

CAPNOGRAPHY

EDUCATIONAL SERIES

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 the EtCO₂ and a graphic display (waveform) of CO₂ throughout the respiratory cycle.

CO₂, produced by cells, is transported via the vascular system and diffused into the alveoli to be exhaled. PaCO₂, the partial pressure of CO₂ in arterial blood, is normally 2–5mmHg higher than EtCO₂ in the airway.



Capnography • Intubated Patient

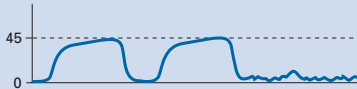
Applications on intubated patients:

- Verification of ET tube placement
- Monitoring and detection ET tube dislodgment
- Loss of circulatory function
- Determination of adequate CPR compressions
- Confirmation of return of spontaneous circulation

Examples:

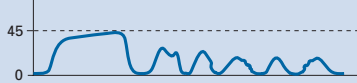
Sudden loss of waveform, EtCO₂ near zero

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



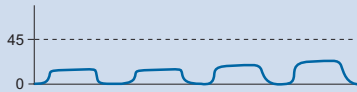
Decreasing EtCO₂ with loss of plateau

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



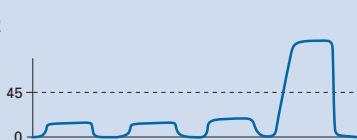
CPR Assessment

- Attempt to maintain minimum of 10mmHg



Sudden increase in EtCO₂

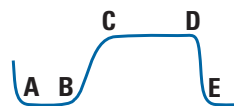
- Return of spontaneous circulation



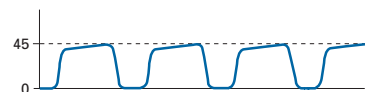
Normal Ranges:

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

Normal Waveform:



- A–B Respiratory baseline
- B–C Expiratory upslope
- C–D Expiratory plateau
- D End-tidal value—peak CO₂ concentration—at the end of exhalation
- D–E Inspiratory downstroke



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 defibrillator/monitors may be used on patients of any age.

Monitoring and Printing:

Capnography waveforms on the monitor screen are condensed to provide adequate information in the 4-second view. The correct respiratory rate is displayed in breaths per minute (bpm). Printouts of the waveforms are in real time and therefore may differ in duration.

Note:

Examples are illustrations for training purposes. Level of sedation and severity of condition may affect respiratory rate and EtCO₂ level in patients.

Troubleshooting Tips for EtCO₂ Monitoring with LIFEPAK defibrillator/monitors:

Observation	Possible Cause
ALARM APNEA message appears.	No breath has been detected for 30 seconds since last valid breath (>8mmHg).
CO ₂ FILTERLINE OFF message appears.	FilterLine [®] disconnected or not securely connected.
CO ₂ FILTERLINE BLOCKAGE message appears.	FilterLine is twisted or clogged. Airway adapter clogged.
CO ₂ FILTERLINE PURGING message appears.	FilterLine tube twisted or clogged, or rapid altitude change occurred.
EtCO ₂ values are erratic.	Leak in the tubing. Ventilated patient breathes spontaneously.
EtCO ₂ values are consistently higher or lower than expected.	Physiological cause. Ventilator malfunction. Improper calibration.
xxx appears in place of EtCO ₂ value.	CO ₂ module not calibrated successfully, or CO ₂ module fails.

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



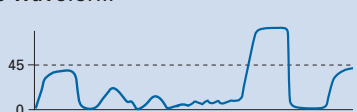
Rapid rate with decreased EtCO₂

- Hyperventilation



Decreased EtCO₂, variable waveform

- Apnea, inadequate breath
- Sedation



The LIFEPAK[®] 12 defibrillator/monitor with Microstream[®] capnography provides 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.)

