Departmental Policy	Dept.: Intensive Care Services	Policy No: 1-2-9451-03-009 Version No: 03
Title: Heliox Delivery via Mechanical Ventilation		**JCI Code:** COP

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1. INTRODUCTION

1.1 Helium is the second lightest element found in nature and its low density is the basis for its use as a therapeutic gas, breathing a low-density gas mixture can decrease the driving pressure needed to move gas in and out through the large airway through laminar flow.

1.2 Helium will not support life and must be mixed with at least 20% oxygen. Basically, helium replaces the nitrogen in atmospheric air. Usually therapeutic mixtures are 70/30 or 80/20 (% Helium/% Oxygen), in PSMMC, the premixed cylinders are available an 80/20 combination

2. PURPOSE

To describe the delivery of Heliox as a therapeutic modality for use with spontaneously breathing patients and mechanically ventilated patients.

3. RESPONSIBILITIES

3.1. The Senior RCP is responsible for ensuring the equipment is properly set up and monitored on all patients receiving Heliox therapy.

3.2. Junior RCS staff may manage Heliox therapy under the supervision of the Senior RCP.

4. APPLICABILITY

4.1. This policy applies to all Respiratory Cares Services staff that provides Inhaled Heliox therapy to patients breathing spontaneously or on mechanical ventilation in the Intensive Care Unit.

5. POLICY

5.1. Initiation of Heliox therapy must be ordered by the Intensive Care Units physician.

5.2. It is the responsibility of Respiratory Therapist to set up, initiate, adjust, monitor and evaluate the effectiveness of heliox as per written physician's order.

5.3. Before initiation of Heliox therapy, the SENIOR Respiratory Care Practitioner (RCP) must ensure that there is sufficient number of Heliox tanks.

5.4. The physician must be notified if there are limited numbers of Heliox tanks in hand.

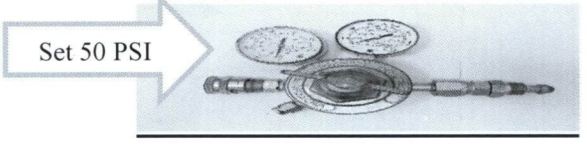
5.5. The RT assistant must inform the Equipment Supervisor about the Heliox inventory on a weekly basis.

5.6. Heliox cylinders shall be replaced at 500 psig.

6. PROCEDURES

6.1. The ICU physician should give the written order for initiating Heliox therapy.
6.2. Identify patient as per the hospital approved 'Hospital Identification Guidelines'
6.3. Wash hands and implement standard precaution as per infection control Guidelines.
6.4. Explains procedure to the patient/family.
6.5. Conscious patient should be warned of effect of heliox gas, is distorted high pitch vocal tone and reassured that it disappears immediately after therapy is stopped.
6.6. Assess patient breath sound, work of breathing and vital signs.
6.7. Intensive Care Services at PSMMC has a special ventilator (Viasys Avea) that is designated and calibrated for use with Heliox.
6.8. **Equipment Needed**
- 6.8.1. Sufficient supply of H-Type Heliox cylinders.
- 6.8.2. Helium regulator / flow meter with nipple adapter.
- 6.8.3. Non-rebreathing mask, nasal cannula and, nebulizer kit
- 6.8.4. Viasys **Avea** Ventilator
- 6.8.5. Pulse Oximetry & Respiratory Rate (RR)
- 6.8.6. Cardiac monitoring Heart Rate & ECG

6.9. **Set Up**
- 6.9.1. Gather required equipment as outlined above
- 6.9.2. Attach 2 stage helium regulator to the large Heliox tank 80/20.
  - 6.9.2.1. Open the cylinder valve by rotating clockwise the valve on top of the cylinder
  - 6.9.2.2. Set second state helium regulator to 50 psi by turning the "T" handle of the regulator
  - 6.9.2.3. Change adapter of gas inlet on rear of ventilator by removing the medical air (brass colour) flow control to the Heliox (green colour) flow control
  - 6.9.2.4. Ventilator will function as normal using Heliox instead of medical air as a driving gas to the internal blender
  - 6.9.2.5. Set ventilator functions and parameters as usual.



- 6.9.3. <u>For spontaneously breathing patient:</u>
  - 6.9.3.1. Two flow meters are used: one is connected to oxygen wall outlet and one to a heliox cylinder.

6.9.3.2. Heliox can be delivered by two different techniques:

6.9.3.2.1. Tubing from each flow meter is connected to a T-piece that is then attached to the nonrebreather mask (the one-way valve of the rebreather mask should be in place.)

6.9.3.2.2. Connecting the heliox directly to the non-rebreathing mask and using a nasal cannula to administer extra oxygen if needed

6.9.3.3. Adjust the heliox flow meter to 8 LPM or until the bag partially inflated.

6.9.3.4. Secure mask strap over patient head and fix the mask placement using face strips.

6.9.3.5. Because these flow meters are calibrated to the density of oxygen and not helium, the flow displayed on the flow meter will not be accurate for indicating heliox flow.

6.9.3.6. The correction factor for an 80/20 heliox mixture is 1.8, and for 70/30 is 1.6.

For example, if 10L/min is displayed on the O2 flow meter attached on 80/20:

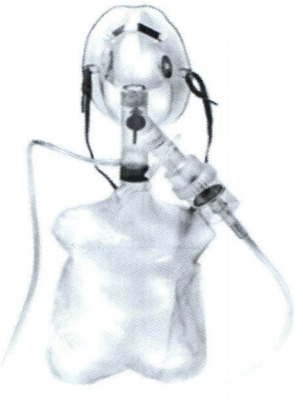
The actual flow will be 18L/min. (10×1.8=18).

6.9.3.7. To calculation available therapy time for heliox H-cylinder , using gauge pressure of 2000 Pis:

$$\frac{\text{Tank pressure (Psig)} \times \text{cylinder factor}}{\text{Flowmeter sitting}} = \text{duration of flow (minute)}$$

$$\frac{2000\times2.5}{10\times1.8} = \frac{5000}{18} = \frac{278 \text{ mint}}{60} = 4\text{hour and } 38\text{mint}$$

2.5: H-cylinder conversion factor



6.10. **Documentation**

6.10.1. Document on the CERNER.

Interactive View and I&O, then specialty Gas Management.

6.10.2. Heliox tank concentration used.

6.10.2.1. Heliox Ratio, 80/20 or 70/30.

6.10.2.2. Heliox Gas Flow

6.10.2.3. Tank pressure psig.

6.10.2.4. Helium second stage regulation pressure i.e.; 50 Pound per Square Inch Gauge. (psig)

6.10.3. Document ABG results as normally done.

6.10.4. Document SpO_2 as normally done.

6.11. **Withdrawal of Heliox Therapy**

6.11.1. Heliox can be discontinued abruptly.

6.11.2. Heliox is an adjunct to other medical therapies.

6.11.3. Heliox does not treat the underlying disorder or disease process.

6.12. **Indications**

6.12.1. To help increase peak flows in asthmatics and to reduce respiratory acidosis through enhanced alveolar ventilation and diffusion and reduces peak pressures required in mechanically ventilated patients.

6.12.2. Heliox has been used successfully as an adjunct to bronchodilators in patient with status asthmaticus.

6.12.3. Heliox has been used as an adjunct to treat reversible obstructive disorders; acute upper airway obstructions from post extubation stridor; croup; bronchial tumors or trauma that is refractory to Racemic Epinephrine

6.12.4. To reduce excessive work of breathing (WOB) in patients with reversible obstructive disorder and treatment for respiratory distress, reduction in dyspnea and work of breathing,

6.13. **Contraindications**

6.13.1. Helium is biologically inert gas. There are no absolute contraindications to the use of Heliox Therapy

6.13.2. Hypoxemia associated with breathing helium mixture, because of using too low O_2 concentration i.e. 20% or very rarely, some cylinders stored for long periods of time have been found to contain these gases in unmixed, or separated.

6.14. **CAUTION**

6.14.1. Must monitoring the Heliox cylinder while being used on patients.

6.14.2. The lower the set FiO_2, the higher the Heliox consumption.

6.14.3. The higher the set RR, Tidal volume (VT), Minute Ventilation (MV), the higher the Heliox consumption.

6.14.4. The low density of the inhaled gases will result in the patient's cough effort being less effective and spontaneous clearing of secretions may be affected, this problem can be rectified by means of washing out the helium before coughing and bronchial hygiene must be maintained.

6.14.5. Conventional ventilators are set up and calibrated to the physical properties of oxygen and medical air. The lower density of helium mixtures pose a delivery problem and inaccuracies. Volume induced lung injury may be at risk because of Helium's increased flow when using oxygen calibrated devices.

6.14.6. Hypoxemia, mucosal drying and retained secretions are potential risks of using Heliox.

7. REFERENCES

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7.2 Egan's Fundamentals of Respiratory Care 10th Edition 2010.

7.3 Fink, J.B. Opportunities and Risks of using Heliox in your Clinical Practice,

7.4 Pibeam's Mechanical Ventilation, physiological and Clinical Applications sixth Edition. Respiratory Care; June 2006, vol. 51

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