Operating Instructions for Microprocessor Controlled Ventilators

Purpose

To provide guidelines for the procedure for the use of microprocessor controlled ventilators.

Audience

Physicians, Nursing staff, and Licensed Respiratory Care Practitioners.

Scope

Current ventilators are microprocessor controlled, pneumatically powered, and modified flow generators. They may be volume or time cycled with Assist/Control, Pressure Control, PRVC, Pressure Support, SIMV, PEEP, and CPAP capabilities. Respiratory Care Services provides microprocessor-controlled ventilators for patients requiring ventilatory assistance or continuous mechanical ventilation.

Accountability:

Ventilator adjustments/management is limited to the following individuals: Licensed RCPs who have undergone training and competency evaluations of the microprocessor controlled ventilator with understanding of age specific requirements of patient populations, and Faculty physicians and or fellows who have undergone training and competency evaluations of the Avea microprocessor controlled ventilator.

Special Training

Training must be equivalent to the therapist entry level in Respiratory Care Service.

Special Consideration:

A licensed registered nurse who has undergone in-service orientation to the ventilator control panel may make ventilator changes limited to FIO2 changes only. Any changes made in FIO2, must be the result of a physician order; a change in FIO2 must be communicated immediately to the RCP assigned to the area and documented in the patient's electronic medical record.

Physician's Order

Must include mode of ventilation, rate, FIO_2, tidal volume, and amount of PEEP desired, and Pressure Support if applicable in cmH_2O. Inspiratory time and peak inspiratory pressure settings are required if pressure control ventilation is used.

Indications

- Apnea
- Impending (acute) respiratory failure
- Exacerbation of chronic ventilatory failure
- Severe hypoxemia
- Need for hyperventilation
- Lung conditioning during ECMO

Goals

- Maintain patent airway
- Improve alveolar ventilation
- Improve oxygenation
- Decrease work of breathing
- Support ventilation of apneic patients
- Hyperventilation of patient with increased ICP
- Lung conditioning during ECMO.

Adverse Effects

The adverse effects of mechanical ventilation can be divided into four categories:

Pulmonary Barotrauma:
- Tension Pneumothorax/Pneumothorax
- Pulmonary Interstitial Emphysema
- Pneumomediastinum
- Pneumopericardium
- Pneumoperitoneum

Cardiovascular Effects:
- Decreased Venous Return
- Decreased Cardiac Output
- Increased Pulmonary Vascular Resistance

Psychological Effects:
- Inability to communicate (See Patient Teaching)
- Psychological dependency on ventilator

Removal of natural defense mechanisms with intubation:
- Contamination of ventilator circuits
- Contamination through suctioning
- Vocal cord paralysis, tracheal stenosis, tracheomalacia, tracheal-esophageal fistula

Equipment

- One microprocessor controlled ventilator
- One high-output humidifier with temperature feedback circuit.
- One disposable breathing circuit with heated wire.

Procedure

Refer to the appropriate equipment manuals for assembly instructions.

Step	Action
1	Attach the power cord with ground to a 115 volt 60 cycle AC electrical outlet.
2	Attach air and oxygen lines to the appropriate 50-psi wall source.
3	Fill the humidifier with sterile distilled water.
4	Turn on the power.
5	Perform an Extended System Test (EST). • Correct the leaks if present and recheck to insure that there are no further leaks.
6	Set up the ventilator with the orders prescribed for the patient.
7	Set the pressure limit control. While making the adjustment, block the patient "Y" connection, deliver a breath, and observe the pressure display on the control panel. It will stop at the set pressure, and an audible and visual alarm will sound. This setting will vary from patient to patient but is usually in the range of 40 to 60 cm H_20. Should usually be 10 cm above patient generated pressure.
8	Adjust the ventilator to the desired FIO_2 using the OXYGEN % control on the ventilator. The alarm is activated by a ± 6% from set FIO_2.
9	Adjust the PEEP control until the display reads at the desired PEEP level.
10	Sensitivity Control Adjustment: Set to flow trigger to ensure synchrony of the ventilator with patient effort.
11	Adjust all alarm limits and verify they are functional. **Note:** Ensure that appropriate apnea alarms limits are set

	on spontaneous breathing patients. These alarm limits are meant as general guidelines. Patient condition and ventilator settings may warrant minor deviations in alarm settings.
12	Document date and time of ventilator set-up along with set ventilator parameters in Epic, per RCS Policy 7.1.1. **Note:** These ventilators can deliver a tidal volume using different flow patterns. • The inspiratory flow pattern are constant flow or decelerating flow • Can be tapered by adjusting Rise Time %

Assessment of Outcome

- Arterial and Mixed Venous Blood Gas Values
- Pulse oximetry and end tidal CO_2 valves
- Respiratory mechanics
- Chest x-rays, auscultation work of breathing evaluation
- Sputum: Culture, amount, color, consistency

Infection Control

Follow procedures outlined in Healthcare Epidemiology Policies and Procedures #2.24; Pulmonary Care Services.
http://www.utmb.edu/policy/hcepidem/search/02-24.pdf

Safety Precautions

Alarms on the ventilator will be activated at all times.

References

Ventilator Operating Manuals.

AARC Clinical Practice Guidelines; Respiratory Care;1992; 37: 882-886 Patient-Ventilator System Checks

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Jimmy M. Cairo, Susan P. Pilbeam, Mosby's Respiratory Care Equipment Mosby; 6th edition (March 15, 1999)

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