

**CLINICAL CONSIDERATIONS**  
**FOR THE**  
**LIFE PULSE HIGH-FREQUENCY VENTILATOR**

01389-04.4

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## RESPIRATORY CARE CONSIDERATIONS

- \* Design or Reorganize a Ventilator Flowsheet.
- \* Medical Orders:
  - Medical orders flowsheet (includes verbal orders).
- \* Determine What Conventional Mechanical Ventilator(s) (CMV) Will Be Used In Tandem With the Life Pulse HFV:
  - Maintain a CMV reserve.
- \* Orientation and Training:
  - All RNs or a core group?
  - New employee training.
  - In-services for RNs and MDs?
- \* Assemble and Apply Back-up Equipment:
  - Conventional Mechanical Ventilator.
  - Patient Box
  - LifePort adapters
  - Life Pulse HFV Humidifier Cartridge Circuits.
  - Teat Lung with LifePort and standard ET tube
- \* Suctioning Protocol:
  - Develop proficiency in the two Life Pulse HFV suction techniques (see "Suction Procedure").
- \* Staffing:
  - 1 on 1 Respiratory Care depends on lability of patient, number of infusions, your hospital's protocol, etc.
- \* Establish a Circuit Change Protocol:
  - Life Pulse HFV circuits are recommended for 7 days of use.
- \* Life Pulse HFV Protocols:
  - Learn and understand patient management protocols.
  - Advise physicians.
- \* Bag and Mask at Bedside
- \* Assessment Notes:
  - Documentation and liability.

- \* Determine Costs and Charges
- \* Develop Set-up, Take-down, and Cleaning Procedures
- \* Policy and Procedure (Written Policy)
- \* Maintain non-Invasive Monitoring:
  - Transcutaneous CO<sub>2</sub> and PO<sub>2</sub>, ETCO<sub>2</sub>, and Pulse Oximetry.

## PHYSICIAN CONSIDERATIONS

- \* Staffing
  - Attendings, Fellows, Residents, other Practitioners?
- \* Medical Orders:
  - Written.
  - Verbal.
- \* Orientation and Training
- \* Establish Jet Protocols:
  - Attaching LifePort Adapter.
  - Initiation of Life Pulse HFV.
  - Patient management.
  - Weaning.
  - Suction frequency.
- \* Follow-up
- \* Support Services
- \* Community Education:
  - When outlying centers should call.
  - When outlying centers should transport.

## NURSING CONSIDERATIONS

- \* Staffing:
  - 1 on 1 Nursing Care depends on lability of patient, number of infusions, your hospitals protocol, etc.
- \* Design or reorganize a bedside flowsheet to include Life Pulse HFV.
- \* Medical Orders:
  - Medical orders flowsheet (includes verbal orders).
- \* Orientation and Training:
  - All RNs or a core group?
  - New employee training.
- \* Suctioning Protocol:
  - Develop proficiency in the two Life Pulse HFV suction techniques (see "Suction Procedure").
- \* Chest X-rays, Echocardiograph, etc.:
  - RN at bedside throughout procedures.
- \* Protocol for Positioning Patient:
  - According to Intensive Care Unit's policy (e.g., PIE-affected side down?).
  - Prevent breakdown of skin.
- \* Minimize Manipulation:
  - Multiple procedures in a short time frame.
- \* Assessment Notes:
  - Documentation
  - Liability
- \* Life Pulse HFV Protocols:
  - Learn and understand patient management protocols.
- \* Nursing Care Plan
- \* Policy and Procedure:
  - Develop a written policy.
- \* Feeding of Patients:
  - As tolerated
  - NJ or OG tube okay?

## SUGGESTED LIFE PULSE HIGH-FREQUENCY VENTILATION CARE PLAN

<u>OBJECTIVE</u>	<u>RATIONALE</u>	<u>PLAN</u>
<p>1. Assess any changes in patient's condition arising during HFV.</p>	<p>An abrupt drop of PCO<sub>2</sub> can cause vasodilation, leading to hypotension. Also, peripheral vasoconstriction occurs which can affect the accuracy of transcutaneous monitoring. Also, HFV causes vibration which hampers assessment of precordial activity and peripheral pulses.</p> <p>Identification of changes in patient's condition may be indicated by changes in SERVO pressure.</p> <p>Volume and tone of HFV breath sounds affect the ability to auscultate heart sounds.</p> <p>Changes in secretions or suctioning tolerance may be indicative of pneumonia, air trapping, or development of bronchospasm.</p> <p>The presence of humidity may reduce the risk of mucus plugging and obstruction.</p> <p>Suctioning</p>	<ol style="list-style-type: none"> <li>1. Monitor and document trends for:               <ol style="list-style-type: none"> <li>a. heart rate with ECG scope.</li> <li>b. arterial blood pressure.</li> <li>c. CVP-waveform (displays chest wall vibration but values remain unchanged).</li> <li>d. respiratory rate (spontaneous breaths only)</li> <li>e. mean airway pressure.</li> <li>f. transcutaneous monitoring and pulse oximetry.</li> <li>g. FiO<sub>2</sub> (FiO<sub>2</sub> settings on CV and HFV must match).</li> <li>h. blood gases.</li> </ol> </li> <li>2. Assess traditional breath sounds during conventional or manual ventilation. Transillumination and chest x-ray may be indicated for further assessment.</li> <li>3. Place Life Pulse in STANDBY mode to assess heart sounds.</li> <li>4. Notify physician of:               <ol style="list-style-type: none"> <li>a. Increasing or thickening secretions and/or mucus plugging.</li> <li>b. Change in tolerance of suctioning procedure.</li> </ol> </li> <li>5. Observe for the presence of mist or clouding on the wall of the green portion of the Life Pulse circuit between the Patient Box and ET tube (Operator's Manual, Sec. VIII).</li> <li>6. Perform suctioning as described in the Operator's Manual, Section VIII.</li> </ol>

<b><u>OBJECTIVE</u></b>	<b><u>RATIONALE</u></b>	<b><u>PLAN</u></b>
2. Maintain patency of ET tube.	<p>Distal end-bevel should be placed in a left axillary position within the trachea.</p> <p>Lack of chest movement may indicate tracheal tube obstruction, extubation, Life Pulse in STANDBY mode, or tension pneumothorax (barotrauma; see Table 2).</p>	<ol style="list-style-type: none"><li>1. Assist physician with attachment of LifePort adapter.</li><li>2. Maintain proper positioning of the ET tube.<ol style="list-style-type: none"><li>a. Affix tracheal tube to patient's face.</li><li>b. Obtain order for follow-up chest x-ray.</li></ol></li><li>3. Assess chest movement (chest wall vibration).<ol style="list-style-type: none"><li>a. No chest movement indicates inadequate ventilation.</li><li>b. Manually ventilate patient if Life Pulse is in STANDBY mode during alarm condition.</li><li>c. Refer to "Quick Reference Guide for Patient Management and Alarms" (attached).</li><li>d. Notify physician and respiratory therapist.</li></ol></li><li>4. Assess for HFV breath sounds.<ol style="list-style-type: none"><li>a. Loud thumping quality with a high-pitched tone is normal.</li><li>b. Lower pitched tones may represent decreased ventilation of a lung field, possible extubation, or presence of pneumothorax.</li><li>c. Higher-pitched tones, with a musical quality, may indicate need for suctioning.</li></ol></li><li>5. Perform suctioning as described in the Operator's Manual, Section VIII.<ol style="list-style-type: none"><li>1. Perform routine vital signs.</li><li>2. Assess neurological status.</li><li>3. Assess for signs of sepsis.</li><li>4. Maintain aseptic technique with any procedure.</li></ol></li></ol>
3. Nursing Procedures.		

# TABLE 1 CLINICIAN'S RESPONSIBILITIES PRIOR TO LIFE PULSE HFV

## RESPONSIBILITIES

## INTERVENTIONS

A. Ensure that appropriate monitoring equipment is available and working.	* Gather and apply needed monitoring devices with assistance from other team members. * Organize an environment to facilitate care.
B. Obtain and document baseline assessment data.	* Perform a full system assessment, draw appropriate blood gases, and correlate results with non-invasive monitoring.
C. Orient parents to the new bedside environment and patient care plans.	* Explain to the parents new equipment and the rational for using it as it pertains to the patient's condition. * Encourage and allow time for questions and provide answers or a referral.
D. Assist with necessary procedures (e.g., attachment of LifePort adapter).	* Participate with other team members during necessary procedures. * Assist with x-ray examinations if needed.
E. Ensure patient safety during transition from CMV to the Life Pulse.	* Prepare for possible patient deterioration or improvement necessitating increased or decreased Life Pulse support and possible pharmacological support.
F. Provide emotional support for the family.	* Answer questions as needed. * Allow time alone with the infant (prior to initiating therapy, if possible). * Provide anticipatory guidance regarding potential patient instability.
G. Ensure patency of airway.	* Observe patient for constant chest movement. * Maintain tracheal tube placement and stability. * Suction as needed.
H. Perform safe and effective suctioning procedure.	* Maintain suction throughout the procedure when suctioning while the Life Pulse is operating.

# TABLE 1 CLINICIAN'S RESPONSIBILITIES PRIOR TO LIFE PULSE HFV

<u>RESPONSIBILITIES</u>	<u>INTERVENTIONS</u>
I. Monitor for complications of mechanical ventilation (e.g., airleak, hypotension, etc.).	<ul style="list-style-type: none"> <li>* Obtain blood gases as needed.</li> <li>* Monitor trends in vital signs and ventilator settings (e.g., SERVO pressure).</li> <li>* Assess for signs and symptoms of barotrauma.</li> <li>* Observe changes in chest movement, quality and quantity of secretions, and listen for changes in breath sounds.</li> </ul>
J. Monitor responses to therapy.	<ul style="list-style-type: none"> <li>* Document and interpret changes in oxygenation and ventilation status following ventilator changes (e.g., non-invasive monitoring, blood gases, chest movement, SERVO pressure, and breath sounds).</li> <li>* Frequently assess activity of chest tubes, if present.</li> </ul>
K. Ensure patient safety and comfort.	<ul style="list-style-type: none"> <li>* Affect administration of analgesics, sedatives, and muscle relaxants as needed.</li> <li>* Be prepared to return the patient to CMV should a mechanical failure occur or the patient not tolerate HFV therapy.</li> </ul>
L. Continue support of parents.	<ul style="list-style-type: none"> <li>* Provide a therapeutic environment at bedside.</li> <li>* Allow for appropriate physical contact.</li> <li>* Allow for expression of emotions and opinions.</li> <li>* Provide consistent information and education.</li> </ul>

## TABLE 2

### ASSESSMENT OF CHEST VIBRATIONS

- A. Normal: continuous with rapid rise and fall
  
- B. Lack of Vibration:
  - \* ET tube displacement
  - \* Tension Pneumothorax
  - \* Life Pulse in STANDBY mode
  - \* Complete obstruction of ET tube
  
- C. Diminished Vibration:
  - \* Air trapping
  - \* Worsening lung compliance
  - \* Worsening air leak
  - \* Malposition or partial obstruction of ET tube (e.g., kinked tube, secretions, mucus plug, etc.)
  - \* Circuit leak
  - \* Rapid weaning of PIP
  - \* Excessive PEEP
  
- D. Excessive Vibration
  - \* PIP setting to high
  - \* Improving lung compliance

## GUIDELINES FOR SUCTIONING DURING HIGH-FREQUENCY VENTILATION

**PURPOSE:** To maintain patency of the ET tube by removing secretions while a patient is on the Life Pulse High-Frequency Ventilation.

**EQUIPMENT:**

1. Sterile suction catheter.

<u>Tracheal Tube</u>	<u>Suction Catheter</u>
2.0-2.5 mm	- 5 Fr.
3.0-3.5 mm	- 6 Fr.
≥ 4.0 mm	- 8 Fr.

2. Sterile gloves.
3. Wall suction set-up with suction canister and tubing; wall suctioning should be set according to hospital policy.
4. Sterile normal saline (NS); disposable plastic ampoule may be used.
5. Small syringe (e.g., TB syringe, used for instilling NS into the jet port of the tracheal tube).

## PROCEDURE

## RATIONALE

- | PROCEDURE   | RATIONALE  |
|---|--|
| 1. Collect the suction equipment.   | 1. Organize the suctioning plan for time efficiency.   |
| 2. Open the catheter package maintaining catheter sterility.  | 2. Prevent introduction of bacteria into the tracheal tube and nosocomial infections.  |
| 3. Draw 0.5 cc NS into the small syringe. Use the syringe needle to draw the NS, then discard needle.   | 3. The small syringe hub fits on the jet port of the tracheal tube for NS instillation.  |
| 4. If the infant does not tolerate suctioning (as evidenced by transcutaneous monitoring, SaO <sub>2</sub> , and heart rate), increase support with manual ventilation and notify physician and respiratory therapist.  | 4. Preoxygenation may help prevent desaturation episodes during the suctioning procedure.  |
| 5. Continue HFV throughout the entire suctioning procedure. (You may choose to suction with the Life Pulse in the STANDBY mode. See the Operator's Manual, Section VIII.)   | 5. The patient continues to receive HFV during the suctioning procedure.   |
| 6. Make certain the READY light is on before attempting to instill NS or suction.   | 6. An illuminated READY light establishes the HFV's alarm limits.  |
| 7. Disconnect the green tube of the circuit from the jet port on the tracheal tube.   | 7. Sterile NS is instilled into the jet port rather than the main ET tube. This procedure assists inspiration rather than exhalation of the NS.  |
| 8. Reconnect the Life Pulse circuit after instilling the NS.  | 8. Assures continuous HFV during the suctioning procedure.   |
| 9. Put on sterile gloves.   | 9. Maintains sterility and guards against acquired infections.   |
| 10. Disconnect the CMV tubing and <b>APPLY CONTINUOUS SUCTION</b> while gently advancing the catheter into the tracheal tube.   | 10. Continuous suction is applied to assist exhalation and avoid interruption of gases delivered by the Life Pulse during the suctioning procedure.  |
| 11. Pass the suction catheter to a predetermined depth. Pause and rotate the catheter while continuing to apply suction to remove accumulated secretions. (NOTE: It is recommended that a pre-measured suction depth be determined. This value should be recorded and posted at the bedside as a suctioning reference.) | 11. Pausing and rotating the catheter near the distal tip of the tracheal tube will assist more effective secretion removal than will simply passing the catheter in and out of the tracheal tube. Pre-measured suction depth is recommended in order to prevent tracheal and carinal damage secondary to catheter trauma. |