

Capnography



End-tidal CO₂ (EtCO₂) is the measurement of carbon dioxide (CO₂) in the airway at the end of each breath. Capnography provides a numeric reading (amount) of EtCO₂, a respiratory rate in breaths per minute and a graphic display (waveform) of CO₂ throughout the respiratory cycle.

2010 AHA Guidelines give quantitative waveform capnography a Class I recommendation for adults for confirmation and monitoring of endotracheal tube placement. During resuscitation for cardiac arrest, if EtCO₂ abruptly increases to a normal value (35 to 45 mmHg), it is reasonable to consider that this is an indicator of ROSC (Class IIa).

Applications:

Capnography is an objective monitoring tool for patients in respiratory distress and patients undergoing procedural sedation. It may be used to confirm, monitor and document ET tube intubation. A nasal-oral cannula is used to assess, monitor and document the respiratory status of the non-intubated patient. EtCO₂ monitoring with LIFEPAK® monitor/defibrillators may be used on patients of any age.

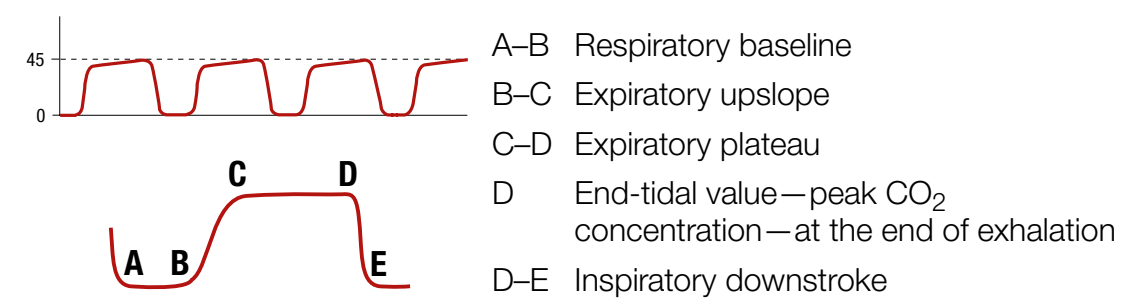
The American Society of Anesthesiologists (ASA) Committee on Standards and Practice Parameters redefined the standard for basic anesthetic monitoring.

Effective July 1, 2011, Basic Anesthetic Monitoring Standard 3.2.4. requires: "... During moderated deep sedation, the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and monitoring for the presence of exhaled carbon dioxide unless precluded or invalidated by the nature of the patient, procedure or equipment."

Normal Ranges:

Arterial PaCO₂ 38–45 mmHg
Airway EtCO₂ 35–45 mmHg (4–6 Vol.%)

Normal Waveform:



Capnography • Intubated Patient

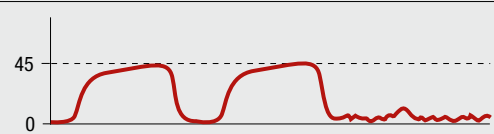
Applications on intubated patients:

- Verification of ET tube placement
- Monitoring and detection of ET tube dislodgement
- Detection of loss of circulatory function
- Determination of adequate CPR compressions
- Confirmation of return of spontaneous circulation (ROSC)

Examples:

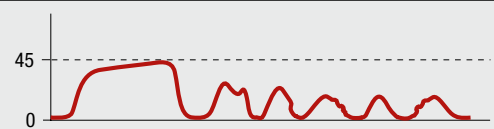
Sudden loss of waveform, EtCO₂ near zero

- ET tube disconnected, dislodged, kinked or obstructed
- Loss of circulatory function



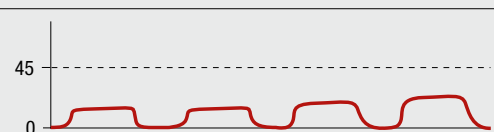
Decreasing EtCO₂ with loss of plateau

- ET tube cuff leak or deflated cuff
- ET tube in hypopharynx
- Partial obstruction



CPR Assessment

- Attempt to maintain minimum of 10 mmHg



Sudden increase in EtCO₂

- Return of spontaneous circulation



Capnography • Non-intubated Patient

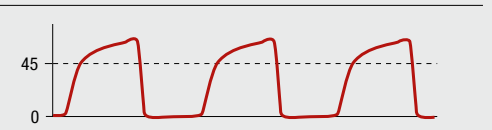
Applications on non-intubated patients include:

- Assessment of asthma and COPD
- Documented monitoring during procedural sedation
- Detection of apnea or inadequate breathing
- Measurement of hypoventilation
- Evaluation of hyperventilation

Examples:

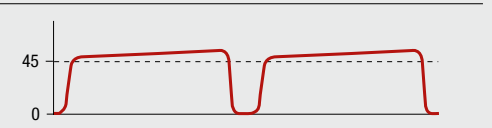
Plateau has curved, "shark-fin" appearance

- Asthma
- COPD



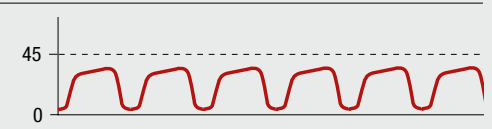
Slow rate with increased EtCO₂

- Hypoventilation
- Partial airway obstruction



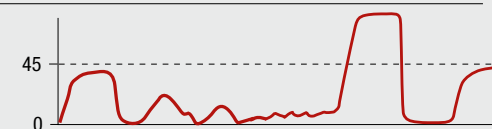
Rapid rate with decreased EtCO₂

- Hyperventilation



Decreased EtCO₂, variable waveform

- Apnea, inadequate breath
- Sedation



Troubleshooting Tips for EtCO₂ Monitoring with LIFEPAK monitor/defibrillators:

Observation

ALARM APNEA message appears.
CO₂ FILTERLINE OFF message appears.
CO₂ FILTERLINE BLOCKAGE message appears.
CO₂ FILTERLINE PURGING message appears.
EtCO₂ values are erratic.
EtCO₂ values are consistently higher or lower than expected.
XXX appears in place of EtCO₂ value.

Possible Cause

No breath has been detected for 30 seconds since last valid breath (>8 mmHg).
FilterLine® is disconnected or not securely connected.
FilterLine tube is twisted or clogged. Airway adapter is clogged.
FilterLine tube is twisted or clogged or rapid altitude change has occurred.
Leak in the tubing or ventilated patient breathes spontaneously.
Physiological cause, ventilator malfunction or improper calibration.
CO₂ module not calibrated successfully or CO₂ module fails.

The LIFEPAK® 12, 15 and 20e monitor/defibrillators with Microstream® capnography provide the most versatility and ease of use:

- Superior moisture handling eliminates need for water traps or additional filters
- No calibration required between patients
- Does not require user corrections or compensation for commonly used gasses (O₂, N₂O, etc.)



See device Operating Instructions for complete directions for use, indications, contraindications, warnings, precautions and potential adverse events.

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