

Capnography

THIS PROCEDURE APPLIES TO: All patients who have undergone advanced airway management, including endotracheal intubation or placement of a supraglottic airway, those receiving supplemental oxygen, or who have received sedation, antipsychotic medication, or narcotic pain management. This procedure also applies whenever directed by protocol.

EXCLUSION CRITERIA: None

AUTHORIZATION: All providers when available

PROCEDURE

Waveform Capnography is required for:

1. Non-intubated patients with a chief complaint potentially affected by a metabolic or respiratory condition. If oxygen is required via a nonrebreather mask or CPAP, first apply an EtCO₂ nasal cannula, then place the nonrebreather mask over the nasal cannula. If a nonrebreather mask is not necessary, use only the EtCO₂ nasal cannula.
2. All intubated patients:
 1. Immediately after intubation or placement of a supraglottic airway, and before administering the first ventilation, attach the EtCO₂ sensor between the endotracheal (ET) tube and the bag-valve mask (BVM).
 2. Monitor the first ventilation with capnography and auscultate the epigastrium using a stethoscope.
 3. Target capnography levels are:
 - 35 – 45 mmHg for a perfusing patient,
 - 10 – 15 mmHg for a non-perfusing patient, and
 - 35 – 40 mmHg for a patient with a closed head injury.

Number Interpretation

1. EtCO₂ levels less than 35 mmHg may indicate:
 - Hyperventilation
 - Decreased metabolic rate
 - Hypoperfusion
 - Airway obstruction
 - Air trapping
 - Impending cardiac arrest

- EtCO₂ levels greater than 45 mmHg may indicate: *(Note: Patients with chronic lung disease, such as COPD, may normally have higher readings)*
 - Hypoventilation
 - Increased metabolic rate
 - Hypertension
 - Return of spontaneous circulation post-cardiac arrest
 - Acidosis
- EtCO₂ measurements during resuscitation are strong indicators of survivability. An EtCO₂ level of 10 mmHg or lower, 20 minutes after the start of Advanced Cardiac Life Support (ACLS), is a predictor of poor outcome in patients with electrical activity but no pulse who have not received Sodium Bicarbonate. If the EtCO₂ remains \leq 10 mmHg after 20 minutes of quality compressions without hyperventilation, consider terminating resuscitation efforts.

Waveform Interpretation

- The normal capnography waveform has a square shape.
- A waveform of normal shape but low amplitude suggests reduced blood flow. This may occur in cases of shock, tension pneumothorax, pulmonary embolism, or pericardial tamponade. Low amplitude may also indicate hyperventilation, though the wave duration is typically shorter in hyperventilation compared to low blood flow.
- A rapid and steady decrease in waveform amplitude suggests declining pulse perfusion and impending cardiac arrest. A sudden return to normal amplitude may indicate a return of pulse or improved perfusion.
- A "stair-stepping" pattern, where each successive wave is higher or lower than the previous one, indicates CO₂ retention due to inadequate exhalation time between breaths. Identify and address potential causes for this pattern if possible.
- Failure to produce a recognizable waveform immediately after intubation, or a sudden cessation of waveforms, may indicate apnea or a dislodged or obstructed ET tube. In these cases, replace the ET tube.

Documentation

As indicated above, document at least three EtCO₂ measurements for each patient (press print three separate times). At a minimum, include measurements taken after initial intubation, during every patient move, and upon transferring care to another provider. The format for documentation may be written as: EtCO₂=XX.

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