

Clinical Considerations
for the
Bunnell LifePulse[®]
High-Frequency Jet Ventilator



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TABLE OF CONTENTS

Respiratory Care Considerations.....	3
Physician Considerations.....	5
Nursing Considerations.....	6
Sample HFJV Care Plan.....	7
Table 1..... Clinician's Responsibilities Prior To HFJV	10
Table 2..... Assessment of Chest Vibrations	12
Guidelines for Suctioning During HFJV.....	13

RESPIRATORY CARE CONSIDERATIONS

- * Design or Reorganize a Ventilator Flowsheet (includes electronic charting).
- * Medical Orders:
 - Medical orders flowsheet (includes verbal and electronic orders).
- * Determine What Conventional Mechanical Ventilator(s) (CMV) Will Be Used in Tandem With HFJV:
 - Maintain a CMV reserve.
- * Orientation and Training:
 - All RTs or a core group?
 - New employee training
 - In-services for RTs, RNs and MDs?
- * Assemble Equipment:
 - LifePulse (Back-up LifePulse?)
 - Conventional Mechanical Ventilator
 - WhisperJet Patient Box (Back-up WhisperJet?)
 - LifePort adapters
 - HFJV Patient Breathing Circuits
- * Suctioning Protocol:
 - Develop proficiency in HFJV suction technique (see "Suction Procedure", page 13).
- * Staffing:
 - 1 on 1 Respiratory Care depends on acuity of patient, your hospital's protocol, etc.
- * Establish a Circuit Change Protocol:
 - HFJV circuits guaranteed up to 7 days.
- * HFJV Protocols:
 - Learn and understand patient management protocols.
 - Advise physicians.
- * Manual resuscitation system at bedside
- * Assessment Notes:
 - Charting and Documentation.

- * Determine Costs and Charges
- * Develop Set-up, Take-down, and Cleaning Procedures
- * Policy and Procedure (Written Policy)
- * Maintain Non-Invasive Monitoring:
e.g., Transcutaneous CO₂ and PO₂, and Pulse Oximetry.

PHYSICIAN CONSIDERATIONS

- * Staffing
 - Attendings, Fellows, Residents, other Practitioners
- * Medical Orders:
 - Written
 - Verbal
- * Orientation and Training
- * Establish HFJV Protocols:
 - Initiation of HFJV (e.g., indications for use, initial settings, etc.)
 - Patient management
 - Weaning
 - Suction frequency
- * Follow-up
- * Support Services
- * Community Education:
 - Teach outlying centers about HFJV and when they should transport for HFJV treatment

NURSING CONSIDERATIONS

- * Staffing:
 - 1 on 1 Nursing Care depends on acuity of patient, number of infusions, your hospital's protocol, etc.
- * Design or reorganize a bedside flowsheet to include HFJV (includes electronic charting)
- * Medical Orders:
 - Medical orders flowsheet (includes verbal orders)
- * Orientation and Training:
 - All RNs or a core group?
 - New employee training plan
- * Suctioning Protocol:
 - Develop proficiency in HFJV suction technique (see "Suction Procedure", page 13)
- * Chest X-rays, Echocardiograph, etc.:
 - RN at bedside throughout procedures
- * Protocol for Positioning Patient:
 - According to Intensive Care Unit's policy
 - Prevent breakdown of skin
- * Minimize Manipulation:
 - Multiple procedures in a short time frame ("Cluster Care")
- * Assessment Notes:
 - Documentation
- * HFJV Protocols:
 - Learn and understand patient management protocols.
- * Nursing Care Plan (see pages 7-9)
- * Policy and Procedure:
 - Develop a written policy
- * Feeding of Patients:
 - As tolerated
 - NJ, NG, or OG tube

SAMPLE HFJV CARE PLAN

<u>OBJECTIVE</u>	<u>RATIONALE</u>	<u>PLAN</u>
<p>1. Assess any changes in patient's condition arising during HFJV.</p>	<p>An abrupt drop of PCO₂ can cause vasodilation, leading to hypotension. Peripheral vasoconstriction occurs which can affect the accuracy of transcutaneous monitoring.</p> <p>Identification of changes in patient's condition may be indicated by changes in Servo.</p> <p>Volume and tone of HFJV breath sounds affect the ability to auscultate heart sounds</p> <p>Changes in secretions or suctioning tolerance may indicate pneumonia, air trapping, or bronchospasm. Adequate humidification may reduce the risk of mucus plugging.</p> <p>Suctioning</p>	<ol style="list-style-type: none"> 1. Monitor and document trends for: <ol style="list-style-type: none"> a. heart rate with cardiorespiratory monitoring b. arterial blood pressure c. CVP-waveform (displays chest wall vibration but values remain unchanged) d. respiratory rate (spontaneous breaths only) e. mean airway pressure f. TCMs and SaO₂ g. FiO₂ (FiO₂ settings on CV and HFJV must match) h. blood gases 2. Understand Servo and what changes may represent. Assess traditional breath sounds during conventional or manual ventilation. Chest x-ray may be indicated for further assessment 3. Place HFJV in STANDBY to assess heart sounds. 4. Notify physician of: <ol style="list-style-type: none"> a. Increasing or thickening secretions and/or mucus plugging. b. Change in tolerance of suctioning procedure. 5. Observe for the presence of mist or clouding on the wall of the green Jet line of the ET tube. 6. Perform suctioning per hospital protocol

<u>OBJECTIVE</u>	<u>RATIONALE</u>	<u>PLAN</u>
2. Maintain patency of ET tube.	Distal end-bevel must be placed in a left axillary position within the trachea. Lack of chest movement may indicate endotracheal tube obstruction, extubation, HFJV in STANDBY mode, or tension pneumothorax (barotrauma; see Table 2).	1. Assist physician or RT with attachment of LifePort adapter. 2. Maintain proper positioning of the ET tube. a. Obtain order for follow-up chest x-ray if necessary. 3. Assess chest movement (chest wall vibration). a. No chest movement may indicate inadequate ventilation. b. Manually ventilate patient if HFJV is in STANDBY mode during alarm condition. c. Refer to "Quick Reference Guide". d. Notify physician and respiratory therapist. 4. Assess for HFJV breath sounds. a. Soft thumping quality with a high-pitched tone is normal. b. Lower pitched tones may represent decreased ventilation of a lung field, possible extubation, or presence of pneumothorax. c. Higher-pitched tones, with a musical quality, may indicate need for suctioning. 5. Perform suctioning per hospital protocol.

OBJECTIVE

4. Nursing
Procedures

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RATIONALE

PLAN

1. Perform routine vital signs assessment.
2. Assess neurological status.
3. Assess for signs of sepsis.
4. Maintain aseptic technique with any procedure.

TABLE 1
CLINICIAN'S RESPONSIBILITIES PRIOR TO HFJV

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

TABLE 1 (cont.)

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

TABLE 2

ASSESSMENT OF CHEST VIBRATIONS

- A. Normal: continuous with wiggle**

- B. Lack of wiggle:**
 - * ET tube displacement
 - * Tension Pneumothorax
 - * HFJV in STANDBY mode
 - * Complete obstruction of ET tube

- C. Diminished Vibration:**
 - * Air trapping
 - * Worsening lung compliance
 - * Increased airway resistance
 - * 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 too high
 - * Improving lung compliance
 - * Decreasing airway resistance

GUIDELINES FOR SUCTIONING DURING HFJV

PURPOSE: To maintain patency of the ET tube by removing secretions while a patient is on High-Frequency Jet Ventilation (HFJV).

EQUIPMENT:

1. Sterile or Closed suction catheter.
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 ampule may be used.

PROCEDURE

RATIONALE

- | | |
|--|---|
| 1. Collect the suction equipment. | 1. Organize a suctioning plan for time efficiency. |
| 2. If the infant has a history of not tolerating suctioning (as evidenced by transcutaneous monitoring, SpO ₂ , and heart rate), increase support with manual ventilation and notify physician and respiratory therapist. | 2. Preoxygenation may help prevent desaturation episodes during the suctioning procedure. |
| 3. Place the LifePulse in the STANDBY mode. | 3. This step prevents LifePulse alarms from shutting down the ventilator during suctioning. |
| 4. Maintain adequate ventilatory support | 4. Patient needs ventilatory support during in-line suctioning. |

PROCEDURE

5. Perform normal suctioning procedure.
6. When finished suctioning, press the ENTER button to restart the LifePulse.
7. Make sure monitored pressures are stable and the READY light is on before leaving the patient's bedside.

RATIONALE

5. Same procedure as used with conventional ventilator.
6. Reestablish HFJV after suctioning.
7. Ready light indicates that alarms are active.