Capnography

Pea Ridge Fire Department

EMS Refresher

Arterial Blood Gas Analysis

- Blood is analyzed for pH, Pa_{O_2}, $Hc_{O_3^-}$, base excess, and Sa_{O_2}.
  - pH, $Hc_{O_3^-}$ evaluate acid-base status.
  - Pac_{O_2} indicates effectiveness of ventilation.
  - Pa_{O_2} and Sa_{O_2} indicate oxygenation.

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Detects carbon dioxide in exhaled air
  - Adjunct for determining ventilation adequacy
  - Confirms advanced airway placement
  - $ETCO_2$ detector types:
    - Colorimetric
    - Digital
    - Digital/waveform

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Colorimetric capnographer
  - Reading after 6 to 8 positive pressure breaths
  - Replace with quantitative device as soon as possible.

Courtesy of Marianne Gausche-Hill, MD, FACEP, FAAP.

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Capnometer
  - Numeric reading of exhaled CO_2
- Capnographer
  - Graphic representation of exhaled CO_2
  - Types:
    - Waveform
    - Digital/waveform

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Waveform capnography
  - Provides real-time CO_2 information
  - Displays a graphic waveform
- Quantitative waveform capnography
  - Recommended for monitoring initial and ongoing placement of an advanced airway device

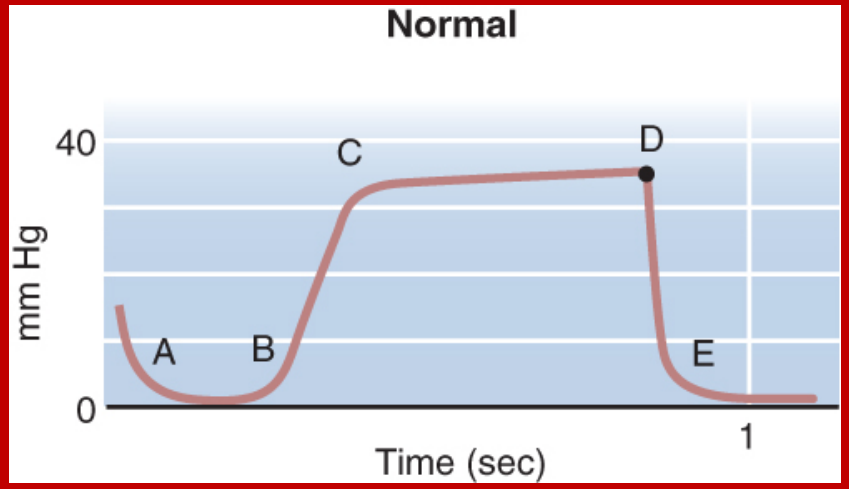
End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Capnography can indicate chest compression effectiveness and detect return of spontaneous circulation.
- Key features of normal capnographic waveform:
  - Contour
  - Baseline level
  - Rate and rise of the carbon dioxide level

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Waveform capnography (cont'd)
  - Phase I (A-B): Initial stage of exhalation
  - Phase II (B-C): Expiratory upslope
  - Phase III (C-D): Expiratory or alveolar plateau
  - Phase IV (D-E): Inspiratory downstroke

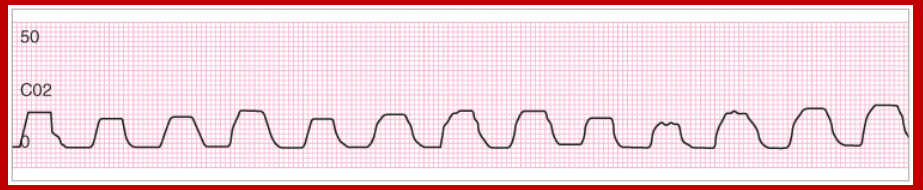


End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Abnormal capnographic waveforms
  - Hypoventilation
    - Tall waveforms and high $ETCO_2$ value
  - Hyperventilation
    - Small waveforms and low $ETCO_2$ value
  - Uses of waveform capnography in nonintubated patient:
    - Assess pathologic process that causes pulmonary air trapping
    - Gauge effectiveness of treatment

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

A.



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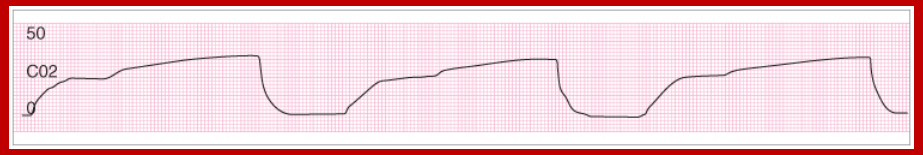

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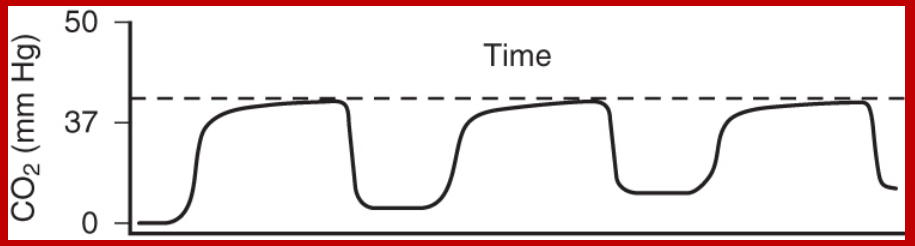
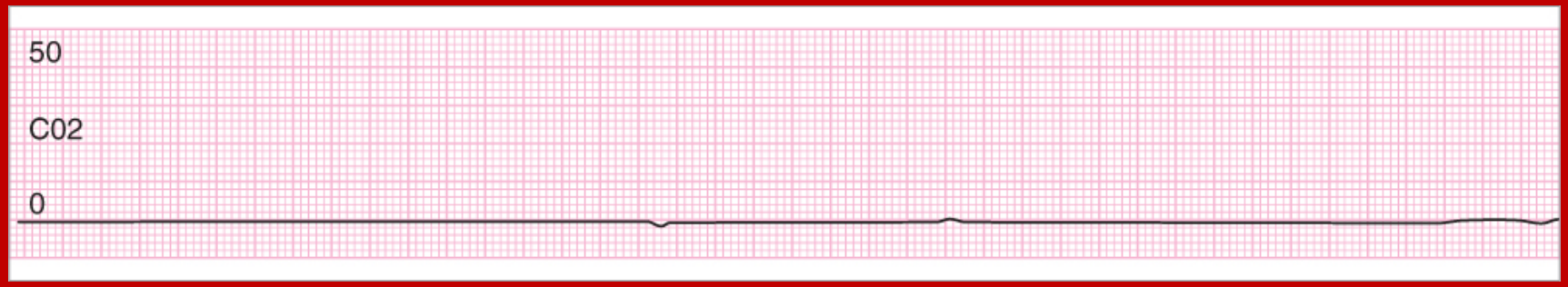


D.

End-tidal Carbon Dioxide ($ETCO_2$) Assessment

- Abnormal capnographic waveforms
  - Inadvertent extubation
  - Tubing obstruction



End-tidal Carbon Dioxide ($ETCO_2$) Assessment

Table 15-6 Causes of Increased and Decreased $ETCO_2$ Levels

	↑ $ETCO_2$	↓ $ETCO_2$
Spontaneously breathing	Hypoventilation	Hyperventilation
Apneic with a pulse	Positive pressure ventilation is too slow.	Positive pressure ventilation is too fast.
Apneic and pulseless	Positive pressure ventilation is too slow. Could indicate ROSC[b]	Misplaced ET tube[a] Decreased CO_2 return to the lungs (prolonged arrest) Chest compressions are of inadequate rate and/or depth. Positive pressure ventilation is too fast.[c]

Abbreviations: CO_2, carbon dioxide; ET, endotracheal; ROSC, return of spontaneous circulation

[a] No $ETCO_2$ light-emitting diode reading is displayed, and capnographic waveform is flat.
[b] With ROSC, an abrupt and sustained increase in $ETCO_2$ occurs (typically >40 mm Hg).
[c] In cardiac arrest of short duration.

Please Move to the Next Section

THANK YOU