

AIRWAY – VENTILATOR (EMV +)

1. Level: Paramedic/CCT, RN (special training required)
2. Purpose: To provide optimal care of those patients requiring mechanical ventilatory support during transport.
3. Indications:
 - 3.1. Emergency and non-emergency patients requiring ventilatory support during transport
4. Contraindications:
 - 4.1. For inter-facility transports, pediatric patients <1 year of age require the presence of a respiratory therapist and/or team transport to use this ventilator, unless otherwise approved by an LaSalle Medical Director.
 - 4.2. Patients less than 5 kg.
 - 4.3. Tidal volumes of less than 50 ml.
5. Precautions:
 - 5.1. The paramedic must accompany the patient when transporting emergency and non-emergency patients requiring a mechanical ventilator. At no time is it acceptable for the EMT or AEMT to be the sole patient care provider on a ventilator dependent patient.
 - 5.2. At no time should a paramedic transport a patient on any mechanical ventilator unless they have received adequate instruction on that device.
 - 5.3. If you encounter any complications during a ventilator transport immediately remove the patient from the ventilator and assist ventilations via the BVM.
 - 5.3.1. For patient specific issues, contact medical control via the medical control recorded line system.
 - 5.3.2. For ventilator specific issues, contact the Communication Center supervisor to be placed in contact with the CCT Helpline.
6. Procedure:
 - 6.1. Acquire ventilator and equipment
 - 6.1.1. EMV+ Ventilator (with carrying case)
 - 6.1.1.1. Carrying case can remain in the ambulance during patient contact.
 - 6.1.2. Ventilator Charger
 - 6.1.3. 2 Ventilator Circuits
 - 6.1.3.1. The pediatric circuits must be used if the Tidal volume is 50- 300 cc.
 - 6.1.3.2. The adult circuits must be used if the Tidal volume is 200-1500 cc.
 - 6.1.4. 1 Artificial Nose
 - 6.1.4.1. The artificial nose should be used for warming and humidification for any patient expected to be on the ventilator for greater than 30 minutes.
 - 6.1.5. Oxygen Supply Hoses
 - 6.1.6. Portable Oxygen Cylinder (with adequate amount of oxygen and Ohio fitting)
 - 6.1.7. BVM
 - 6.1.8. Portable Suction
 - 6.1.9. Inline HEPA Filter
 - 6.2. Obtain patient information including vent settings, if available.
 - 6.2.1. For inter-facility transports, request to speak with a vent technician or respiratory therapist. Inquire as to vent settings, problems, patient disposition, and any other pertinent information.
 - 6.2.2. Mode of Operation

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- 6.2.2.1. Assist Control (AC)
 - 6.2.2.1.1. Volume Targeted (AC-V)
 - 6.2.2.1.1.1. For field application of the EMV+ in the acute emergency setting (see [ADVANCED AIRWAY CONFIRMATION / MANAGEMENT Protocol](#)), Assist Control-Volume (AC-V) is typically the indicated mode for adult and pediatric patients.
 - 6.2.2.1.2. Pressure Targeted (AC-P)
- 6.2.2.2. Synchronized Intermittent Mandatory Ventilation (SIMV)
 - 6.2.2.2.1. Volume Targeted with or without Pressure Support (SIMV-V or SIMV-V + PS)
 - 6.2.2.2.2. Pressure Targeted with or without Pressure Support (SIMV-P or SIMV-P + PS)
- 6.2.2.3. Continuous Positive Airway Pressure (CPAP) (NPPV or PPV)
 - 6.2.2.3.1. Non-invasive Positive Pressure Ventilation (NPPV) or Positive Pressure Ventilation (PPV)
 - 6.2.2.3.1.1. For NPPV, it is optimal to use the patient's own interface (mask). If this is not an option, the CPAP mask can be used.
 - 6.2.2.3.1.2. NPPV masks should be non-vented for use with the EMV+ ventilator.
 - 6.2.2.3.2. With or Without Pressure Support
- 6.2.2.4. Bi-Level (BL)
 - 6.2.2.4.1. Non-Invasive Positive Pressure Ventilation (NPPV) or Positive Pressure Ventilation (PPV)
 - 6.2.2.4.1.1. For NPPV, it is optimal to use the patient's own interface (mask). If this is not an option, the CPAP mask can be used.
 - 6.2.2.4.1.2. NPPV masks should be non-vented.
- 6.2.2.5. Rate
 - 6.2.2.5.1. Default rate set on EMV+ is 12 bpm.
 - 6.2.2.5.2. ROSC patients should be ventilated at 10 bpm.
 - 6.2.2.5.3. Use Pediatric Broselow Tape for specific ventilatory rates in pediatrics less than 12 years-old or less than 80 pounds (36 kg).
- 6.2.2.6. Tidal Volume (Vt)
 - 6.2.2.6.1. 6-8 cc/kg based on ideal body weight for adult and pediatric patients
- 6.2.2.7. FIO2
 - 6.2.2.7.1. FiO2 should be titrated to maintain SPO2 $\geq$ 95%.
- 6.2.2.8. Inspiratory time (I time)/I:E Ratio
 - 6.2.2.8.1. Neonates typically require I:E ratios of 1:1.
 - 6.2.2.8.2. Reactive airway diseases such as asthma and COPD require longer exhalation time. The minimum I:E ratio for these patients is 1:3. If the patient requires longer to exhale,

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consider increasing the I:E ratio, but use caution, as this will decrease the inhalation time, and could result in high pressure alarms and under ventilation.

6.2.2.9. PEEP

6.2.2.9.1. Default PEEP setting is 5 cmH₂O.

6.2.2.9.2. Consider using less PEEP or no PEEP in hemodynamically compromised patients.

6.2.2.10. Peak airway pressures

6.2.2.10.1. Caution with peak airway pressures greater than 40 cmH₂O.

This causes a significant change in thoracic pressures and can lead to decreases in blood pressure.

6.2.2.11. Sedation, if required.

6.2.2.12. Compliance

6.3. Application of Vent

6.3.1. Speak with the patient if possible, explain the procedure, and ask the patient if he/she is in any distress.

6.3.2. Establish primary baseline vital signs.

6.3.3. Attach the ECG, ETCO₂, SpO₂, and NIBP.

6.3.4. Re-establish baseline vital signs.

6.3.5. Prepare the ventilator.

6.3.5.1. Attach supply hoses to the ventilator and portable oxygen cylinder.

6.3.5.2. Attach the patient circuits/filters to the ventilator and artificial nose.

6.3.5.3. Turn the ventilator on, check settings, and confirm they are correct.

Do NOT place the patient on the vent before you turn it on.

6.3.5.4. Explain the procedure to the patient.

6.3.5.4.1. Have the patient inhale deeply before changing to the other ventilator, if possible.

6.3.5.5. For inter-facility transports, disconnect from the facility ventilator.

6.3.5.6. Connect to EMV+ ventilator.

6.3.5.7. Monitor the patient for any changes.

6.3.5.7.1. Resolve any patient/ventilator issues prior to departing the sending facility for inter-facility transports.

6.3.5.7.2. Request assistance from respiratory therapist as needed.

6.3.5.8. Establish secondary baseline vital signs.

6.4. Transport

6.4.1. Obtain vital signs every 5 minutes.

6.4.2. Attach charger to the ventilator and assure the ventilator is actively charging.

6.4.3. Contact receiving medical facility; assure they have a ventilator waiting and advise them of ETA and any changes in the patient's condition.

6.5. Arrival at Destination Bedside

6.5.1. Advise vent technician or respiratory therapist of ventilator settings, problems, and changes.

6.5.2. Verify that the receiving facility ventilator is ready.

6.5.3. Explain the procedure to the patient.

6.5.3.1. Have the patient inhale deeply before changing to the other ventilator, if possible.

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- 6.5.4. Disconnect from the transport ventilator and connect to the ventilator of the receiving facility.
- 6.6. Completion of call
 - 6.6.1. Dispose of ventilator circuits along with any other additional disposable supplies.
 - 6.6.2. Place ventilator on charge in the ambulance. Assure ventilator and charger are properly secured.
 - 6.6.3. Place all hoses and other non-disposable supplies in carrying case.
 - 6.6.4. Replace any disposable supplies when practical and prior to the completion of your shift.
- 6.7. Special Considerations
 - 6.7.1. Inter-facility Transports: Do NOT use Propofol infusions for sedation on any mechanically ventilated patient under the age of 13. Contact Medical Control via the Communication Center, if needed. The preferred sedation for mechanically ventilated patients under age 13 is fentanyl with midazolam and, if hypersensitivity exists, ketamine can be utilized.
 - 6.7.1.1. Sedation Dosing (Mechanically Ventilated Patients Under Age 13)
 - 6.7.1.1.1. Fentanyl Infusion: 0.5-2 mcg/kg/hr. Max 3mcg/kg/hr
 - 6.7.1.1.1.1. Preparation: Mix 200 mcg Fentanyl into 100 ml of NS or D5W.
 - 6.7.1.1.2. Midazolam Infusion: 0.1-1.0 mg/kg/hr
 - 6.7.1.1.2.1. Preparation: Mix 20 mg in 100 ml NS or D5W
 - 6.7.1.1.3. Ketamine Infusion: 0.5-2 mg/kg/hr and titrate to adequate sedation
 - 6.7.1.1.3.1. Preparation: Mix 250 mg of Ketamine into 100 ml of NS or D5W