



HEALTH HOLDING

HAFER ALBATIN HEALTH
CLUSTER
MATERNITY AND
CHILDREN HOSPITAL

Department:	Neonatal Intensive Care Unit (NICU)		
Document:	Multidisciplinary Policy and Procedure		
Title:	High Frequency Oscillatory Ventilation Use in Neonates		
Applies To:	All NICU Staff and Respiratory Therapists		
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1. PURPOSE:

- 1.1 High frequency oscillatory ventilator (HFOV) optimizes lung inflation, improve ventilation and oxygenation and minimize ventilator induced lung injury.

2. DEFINITONS:

- 2.1 High frequency oscillation is a gentle form of mechanical ventilation. Pressure oscillations within the airway produce tiny tidal volumes, often less than the dead space, around a constant MAP, thus, maintaining lung volume (Frequency 3-15 Hz: 180-900 breaths/ minute; 1 Hz= 60 bpm). At high frequencies (commonly 10-15 Hz), the peak inspiratory and expiratory pressures approach MAP, thus, higher MAP can be used to improve oxygenation without worsening lung barotraumas.
- 2.2 Tidal volumes are determined by the amplitude of the airway pressure oscillations, which in tum, are determined by the stroke of the device producing the oscillations.
 - 2.2.1 Sensor Medics 3100A produces it's oscillations via an electronically controlled piston and diaphragm.
 - 2.2.2 HFOV Drager 8000 plus is based on oscillation of the exhalation valve membrane. It is suited for use in patients weighing < 1500-2000gm due to its inability to generate large enough tidal volumes and variations in I/E ratios with frequency changes.
 - 2.2.3 ACUTRONIC fabian HFO is equipped with an electromagnetic expiratory valve, highly precise electronic flowmeters and a uniquely designed HFO module without using silencers.
- 2.3 A continuous flow of fresh gas rushes in and powers the oscillations. Variations in the flow rate and patient circuit outflow resistor control Mean Airway Pressure.
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- 2.5 Ventilation (CO₂ removal) = Frequency x VT² (Amplitude)²
 - 2.5.1 Increasing the frequency attenuates the amplitude pressure wave transmitted to the alveoli and thus decreases the tidal volume and increases the PCO₂.
 - 2.5.2 Decreasing the frequency gives more time to the pressure wave to be transmitted to the alveoli, increases the amplitude (VT) and decreases PCO₂.
 - 2.5.3 Increasing amplitude increases tidal volume and decreases PCO₂.
- 2.6 Oxygenation is proportional to MAP & FiO₂ higher MAP recruits more alveoli, improves ventilation/ perfusion matching and increases lung volume.
- 2.7 Amplitude = the size of the pressure wave, or tidal volume.
- 2.8 Frequency = the number of breath per minute.
- 2.9 **Abbreviations:**
MAP = the mean airway pressure throughout the respiratory cycle.
VT = tidal volume.
FiO₂ = fractional inspired oxygen.

3. POLICY:

- 3.1 Starting high frequency oscillatory ventilation needs consultant order.
- 3.2 The assigned staff is responsible to monitor the changes in the vital signs and give care to the patient
- 3.3 The respiratory therapist is responsible to check the functioning of the ventilator, change the settings as per physician order, suctioning the patient and other assigned works.

4. PROCEDURE:

4.1 Initiation of HFOV:

- 4.1.1 Involves the switch from conventional mechanical ventilation to the point at which the patient is stabilized on HFOV.
- 4.1.2 Connect the patient to vital signs monitor.
- 4.1.3 Indwelling arterial and venous catheters are recommended.
- 4.1.4 Optimize the patient's cardiac output (BP and perfusion) prior to the initiation of HFOV. Patients usually require increased fluids to ensure adequate circulating blood volume and maintain cardiac output. Bolus fluids should be considered. Inotropes are frequently insufficient. An echocardiogram to assess general cardiac function would be helpful.
- 4.1.5 Arterial blood gases and antero-posterior chest X-Ray is obtained prior to initiation and soon after optimization on HFOV. Optimal lung inflation is probably achieved when lung volume is around the level of the 9th right posterior rib.
- 4.1.6 Adequate sedation.

4.2 Maintenance of HFOV therapy:

- 4.2.1 Blood gases are obtained a minimum of every 6 hours for the first 24 hours, thereafter, as required with a minimum of every 8 hours.
- 4.2.2 Chest X-Ray every 12 hours for the first 24 hours, then daily and as required with every major change in the patient's clinical status.
- 4.2.3 Patient assessment must include assessment of breath sounds, degree of chest wiggle (the rapid movements of the chest wall of the patient in response to the delivery of small volumes of gas into the airways several times a second).and symmetry of oscillatory intensity.
- 4.2.4 Manipulate MAP and amplitude based on blood gases and hemoglobin oxygen saturation.

4.3 Weaning from HFOV : Should be a gradual process:

- 4.3.1 As the patient's lungs become more compliant, over-inflation will occur unless you are closely monitoring with chest X-Ray.
- 4.3.2 With the lungs at optimal volume as per X-Ray, the FiO₂ is weaned as tolerated to less than 40% prior to any weaning of MAP.
- 4.3.3 After FiO₂ < 40%, wean MAP by 1-2 cmH₂O at a time, The amplitude is weaned by 2-3 cm H₂O at a time.
- 4.3.4 If frequency was lowered during the acute phase to reduce CO₂, return it to its original setting
- 4.3.5 The need to switch back to conventional ventilation and the point at which to make that switch is patient specific. Rough parameters to wean to CMV are MAP 10-12cmH₂O and amplitude < 30 cm H₂O.
- 4.2.3.4

5. MATERIALS AND EQUIPMENT:

- 5.1 HFO Ventilator with tubing
- 5.2 Oxygen and air supply ports

6. RESPONSIBILITIES:

- 6.1 Physician
- 6.2 Respiratory therapist
- 6.3 Nurse

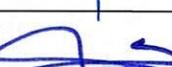
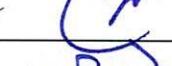
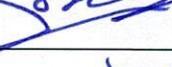
7. APPENDICES:

N/A

8. REFERENCES:

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9. APPROVALS:

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