

HIGH-FLOW NASAL CANNULA

Table of Contents

- [Critical Points](#)
- [Supplies](#)
- [Procedure](#)
- [Troubleshooting](#)
- [References](#)

Critical Points

1. High Flow Nasal Cannula (HFNC) delivers supplemental oxygen at higher flow rates than a standard nasal cannula. The gas is humidified and heated to a range of 31°C-35°C, to enhance patient comfort.
 - a. Initiation of HFNC therapy may take place in the Transitional Care Units (C5 TCUP & C4 CTCU), Intensive Care Units (ICU) or Emergency Department (ED).
 - b. Patients can also be transferred from ICU to TCU on HFNC.
2. In **C4 CTCU**, oxygen flow rate limits are determined by age:
 - a. Age specific flow rate ranges:
 - i. 2 – 8 L for infants less than 1 year of age
 - ii. 2 – 10 L for children 1 - 4 years of age
 - iii. 2 – 20 L for children greater than 4 years of age
 - b. Flow rates may be titrated within the age specific flow rate range as clinically indicated.
 - c. No change in flow occur without a provider order; Up-titration requires primary attending notification (daytime) and PICU/CICU attending notification (nighttime & weekends).
CAVEAT: Non-cardiac patients boarded on C4 CTCU, (i.e. patients with respiratory disease without cardiac disease) can match the TCUP limits in critical point 3.
3. In **C5 TCUP**, oxygen flow rate limits are determined by weight, up to 2 L/kg with a maximum rate of 25 L.
 - a. No change in flow may occur without a provider order; Up-titration requires primary attending notification (daytime) and PICU/CICU attending notification (nighttime & weekends).
 - b. If a patient reaches 2 L/kg or 25 L *and* is experiencing respiratory distress, then a Rapid Response Team (RRT) call is indicated. Final disposition to be determined by the team.
 - c. An RRT should be called in any situation where any team member, including caregivers, are concerned about stability at any flow rate on HFNC.
4. On acute care units use of HFNC therapy is restricted to patients who are at end of life. See [Guidelines for Pediatric Patient Placement](#).
5. If a patient develops acute respiratory distress, notify respiratory therapy (RT) and provider, and follow the Chain of Command nursing policy.
 - a. It is reasonable to increase the oxygen flow rate to the maximum allowable flow rate based on weight/age - specific guidelines and set the blender to 100% FiO₂ until the managing team and/or RT arrive at the bedside to assess the patient.

HIGH-FLOW NASAL CANNULA (*continued*)

Supplies

High flow oxygen delivery system will be set up and managed by RT, including changing equipment, setup, and preparing patient for off unit transport, as necessary.

- Air / oxygen blender with flowmeter
- Humidification system for HFNC delivery, including pole-mounting clamp attached to blender
- HFNC heated wire circuit, humidifier, canister, and water
- HFNC nasal interface (Do not substitute interfaces with standard nasal cannulas.)
- Calibrated oxygen analyzer

Procedure

TRANSFER AND INITIATION CRITERIA

1. **Transfer** to TCU on HFNC is intended for use in patients who are ready to transition to lower level of care and identified as clinically appropriate (e.g. may include assessment of respiratory status based on, but not limited to respiratory rate, oxygen saturation, work of breathing). The decision to transfer any patient on HFNC from CICU to CTCU should be discussed and agreed upon by the CICU and CTCU attending physicians.
2. **Initiation** of HFNC in the TCU may occur as follows:
 - **CTCU: HFNC oxygen support will be managed by CTCU team.**
 - **Initiation** of HFNC in CTCU may occur only after being assessed and deemed appropriate for CTCU by the cardiology attending or fellow, charge RN, and charge RT.
 - **TCUP: HFNC oxygen support will be managed by the TCUP team.**
 - **Initiation** of HFNC in TCUP may occur only after being assessed by a critical or transitional care provider. HFNC may be applied in the following settings:
 - ♦ **Direct admit from ED** in respiratory distress, with increased WOB but does not show signs of impending respiratory failure: (PaO₂ <60, unable to maintain oxygen saturations >90%, altered mental status, change in VS > 20% above baseline) Patient may exhibit increased WOB at baseline.
 - ♦ **TCU patient** who develops respiratory distress, with increased WOB not responsive to escalating NC flow rate but who does not show signs of impending respiratory failure: (PaO₂ <60, unable to maintain oxygen saturations >90%, altered mental status, change in VS > 20% above baseline)
 - **CAVEAT:** Direct admissions to TCUP from an outside hospital (OSH) will **NOT** be eligible for initial HFNC management in TCU. These patients must be admitted to PICU for evaluation and care until they meet transfer criteria to TCU.

ORDER VERIFICATION

1. RT will verify provider orders for oxygen concentration and flow.

MONITORING & ASSESSMENT

1. Monitoring
 - a. Patients will be on continuous pulse oximetry and cardiorespiratory monitoring in order to assess for changes in respiratory status.

HIGH-FLOW NASAL CANNULA (continued)

- b. Document heart rate, respiratory rate, and SpO₂ with vital signs and as needed.
2. Assessment
 - a. In addition to performing on-going assessment, reassess patient when there is a provider-ordered change in oxygen concentration or flow rate.
 - b. With every flow titration, perform and document heart rate, respiratory rate, oxygen saturation, and respiratory pattern, effort and any retractions:
 - i. Q 30 minutes x 2, then
 - ii. Q 1 hour x 2, then
 - iii. Q 3 hours, or per provider order for VS frequency
 - c. Assess skin near and under cannula and oxygen tubing:
 - i. On admission
 - ii. After transfer
 - iii. After off-unit procedures (i.e., X-ray)
 - iv. At least every shift.
 - d. The circuit on the HFNC is warm.
 - i. Avoid patient's direct contact with the circuit, including patient's clothing and blanket.

WEANING / TITRATING HIGH FLOW OXYGEN DELIVERY

- The decision to adjust flow rates and oxygen concentrations will be based on respiratory status including, but not limited to, oxygen saturations, respiratory rate, and work of breathing.
- **For Non-cardiac patients:**
 - FiO₂ can be weaned to 40%; Order must be written to wean FiO₂ based on oxygen saturations
 - Flow will be titrated by provider order and based on WOB
- All escalation of flow rates require a provider order from the TCU team (see Critical Point 2a).
- If a flow rate outside of the weight specifications is required, the patient should have an RRT to assess patient stability and in some cases for possible transfer to the ICU when indicated.

DOCUMENTATION / EDUCATION

1. Educate patient/parents on HFNC therapy use and intervention goals.
2. RN will document prescribed oxygen therapy, flow rate, and device on medical record flow sheet:
 - a. On admission and with vital signs
 - b. When there is an order change to oxygen concentration or flow rate
3. RN will document patient's response to oxygen/aerosol therapy on flow sheet:
 - a. At least every shift and with vital signs; See above for frequency of assessment for each unit.
 - b. If changed from initial assessment.
 - c. Include: venous blood gas (VBGs) or SpO₂ if available and any relevant clinical findings related patient's need for oxygen/aerosol therapy.
4. Expect RT to document:
 - a. Upon initial setup - FiO₂, liter flow, temperature, SpO₂, and patient assessment.
 - b. Subsequent patient assessments and equipment checks performed every 4-6 hours, at minimum.

HIGH-FLOW NASAL CANNULA (*continued*)

Troubleshooting

Problem	Suspected issue	Action
For any system alarms		<ul style="list-style-type: none"> • Call RT immediately • DO NOT silence alarm or turn off machine
See Oxygen Therapy for HFNC equipment, setup, and application by Respiratory Care Services.		

References

Level of Evidence (FAME*)	Level*	Reference
Level of Evidence (FAME*)	E2	Franklin, D., Babl, F.E., Schlapbach, L.J., Oakley, E., Craig, S., Neutze, J., ...Schibler, A. (2018). A randomized trial of high-flow oxygen therapy in infants with bronchiolitis. <i>New England Journal of Medicine</i> 378(12), 1121-1131. doi: 10.1056/NEJMoa1714855
	E2	Frizzola, M., Miller, T.L., Rodriguez, M.E., Zhu, Y., Rojas, J., Heseck, A., ...Dysart, K. (2011). High-Flow nasal cannula: Impact on oxygenation and ventilation in an acute lung model. <i>Pediatric Pulmonology</i> 46(1): 67-74. doi:10.1002/ppul.21326
	E2/3	Piedra, P., & Stark, A. (2019, February 26). Bronchiolitis in infants and children: Treatment, outcome, and prevention. In A.Q. Lam (Ed.), <i>UpToDate</i> . Retrieved from: http://www.uptodate.com/contents/bronchiolitis-in-infants-and-children-treatment-outcome-
* FAME Scale details: See nursing policy Procedure, & Competency Development, Review, & Approval		

Procedure History

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HIGH-FLOW NASAL CANNULA (*continued*)

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