

Status **Active** PolicyStat ID **12727886**



Seattle Children's
HOSPITAL • RESEARCH • FOUNDATION

Originated 1/1/2012
Last 12/1/2022
Approved
Effective 12/1/2022
Last Revised 12/1/2022
Next Review 11/30/2025

Owner **Missy Lein:**
Clinical Nurse
Specialist

Document Area **Clinical**

Document Types **P&P**

High Flow Nasal Cannula (HFNC), 10200

Policy/Procedure

PURPOSE:

To safely and consistently manage patients receiving High Flow Nasal Cannula (HFNC).

POLICY:

Patients on High Flow Nasal Cannula (HFNC) at Seattle Children's will receive safe, effective appropriate care.

DEFINITIONS:

High Flow Nasal Cannula - a level of flow greater than the patient's inspiratory flow, based on estimates for age and size, with humidified and heated gas. It is possible to use the HFNC device to deliver humidified and heated gas below the flow level defined as "high flow" without the level of physiologic support or risk inherent to "high flow."

PROCEDURE:

Description

- A. High flow nasal cannula (HFNC) is a form of respiratory support used in patients requiring more support than low flow oxygen or as a transition from higher levels of respiratory support. It requires the delivery of blended heated and humidified gas through a respiratory circuit to nasal cannula interface. The positive airway pressure that it can deliver may be inconsistent and unpredictable; therefore it must be used carefully.

Therapy

- A. Use in patients placed on HFNC for concern of new acute respiratory distress (See also [CSW Pathways\[LM1\]](#) Bronchiolitis, Pneumonia and Asthma):
1. For patients in acute respiratory distress, HFNC may be initiated in acute care. Acute care team (Provider, RN, and RT) will huddle with RISK RN (if possible) before initiation.
 - a. Initiate HFNC at maximum flow rate (see [Appendix I](#)) at an FiO₂ to maintain SpO₂ ≥ 90%.
 - i. Maximum FiO₂ is 50%.
 - ii. Make patient NPO
 - b. A huddle will occur 60 minutes after HFNC initiation and will include the Acute Care Attending MD, the bedside RN, the Acute Care RT, and the RISK RN.
 - i. For patients with hypoxia or respiratory distress not improved: initiate RRT to determine respiratory support needs and appropriate bed placement (ICU vs. Acute Care). Increasing flow limits above floor maximum will require Off-Policy approval. See [P&P: Escalation Protocol for Patient Care, Safety Concerns, or Off-Policy Requests, 10219](#).
 - ii. For patients with improved respiratory status: remain in acute care. May orally feed when on floor minimum settings and there is no other concern for potential aspiration.
 2. If the patient is concerning for respiratory failure, the patient will be transferred to the ICU.
 - a. Criteria for transfer to ICU:
 - i. Desaturations below 90% despite FiO₂ 50% or greater
 - ii. Late signs of respiratory failure including: inappropriately low respiratory rate with worsening obstruction, lethargy despite noxious stimuli, poor perfusion, apnea > 20 seconds with associated bradycardia/desaturation requiring intervention.
- B. Use in patients on HFNC transferred to acute care from the ICU
1. Patients must meet transfer criteria prior to transfer from the ICU (see [Appendix I](#)).
 2. Patients may resume use of HFNC without an RRT if it has been less than 24 hours since discontinuation in cases of acute illness and less than 72 hours in patients with chronic disease, unless clinical concern warrants a RRT.
 - a. For reinitiation after more than 24 hours, acute care team will huddle with RISK RN.
- C. Use of HFNC for Chronic Respiratory Insufficiency/Failure

1. Patients must meet criteria for consideration shown in [Appendix II](#), including pulmonary consultation and presence of chronic respiratory disease.
 - a. In slowly changing patients, HFNC may be initiated at flow rates at or below acute care max. Acute care team (Attending MD, Pulmonary consultation, RN and RT) will huddle to discuss therapeutic goals. RRT not required.
 - b. For chronic patients with new respiratory distress, increasing HFNC above floor maximum require RRT and Off-Policy approval. See Escalation Protocol for Patient Care, Safety Concerns, or Off-Policy Requests, 10219.
 2. Weaning may include flow rates below 0.5lpm/kg and a slower weaning strategy, including progressive extension of sprints in special circumstances (see CDH pathway).
 3. Patients who have limitation of resuscitation may benefit from supportive use of HFNC above the flow limits for acute care and on case by case basis, may receive support up to the maximum ICU HFNC flow limits for age
- D. Use in patients in the Intensive Care Unit.
1. See maximal ICU flow limits for weight.
 2. For use in post-extubation, perform initial trial with nasal cannula oxygen prior to initiation of HFNC.

Weaning HFNC for Acute Respiratory Distress

- A. Wean flow and FiO₂ quickly in improving patients, including at night.
1. Wean as follows:
 - a. if patient on FiO₂ >21%: acute care max flow → minimum flow → off;
 - b. If patient is on FiO₂ of 21%: acute care max flow → off.
 2. Avoid gradual weans using other flow rates.
- B. Attempt HFNC wean at least once/day unless patient is experiencing ongoing or worsening respiratory distress.
1. RT or RN will assess readiness to wean Q4 hour
 2. If a wean is trialed, a provider will remain at bedside for the first 10 minutes to observe the patient. The provider will reassess within 2 hours to ensure a sustained successful wean.
- C. Definition of failed wean: increased work of breathing that the team judges difficult to sustain for the next 12-24 hours which resolves when flow wean is reversed.
1. The team may restart HFNC without an RRT as long as severity of respiratory distress does not warrant an RRT.

Safety Considerations

- A. Closely monitor for water in the circuit to prevent contact with the patient

- B. Closely monitor humidifier to assure system does not run dry. High flow oxygen without humidification leads to nasal dryness and coughing.
- C. Patients on HFNC with increasing flow and FiO₂ needs may quickly progress to respiratory failure that may not be appreciated.
- D. When an infant is transitioning off HFNC discuss with respiratory therapy. Do not move from blended HFNC and humidification to wall oxygen at same liter flow with low flow nasal cannula. (i.e. 2L at 40% HFNC is not the same as 2L wall oxygen per nasal cannula in an infant).
- E. **Maximal flow rate, using the pediatric HFNC system, is 40LPM.**

Assessment/Monitoring

A. Respiratory:

1. Continuous SaO₂ monitoring and ECG monitoring as ordered
2. Assess breath sounds at least every 4 hours and prn.
3. Assess for signs and symptoms of respiratory distress:
 - a. Tachypnea
 - b. Nasal flaring
 - c. Retractions
 - d. Grunting
 - e. Overall work of breathing
 - f. Diminished or asymmetric breath sounds
 - g. Head bobbing
4. Tachypnea along with tachycardia and changes to level of activity (inconsolable, fussy, lethargy, difficulty feeding) may be signs of impending respiratory failure.
5. Assess for signs of pneumothorax from positive airway pressure. This would include signs of acute respiratory distress including:
 - a. Increased respiratory rate.
 - b. Shallow respirations.
 - c. Cyanosis.
 - d. Asymmetrical breath sounds.
 - e. Tachycardia.
 - f. Hypotension
6. CXR and blood gases should be monitored per attending service.

B. Gastrointestinal:

1. Feeding regimen per physician orders in collaboration with nutrition services.
2. In infants use extreme care in nipple feeding. Closing of the infant's mouth may increase delivered positive airway pressure from HFNC system and put the patient at higher risk for aspiration.

3. Oral feedings per infant PT/OT team and plan of care.
- C. Infection:
1. Lung infection secondary to administration of heated, humidified gas is rare, but has been reported. Monitor temperature every 4 hours.
- D. Skin Care:
1. Assess nares for pressure points. See **GOC:** [Skin Care and Prevention of Pressure Injury, 10965](#).
 2. Assure nasal cannula does not create pressure areas anywhere it comes in contact with skin (inside the nares, ears, head, etc.)

Equipment

- A. Patients receiving HFNC in ACU and ICU will have approximately two patient assessments and respiratory device checks per shift. If HFNC flow has been changed, then an additional patient assessment and device check will be completed following each change.
- B. Document respiratory assessment every 4 hours including blender FiO₂ settings and liter flow settings.
1. Notify MD for any changes in oxygen saturation.
 2. Adjust oxygen concentration (FiO₂) per physician order. This may be done by an RN or RT.
 3. Changes to flow must be done in collaboration with respiratory therapy and medical team. Weaning HFNC for patients not on the Bronchiolitis Pathway require pulmonary service consideration.
- C. Contact your respiratory therapist if a patient needs to transport off-unit.

PATIENT/FAMILY/CAREGIVER EDUCATION:

- A. Demonstrate ability to care for child on HFNC if discharge on HFNC is anticipated.
- B. Describes signs of respiratory distress
- C. Demonstrates use of oxygen therapy and equipment
- D. Demonstrate infant care and feeding

SEE ALSO:

- [Job Aid: High Flow Nasal Cannula \(HFNC\), 12041](#)

REFERENCES:

Abboud PA et al. Predictors of failure in infants with viral bronchiolitis treated with high-flow, high-humidity nasal cannula therapy. *Pediatr Crit Care Med*. 2012;13(6):e343-9.

Arora B et al. Nasopharyngeal airway pressures in bronchiolitis patients treated with high-flow nasal cannula oxygen therapy. *Pediatr Emerg Care*. 2012;28(11):1179-1184.

DeKlerk A. Humidified high-flow nasal cannula: is it the new and improved CPAP? *Adv Neonatal*

Care, 2012;8: 98-106.

Hasan RA, Habib RH. Effects of flow rate and airleak at the nares and mouth opening on positive distending pressure delivery using commercially available high-flow nasal cannula systems: A lung model study. *Pediatr Crit Care Med*. 2011;12(1):e29-33.

Hegde S, Prodhan P. Serious air leak syndrome complicating high-flow nasal cannula therapy: A report of 3 cases. *Pediatrics*. 2013;131(3):e939-44.

Kalburgi S and Halley T. High-Flow Nasal Cannula Use Outside of the ICU Setting. *Pediatrics*. 2020;146(5):e20194083

Kubicka ZJ et al. Heated, humidified, high flow nasal cannula therapy: yet another way to deliver continuous positive airway pressure? *Pediatrics*. 2008;121: 82-88.

Lampland AL et al. Observational study of humidified high flow nasal cannula compared with nasal continuous positive airway pressure. *Journal of Pediatrics*. 2009;154:177-182

Lee JH et al. Use of high flow nasal cannula in critically ill infants, children, and adults: A critical review of the literature. *Intensive Care Med*. 2013;39(2):247-257.

Luo J., et al. Efficacy of high flow nasal cannula vs standard o2 therapy or nasal continuous positive airway pressure in children with respiratory distress: A Meta-Analysis. *Journal of Pediatrics*. 2019; 215:199-208

Mayfield S et al. High flow nasal prong oxygen reduces the need for mechanical ventilation in bronchiolitic infants. *Pediatr Crit Care Med*. 2011;12(3):A118.

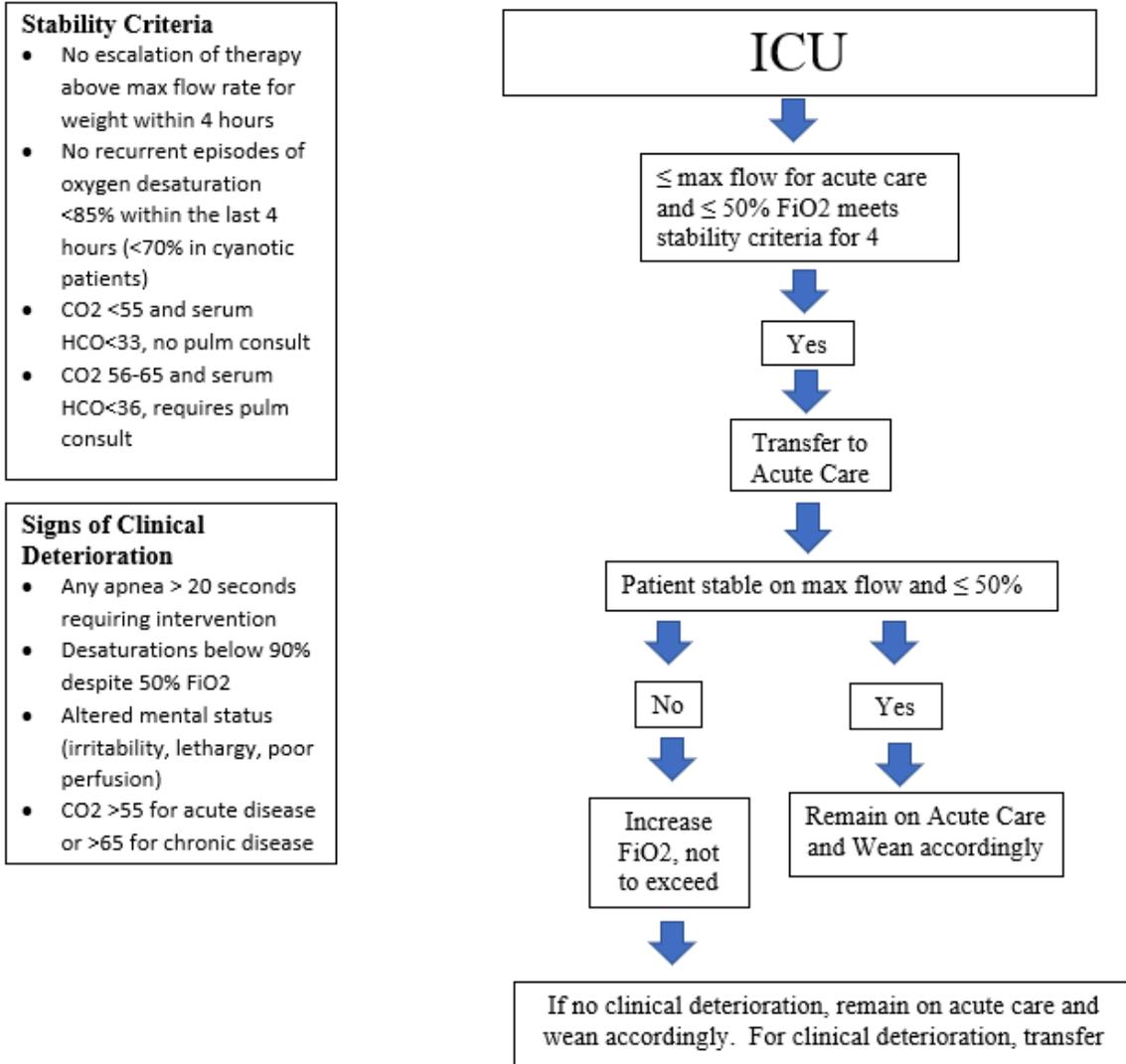
McKiernan C et al. High flow nasal cannulae therapy in infants with bronchiolitis. *J Pediatr*. 2010;156(4):634-638.

Spentzas T et al. Children with respiratory distress treated with high-flow nasal cannula. *J Intensive Care Med*. 2009;24(5):323-328.

Weiler, T. et al. The relationship between high flow nasal cannula flow rate and effort of breathing in children. *J Pediatr* 2017; 189:66-71.

APPENDIX

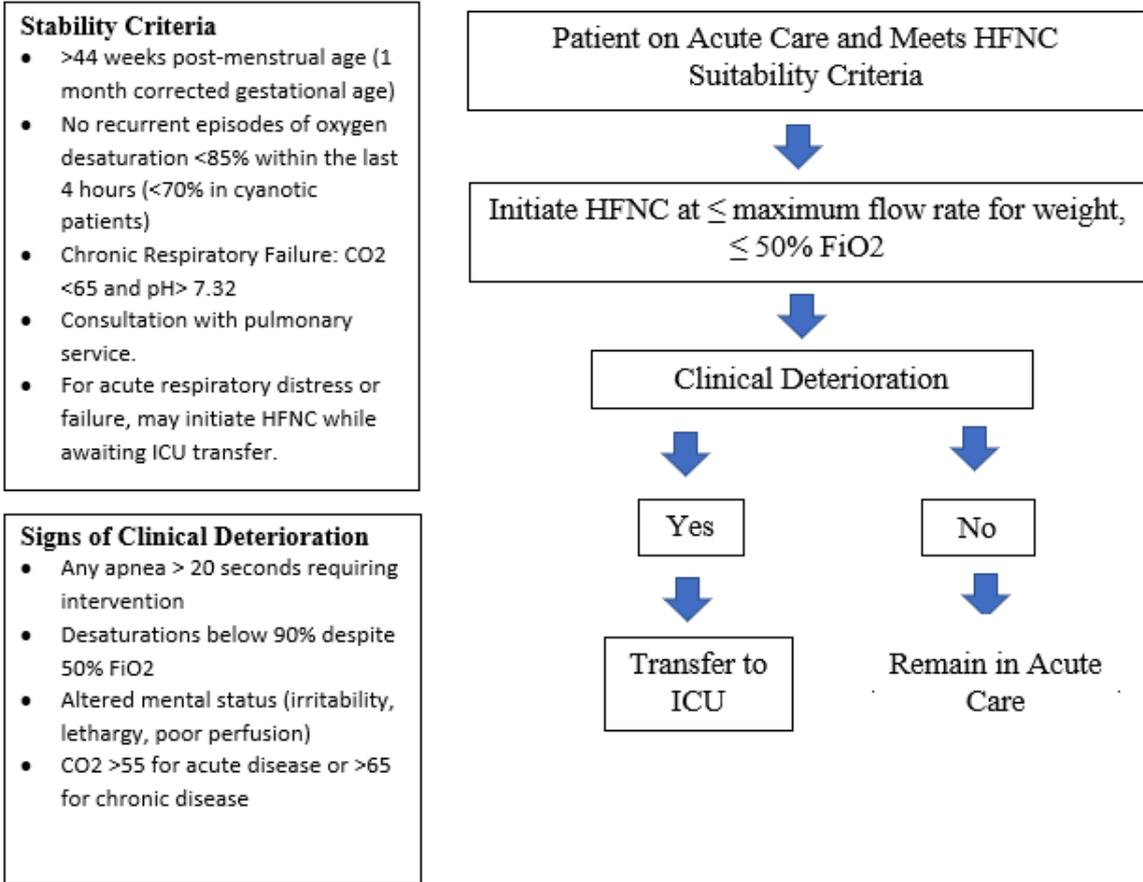
Appendix I: High Flow Nasal Cannula Transfer from ICU



SCH High-Flow Nasal Cannula Flow Rates:

Minimum Flow	Acute Care Maximum Flow	ICU Maximum Flow
0.5L/kg/min	1.5L/min/kg or 25L/min	2L/min/kg or 40L/min

Appendix II: Initiation of HFNC in Acute Care



SCH High-Flow Nasal Cannula Flow Rates:

Minimum Flow	Acute Care Maximum Flow	ICU Maximum Flow
0.5L/kg/min	1.5L/min/kg or 25L/min	2L/min/kg or 40L/min

Attachments

[APPENDIX.docx](#)

[b64_d4c6011d-d4e3-4aef-bea2-30194a6b3602](#)

[b64_f9ae200b-5940-466e-b8ba-d26d2ff42b98](#)

Approval Signatures

Step Description	Approver	Date
------------------	----------	------

Release for Publication	Dale Landis: Director, Accreditation & Regulatory Compliance	12/1/2022
Executive Leadership	Bonnie Fryzlewicz: SVP & Chief Nursing Officer	12/1/2022
Executive Leadership	Ruth McDonald: VP - Chief Medical Operations Officer	11/30/2022
Document Quality Control	Tim Klein: Program Coordinator III	11/30/2022
Document Owner	Missy Lein: Clinical Nurse Specialist	11/30/2022

COPY