Heliox Therapy

Purpose / Description:
Helium's density is less than Nitrogen's, so at any given gas flow there is less turbulence. This property of helium can benefit patients with airway obstructions by improving gas exchange, lowering airway resistance, and reducing work of breathing.

Indications / Applications of Heliox:
The use of heliox has led to clinical improvement in respiratory distress and reduced work of breathing in a variety of obstructive lesions including:
1. Upper Airway Obstruction:
   a. Viral & post-extubation croup
   b. Anaphylaxis
   c. Vocal cord paralysis
   d. Upper airway masses, including tumors
2. Lower Airway Obstruction
   a. Asthma
   b. COPD
   c. Brochiolitis
   d. Bronchopulmonary dysplasia

The effectiveness depends on the concentration of helium:
- Best: 80% helium / 20% oxygen
- Mixtures containing less than 60% helium are too dense to be clinically beneficial. *Heliox offers no permanent solution to a pathological process.*

Contraindications:
There are no absolute contraindications for heliox.

Policy:
A. 70/30% heliox will be administered per physician order by Cardiopulmonary Services to those patients with airway obstructions.
B. Heliox regulators are maintained by Cardiopulmonary Services and cylinders by Physical Plant.
C. A full Heliox cylinder will remain on reserve at all times in the PICU and MICU storage area, in the ER Asthma room and anywhere heliox is in use. These cylinders will be requisitioned and maintained by the Respiratory Therapist or Technician. Cylinders are obtained from General Service Store (Ph# 5-5850) during regular business hours and from Maintenance (Beeper # available from operator) after hours.
D. The Respiratory Therapist or Technician will be responsible for monitoring the administration of heliox and ensuring adequate supply for patient use. Cylinders are to be replaced at 200 PSI. The Respiratory Therapist or Technician will ensure timely placement on the patient.
   
   **DURATION OF CYLINDER:** \[
   3.14 \times \text{PSI} \times 1.6 \times \text{FLOW} = \text{MINUTES}
   \]
E. All patients receiving heliox therapy will be monitored with continuous pulse oximetry and will have documentation of therapy as per department guidelines every 4 hours.

Equipment:
Heliox regulator; high pressure hose with DISS connections for oxygen on one end and air on the other end, or heliox regulator must have a quick connect for air; oxygen analyzer; G-cylinder of 70/30 heliox; pulse oximeter; and air and oxygen flow meter.
Procedure:

A. Heliox Through a Mechanical Ventilator
1. Check the patients chart for an appropriate order. The order should read as follows:
   - 70/30 heliox through vent.
   - Vent. Settings: Pressure Control, Rate __, Insp. Press. __, PEEP __, FIO2 __, I-Time __.
   - ABG Q __.
2. Call to obtain two tanks of 70/30 heliox. (If you do not know how to obtain heliox, read policy-C in this Heliox section.)
3. Wash hands and apply personal protective equipment.
4. Identify self and department and explain the procedure to the patient.
5. Identify patient by comparing hospital and billing numbers on the armband to those on the physicians’ orders for therapy.
6. Place heliox regulator on the G-cylinder. The cylinder should be cracked slightly before placing the regulator, so that trash inside the connection will be removed.
7. Change vent mode to Pressure Control. Determine the PIP you will need to obtain the exhaled tidal volume that is ordered. Set the rate, PEEP, FIO2, and I-Time as ordered.
8. If the heliox regulator has an air quick connect, then connect the air hose from the vent to the regulator. If heliox regulator does not have a quick connect, then connect your high pressure hose with oxygen DISS connection to the regulator and connect air DISS connection to the air inlet on the ventilator.
9. Turn the heliox cylinder on and set the regulator at 50 psi.
10. Adjust the FIO2 knob on the vent to deliver the FIO2 that is ordered. When using the SERVO 300 you must put an analyzer in line and disconnect the O2 cell. To obtain an FIO2 of 30% you must set the vent on 21% since you have 70/30 heliox on the air side.
11. **Make sure the patient has good chest movement for the pressure you have set. You can not go by the volumes on the vent.**
12. You should obtain an ABG within 30 minutes to determine if ventilation is adequate.
13. Document vent settings per policy, and the pressure inside the heliox cylinder with each vent check.
14. Always have a heliox tank on standby.
15. Discard all personal protective equipment and wash your hand.

B. Intubated Patients Without Mechanical Ventilation
1. Check the patients chart for an appropriate order. The order should read as follows:
   - 70/30 Heliox via T-Piece
   - Pulse ox
2. Call to obtain two tanks of 70/30 heliox. (If you do not know how to obtain heliox, read policy-C in this Heliox section.)
3. Wash hands and apply personal protective equipment.
4. Identify self and department and explain the procedure to the patient.
5. Identify patient by comparing hospital and billing numbers on the armband to those on the physicians’ orders for therapy.
6. Place heliox regulator on the G-Cylinder.
7. If the heliox regulator has an air quick connect, then connect an air flowmeter. If the regulator does not have a quick connect, then connect an oxygen flowmeter to the oxygen DISS connection on the heliox regulator.
8. Turn the heliox cylinder on and set the regulator at 50 psi.
9. Attach a humidifier filled with sterile water to the flowmeter.
10. Attach oxygen tubing from the humidifier to a NIF nipple connected to a six-inch piece of corrugated tubing by a 15-mm adapter. Then connect the corrugated tubing to a T-Piece that has 24 inches of reservoir tubing distal to patient. Connect the T-piece to the endotracheal or tracheostomy tube.
11. Adjust heliox flowmeter so that heliox is not depleted from reservoir tubing during inspiration.
12. An oxygen analyzer should be placed in line to measure the concentration of oxygen being delivered.
13. If an FIO2 of greater than 30% is desired, place a one-way valve with an oxygen nipple on the humidifier and attach the 6 feet of corrugated tubing from the T-Piece to the one-way valve. Attach oxygen tubing from an oxygen flowmeter in the wall to the oxygen
nipple on the one-way valve. Increase the liter flow on the oxygen flowmeter until you reach the desired oxygen concentration.

14. Connect the patient to a pulse oximeter.
15. Document on Cardiopulmonary progress note per policy. With each progress note entry, include the pressure inside the heliox cylinder.
16. Always have a heliox tank on standby.
17. Discard all personal protective equipment and wash your hands.

C. Non-intubated Patients

1. Check patient's chart for an appropriate order. The order should read as follows:
   - Place patient on 70/30 Heliox
   - Pulse ox

2. Call for two tanks of heliox tanks to be delivered. (If you do not know how to obtain heliox, read policy-C in this Heliox section.)

3. Wash hands and apply personal protective equipment.
4. Identify self and department to the patient and explain the procedure to the patient.
5. Identify patient by comparing hospital and billing numbers on the armband to those on the physicians’ orders for therapy.
6. Place heliox regulator on the G-cylinder.
7. If the heliox regulator has an air quick connect, then connect an air flowmeter. If the regulator does not have a quick connect, then connect an oxygen flowmeter to the oxygen DISS connection on the heliox regulator.
8. Turn the heliox cylinder on and set the regulator at 50 psi.
9. Attach a nonrebreathing mask with safety vent™ to the flowmeter.
10. Place delivery device on patient and adjust heliox flowmeter so that the reservoir bag only empties halfway during inspiration. A good seal should be maintained to assure delivery of the desired concentration of helium and oxygen.
11. Connect the patient to a pulse oximeter.
12. Document on a Cardiopulmonary progress note per policy. With each progress note entry, include the pressure inside the heliox cylinder.
13. Always have a heliox tank on standby.
14. Discard all personal protective equipment and wash your hands.