



Capnography

INDICATIONS

- Altered mental status
- Cardiac arrest with return of spontaneous circulation (ROSC)
- Any serious trauma or medical condition
- Any use of Naloxone (Narcan)

CONTRAINDICATIONS

None

PROCEDURE

Follow manufacturer's instructions for placement and use of device.

Use on both adult and pediatric patients.

Endotracheal tube (ETT)/blind insertion airway device (BIAD)/bag valve mask (BVM):

- Turn on recording instrumentation.
- Place ET CO_2 sampling device in between ventilation device (BVM/ventilator) and the mask/endotracheal tube (ETT)/King Airway/Combitube/ Laryngeal Mask Airway (LMA)
- Attach sampling device to recording instrumentation and ventilate.
- The Capnometer shall remain in place with the airway and be monitored throughout prehospital care and transport.

Non-intubated spontaneously breathing patient:

- Turn on recording instrumentation.
- Place the sampling nasal cannula on the patient.
- Attach sampling device to recording instrumentation. Observe and record results.
- The capnometer shall remain in place with the airway and be monitored throughout prehospital care and transport.

Continuous positive airway pressure (CPAP)/ Bilevel positive airway pressure (BiPAP):

- Follow manufacturer's recommendations for placement of ET CO_2 in conjunction with use of CPAP/BIPAP.
- Place sampling nasal cannula on the patient.
- Place CPAP/ BiPAP mask on patient ensuring a good seal.
- Observe and record results.
- The capnometer shall remain in place with the airway and be monitored throughout prehospital care and transport.

PEARLS

- Normal range → ET CO_2 in adult and pediatric patients is 35-45 mm Hg.
- Cardiac arrest → Attempt to keep ET CO_2 above 10 mm Hg.
- Post-cardiac arrest → Attempt to keep ET CO_2 between 34-40 mm Hg.
- If ET CO_2 levels remain above 45 mm Hg despite ventilatory assistance, bronchodilators, CPAP or BIPAP, intubation may be needed.



Capnography

- When ETCO_2 is not detected, three factors must be addressed:
 - Loss of airway/apnea → Esophageal ETT placement or migration
 - Circulatory collapse → Cardiac arrest, pulmonary embolism, hypoperfusion
 - Equipment failure → Disconnected BVM or ventilator, obstruction in ETCO_2 detector or sampling tube

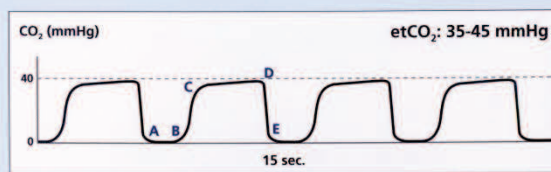
Normal and Abnormal etCO_2 /Capnograph Waveforms

Normal Capnogram

The normal capnogram is a waveform which represents the varying CO_2 level throughout the breath cycle.

Waveform Characteristics:

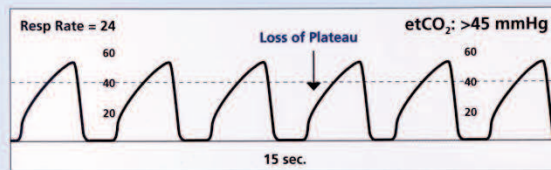
- A-B: Baseline
- B-C: Expiratory Upstroke
- C-D: Expiratory Plateau
- D-E: Inspiration
- E: End-Tidal Concentration



Bronchospasm/Asthma

Other Possible Causes:

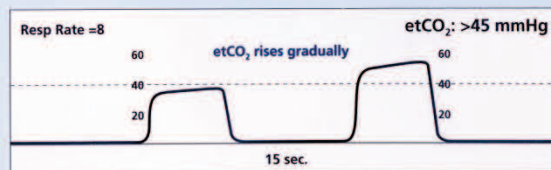
- Bronchospasm/COPD
- Obstruction in the expiratory limb of the breathing circuit
- Presence of a foreign body in the upper airway
- Partially kinked or occluded artificial airway



*Increasing etCO_2 (Hypoventilation)

Other Possible Causes:

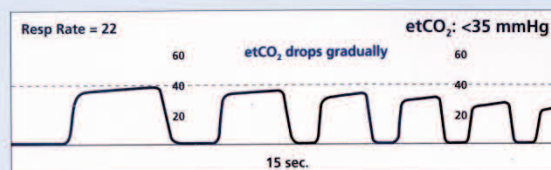
- Decrease in respiratory rate
- Decrease in tidal volume
- Increase in metabolic rate
- Rapid rise in body temperature (malignant hyperthermia)



*Decreasing etCO_2 (Hyperventilation)

Other Possible Causes:

- Increase in respiratory rate
- Increase in tidal volume
- Metabolic acidosis
- Fall in body temperature



*Assumes adequate circulation and alveolar gas exchange

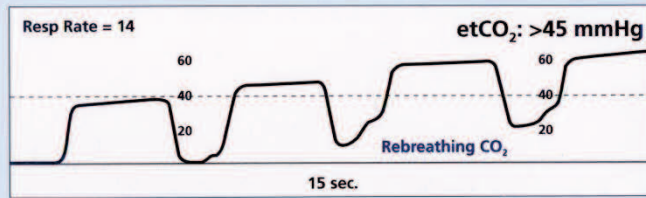


Capnography

Rebreathing CO₂

Other Possible Causes:

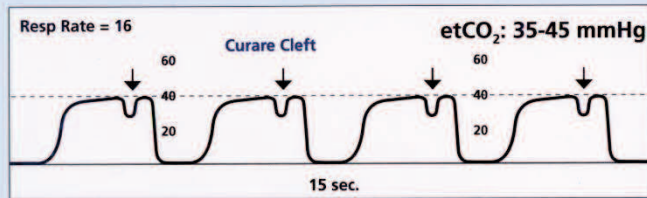
- Faulty expiratory valve
- Inadequate inspiratory flow
- Partial rebreathing
- Insufficient expiratory time



Curare Cleft

Other Possible Causes:

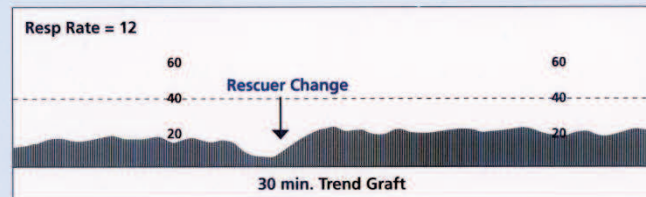
- Patient is mechanically ventilated
- Depth of cleft is proportional to degree of muscle relaxants



Cardiac Arrest

Other Possible Causes:

- Decreased or absent cardiac output
- Decreased or absent pulmonary blood flow
- Sudden decrease in CO₂ values



Return of Spontaneous Circulation

Other Possible Causes:

- Increase in cardiac output
- Increase in pulmonary blood flow
- Gradual increase in CO₂ production



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