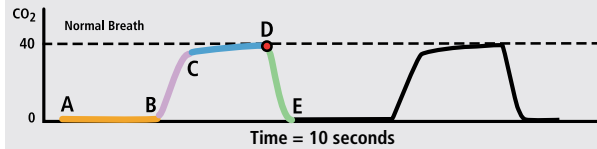


Capnography During Pre-Hospital Care etCO₂ Waveform Guide



Normal waveform⁹

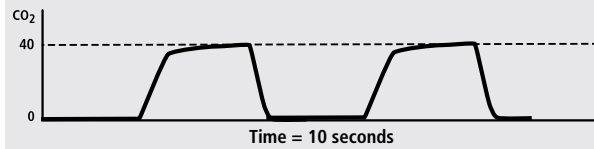
Phases of ventilation



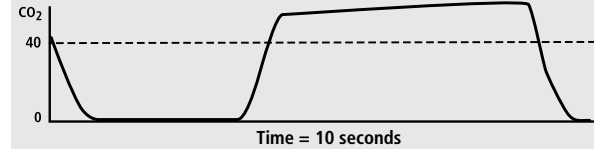
- A-B: Dead space ventilation, beginning of exhalation
- B-C: Rapid rise in CO₂, early exhalation
- D: Alveolar plateau, end of expiration, end tidal CO₂ (etCO₂)
- D-E: Inhalation

Ventilatory patterns

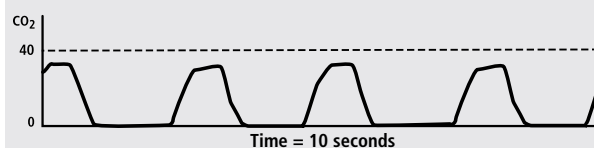
Normal



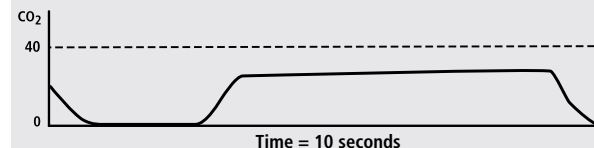
Hypoventilation/Effective ventilation



Tachypnea/Hypocarbica

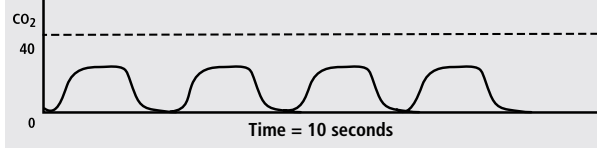


Bradypnea/Hypercarbia

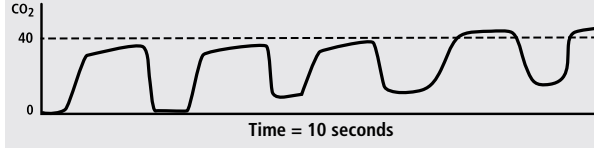


Waveforms in acute disease

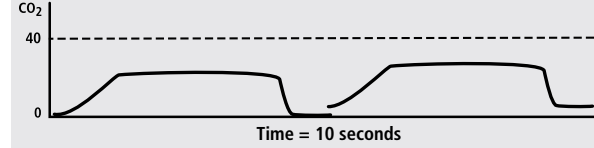
Cardiac arrest with manual CPR



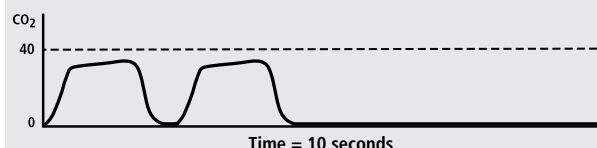
Rebreathing



Shallow ventilation/Low tidal volume



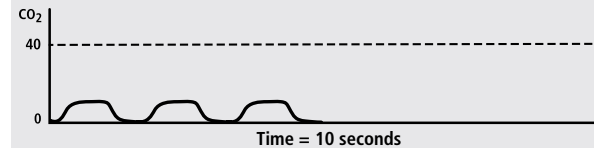
Complete airway obstruction or complete laryngospasm



Asthma and emphysema



Low perfusion state, inadequate cuff seal on endotracheal tube



Intubated Applications/ Advanced Airway Placement¹⁻³

Verify ETT placement and ensure continuous ETT position during transport

Ensure continuous ETT position during transport

Effectiveness of cardiac compression

- Gauge of ICP in isolated head injury
- One of the earliest signs of ROSC⁴⁻⁶

Non-Intubated Applications⁷⁻¹⁰

Monitor Ventilation Status:

- Obstructive Lung Disease (asthma/COPD)
- Pulmonary Edema/CHF
- Overdose
- Post-ictal/seizure
- Respiratory failure
- Sedation/analgesia

Monitor Perfusion Status:

Trending tool for hypoperfusion states

- Sepsis
- Hypovolemia
- Stable vs. unstable tachycardia (trending tool)
- Pacing: mechanical vs. electrical capture

Rapid Assessment and Triage Tool¹¹

- Critically ill patients
- Chemical terrorism

1. American Heart Association (AHA) 2010 Guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) October 18, 2010.
 2. European Resuscitation Council Summary of the Main Changes in the Resuscitation Guidelines, ERC Guidelines 2010.
 3. Krauss, B., Silvestri, S. et al. The Effectiveness of Out-of-Hospital Use of Continuous End-Tidal Carbon Dioxide Monitoring on the Rate of Unrecognized Misplaced Intubation Within a Regional Emergency Medical Services System, Annals of Emergency Medicine, Volume 45, Number 5, May 2005.

4. Wayne, M.A., Levine, R.L., Miller, C.C. Use of end-tidal Carbon Dioxide to Predict Outcome in Prehospital Cardiac Arrest, Annals of Emergency Medicine, 1995; 25(6):762-767.
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 6. Garnett, A.R. et al. End-tidal carbon dioxide monitoring during cardiopulmonary resuscitation, Journal of American Medicine Association, 1987, 257(4), 512-515.
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 9. Krauss, Capnography: An Emerging Standard of Care in EMS, Today's Emergency, Volume 12, No. 2, Summer 2006, 38-42.
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 11. Krauss, B., Capnography as a Rapid Assessment and Triage Tool for Chemical Terrorism, Pediatric Emergency Care, Volume 21, Number 8, August 2005.