical Review at 60 minutes (ST3+ Registrar or Consultant)**
   Maximum suggested time to a response is 90 minutes:
   Look for
   i) Improved Respiratory PEW score.
   ii) Heart rate: typically decreases within 60 minutes by 15-20% from baseline.

If > 50% Oxygen required for SpO2 ≥ 92% then transfer to CHDU. Notify ICU (0110)
Follow the Paediatric Escalation Plan if there are concerns before this.

Management of the Child who does not respond to High Flow
Consultant Paediatrician review
Consider CPAP trial, Call Intensive Care (0110), WATCH retrieval team and Paediatric Anaesthetist: In hours (0800-1800) 30949 / Out of hours: switchboard
Manage on CHDU

Ongoing Management of the Child who Responds to High Flow

Monitoring: continuous SpO2, hourly observations including cannula position and gastric distension
Feeding: commence enteral feeding if stable at 4 hours

Weaning and discontinuing treatment:

Oxygen should be weaned before flow.
Oxygen can be weaned to the lowest amount that gives the desired saturations.
(SpO2 > 92%)

The need to continue High Flow should be considered and documented by the medical team daily.

For babies with bronchiolitis, the weaning will occur over approximately 24 hours.

Example:

Wean FiO2 by 5-10% every 4 hours
If SpO2 ≥ 92% and Resp component of PEW score < 3 then continue to wean

When FiO2 25% and Child stable with SpO2 > 94% then switch to low-flow oxygen therapy if required.

The flow should not be weaned below the child's peak inspiratory flow rate since this will make the child work harder to overcome the resistance of the cannula. Room air can be drawn in if flow is reduced, decreasing the oxygen concentration delivered to the child.

Blood gas analysis is not essential in order to wean from HFNT but may be used at the clinician's discretion. Regular patient assessment should provide the indicators needed to wean and discontinue treatment. Discontinuation of treatment can be to room air, low flow nasal cannula or to an alternative oxygen delivery, however the impact of inadequately heated and humidified gas on the mucociliary transport system should be considered.

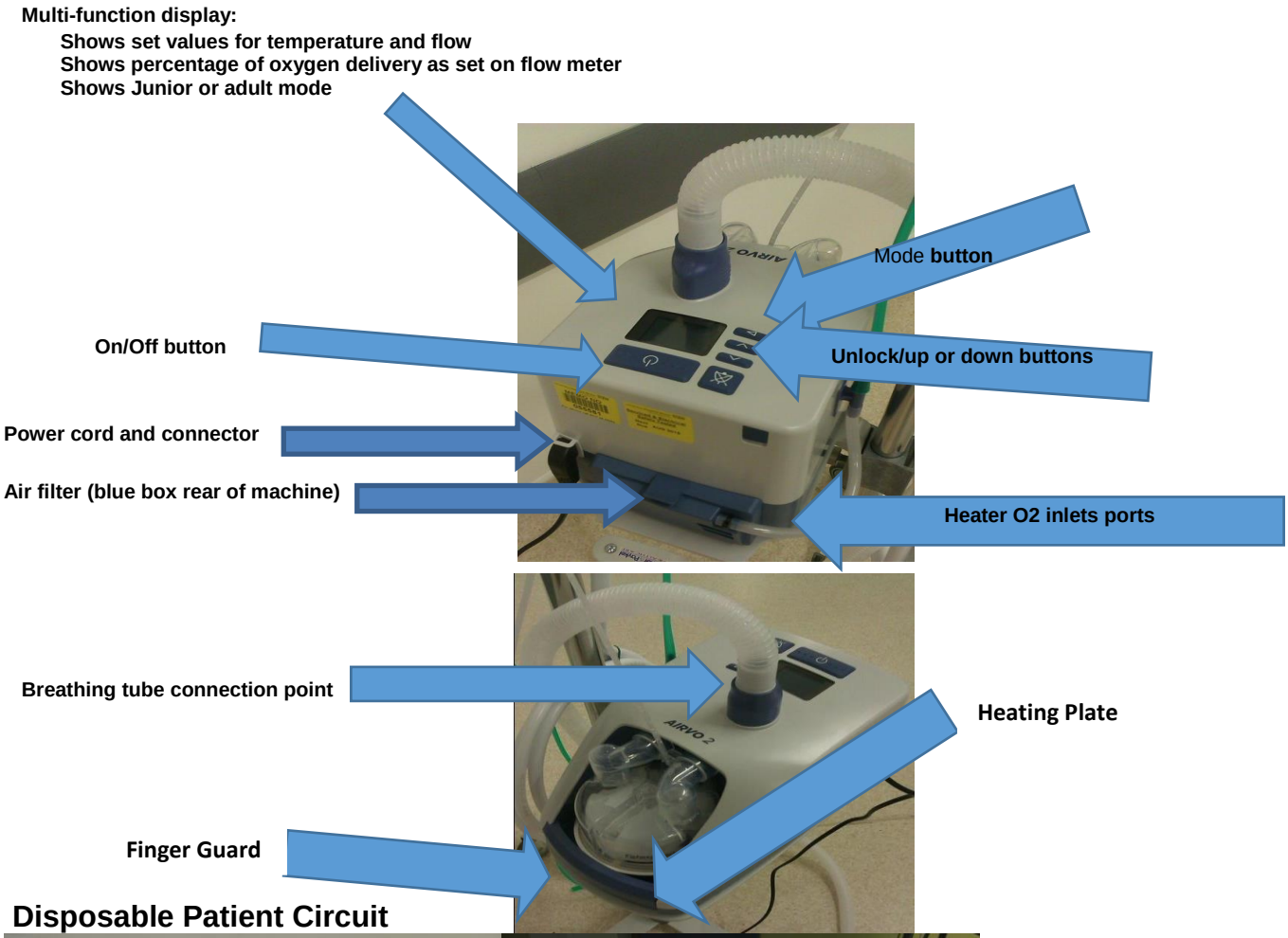
Transfer of patients on High Flow on Level 12:

A Portable battery is currently not available at PHNT for the Airvo 2 to enable transfer without discontinuing treatment. For transfers between wards on Level 12 use the transfer guide in Section 11.

These patients should be transferred by a Paediatric nurse AND an ST3+ Paediatrician both with paediatric immediate life support training.
The paediatric transfer bag from CHDU and an appropriately sized bag-valve mask device should be taken with continuous ECG and SpO2 monitoring.

10 AIRVO 2 DEVICE SET UP

AIRVO 2



Disposable Patient Circuit

Figure 1 **Figure 2**

There are *two* different tubing sets:

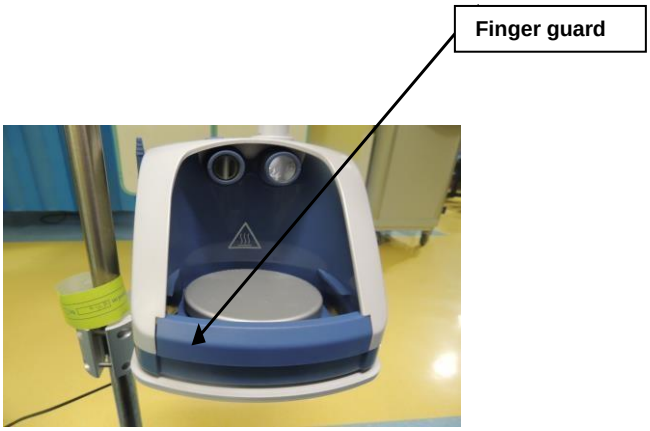
1. Airvo 2 Junior tubing and kit set
2. Airvo 2 Adult tubing and kit set

The junior tubing set is for use with the I**nfant** and **Paediatric** nasal cannula. The adult set is for use with the **Adult** nasal cannula and the tracheostomy connector.

Setting up the Machine

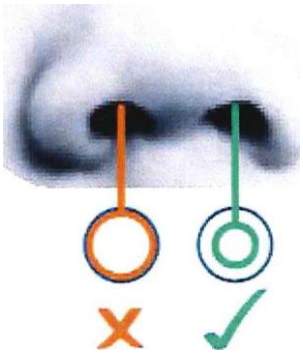
Prior to commencing AIRVO 2 therapy, explain the procedure fully to the child and/or parents to reduce anxiety. Then ensure the following procedures are performed:

1. Connect the adaptor to the top of the auto fill water chamber and push into heater plate, ensuring the finger guard clicks shut.



2. Pierce a bag of sterile water for inhalation with the spike and hang from pole.
3. Connect heated breathing tubing to connection port ensuring you have the correct tubing – junior or adult.

4. Attach correct size nasal cannula ensuring that the nares are no more than half occluded. For babies less than 3 kg please see appendix 2 and use the neonatal cannula.



Choice of nasal cannula is based on nostril diameter and not just on the age or weight of the child.

Product	Weight range	Max flow rate (L/min)
Infant Size	3-15Kg	20
Paediatric Size	12-22kg	25
Small (Adult mode)	> 22Kg	35
Medium (Adult mode)	> 22Kg	50
Large (Adult mode)	> 22Kg	60

5. Attach oxygen tubing to the oxygen inlet port (if needed).
6. Plug in power cord and turn the machine on.
7. The device will initially indicate disinfection status.
8. The device is now ready to set.

Connecting to the Patient

1. Select the correct mode. The machine is set in junior mode. To change to adult mode, press and hold the button with the triangle shape until the machine beeps and the bird and butterfly disappear. To change back to Junior mode repeat this process.
2. To set the flow rate press the triangle button. This will initially display the set temperature (this is pre-set and cannot be changed). Press again and the flow will be displayed.

Guide to Setting the Flow rates

Weight	Suggested flow	Flow range for age group
3-12.5kg	2L/Kg/Min	Range 2-25L/min
Above 25L/min adult mode, interface and tubing required		
12.5-15kg	2L/kg/min	Maximum flow 30L/min
16-30kg	2L/kg/min	Maximum flow 35L/min
31-50kg	40L/min	Maximum flow 50L/min
>50kg	50L/min	Maximum flow 60L/min

3. Press and hold together the up and down arrows to unlock the machine and then press up or down to select the desired flow rate.
4. When the desired flow rate is set then the machine will either lock itself again after a few seconds or you can lock it yourself by pressing the button with the triangle shape again.
5. The oxygen percentage screen will appear next. This is reading the amount of oxygen being delivered **depending** on how much flow you have set at the oxygen flow meter. Set the initial percentage to 40% unless instructed otherwise. Use the oxygen flow meter at the wall (0-15L/min) unless you have a patient requiring more than 25L on the machine. In this case you may need to use the 30L/min flow meter connected to the machine. For higher oxygen concentrations both the wall and machine flow meter may be required. (NB any child requiring >50% oxygen to maintain saturations of >92% must be escalated as per PEW criteria.)
6. Once the desired settings have been set, the cannula can now be attached to the patient.

Attaching the nasal cannula

1. Select the appropriate size nasal cannula. Prongs should not occlude more than half of the diameter of the child's nostril. If the patient can fit two sizes, select the smaller size. If the purple infant cannula are too large (e.g a baby < 3kg), then use the Neonatal cannula with the Optiflow Machine. Refer to Standard Operating Procedure (SOP) for the Neonatal Optiflow Machine in Section 13 of this policy.

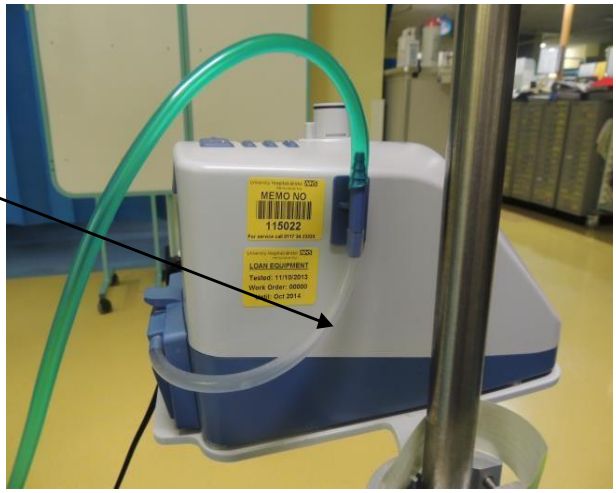
2. Prepare the skin, ensuring the face is clean and dry.

3. Connect the cannula to the AIRVO 2 tubing. Place hand close to the prongs to ensure that there is gas flow.

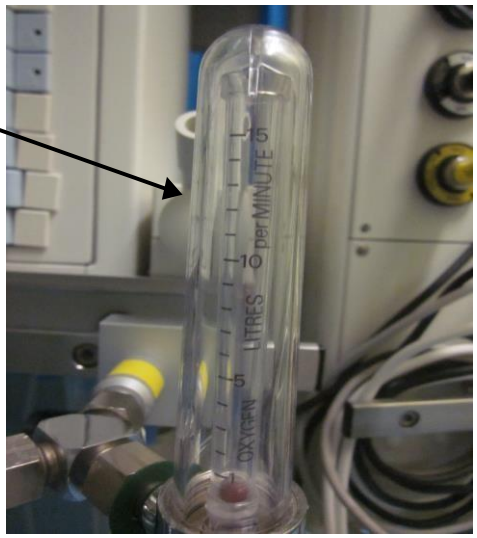
- If using junior tubing remove the first backing tabs from the Wiggle pads on the nasal cannula, leaving the second backing tabs in place.
- Hold the ends of the Wiggle pads and apply slight tension to the cannula.
- Position the prongs as far into the nares as possible so that the cannula bridge rests just underneath the septum.
- Position horizontally across the face and stick Wiggle pads onto the cheeks.
- Remove the second backing tabs and stick the Wiggle pads onto the cheeks. Ensure the Wiggle pads are well adhered to the face.
- If using the small, medium or large nasal cannula for older children. I.E when using the adult circuit, Wiggle pads are not required.

Oxygen Therapy

The oxygen inlet port is located on the left hand side of the machine.



Depending on how much air flow and oxygen % you wish to administer depends upon which flow meter you will need to use. The 15L/min flow meter which is standard throughout the hospital and located on the wall is to be used where possible.



An example of oxygen therapy and air flow setting is:
With the Infant or Paediatric nasal cannula, 15L/min oxygen will give you 95% oxygen if the air flow setting is at 10L/min. Therefore if you need to increase the air flow but wish to remain in 95% oxygen then you will need to use the 30L/min oxygen meter on the machine.

All AIRVO 2 machines have **30L/min** oxygen flow meters.

For children needing very low percentage of oxygen you may need to use a low flow meter.

1. To administer oxygen using the 15L/min flow meter at the wall attach green oxygen tubing to the oxygen port on the AIRVO 2 machine (Fig 1) and to the flow meter (Fig 2). A secondary source of oxygen **must** be available at the bedside for emergency situations.

Figure 1

Figure 2

2. Whilst looking at the AIRVO 2 screen, turn the flow meter up **slowly** until your prescribed oxygen percentage is displayed on the screen.

   N.B if you change the air flow setting on the machine, this will change your oxygen percentage so you may need to turn the flow meter up or down accordingly.

3. If you need to use the 30L/min flow meter you will need to plug this into the oxygen supply at the wall via the white gas outlet pipe. The oxygen is then given using either of these flow meters in the same way as above.

11 General Operational Guidelines

General Operational Guidelines

1. Check that the AIRVO 2 tubing is warm.

Alarms

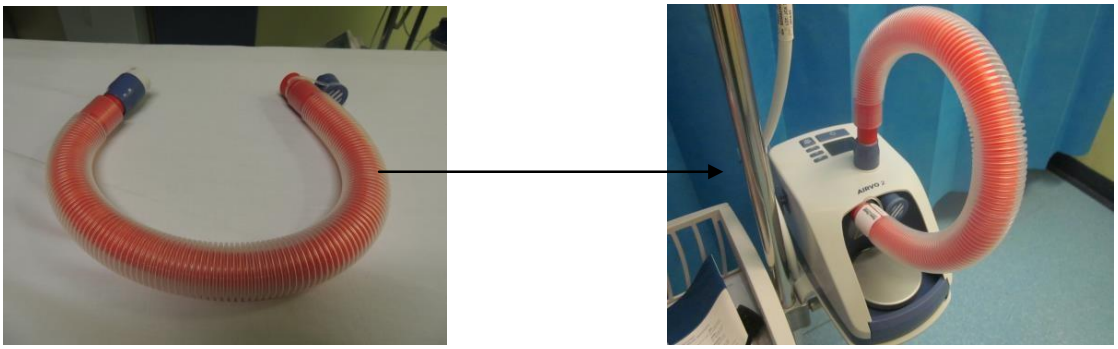
1. Each device has a laminated quick reference guide attached with information on alarms, their cause and action to be taken.
2. If the alarm guide is not attached, please inform our Clinical Educators who will ensure one is attached.

Shut down

1. Stop the machine by pressing the on/off button. Disconnect from the mains power supply.
2. Remove the nasal cannula from the patient if required (If there is a possibility of your patient needing to recommence this treatment then leave the Wiggle pads on the patients face).
3. Disconnect the water bag from the spike.
4. Remove the water chamber from the heater plate by pressing down on the finger guard **(Take care as this will be hot).**
5. Remove the patient circuit from the machine.
6. Discard the disposables as per PHNT policy for the Safe Handling, Management and Disposal of Hospital Waste.

Cleaning Process

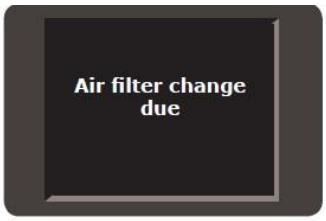
- Wash the machine as per trust guidelines.
- Clean the chamber ports and the breathing tube connection port, avoiding left hand water chamber port.
- Connect the red disinfection hose.



- Turn the machine on by pressing the on/off button. The machine will automatically recognise that the cleaning process needs to start and will start counting down from 55 minutes.
- When the cleaning process has finished label with green tape with the red hose remaining in situ and return to a designated AIRVO 2 storage area.

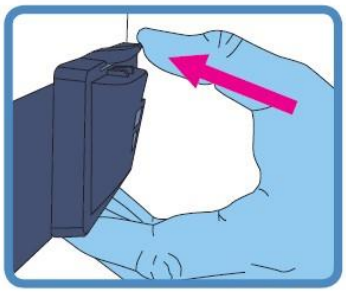
- Blue filter at the back of machine will need changing every 1000 hours or every three months (machine will alert you when it requires changing) If unsure speak to MEMS. Please place a sticker on machine when filter changed.

- A message will be displayed on the screen “AIR FILTER CHANGE DUE” - It will ask whether you want to change the filter “NOW OR LATER”.
- Use arrow button to say “**NOW**”



If the unit tells you that a filter change is due:

1. Take the filter holder from the back of the unit and remove the filter.
2. Replace the old filter with a new one.



3. Reattach the filter holder to the unit (clip the bottom of the filter holder in first, then rotate it upwards until the top clips into place).
4. Press the Mode button to move on to the next screen.

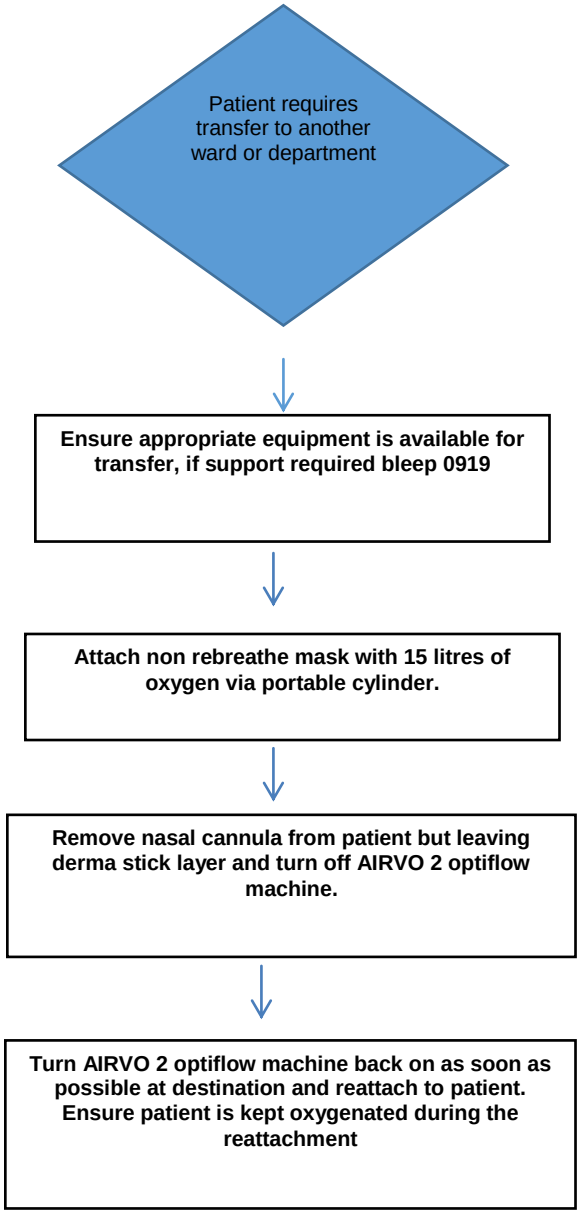
Specific Nursing Care of the Patient Receiving AIRVO 2 Optiflow Therapy

1. Observe the nasal cannula at least hourly to ensure they are in the correct position
2. Observe the nose and face for evidence of pressure sores
3. Check and record the water level hourly ensuring that not too much water has drained into the water chamber. Replace the sterile water bag every 24 hours
4. Change nasal cannula every seven days
5. Change AIRVO 2 circuit every fourteen days

12 Transfer Flowchart

Flow Chart for transfer of a patient on AIRVO 2

(**AIRVO 2 machine has no battery power or mechanism for oxygen delivery when switched off**.)

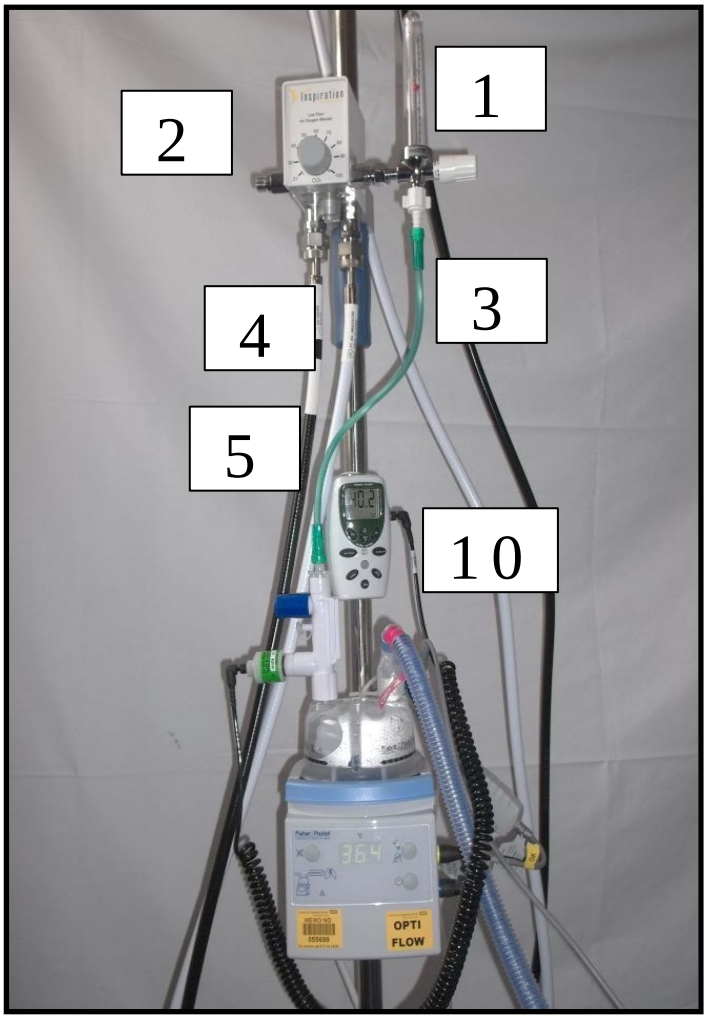


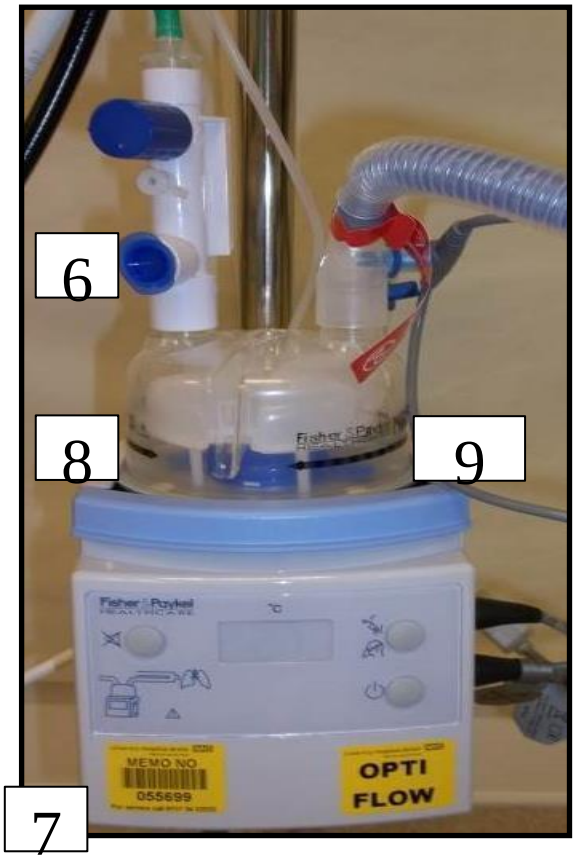
13 STANDARD OPERATING PROCEDURE FOR NEONATAL OPTIFLOW THERAPY

For infants ≤3 kg or where the AIRVO2 nasal cannula are too large for the infant.

Neonatal Optiflow Device

1. Flow meter 15L/min – set flow
2. Oxygen blender – set oxygen
3. Green oxygen tubing
4. White piped oxygen tubing
5. Black piped air tubing
10. Oxygen analyser





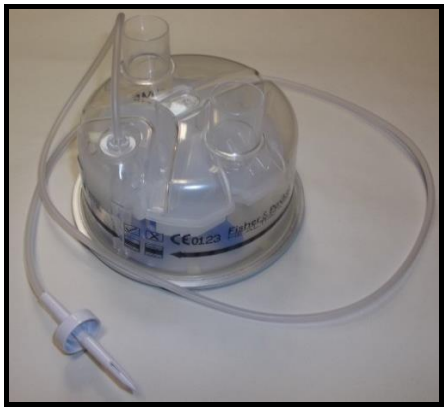
Neonatal Optiflow Device Cont.

6. Pressure relief valve
7. Humidifier MR850
8 Water chamber
9 Temperature probe

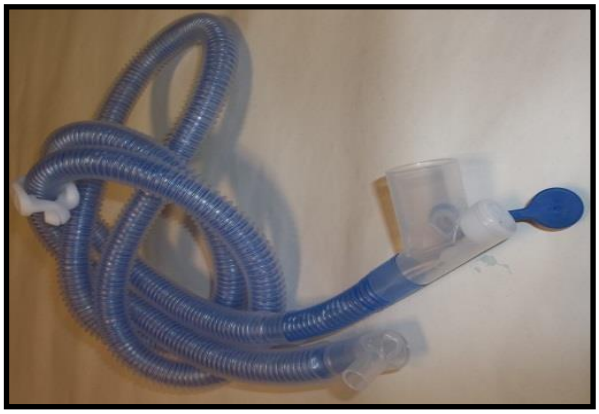
Pack Contents

Pressure Relief Valve

Water Chamber



Heated Breathing Tubing



There is one patient circuit for use in neonates / infants <3kg or with infants with small nares.

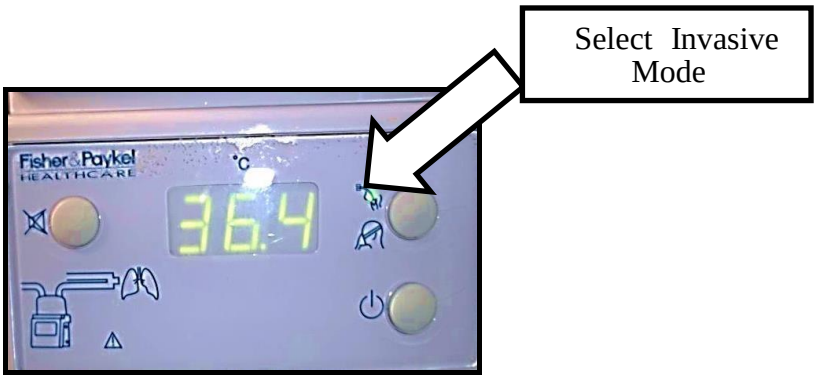
Infant (purple) and Paediatric (green) cannula can also be used on this neonatal system where ≥ 8 litres are required. However, please use AIRVO 2 Optiflow machine in the first instance for larger infants/children).

Setting up the Device

Explain the procedure fully to the child and / or parents to reduce anxiety. Then ensure the following procedures are performed:

1. Plug in the black piped air tubing and the white piped oxygen tubing at the wall
2. Plug in power cord to the humidifier MR850.
3. Place the auto fill water chamber onto the heater plate ensuring the finger guard clicks shut.
4. Pierce a bag of sterile water for inhalation with the spike and hang from pole.
5. Connect pressure relief valve to water chamber.
6. Connect green oxygen tubing from the pressure relief valve to the flow meter on the oxygen / air blender.
7. Connect heated breathing tubing to connection port ensuring you have the correct tubing.

Humidifier MR850

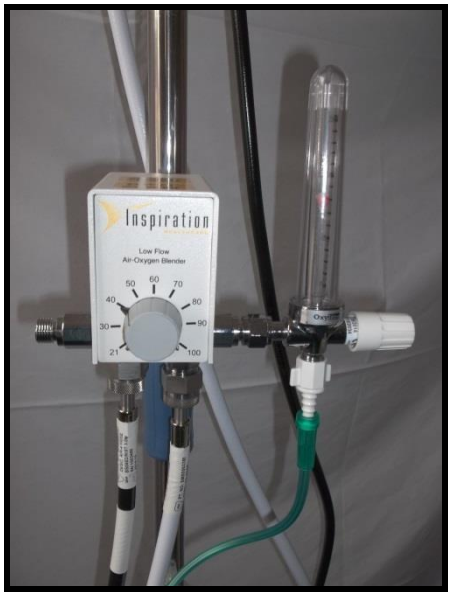


Connect the grey non disposable heater probes to:

a. humidifier dome (clover leaf in shape connection),
b. tubing nearest water chamber (triangular – push right in)
c. tubing closest to patient and nasal cannula

1. Select invasive mode on the humidifier MR850.
2. The humidifier will auto regulate to around 37^{OC}.

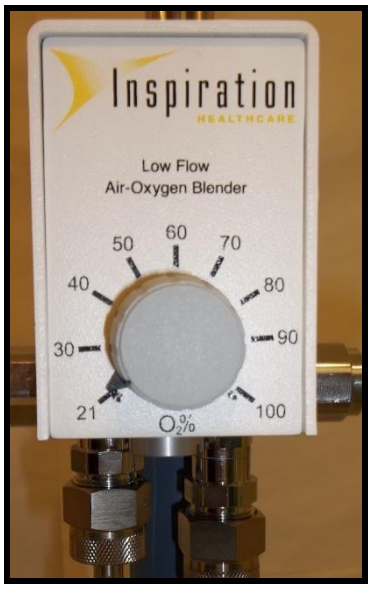
Setting the Flows



1. To set the flow rate adjust the flow meter (note this is different to the AIRVO 2 Optiflow where the flow is set on the machine and the oxygen is adjusted at the flow meter).

2. A maximum of 8 L/min of flow can be given using the premature and neonatal prongs

Oxygen Therapy



1. To set the oxygen percentage dial to required amount using the oxygen blender.

2. Use oxygen analyser to check percentage of oxygen delivered near pressure relief valve.

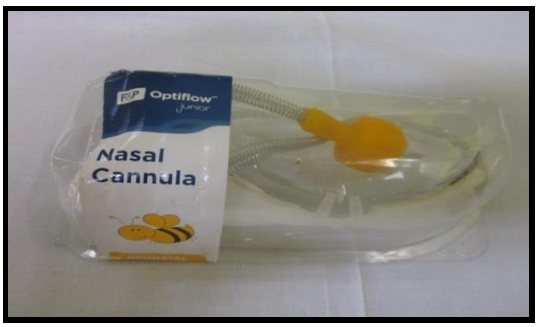
Connecting to the Patient.

Once the desired settings have been set, the cannula can now be attached to the patient.

Attaching the Nasal Cannula

Select the appropriate size nasal cannula. Prongs should not fill the nares and a clear gap should be visible around each prong. If the patient can fit two sizes, select the smaller size.

Product	Approx. weight range	Max flow rate (L/min)
Premature		6-8
Neonatal		6-8



1. Prepare the skin, ensuring the face is clean and dry.
2. Connect the cannula to the Neonatal Optiflow tubing. Place hand close to the prongs to ensure that there is gas flow.
3. Remove the first backing tabs from the Wiggle pads on the nasal cannula, leaving the second backing tabs in place.
4. Hold the ends of the Wiggle pads and apply slight tension to the cannula.
5. Position the prongs as far into the nares as possible so that the cannula bridge rests just underneath the septum.
6. Position horizontally across the face and stick Wiggle pads onto the cheeks.
7. Remove the second backing tabs and stick the Wiggle pads onto the cheeks. Ensure the Wiggle pads are well adhered to the face.

Alarms

1. There are ‘no’ alarms built into this Neonatal Optiflow system.
2. However, if the flow is increased above 8 litres the blue pressure relief valve will release making a hissing noise and will not deliver any higher flow.
3. The humidifier does have alarm settings. If humidifier alarms check each temperature probe to make sure it is pushed in far enough.
4. Each device has a laminated quick reference guide attached with information on alarms, their cause and action to be taken.

Specific Nursing Care of the Patient Receiving Neonatal Optiflow Therapy

1. Observe the nasal cannula at least hourly to ensure they are in the correct position
2. Observe the nose and face for evidence of pressure sores.
3. Perform and record hourly observations including Paediatric Early Warning Score, flow rate of air and oxygen and humidification temperature.
4. Check and record the water level hourly ensuring that not too much water has drained into the water chamber. Replace the sterile water bag every 24 hours**.**
5. Check that the Neonatal Optiflow tubing is warm.
6. Change tubing and cannula every seven days.

Finishing Treatment

1. Turn the flow meter off.
2. Remove the nasal cannula from the patient if required (If there is a possibility of your patient needing to recommence this treatment then leave the Wiggle pads on the patients face).
3. Disconnect the water bag from the spike.
4. Remove the water chamber from the heater plate by pressing down on the finger guard **(Take care as this will be hot)**.
5. Remove the patient circuit from the machine.
6. Discard the disposables as per trust guidelines.

Cleaning Process

1. Dispose of the patient circuit / humidifier dome and green oxygen tubing
2. Wash the machine as per PHNT the Management and Use of Medical Devices Policy.
3. **DO NOT DISPOSE OF THE HEATER WIRES**.

14	Responsibilities

Doctors:

Ensure that they comply with this policy in relation to the management of children less than 16 years of age requiring High Flow Nasal Cannula Therapy.

Ensure timely review when requested by nursing staff to review patients on High Flow of an appropriate seniority as detailed in this policy.

Matrons/Line Managers and Team Leaders are responsible for:

Ensuring that all staff have access to and comply with this policy in relation to the management children less than 16 years of age requiring High Flow Nasal Cannula Therapy.

Establishing local mechanisms for regular evaluation of the implementation and effectiveness of this policy document.

Ensuring that any changes to this policy document are approved through the correct process (Child Health Clinical Governance).

Ensuring that all incidents across Paediatrics, involving High Flow Nasal Cannula Therapy, are reported in line with PHNT Reporting of Incidents procedures.

Providing appropriate and timely feedback to PHNT staff involved in any incident involving High Flow Nasal Cannula Therapy.

Ensuring that staff are supported to attend training as appropriate regarding the safe management of High Flow Nasal Cannula Therapy.

Ensuing that wherever appropriate learning incidents are fed back to the Children and Young People's Clinical Educator, to facilitate the introduction of any appropriate training interventions regarding such incidents.

Clinical Educator is responsible for:

Ensuring that The Acute Paediatrics Training Needs Analysis accurately reflects training requirements for staff in relation to High Flow Nasal Cannula Therapy training, also considering other Paediatric areas as applicable.

Identifying Nursing staff training needs regarding High Flow Nasal Cannula Therapy from learning outcomes from Incidents, and from latest DOH /Patient Safety Alert guidance.

Working with the Line Managers to ensure all appropriately identified staff attend High Flow Nasal Cannula Therapy training, to include refresher /revalidation training as appropriate.

Ensuring that records are kept to evidence that the training has taken place.

Ensuring regular review of this policy document with the document authors to include amendments following on from changes in practice or DoH /NICE guidance/legislation, or Patient Safety Alerts, and internal incidents.

All Staff working in PHNT, who are required to carry out High Flow Nasal Cannula Therapy and management, are responsible for:

Ensuring that they familiarise themselves with their role and responsibility in relation to safe management of High Flow Nasal Cannula Therapy.

Ensuring awareness of this policy, as well as their responsibilities regarding their own Professional Codes of Conduct.

Identifying the need for any change to this policy document as a result of becoming aware of changes in practice and advising their line manager or the Paediatric Clinical Educator accordingly.

Identifying own training needs in respect of this policy document and informing their line manager.

Attending the identified level of training, accept advice and engage in supervision when provided.

Ensuring any incident involving High Flow Nasal Cannula Therapy management are reported following PHNT Incident reporting procedure.

15 Monitoring Compliance and Effectiveness

Monitoring of all incidents involving High Flow Nasal Cannula Therapy is essential in order to identify where lessons can be learnt and to prevent harm to patients occurring and the build-up of unsafe practice.

Line managers or a nominated person will monitor each incident that occurs within their area, and will analyse and collate the detail of tracheostomy incidents taking place in order to identify any particular patterns.

This policy will be subject to AN initial yearly review or earlier should any significant issue be identified, if learning requires implementing or these is a change in guidelines or legislation.

16 Consultation and Ratification

The design and process of review and revision of this policy will comply with The Development and Management of Trust Wide Documents.

The review period for this document is set as default of one year from the date it was last ratified, or earlier if developments within or external to the Trust indicate the need for a significant revision to the procedures described.

This document will be approved by the Child Health Clinical Governance and ratified by the Executive Director of Nursing.

Non-significant amendments to this document may be made, under delegated authority from the Executive Director, by the nominated author. These must be ratified by the Executive Director and should be reported, retrospectively, to the approving group, Child Health Clinical Governance.

Significant reviews and revisions to this document will include a consultation with named groups, or grades across the Trust. For non-significant amendments, informal consultation will be restricted to named groups, or grades that are directly affected by the proposed changes.

17 Dissemination and Implementation

Following approval and ratification, this policy will be published in the Trust's formal documents library and all staff will be notified through the Trust's normal notification process, currently the 'Vital Signs' electronic newsletter.

Document control arrangements will be in accordance with The Development and Management of Trust Wide Documents.

The document author(s) will be responsible for agreeing the training requirements associated with the newly ratified document with the named Executive Director and for working with the Trust's training function, if required, to arrange for the required training to be delivered.

18 References

References:

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Early high flow nasal cannula therapy in bronchiolitis, a prospective randomised control trial (protocol): A Paediatric Acute Respiratory Intervention Study (PARIS). *BMC Pediatr* 2015 14;15:183

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High-flow nasal cannula oxygen therapy for infants with bronchiolitis: Pilot study J *Paediatr Child Health*, 50: 373–378

Dissemination Plan and Review Checklist | Appendix 1

Dissemination Plan	
Document Title	HIGH FLOW NASAL CANNULA OXYGEN THERAPY IN CHILDREN (AIRVO 2 DEVICE)
Date Finalised	January 17th 2017
Previous Documents	
Action to retrieve old copies	N/A

Dissemination Plan

Recipient(s)	When	How	Responsibility
Nursing and Medical Staff in Acute Paediatrics, Anaesthetics, Emergency Department and Intensive Care.		Vital Signs	Information Governance Team

Review Checklist		
Title	Is the title clear and unambiguous?	Y
	Is it clear whether the document is a policy, procedure, protocol, framework, APN or SOP?	Y
	Does the style & format comply?	Y
Rationale	Are reasons for development of the document stated?	Y
Development Process	Is the method described in brief?	Y
	Are people involved in the development identified?	Y
	Has a reasonable attempt has been made to ensure relevant expertise has been used?	Y
	Is there evidence of consultation with stakeholders and users?	Y
Content	Is the objective of the document clear?	Y
	Is the target population clear and unambiguous?	Y
	Are the intended outcomes described?	Y
	Are the statements clear and unambiguous?	Y
Evidence Base	Is the type of evidence to support the document identified explicitly?	Y
	Are key references cited and in full?	Y
	Are supporting documents referenced?	Y
Approval	Does the document identify which committee/group will review it?	Y
	If appropriate have the joint Human Resources/staff side committee (or equivalent) approved the document?	Y
	Does the document identify which Executive Director will ratify it?	Y
Dissemination & Implementation	Is there an outline/plan to identify how this will be done?	Y
	Does the plan include the necessary training/support to ensure compliance?	Y
Document Control	Does the document identify where it will be held?	Y
	Have archiving arrangements for superseded documents been addressed?	Y
Monitoring Compliance & Effectiveness	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Y
	Is there a plan to review or audit compliance with the document?	Y

Review Date	Is the review date identified?	Y
	Is the frequency of review identified? If so is it acceptable?	Y
Overall Responsibility	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Y

Equalities and Human Rights Impact Assessment	Appendix 2

Core Information	
Manager	Care Group Manager
Directorate	Acute Paediatrics
Date	January 2017
Title	HIGH FLOW NASAL CANNULA OXYGEN THERAPY IN CHILDREN (AIRVO 2 DEVICE)
What are the aims, objectives & projected outcomes?	The procedures described in this document are intended to support staff in the safe management of High Flow Nasal Cannula Oxygen Therapy.

Scope of the assessment
All protected characteristics have been considered when developing the policy. Workforce and Service user monitoring, analysis and publication will be undertaken to ensure compliance with legislative requirements and to meet CQC requirements.

Collecting data	
Race	There is no evidence to suggest that there is a negative impact on race regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.
Religion	There is no evidence to suggest that there is a negative impact on religion or belief or non-belief regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.
Disability	There is no evidence to suggest that there is a negative impact on disability regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.
Sex	There is no evidence to suggest that there is a negative impact on sex regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.
Gender Identity	There is no evidence to suggest that there is a negative impact on gender identity regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.

Sexual Orientation	There is no evidence to suggest that there is a negative impact on sexual orientation regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.
Age	There is no evidence to suggest that there is a negative impact on age regarding this policy. Workforce and service data is currently monitored, analysed and published on the Trust website. Areas of concern will be addressed through appropriate action plans. Data from workforce surveys, complaints and service user surveys will be monitored and analysed as required.