



State of Maryland

**Maryland
Institute for
Emergency Medical
Services Systems**

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To: Commercial EMS Services

From: Timothy Chizmar, MD
State EMS Medical Director

Date: December 12, 2022

Re: **Heated/Humidified High Flow Nasal Cannula for Pediatrics (15.2-P) –
Emergency Protocol**

This emergency protocol is being issued by the Maryland Institute for Emergency Medical Services Systems, after approval by the Executive Director of MIEMSS and the Chairman of the State Emergency Medical Services Board.

Protocol 15.2-P has been developed to address the surge of pediatric patients requiring heated and humidified high flow nasal cannula during interfacility transport. Protocol 15.2-A has been revised to remove the brief pediatric section and ensure overall consistency.

The protocol will be reviewed by the State Emergency Medical Services Board during their December meeting. However, it is available for immediate implementation by qualified specialty care transport (SCT) services.

Please notify the State Office of Commercial Ambulance Licensing and Regulation (slegore@miemss.org) and the Office of the Medical Director (chyzer@miemss.org) if your SCT service would like to utilize this protocol.

Please direct any questions regarding the protocol content to the Office of the Medical Director.

Attachments:

Protocol 15.2-A: HHFNC (Adults), revised

Protocol 15.2-P: HHFNC (Pediatrics)

Optional Supplemental Protocol – AIRWAY MANAGEMENT: HEATED/HUMIDIFIED HIGH-FLOW NASAL CANNULA (HHFNC)

1. PURPOSE

To define the indications for the initiation or continuation of HHFNC by an appropriately trained paramedic for patients 13 years of age and older.

2. INDICATIONS

Patients with hypoxic respiratory failure, which may be due to the following causes: pulmonary edema, pneumonia, pulmonary embolism, pulmonary hypertension, or interstitial lung disease.

3. CONTRAINDICATIONS

- Inability to provide continuous, heated humidification using an approved delivery device.
- Inability to provide therapy through an appropriate sized nasal prongs
- Insufficient supply of oxygen to complete the transport
- Basilar skull fracture or severe facial trauma
- Circumstances in which BiPAP/CPAP, endotracheal intubation or surgical airway is indicated
- Patient cannot tolerate transport on 100% FiO₂ (if blended air is not available)

4. PROCEDURE

- Ensure that an adequate supply of oxygen is available for the transport.
 - Calculate the amount of oxygen available to transport the patient with current therapy:

$$\text{Minutes of available oxygen} = \frac{(\text{Tank PSI} \times \text{Tank Factor})}{(\text{Flow rate} \times \text{FiO}_2)}$$

Tank PSI: pounds
 Tank Factor: D size = 0.16; E size = 0.28; G size = 2.41; H and K size = 3.14;
 M size = 1.56
 Flow rate: liters per minute
 FiO₂: expressed as a fraction (e.g., 40% = .40)
 - Estimate total duration of transport, and ensure there is at least twice the amount of necessary oxygen available.
- Perform appropriate patient assessment, including obtaining vital signs, pulse oximeter (SpO₂) reading, and cardiac rhythm.
- Set FiO₂ to maintain SpO₂ at or above 94% (or to patient's baseline oxygen saturation, if known).
- Set flow rate in liters per minute (L/min) to decrease work of breathing.
 - Flow calculation: 2 L/kg/min up to the first 12 kg, plus 0.5 L/kg/min for each kg thereafter, up to a maximum flow rate of 60 L/min.
- Reassess vital signs, work of breathing, mental status and breath sounds.
- Consider the need for escalation of respiratory support if patient remains in respiratory failure on more than 2 L/kg/min of flow or maximum settings for the delivery device.



FOR CIRCUMSTANCES IN WHICH THE PATIENT DOES NOT IMPROVE OR CONTINUES TO DETERIORATE ON HHFNC, TERMINATE HHFNC ADMINISTRATION AND ESCALATE RESPIRATORY SUPPORT TO PROVIDE POSITIVE PRESSURE VENTILATION VIA CPAP, BIPAP, BVM OR ENDOTRACHEAL INTUBATION, IF NECESSARY.



1. PURPOSE

To define the indications and contraindications for continuation of HHFNC for patients less than 13 years of age undergoing interfacility transport by an appropriately trained paramedic, who is credentialed and operating as part of a specialty care transport service. The SCT service must routinely transport pediatric patients and have age-appropriate HHFNC equipment.

2. INDICATIONS

Patients with hypoxic respiratory failure who meet **all** of the following criteria:

- a) Patient age: 3 months (corrected gestational age) to 12 years
- b) Patient started on HHFNC flow prior to transport for support of respiratory illness
- c) Patient has been on stable or decreasing rate of flow for at least 6 hours prior to transport
- d) HHFNC rate is $\leq 2L/kg/min$, up to 24 L/min maximum rate of flow, and FiO_2 is $\leq 50\%$
- e) Patient has been screened by a specialty care transport team medical director or RN and has been approved for paramedic only transport

3. CONTRAINDICATIONS

- a) Inability to provide continuous HHFNC using approved delivery device
- b) Inability to provide therapy through appropriate sized nasal prongs
- c) Insufficient supply of oxygen to complete the transport
- d) Basilar skull fracture or severe facial trauma
- e) Circumstances in which BiPAP/CPAP, endotracheal intubation or surgical airway is indicated
- f) Patient cannot tolerate transport on 100% FiO_2 (if blended air is not available)

4. PROCEDURE

- a) Ensure that an adequate supply of oxygen is available for the transport.
 - (1) Calculate the amount of oxygen available to transport the patient with current therapy:

$$\text{Minutes of available oxygen} = \frac{(\text{Tank PSI} \times \text{Tank Factor})}{(\text{Flow rate} \times \text{FiO}_2)}$$

Tank PSI: pounds
 Tank Factor: D size = 0.16; E size = 0.28; G size = 2.41; H and K size = 3.14;
 M size = 1.56
 Flow rate: liters per minute
 FiO_2 : expressed as a fraction (e.g., 40% = .40)
 - (2) Estimate total duration of transport, and ensure there is at least twice the amount of necessary oxygen available.
- b) Perform appropriate patient assessment, including obtaining vital signs, pulse ox (SpO_2) and breath sounds.
- c) If using blended air, set FiO_2 to match the FiO_2 on which patient has been maintained in the sending facility. Goal SpO_2 of $\geq 94\%$ or per medical direction.
- d) Set flow rate (L/min) to match the flow rate the patient is currently receiving. If the flow rate cannot be matched exactly, round up to next closest flow rate setting on the transport HHFNC device.
- e) Reassess vital signs, work of breathing, mental status and breath sounds.
- f) If patient appears unstable for transport (e.g., hypoxic, agitated) on current HHFNC settings, consult the SCT service medical direction.