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).

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 gases (O2, N2O, etc.)

Normal Ranges:
- Arterial PaCO2: 38–45 mmHg
- Airway EtCO2: 35–45 mmHg (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® 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 moderate 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 Waveform:

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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.

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
- Decreasing EtCO2 with loss of plateau
- CPR Assessment
- Sudden increase in EtCO2
- Return of spontaneous circulation

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
- Slow rate with increased EtCO2
- Rapid rate with decreased EtCO2
- Decreased EtCO2, variable waveform

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