

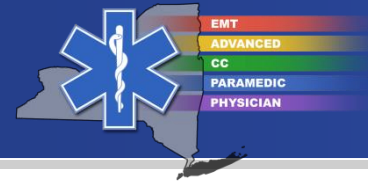
# Automatic Transport Ventilator

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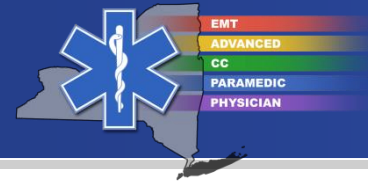
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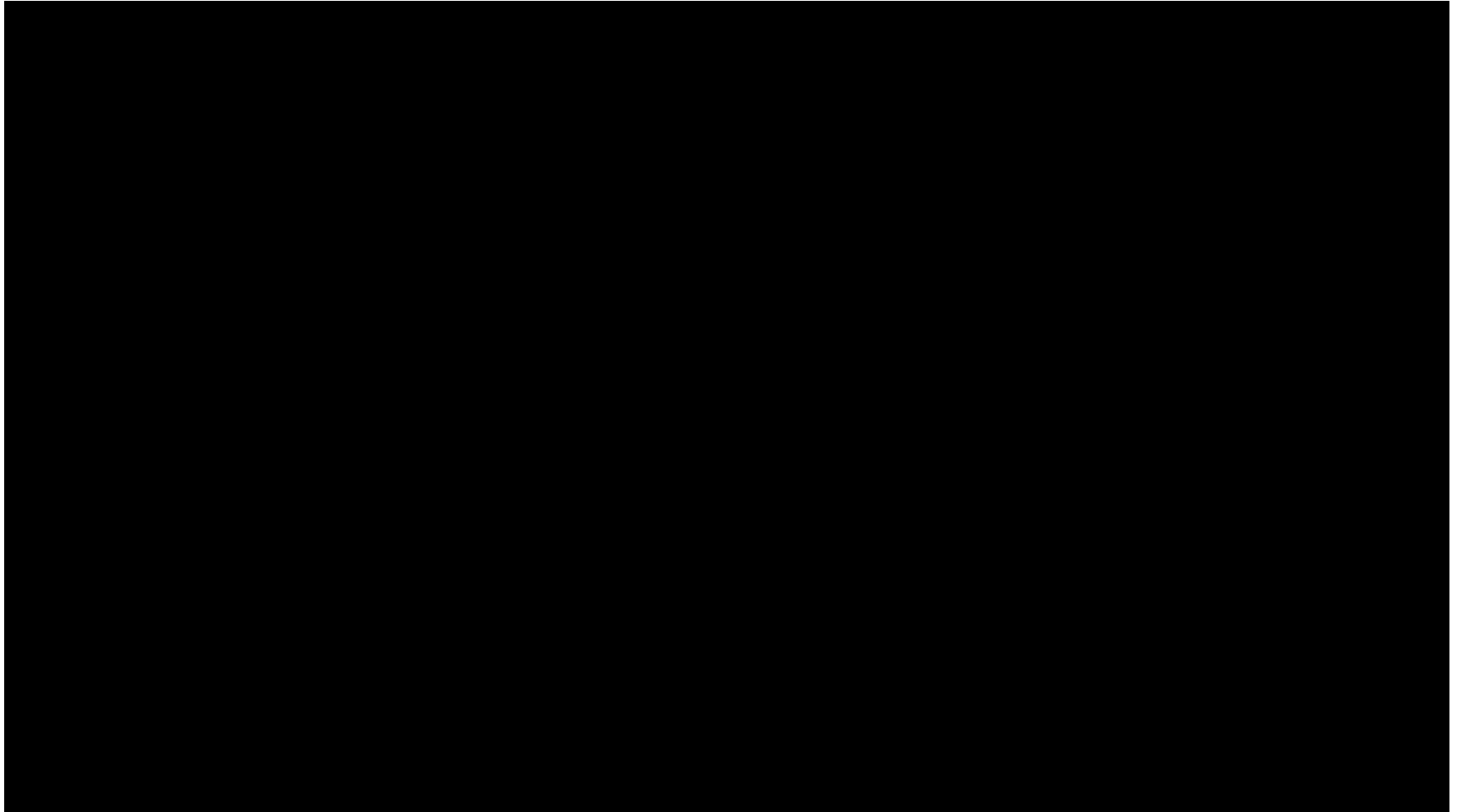
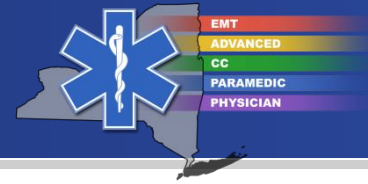


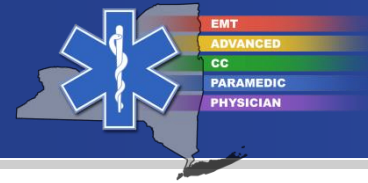
- No financial conflicts of interest



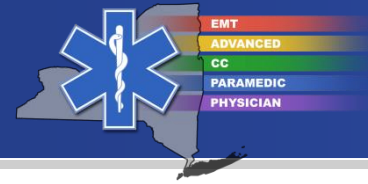
- Video: general concepts
- General parameters
- Recommended minimum requirements for ventilator
- Initiating ventilation
- Key points
- Video: ventilator settings

# Video: General Concepts



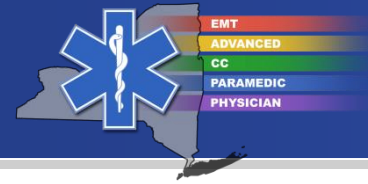


- These are general guidelines
- Please refer to the manufacturer's ventilator operation manual for specific directions on how to operate your ventilator
- The general parameters include  $\text{FiO}_2$ , PEEP, mode, pressure support, volume control, rate, and I-time
  - Changes to  $\text{FiO}_2$  and PEEP affect oxygenation (reflected in  $\text{SaO}_2$ )
  - Changes to volume and rate affect ventilation (reflected in  $\text{EtCO}_2$ )



- $\text{FiO}_2$  is the fraction of inhaled oxygen expressed as a percent
- You may start with an  $\text{FiO}_2$  of 1.0 or 100%
- Titrate the  $\text{FiO}_2$  during transport to keep the  $\text{SpO}_2$  between 92-96%

# General Parameters – PEEP



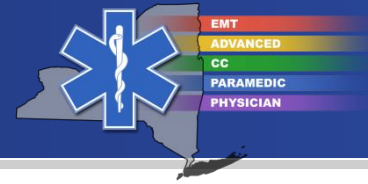
- PEEP is positive end expiratory pressure
- Generally PEEP is started at 5 cm H<sub>2</sub>O
- May increase to 10 cm H<sub>2</sub>O, as needed, to improve oxygenation



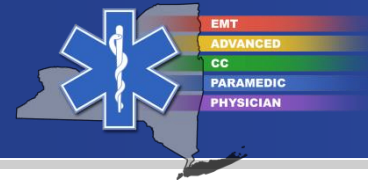
- Mode is generally A/C or SIMV in the transport environment
  - A/C is assist control
    - Ventilator will deliver breaths based at programmed rate if the patient does not trigger a breath on his or her own
    - Tidal volume is the same regardless of whether the breath is ventilator or patient-triggered
  - SIMV is synchronized intermittent mandatory ventilation
    - Ventilator will also deliver breaths at a programmed rate if the patient does not trigger a breath on his or her own
    - Patient-triggered breaths are not assisted (but may have pressure support, if programmed)
  - A/C and SIMV are essentially the same in patients who are not breathing on their own (e.g. paralyzed/sedated)



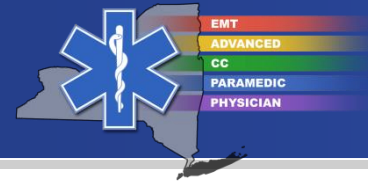
# General Parameters – Pressure Support



- Use pressure support if mode is SIMV (if available)
- Affects patient-triggered breaths only
- Delivers a continuous inspiratory pressure (rather than volume) and then drops to the set level of PEEP during exhalation
- Commonly used in combination with SIMV to decrease work of breathing during patient-triggered breaths
- Pressure support is not applicable in A/C because A/C mode delivers a constant volume (not pressure)
- Utilize 5-10 cm H<sub>2</sub>O of pressure support



- Volume control is the tidal volume the ventilator will deliver
- Set between 6-8 mL/kg of *ideal* body weight (420-560 mL for a 70 kg patient)
- This parameter is used with both A/C and SIMV modes because both modes are essentially the same for ventilator-triggered breaths and deliver a fixed volume in these instances
- Adjust to maintain a plateau pressure [Pplat] < 30 cm H<sub>2</sub>O or PIP (peak inspiratory pressure) < 35 cm H<sub>2</sub>O

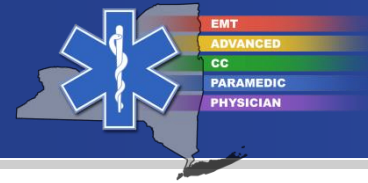


- Will determine minimum respiratory rate if the patient is not breathing on his or her own
- Child: 16-20 breaths per minute
- Adult: 12-14 breaths per minute
- Can adjust based on EtCO<sub>2</sub>



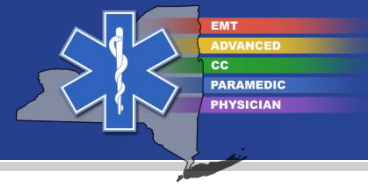
- I-time is the amount of time spent in inspiration during a given cycle
  - Child: 0.7-0.8 seconds
  - Adult: 0.8-1.2 seconds
- A similar concept is the I:E ratio (inspiratory to expiratory ratio)
  - If the rate is set at 12 breaths per minute (one breath every 5 seconds) and the adult I-time is 1 second then the I:E ratio is 20 %
  - Generally set at 33%
  - May be lower in patients with COPD to allow more time for exhalation

# Recommended Ventilator Requirements

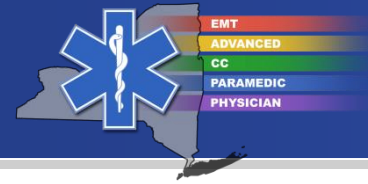


- Confirm pressure limit / safety relief at max of 40 cm H<sub>2</sub>O
- Ability to adjust volume to 4-8 mL/kg of ideal body weight
- Ability to adjust rate in the minimum range of 10-30 breaths per minute
- Ability to add PEEP or a PEEP valve in the minimum range of 5-10 cm H<sub>2</sub>O
- Ability to accommodate patient-triggered breaths

# Initiating Mechanical Ventilation – Preparation

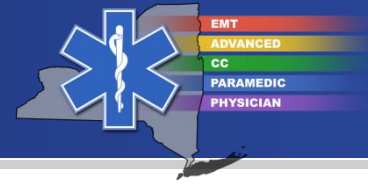


- Use EtCO<sub>2</sub> and pulse oximetry to evaluate effectiveness of ventilation and oxygenation as well as to confirm airway device placement
- Prepare BVM
  - Keep bag ready at all times in case of ventilator failure
  - Keep mask immediately available in the event of a dislodged tube
- Assure a secondary oxygen source with a minimum of 1000 psi in a D tank
  - Attach ventilator to this oxygen source
- Attach a disposable ventilator circuit to ventilator
- Attach gas outlet, pressure transducer, and exhalation valve tubes to corresponding connectors



- Program parameters:
  - Select mode (A/C or SIMV), if applicable
  - Select rate and titrate to EtCO<sub>2</sub>
    - If the EtCO<sub>2</sub> is too high, increase the rate
    - If the EtCO<sub>2</sub> is too low, decrease the rate
  - Select tidal volume based on ideal body weight
  - Select FiO<sub>2</sub>
    - May start at FiO<sub>2</sub> of 1.0 (100% O<sub>2</sub>) then titrate down to maintain SaO<sub>2</sub> 92-96%
  - Verify high pressure alarm is no higher than 40 cm H<sub>2</sub>O
  - Set PEEP to 5 cm H<sub>2</sub>O

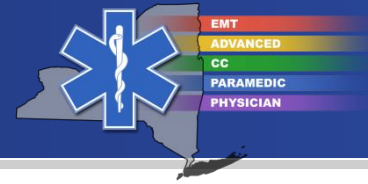
# Initiating Mechanical Ventilation – Verification



- Observe several breaths
- Confirm adequate chest rise
- Monitor and adjust for EtCO<sub>2</sub> and SpO<sub>2</sub>
  - Rate and tidal volume affect EtCO<sub>2</sub>
  - FiO<sub>2</sub> and PEEP affect SpO<sub>2</sub>
- Record all set parameters on the patient record
- Monitor and record PIP, if applicable



# Key Points



- If the ventilator should fail at any time or if an alarm is received that cannot be corrected, ventilate the patient immediately with a BVM connected to 100% oxygen
- Keep the appropriate sized mask with the BVM readily accessible in case of a problem with airway placement
- Do not use automated transport ventilators when performing CPR; ventilate with a BVM during CPR

# Video

