

Respiratory Protocol - Ventilator Management Protocol

POLICY

This policy provides a standard, evidence supported approach to ventilator care, and discontinuation from the ventilator in a safe efficient manner. This protocol involves the entire team, which includes physicians, respiratory therapists and registered nurses. All residents requiring mechanical ventilation in the Ventilator and Tracheostomy Care Program are managed following this protocol unless otherwise ordered by their physician.

GOALS

To provide a standard, rational approach to ventilator care, maintain continuity of care and provide a recognized strategy of management of the resident's ventilation requirements based on current technology, recent studies, and the American Association for Respiratory Care (AARC) guidelines.

EQUIPMENT

- Ventec Life VOSCN Ventilator
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GUIDELINES

PROCESS FOR ORDERING VENTILATOR MANAGEMENT PROTOCOL (VMP)

The use of Ventilator Management Protocol (VMP) shall be initiated by physician order, written in the physician's order sheet.

1. Initial and subsequent ventilator parameters shall be documented in PointClickCare.
2. Ventilator parameters shall be documented in PointClickCare every shift.
3. Any physician order not covered by the protocols should be written in the physician's order sheet.
4. The attending physician may write, "discontinue VMP" at any time.
5. A patient that meets the VMP exclusion criteria shall not be managed using the protocol.

Exclusion from VMP includes the following criteria; these residents' shall require direct physician management of the ventilatory parameters:

1. Resident less than 16 years old.
2. A written ventilator order from the primary or consulting physician that varies from VMP and does not permit adjustment of ventilator parameters based on VMP. In such a scenario, the physician will be contacted for clarification as to whether further ventilator adjustments shall be made based on VMP. The physician then has the choice to approve further use of VMP or to discontinue VMP.



The physician does not need to be notified if:

1. Weaning FiO₂
2. Increasing FiO₂ if not going greater than 50
3. Increase in PSV of 5 or less to maintain adequate tidal volume
4. Changing in and out of volume support

The physician will be notified when:

1. The respiratory therapist wishes to initiate VMP on a resident who is not currently on the protocol
2. If the resident's condition is deteriorating.
3. The respiratory therapist is unable to determine appropriate therapy.
4. If the FiO₂ is >60% and SpO₂ <90% with 5cm H₂O PEEP.
5. When pre-determined therapy limits are reached, i.e. FiO₂, V_t, PEEP, RR, etc.
6. If PEEP >5 has been approved, and now PEEP >8 is indicated.
7. A RR >30 or <8 is indicated
8. A V_T >10 ml/kg ideal body weight or < 6 ml/kg is indicated.
9. If V_T or PEEP is indicated that results in PIP >=40 or plateau pressure >30.
10. Weaning success or failure
11. Increasing FiO₂ above 50% is indicated to maintain SPO₂
12. Change in PSV >5 cmH₂O is made
13. A change in tidal volume is made > 200 ml



DEFINITION OF MODES AND SUGGESTIONS FOR USE OF MODES

Mandatory breath modes

A. Volume ventilation (VV): a preset volume is delivered. VV is used in either assist/control (AC), where every breath receives minimally the set volume; or SIMV, where the minimum set volume is delivered at a rate based on the breath rate set for mandatory breaths (SIMV rate).

B. Pressure ventilation (PV) or pressure control ventilation (PCV): a preset pressure is delivered. PV (PCV) is used in either assist/control, where every breath receives minimally the set volume; or SIMV, where the minimum set pressure is delivered at a rate based on the breath rate set for mandatory breaths (SIMV rate).

Support breath modes

A. Pressure support (PS): a patient-triggered, pressure targeted, flow-cycled mode. This can be a stand-alone breath type in patients who have an intact respiratory drive, or it can be used in combination with mandatory breath types.

B. Volume support (VS): a patient-triggered, pressure targeted, flow-cycled mode that guarantees a set volume delivery. This can be a stand-alone breath type in patients who have an intact respiratory drive, or it can be used in combination with mandatory breath types.

C. Spontaneous/CPAP: Spontaneous breathing through the ventilator, which allows for monitoring and alarms and also allows for adjustment of the baseline to a continuous positive airway pressure value. This breath type provides only pressure or flow assist to the patient. It can be used alone in patients with adequate respiratory drive and ventilation capabilities or in combination with mandatory breath types.

Initial ventilator setting will generally be volume modes (AC, SIMV). For example, patient's moving no minute volume or, conversely, patients demanding excessive minute volumes, AC might be more appropriate. For patients with an inadequate respiratory drive, needing from minimal to total support, SIMV might be more efficient. Generally, other modes such as Spontaneous, PRVC, APRV, PCV, PV, etc., modes should be reserved for management and weaning scenarios.



PROCEDURE

INITIAL VENTILATOR MANAGEMENT

For a patient to be a candidate for the Ventilator and Tracheostomy Care Program, the following ventilator criteria must be met prior to the patient transfer:

1. Acceptable arterial blood gases have been documented within 48 hours prior to transfer, documenting an adequate acid base status and oxygenation
2. Respiratory stability including absence of episodes of dyspnea or deterioration of respiratory function that require frequent ventilator setting changes.
3. The settings of the ventilator should be those ordered for the transfer
 - a. **Mode:** Assist Control (AC) mode or SIMV mode of ventilation is acceptable.
 - b. **PEEP:** Equal or less than or equal to 7 is acceptable.
 - c. **Pressure Support (PS):** Equal or less than to 10 is acceptable.
 - d. **Oxygen concentration:** Equal or less than 40% FiO₂. SaO₂ is kept at 92% or greater. Supplemental oxygen is delivered via an oxygen concentrator at up to 5 liters per minute flow rate. For every liter per minute, the FiO₂ increases by 4% as per the chart below:
 - 1 lpm = 24%
 - 2 lpm = 28%
 - 3 lpm = 32%
 - 4 lpm = 36%
 - 5 lpm = 40%

SUBSEQUENT VENTILATOR MANAGEMENT

The Respiratory Therapist shall make subsequent ventilator adjustments attempting to achieve and maintain the ventilation setting that best meets the needs and goals set for the resident, as well as for the resident's general comfort.

Note: Regular assessments of general appearance, vital signs, breath sounds and hemodynamic stability should be evaluated a minimum of every shift as well as prior to and during any ventilator adjustments.



The following values will be maintained, unless otherwise ordered by physician:

1. EtCO₂: 30 to 50 mmHg, unless the resident's "usual" PaCO₂ is chronically elevated.
2. SpO₂ > 92%
3. In residents with COPD, adjust parameters to the resident's "normal" value
4. Obtain non-invasive oxygen saturation (SpO₂) and end tidal CO₂ (EtCO₂)
5. Adjust the ventilator settings to correct abnormal SpO₂ and EtCO₂ values.
 - a. Abnormal EtCO₂ values >45 mmHg:
 - i. Increase rate in increments of 2 to obtain acceptable values.
 - ii. Increase Tidal Volume by increments of 50ml to obtain acceptable values
 - b. Abnormal EtCO₂ values <35 mmHg:
 - i. Decrease rate in increments of 2 to obtain acceptable values.
 - ii. Decrease Tidal Volume by increments of 50ml to obtain acceptable values.
 - c. Abnormal SpO₂ values:
 - i. SpO₂ <90%, increase oxygen liter flow in increments of 1 LPM to obtain acceptable values
 - ii. For hypoxia (SaO₂<92%) requiring >10 LPM oxygen, increase PEEP in steps of 1 cmH₂O at a time to PEEP max (Specific Dr. order required)
 - iii. If hypoxia persists at PEEP max, increase the oxygen liter flow in steps of 1 LPM until SpO₂ > 92%.
 - iv. For SpO₂ >92% at PEEP maximum, oxygen liter flow is first reduced in steps of 1 LPM until ≤ 10 LPM, then PEEP is reduced in steps of 1 to a minimum of 5 before further reduction in oxygen liter flow

A non-invasive monitoring is not the absolute control for maintaining ventilatory support. Sudden changes in cardiovascular status, respiratory rate, and color may mandate a change in ventilator parameters. Once a resident is stabilized, and once the problem that resulted in the need for ventilatory support has been resolved, the resident should be continuously monitored for indications for weaning.

REFERENCES:

American Association for Respiratory Care (AARC) Clinical Practice Guideline – Adult Mechanical Ventilator Protocols, Sept 2003

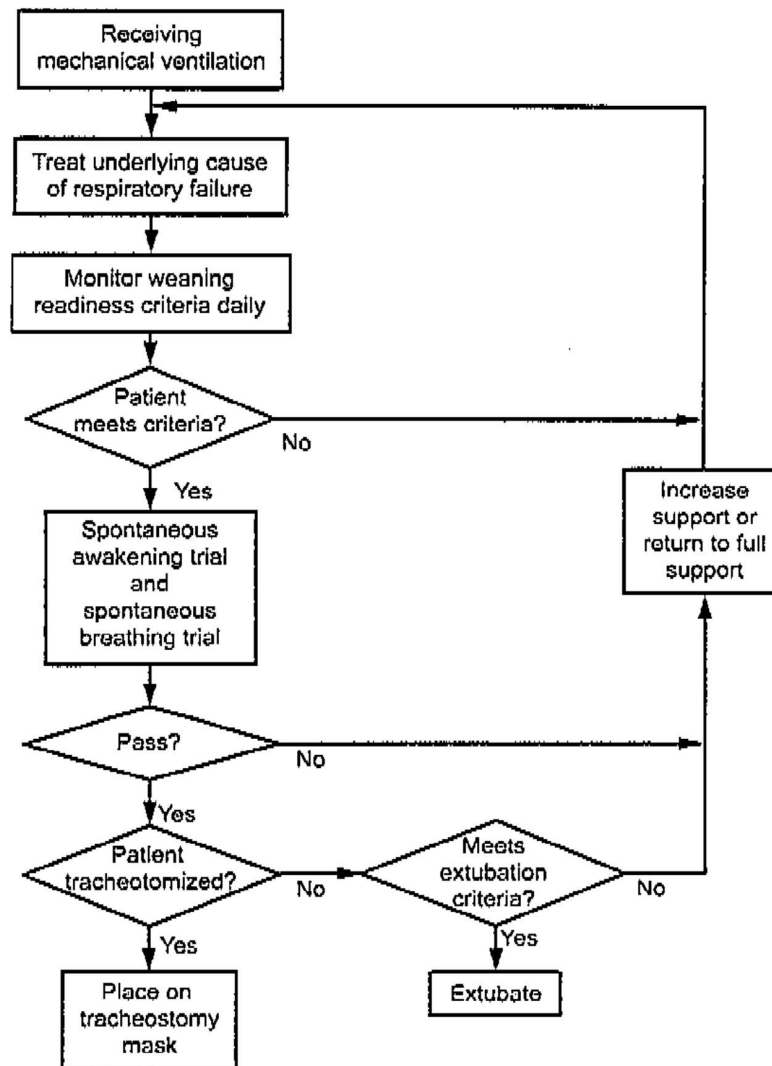
AARC Clinical Practice Guideline - Evidence-Based Guidelines for Weaning and Discontinuing Ventilatory Support - 2002

Carl F Haas, and Paul S Loik, Ventilator Discontinuation Protocols. *Respir Care* 2012;57:1649-1662

Koch RL. Therapist driven protocols: a look back and moving into the future. *Crit Care Clin*. 2007;23:149-59, vii-viii.



Flow diagram of a weaning protocol emphasizing treating the underlying reason for mechanical ventilation, daily monitoring for the earliest indication that the patient is ready to be liberated from the ventilator, a sedation holiday in conjunction with a spontaneous breathing trial, and an assessment of readiness for extubation.



Carl F Haas, and Paul S Loik Respir Care 2012;57:1649-1662

