

### Site Applicability

The application of High Flow Humidified Nasal Prongs therapy can be initiated in Pediatric Intensive Care Unit (PICU), Emergency, T6, T7 and T8.

### Practice Level/Competencies

Set-up and management of high flow therapy is a basic foundational competency for Registered Respiratory Therapists (RRT).

At BC Children's Hospital, monitoring a patient on high flow therapy is considered an advanced competency for Registered Nurses (RN) and practiced after the RN has had the required education, including completion of LearningHub course: "High Flow Oxygen Therapy"; completed his/her learning validated document by the appropriate clinical support person. (i.e. Clinical Nurse Educator, Clinical Resource Nurse or RRT)

### Policy Statements

Set up, weaning and escalation of flow and FiO<sub>2</sub> will be carried out by the RRT in consultation with the physician (Most Responsible Physician (MRP)/ Intensivist/ Respiriologist).

The RN may adjust the oxygen concentration (O<sub>2</sub>%) delivered to the patient as per the order set. Note that the FiO<sub>2</sub> is achieved by setting the O<sub>2</sub>% on the high flow blender. If the patient requires a FiO<sub>2</sub> above what is indicated in the order set, the RN can increase O<sub>2</sub>% and must contact the RRT and MRP to assess the patient.

On the medical inpatient units, high flow therapy may be initiated by the MRP. The order set must include flow (L/min), FiO<sub>2</sub> and SpO<sub>2</sub> range for the patient.

### Indications

- Prevention of, or relief from, hypoxemia with respiratory distress due to:
  - Pneumonia
  - Bronchiolitis
  - Asthma
  - Chronic Lung Disease
  - Congestive heart failure
  - Congenital heart disease
- Continuing hypoxemia and/or signs of moderate to severe respiratory distress despite low flow oxygen therapy
- Weaning therapy from Non-Invasive Positive Pressure Ventilation
- Support post extubation and mechanical ventilation

### Contraindications

- Pneumothorax or other air leaks
- Excessive nasal secretions or severe rhinitis
- Upper GI Bleed
- Gastric or esophageal surgery
- Inability to maintain airway
- Other airway disorders
- Bilateral choanal atresia
- Recent facial trauma or surgery

### Equipment & Supplies

- High efficiency humidification device (Fisher & Paykel Humidifier Model 850)
- Heated breathing circuit kit with autofeed humidification chamber
  - ≥ 22kg : RT202 Adult Breathing Circuit Kit
  - < 22kg : RT330 Optiflow Junior Breathing Circuit Kit
- Dual flow humidification chamber adapter for gas tubing connection to the Adult Breathing Circuit
- Oxygen tubing
- Oxygen blender
- High pressure air and oxygen hoses
- Oxygen Flowmeter x 2 - attached to the blender to provide flow through the heated humidifier and for emergency equipment
- 1 L inhalation sterile water (H<sub>2</sub>O) bag
- Temperature probe
- High flow nasal cannula of appropriate size
- Wiggle pads
- Duoderm
- Suction tubing, appropriate sized Yankeur and Little Sucker™
- Appropriate sized MDI
- Appropriate personal protective equipment (PPE)

### Procedure

SET-UP AND MANAGEMENT BY RRT	
Steps	Rationale
1. <b>PERFORM</b> hand hygiene and <b>DON</b> personal protective equipment (PPE).	<i>To reduce transmission of microorganisms.</i>
2. <b>VERIFY</b> patient with two patient identifiers.	<i>Ensures identification mechanism is present to prevent treatments, medications, and procedures to wrong child.</i>
3. <b>REVIEW</b> patient history, including baseline oxygen saturations. <b>ASSESS</b> patient for signs and symptoms of inadequate oxygenation and ventilation with current low flow oxygen therapy support. <b>IDENTIFY</b> need for high flow oxygen therapy.	<i>Required data to assess need for high flow oxygen therapy.</i>
4. <b>OBTAIN</b> medical order indicating need for high flow oxygen therapy. See <a href="#">High Flow Humidified Nasal Prong Oxygen Therapy (High Flow Therapy) Order Set</a> .	<i>A medical order is required for ongoing oxygen therapy.</i>
5. <b>OBTAIN</b> appropriate high flow set up.	<i>Make sure the circuit size is optimal for the patient weight.</i>
6. <b>CONNECT</b> 1 L inhalation sterile water bag is connected to humidifier pot; spike bag, ensuring bag is above the chamber.	<i>Allows automatic drainage into the pot.</i>
7. <b>CONNECT</b> the circuit's inspiratory limb to the humidifier pot; insert temperature probes as per manufacture recommendation.	<i>Ensures proper connection of humidifier pot allowing proper temperature of high flow therapy circuit.</i>
8. <b>ATTACH</b> oxygen tubing from the flowmeter on the blender to the flow adapter on humidifier pot. If using oxygen ensure the oxygen analyzer is in line. Use T-piece connector.	<i>Prepares system.</i>
9. <b>ATTACH</b> blender to the wall high pressure medical	

# HIGH FLOW HUMIDIFIED NASAL PRONG OXYGEN THERAPY

## DOCUMENT TYPE: PROCEDURE

air and oxygen sources (50 PSI)	<i>The nasal prongs should not occlude the nares. Patients should be able to exhale around the nasal prongs. The prong size should not exceed 50% of the nares.</i>			
10. <b>CONNECT</b> appropriate size high flow nasal cannula to proximal end of the inspiratory limb.				
11. <b>TURN ON</b> humidifier. <b>NOTE:</b> The humidifier will pre-set temperature and is servo controlled – should always be in “ <b>invasive</b> ” mode.				
12. <b>TURN ON</b> flow as per orders and <b>ADJUST</b> desired oxygen concentration (O <sub>2</sub> %) on blender. Check to ensure there is flow before placing on patient.				
<b>Nasal cannula size and prong specific flow rates</b>				
Patient Weight	Estimated Nasal Prong Size	Prong Flow Rate with Optiflow (min - max)	F&P Mode	Prong Flow Rate with Airvo (min - max)
0.5 - 2.5 kg	Premature (XS)	0.5 - 8 L/min	Junior	-
0.9 - 4 kg	Neonatal (S)	0.5 - 9 L/min	Junior	-
1 - 10 kg	Infant (M)	0.5 - 10 L/min	Junior	-
3 - 20 kg	Intermediate Infant (L)	0.5 - 23 L/min	Junior	2 - 20 L/min
5 - 22 kg	Pediatric (XL)	0.5 - 25 L/min	Junior	2 - 25 L/min
> 22 kg	Small	10 - 50 L/min	Adult	10 - 50 L/min
> 22 kg	Medium	10 - 60 L/min	Adult	10 - 60 L/min
> 22 kg	Large	10 - 60 L/min	Adult	10 - 60 L/min
Note: When increasing the flowrate over 25 L/min, RRT to gradually increase flowrate over two minutes and observe how the change is tolerated.				
13. <b>APPLY</b> cannula to patient using wiggle pads.	<i>Provides comfort and safety for patient.</i>			
14. <b>MONITOR</b> and <b>COMPLETE</b> site-to-source checks after initiation of high flow therapy. <b>MONITOR</b> the patient and perform a respiratory assessment, including PRAM Score, q3h and PRN.	<i>The use of the PRAM Score will assist in identifying deterioration in the patient respiratory status.</i>			

### MONITORING AND ON-GOING CARE BY NURSING

Steps	Rationale
1. <b>PERFORM</b> hand hygiene and <b>DON</b> PPE.	<i>To reduce transmission of microorganisms.</i>
2. <b>VERIFY</b> patient with two patient identifiers.	<i>Ensures identification mechanism is present to prevent treatments, medications, and procedures to wrong child.</i>
3. <b>CONFIRM</b> prescriber order for nasal high flow, including flow rate and FiO <sub>2</sub> . <b>ENSURE</b> patient is within ordered parameters.	
4. <b>LIAISE</b> with RRT to <b>CONDUCT</b> a collaborative PRAM assessment, review the high flow therapy system, and to discuss any patient care concerns.	<i>Promotes teamwork and enhances patient care.</i>
5. <b>PERFORM</b> a thorough <b>ASSESSMENT</b> : <b>CONDUCT</b> a full set of vital signs, <a href="#">per “Nursing Assessment Of Pediatric Patients And Related Documentation: Inpatient Units”</a> policy, (Heart Rate, Respiratory Rate, Blood Pressure, Oxygen Saturations, and Temperature) q4h and PRN. <b>DOCUMENT</b> PEWS score as per <a href="#">PEWS and High Flow Oxygen Therapy Guideline</a> :	<i>To monitor patient trends and respond appropriately. Escalate as necessary per <a href="#">PEWS Escalation Aid</a>.</i>

Date: Jan 1, 2017	Initials: AB
Time: 08	
Respiratory Rate (1 minute)	80
Resp: *	70
	60
	50
	40
	30
	20
O <sub>2</sub> Saturation (%)	94
Supplemental O <sub>2</sub> Concentration Delivered	<3L or 30%
	≥3L or 30%
	≥6L or 40%
	≥8L or 50%
Mode of Delivery	HFNP
Respiratory Distress	None
	Mild
	Moderate
	Severe
PEWS Score for Respiratory (record most severe score)	1

FiO<sub>2</sub> ordered is 35%

To monitor efficacy of high flow oxygen and escalate care as needed.

This is to help monitor the patient to assess for deterioration or improvement of respiratory status.

Note: Specify FiO<sub>2</sub> % versus placing a check mark in order to track and trend settings. Also note flow rate in this section. However, PEWS score is only based upon FiO<sub>2</sub> %.

**MAINTAIN** continuous oxygen saturation monitoring, per ["Oximetry \(Spo2\) Monitoring" Policy](#), unless otherwise ordered. **ENSURE** monitor is set to appropriate patient profile and parameters. **RECORD** oxygen saturations, HR and O<sub>2</sub>% q1h and PRN.

**ASSESS** cardiorespiratory function including respiratory rate, rhythm, effort, breath sounds, air entry, and oxygen saturations at a minimum of q4h. **DOCUMENT** PRAM score per Appendix A.

6. **PERFORM** a site to source check q1h and PRN.

See Appendix C for guidance on completing a site to source.

### 7. TROUBLESHOOTING:

If your patient's condition is worsening or your patient is desaturating, start a site to source check as the first step for your troubleshooting. Use the site to source job aid if you are not 100% comfortable in doing one on your own.

If there is a disconnect anywhere in the circuit, **NO** alarm will sound. This is why it is crucial to perform regular site to source checks.

If you hear a beeping or tweeting alarm, it is either coming from the humidifier or the oxygen analyzer.

- If it's the O<sub>2</sub> analyzer alarm, check to see if the oxygen analyzer probe fell out from the circuit. If it's in place and still alarming, call the RRT.
- If it's the humidifier alarm, check the water bag to see if it's empty. If there is still water in the bag, check the blue temperature probe on the patient end of the circuit. Sometimes water from the circuit can accumulate on the temperature probe and cool it down. In this case, remove the probe, wipe it with alcohol, then dry it with sterile gauze and place it back in the circuit.

If you hear a rattling sound, it may be water accumulated in the circuit tubing.


- If you see water sloshing in the tubing, hold the circuit tubing up and allow water to drain back into the humidifier pot. **ENSURE** you drain the water towards the pot, and **NOT** towards the patient.

If the RN has completed all initial troubleshooting and there is still a problem, they should call the RRT.

Patients with increasing respiratory distress or oxygen requirements may require a PICU consultation to assess for possible transfer to the PICU for escalation of therapy (ie, noninvasive ventilation or intubation).

8. **PERFORM** nasal and oral care q4h and PRN. If patient requires suctioning, **SUCTION** one nare at

This ensures patient therapy is not interrupted. Cannula prongs work independently of one another,

<p>a time. <b>REMOVE</b> one side of the prongs from the wiggle pad, and suction the ipsilateral nare. <b>PLACE</b> the prong back in position on the wiggle pad, and <b>REPEAT</b> on the other side.</p> 	<p><i>so if the cannula is bent or pinched on one side, the other side will still be able to deliver full flow to the patient.</i></p>
<p>9. <b>ASSESS</b> skin under nasal prongs for evidence of pressure wounds q12h and PRN . <b>READJUST</b> tubing and straps to relieve pressure as necessary. <b>PERFORM</b> Braden Q score q12h and PRN.</p>	<p><i>Pressure from the cannula tubing and straps can lead to development of pressure sores.</i></p>
<p>10. For inhaled medication, such as Salbutamol, <b>REMOVE</b> prongs and <b>ADMINISTER</b> via MDI per <a href="#">‘Using a Metered Dose Inhaler with Spacer for Medication Delivery’</a>.</p>	<p><i>Note: Prongs must be removed from the nares regardless of delivery route. A nebulizer may be advised under RRT discretion. The RRT must be present to deliver medication if using nebulized route.</i></p>
<p>11. <b>ASSESS</b> patient ability to feed two hours after commencing high flow therapy. If WoB, SpO<sub>2</sub> and FiO<sub>2</sub> are stable, patient may feed orally per prescriber’s order. If unable to tolerate oral feeds, consider OT consultation and/or feeding through a nasogastric tube. See <a href="#">Enteral Feeding guidelines</a>.</p>	<p><i>Feeding is not contraindicated on high flow. Patients are to be assessed on an ongoing and individual basis regarding feeding. If patient is not tolerating oral feeds, assess need for NG bolus or continuous feeds. If unable to tolerate continuous feeds, commence IV fluids.</i></p>
<p>12. If transporting a patient, the RN and RRT must accompany with necessary safety equipment. <b>ENSURE</b> oxygen cylinder safety, such that there is adequate remaining oxygen in the cylinder and that the canister is secured safely (ie. in a carrier) See <a href="#">“Patient Transport Inter-Unit”</a> procedure.</p>	<p><i>Oxygen cylinders must be secured in position during transportation, storage, or use as they are combustible and may result in injury. Do not roll, slide, or drop oxygen cylinders.</i></p>
<p>13. <b>CONTACT</b> RRT if:</p> <ol style="list-style-type: none"> <li>Patient has increased respiratory distress</li> <li>SpO<sub>2</sub> falls below prescribed targets</li> </ol>	
<p>14. <b>CONSIDER</b> MRP consultation to PICU if:</p> <ul style="list-style-type: none"> <li>HR, RR, WoB, and oxygen requirement remain unchanged or deteriorating</li> <li>Other clinical deterioration (apneas, bradycardias, deteriorating LOC, poor perfusion)</li> <li>Deteriorating blood gases</li> </ul>	
<p>15. <b>REMOVE</b> PPE and <b>PERFORM</b> hand hygiene.</p>	<p><i>To reduce transmission of microorganisms.</i></p>

### WEANING BY RRT

Steps	Rationale
1. Wean O <sub>2</sub> % to maintain SpO <sub>2</sub> as per the order set.	<i>This should be done in consultation with the bedside nurse and medical team.</i>
2. While weaning the patient's oxygen, PRAM score should be 4 or less	
3. Once patient's FiO <sub>2</sub> is less than 30% and PRAM is	



maintained at 4 or less switch patient over to regular nasal prongs to maintain SpO <sub>2</sub> as ordered.	
<b>4. Discontinuation of high flow therapy:</b> Following discontinuation of high flow therapy, the RRT will <b>CLEAN &amp; RE-CIRCUIT</b> the high flow therapy set-up.	<i>To ensure high flow set-up ready at all times.</i>

### Documentation

**Nursing:** Document on appropriate records q4h and PRN (daily flow sheet, nursing notes):

- method of high flow delivery
- high flowrate and O<sub>2</sub>%
- HR, RR and effort, SpO<sub>2</sub> readings hourly
- BP, Temp, breath sounds, and PRAM q4h and PRN
- site to source check
- patient's response to treatment
- date and time RRT and/or physician consulted
- date and time RRT and/or physician assess patient
- patient/family teaching
- any other pertinent actions or observations
- changes in patient status

**Respiratory Therapy:** Document on appropriate records q3h and PRN (RT flow sheet):

- date and time high flow therapy is initiated
- flowrate and O<sub>2</sub>%
- clinical findings (breath sounds, HR, RR, SpO<sub>2</sub> readings)
- site to source check
- patient response to therapy
- any changes in patient status
- patient progress
- PRAM score – documented on the daily flow sheet

### References

- BC Children's Hospital. (2019). High Flow Oxygen Therapy. *LearningHub*. Retrieved from <http://learninghub.phsa.ca/moodle/course/view.php?id=1701>
- de Klerk, A. (2008). Humidified high-flow nasal cannula: is it the new and improved CPAP? *Advances in Neonatal Care*, 8(2):98-106.
- Dysart, K., Miller, T.L., Wolfson, M.R. and Shaffer, T.H. (2009). Research in high flow therapy: Mechanisms of action. *Respiratory Medicine*, 103: 1400-1405.
- Fisher & Paykel Healthcare Limited. (2019). Optiflow Junior 2 Nasal Cannula. Retrieved from <https://www.fphcare.com/en-ca/hospital/infant-respiratory/nasal-high-flow-therapy/understand/optiflow-junior-2/>
- Foster, K., Hough, J., Pham, T. and Schibler, A. (2009). High flow nasal prong oxygen (HFNP) reduces the need for mechanical ventilation in bronchiolitic infants. *Australian Critical Care*, 22(1):46-47.
- Franklin, D., Babl, F. E., Schlapbach, et al. (2018). A Randomized Trial of High-Flow Oxygen Therapy in Infants with Bronchiolitis. *New England Journal of Medicine*, 378(12), 1121-1131. doi:10.1056/nejmoa1714855.
- Fraser Health Authority. (2017). Respiratory Therapy Clinical Protocol: Oxygen Therapy: Pediatric – Heated Humidified High Flow Nasal Cannula.
- Hough, J.L., Shearman, A.D., Jardine, L.A. and Davies, M.W. (2011). Humidified high flow nasal cannulae: Current practice in Australasian nurseries, a survey. *Journal of Paediatrics and Child Health*.
- Kemp, J. (2018). High Flow Nasal Prong (HFNP) therapy. The Royal Children's Hospital Melbourne. Retrieved from [https://www.rch.org.au/rchcpg/hospital\\_clinical\\_guideline\\_index/High\\_Flow\\_Nasal\\_Prong\\_\(HFNP\)\\_therapy/](https://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/High_Flow_Nasal_Prong_(HFNP)_therapy/)

- McKiernan, C., Chua, L.C., Visintainer, P.F. & Allen, H. (2010). High Flow Nasal Cannulae Therapy in Infants with Bronchiolitis. *Journal of Pediatrics*, 156(4):634-8.
- SickKids. (2015). Heated High Flow Nasal Cannula Therapy. Toronto, ON: SickKids.
- Spentzas, T., Minarik, M., Patters, A.B., Vinson, B. & Stidham, G. (2009). Children With Respiratory Distress Treated With High-Flow Nasal Cannula. *Journal of Intensive Care Medicine*, 24(5):323-328.

### Definitions

**FiO<sub>2</sub>**: fraction of inspired oxygen (e.g. pure oxygen is FiO<sub>2</sub> = 1.0; room air is FiO<sub>2</sub> = 0.21)

**High flow oxygen**: oxygen delivery device that delivers a heated and humidified mixture of air and oxygen at a flowrate that meets or exceeds the patient's peak inspiratory flow. The high flowrate prevents room air entrainment, and therefore provides a precise FiO<sub>2</sub> based on the set O<sub>2</sub>%.

**Hypoxemia**: deficiency of oxygen in the blood. Note: "suspected hypoxemia" is the presence of signs and symptoms of hypoxemia with low arterial oxygen saturation on pulse oximetry, but without an actual arterial blood gas level.

**Hypoxia**: deficiency of oxygen in tissue. A condition in which there is insufficient oxygen in the arterial blood to meet the metabolic demands of the tissues and cells.

**Hypercapnea**: increased amounts of carbon dioxide in the blood

**Oxygen therapy**: administration of oxygen at concentrations greater than room air (FiO<sub>2</sub> = 0.21)

**SaO<sub>2</sub>**: arterial oxygen saturation measured by blood gas (% value)

**SpO<sub>2</sub>**: arterial oxygen saturation measured via pulse oximetry (% value); does not indicate the amount of O<sub>2</sub> delivered to the tissues nor effectiveness of ventilation (carbon dioxide elimination) as it is the percent of total hemoglobin that is fully saturated with oxygen.

**Work of Breathing (WoB)**: patients with deficiencies in oxygenation and/or ventilation may have some evidence of respiratory compromise, as indicated by increased WoB. Decreased work of breathing may be noted as the patient becomes fatigued and progresses toward respiratory failure and respiratory arrest.

Assessment of airway sounds, the patient's position of comfort, and use of accessory muscles provides information regarding the patient's work of breathing. A patient who has abnormal breathing sounds, is in a position to maximize airflow, and is using accessory muscles is in respiratory distress.

- **Airway sounds** - Abnormal airway sounds that can be heard without a stethoscope are often an indication of respiratory distress. These include stridor, snoring, grunting, and wheezing.
- **Positioning** - To maximize airway opening when there is obstruction, a patient may assume the "sniffing position" (neck and head mildly extended with jaw forward) to align the airway axes and improve airflow. For older patients, the tripod position, in which the patient is sitting up and leaning forward on outstretched hands, may be preferred.
- **Accessory muscle use** - Patients with inadequate oxygenation or ventilation often use accessory muscles (such as supraclavicular, intercostal, and/or substernal groups) to increase tidal volume, thereby improving minute ventilation. Retractions result from the use of accessory muscles. They can be supraclavicular, intercostal, and/or substernal. Severe retractions of more than one muscle group may indicate significant hypercapnea with hypoxia.
- **Head bobbing** (extension of the head on inhalation and forward movement on exhalation) and **nasal flaring** (opening of the nostrils to allow the passage of more air) are additional indicators of accessory muscle use and respiratory distress.

### Related Documents

- [Oxygen Therapy & Delivery Procedure](#)
- [High Flow Humidified Nasal Prong Oxygen Therapy \(High Flow Therapy\) Order Set](#)
- [High Flow Oxygen Therapy](#) LearningHub

### Appendix

- [Appendix A: PRAM Score](#)
- [Appendix B: High Flow Oxygen Delivery](#)
- [Appendix C: Site to Source: Troubleshooting Quick Guide](#)

### Developed by

BC Children's Hospital – Pediatric Intensive Care Unit – Respiratory Therapist Educator

### Version History

DATE	DOCUMENT NUMBER and TITLE	ACTION TAKEN
05-Sept-2018	CC.09.13 High Flow Humidified Nasal Prong Oxygen Therapy (High Flow Therapy)	Approved at: BCCH Best Practice Committee
03-Jul-2019	C-05-12-60341 High Flow Humidified Nasal Prong Oxygen Therapy	Approved at: BCCH Best Practice Committee

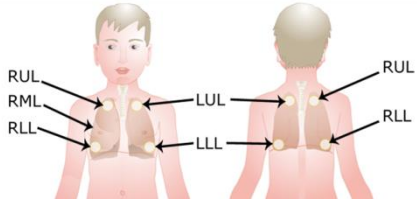
### Disclaimer

This document is intended for use within BC Children's and BC Women's Hospitals only. Any other use or reliance is at your sole risk. The content does not constitute and is not in substitution of professional medical advice. Provincial Health Services Authority (PHSA) assumes no liability arising from use or reliance on this document. This document is protected by copyright and may only be reprinted in whole or in part with the prior written approval of PHSA.




### Appendix A: PRAM Scoring Table

Criteria	Description	Score	Notes
O <sub>2</sub> saturation	≥ 95%	0	O <sub>2</sub> saturation must be measured with the patient breathing ambient air until stabilization of the oximetry value for at least 1 minute
	92 - 94%	1	If the patient is in supplementary oxygen, turn this off when measuring PRAM. If SpO <sub>2</sub> falls <92% you can turn oxygen back on immediately as they have automatically scored maximum (2) points
	< 92%	2	
Suprasternal retraction	Absent	0	The suprasternal retraction is visible indrawing of the skin above the sternum and between the clavicles with every intake of breath
	Present	2	<u>This is a visual assessment</u>
Scalene muscle contraction	Absent	0	Occurs in about 10% of all patients – only with severe <b>exacerbations</b>
	Present	2	<p>The scalenes are deep cervical muscles located in the floor of the lateral aspect of the neck.</p> <p>Scalene contraction cannot be seen. <u>This is a palpable assessment</u></p> <p>Scalene muscles are bordered on each side by the:</p> <ul style="list-style-type: none"> <li>• Sternocleidomastoid muscle</li> <li>• Trapezius muscle</li> <li>• Clavicle</li> </ul> <p>Land mark for locating scalene muscles – at the clavicle in line with the ear lobe.</p>
Air Entry	Normal	0	<b>Use lung fields to grade air entry</b>
	↓at the base	1	Lung field = two contiguous vertical auscultation zones of the major lobes:
	↓at the apex and the base	2	<ul style="list-style-type: none"> <li>• Right anterior lung field: RUL &amp; RML</li> <li>• Right posterior lung field: RUL &amp; RLL</li> <li>• Left anterior lung field: LUL &amp; LLL</li> <li>• Left posterior lung field: LUL and LLL</li> </ul>
	Minimal or absent	3	<p>Graded according to affected lung fields.</p> <p><b>**In cases of asymmetry, the most severely affected lung field determines the rating</b></p>

Wheezing	<p>Absent</p> <p>Expiratory only</p> <p>Inspiratory (± expiratory)</p> <p>Audible without stethoscope or silent chest (minimal or no air entry)</p>	<p>0</p> <p>1</p> <p>2</p>	<p><b>Use auscultation zones to grade wheeze</b></p> <p>At least two auscultation zones must be affected to influence the rating</p>  <p><b>**In cases of asymmetry, the most severely affected lung field determines the rating</b></p>
	PRAM score total (maximum 12)		
<b>Score Severity</b>	<b>0 – 3 Mild</b>	<b>4 – 7 Moderate</b>	<b>8 – 12 Severe</b>

### Appendix B: High Flow Humidified Nasal Prong Oxygen Delivery Devices

Description	Nasal Cannula Size and Prong Specific Flow Rates (min / max)				
	Patient Weight	Estimated Nasal Prong Size	Prong Flow Rate with Optiflow	F&P Mode	Prong Flow Rate with Airvo
<p>Oxygen delivery device that delivers a heated and humidified mixture of air and oxygen at a flowrate that meets or exceeds the patient's peak inspiratory flow. The high flowrate prevents room air entrainment, and therefore provides a precise FiO<sub>2</sub> based on the set O<sub>2</sub>%.</p> 	0.5 - 2.5 kg	Premature (XS)	0.5 - 8 L/min	Junior	-
	0.9 - 4 kg	Neonatal (S)	0.5 - 9 L/min	Junior	-
	1 - 10 kg	Infant (M)	0.5 - 10 L/min	Junior	-
	3 - 20 kg	Intermediate Infant (L)	0.5 - 23 L/min	Junior	2 - 20 L/min
	5 - 22 kg	Pediatric (XL)	0.5 - 25 L/min	Junior	2 - 25 L/min
	> 22 kg	Small	10 - 50 L/min	Adult	10 - 50 L/min
	> 22 kg	Medium	10 - 60 L/min	Adult	10 - 60 L/min
	> 22 kg	Large	10 - 60 L/min	Adult	10 - 60 L/min
	<ul style="list-style-type: none"> <li>The maximum rate is specific to each prong size. It is unable to deliver oxygen at higher rates than the indicated maximum. If requiring more, consultation with RRT, MRP, and PICU is necessary.</li> <li>When increasing the flowrate over 25 L/min, RRT to gradually increase flowrate over two minutes and observe how the change is tolerated.</li> <li>FiO<sub>2</sub> and Flow Rate to be adjusted by RRT only; unless patient is deteriorating, then FiO<sub>2</sub> may be adjusted by RN.</li> </ul>				
	Considerations				
<ul style="list-style-type: none"> <li>Nares should not be occluded by more than 50-60% due to possible excessive pressure.</li> <li>RRT to assess and PRAM patients on High Flow q3h and PRN. RN to assess q1h and PRN and PRAM q4h and PRN. Initial assessment of the shift to be done in collaboration with RRT and RN in order to assess patient, plan care for the shift (including escalation of care or weaning), and review High Flow system.</li> <li>Assess skin qshift for skin breakdown. Adjust prongs and tubing regularly. Reapply new wiggle pads PRN.</li> <li>Perform nasal and oral care q4h and PRN. If patient requires suctioning, suction one nare at a time. Remove one side of the prongs from the wiggle pad, and suction the ipsilateral nare. Place the prong back in position on the wiggle pad, and repeat on the other side.</li> <li>When delivering an inhaled medication, the nasal prongs must be removed. Preferred inhaled medication administration is via a MDI. If nebulizer is recommended, an RRT is to administer. Normal saline nebulizers are not recommended as High Flow is already humidified.</li> <li>Feeding (PO or tube) should be commenced if patient is tolerating High Flow. To be assessed per patient and adjusted as needed.</li> </ul>					

### Appendix C: Site to Source: Troubleshooting Quick Guides

## Site to Source : Troubleshooting Quick Guide

### Follow These Checking Steps Every Hour

### What to Check

(refer to parts guide on reverse page)

#### First check to see if...

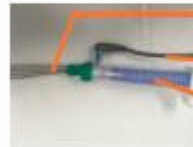
- Are the nares both patent?
- Are the prongs patent?
- Are the prongs kinked/stretched/broken/torn?
- Are the prongs sitting correctly in the nares?
- Are the prongs the proper size (50% of nare diameter)?



01 Nares & Nasal Prongs

#### Then proceed to...

- Are the prongs connected tightly to the circuit?
- Is the temperature probe connected tightly to the end of the circuit?



02 Nasal Prongs  
03 Temperature Probe  
04 Circuit (Patient End)

#### Then proceed to...

- Is the circuit connected to the humidifier?
- Is the temperature probe connected to the beginning of the circuit?



04 Circuit (Humidifier End)  
05 Temperature Probe  
06 Heater Wire  
07 Humidifier Pot

#### Then proceed to...

- Is the O2 analyzer probe tightly connected to the circuit?
- Is the O2 tubing connected to the O2 nipple?



08 Oxygen Analyzer Probe  
09 Oxygen Tubing & Oxygen Nipple (Clear)

#### Then proceed to....

- Is the O2 tubing connected to the flowmeter?
- Is the correct flow set?
- Is the correct FiO2 set?
- Are the set and analyzed FiO2 correlating?



10 Oxygen Nipple (Green)  
11 Flowmeter  
12 Blender  
13 Oxygen Analyzer

#### Finally...

- Is your patient still desaturating or distressed?



**If so, call RT using Vocera by saying the code "Call Floor RT"**

### Site to Source : Airvo Troubleshooting Quick Guide

#### Follow These Checking Steps Every Hour

#### What to Check

##### First check to see if...

- Are the nares both patent?
- Are the prongs patent?
- Are the prongs kinked/stretched/broken/torn?
- Are the prongs sitting correctly in the nares?
- Are the prongs the proper size (50% of nare diameter)?



Nares & Nasal Prongs

##### Then proceed to...

- Are the prongs connected tightly to the circuit?



Circuit Connection

##### Then proceed to...

- Is the circuit connected to the machine?



Circuit Connection

##### Then proceed to...

- When scrolling through the patient settings with the "Play" button, are the settings correct?



"Play" Button

##### Then proceed to...

- Is the back of the machine clear of any obstruction?
- Is the machine plugged into a power outlet?



Air Intake & Air Filter

##### IF the patient is on oxygen...

- Is the oxygen tubing connected to the green tee on the side of the machine?
- Is the oxygen tubing connected to the flowmeter?
- Is the correct oxygen flow set?



Oxygen Tubing Connection



*Finally, if your patient is still desaturating or distressed despite checking the above things, call RT using Vocera by saying the code "Call Floor RT"*