



BACKGROUND:

This procedure describes Orange County EMS Agency (OCEMS) use of transport ventilators for ambulance transfer of patients who: 1) have been stabilized medically, but continue to require ventilator support, or 2) have been stabilized to the extent possible, need ventilator support, and require emergent transport to a higher level of care. Transportation of patients using a transport ventilator shall only occur for patients who are already receiving mechanical ventilation with stable settings (or to the extent possible) and parameters already established by a physician.

INDICATIONS:

1. Transport of the following categories of patients by OCEMS paramedics who have successfully completed an approved transport ventilator training program:
 - A. Ventilator dependent adult (greater than 14 years-old) patients from a hospital non-Intensive Care Unit to another health care facility. Eligible patients for transfer include those in a Step-down Unit, Operating Room Recovery Unit, an emergency department, or on a hospital medical/surgical floor.
 - B. Ventilator dependent adult (greater than 14 years-old) from a home health, long term care facility, skilled nursing facility, or rehabilitation center to an acute health care facility.
2. During local, state, or national declared disaster emergencies, transport of adult patients (greater than 14 years-old) as determined by the Orange County Health Care Agency Department Operations Center Chief or EMS Medical Director.

REQUIRED COMPETENCIES FOR OCEMS PARAMEDIC OPERATED TRANSPORT VENTILATOR PROGRAMS:

1. Transporting agencies must be approved by OCEMS to use and train paramedics for transport ventilator use in ambulance units.
2. Paramedics must successfully complete an approved training course for competency for using an automatic transport ventilator. Paramedics must be retrained and updated on the use of the transport ventilator on an annual basis with documentation of such retraining maintained by the ambulance provider for a three year period.
3. Training shall ensure paramedics are familiar with this procedure and competent to use the specific device fielded by their service during transport.
4. Paramedics must understand important ventilator settings and parameters, and understand the typical range of settings on the ventilator. They must be proficient in identifying the meaning of all ventilator alarms and understand the ongoing assessment of the patient when dependent upon a transport ventilator (bilateral breath sounds, appropriate oxygen saturation, stable blood pressure and pulse).
5. Paramedics must be able to troubleshoot issues with the ventilator and appropriately respond to complications of mechanical ventilation.
6. Agencies using transport ventilators must follow manufacturer recommendations for maintenance, cleaning, testing, and updating the transport ventilators to ensure they are in reliable and safe working order.
7. Agencies must have a CQI program to monitor and improve transport ventilator use.

PROCEDURE:

1. Use of transport ventilators is limited to patients who require mechanical ventilation and are identified in the section labeled "INDICATIONS" above.

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2. Ventilator settings must be established by a physician and continued during transport.
3. Obtain ventilator settings from transfer facility staff and document settings on the PCR.
4. Ventilator settings obtained must include:
 - FiO₂ (percent oxygen)
 - Respiratory rate per minute
 - Tidal (inspiratory) volume per breath
 - Inspiratory Pressure/Pressure Support: Pressure supplied by the ventilator to assist inspiration.
 - Peak Inspiratory Pressures (PIP) and Plateau Pressures: Peak pressure during inspiration and pressure at the plateau phase at the end of inspiration.
 - Inspiratory/Expiratory Ratio (I:E Ratio): The ratio of time between inspiration and expiration.
 - Trigger (voluntary inspiration) sensitivity that allows patient initiated breaths
 - Positive end expiratory pressure (PEEP), if any
 - Ventilator Mode

There are multiple different modes but 2 main ones are used for adults, AC-V and SIMV:

A) Assist Control Volume (AC-V, or VACV): The ventilator delivers full breaths at a preset volume and preset rate (Control breaths). Full breaths are also delivered at the preset volume with initiation of ventilation by the patient (Assist breaths).

B) Synchronous Intermittent Mandatory Ventilation (SIMV): The ventilator delivers full breaths at a preset volume and preset rate (intermittent mandatory breaths). Additional breaths are allowed and often supported with Pressure Support, but volume is determined by the patient's work of breathing. Mandatory and spontaneous breaths are synchronized.
5. Turn on the transport ventilator and enter the ventilator settings prior to transferring the patient onto the transportation ventilator.
6. Observe patient on the transport ventilator for approximately 10 minutes to ensure that the patient is tolerating the transport ventilator prior to leaving the facility.
7. Check for appropriate placement of the airway device initially and every time the patient is transferred, anytime there is a change in condition of the patient, and any other time there is a risk for dislodgement (e.g. sudden significant patient movement during transport). This is done by observation, auscultation, CO₂ monitoring and checking for stability in ventilator parameters.
8. Check vital signs initially and every 10 minutes during transport,
9. Initiate continuous monitoring of pulse oximetry and capnography (End tidal CO₂ - ET-CO₂).
10. Have alternative airway management materials available, including BAG-VALVE and oxygen supply.
11. Use inline suctioning with sterile technique as needed to clear the airway of secretions.
12. Inline albuterol may be given as needed for wheezing (5 mg as per standing order SO-M-35).
13. Observe for potential complications of mechanical ventilation.
 - a) Hypoxia: DOPE pneumonic (Displacement of the tube, Obstruction, Pneumothorax, Equipment failure)

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- b) High pressures: obstruction (secretions, kinked tube, biting tube), air stacking due to vent settings, high volumes, pneumothorax (including tension pneumothorax—refer to standing order PR-060).
 - c) Low pressures: low flow, leak in the circuit, leaking tube cuff.
 - d) Patient not tolerating ventilator: coughing, gagging, and “bucking” the ventilator. Use standing order sedation protocol SO-M-80.
14. If unable to resolve ventilator issues and/or the patient is deteriorating due to ventilator complications, disconnect the ventilator and initiate ventilations using a bag-valve and continue transport.
15. If an endotracheal or tracheostomy tube becomes dislodged, initiate ventilations using a bag-valve and continue transport.
16. Upon arrival to receiving facility, document ventilator setting readings and patient condition on PCR

NOTE:

Anytime there is concern that the transport ventilator is not ventilating a patient adequately or is malfunctioning in any way, do not hesitate to switch to bag-valve ventilation support and continue transport.

Approved:

Carl Schultz, M.D.

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