Capnography

The use and benefits in your patients

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Canpnography Overview

- End Tidal CO$_2$ - What is It?
  - Breathing is done in waves
  - EtCO$_2$ is the amount of CO$_2$ measured at the peak of the wave
  - EtCO$_2$ is measured at nose, mouth, or hub of the ET tube
• A technology that
  – Provides another measurement in assessing your patient
  – Gives an objective measure of your patient’s ventilatory status
  – Shows a graphic picture of your patient’s ventilatory status
  – Presents an early warning of changes in your patient's cardiopulmonary status
  – Supplies important documentation on your patient
PHYSIOLOGY
Physiology of CO$_2$

ALL THREE ARE IMPORTANT!

METABOLISM

PERFUSION

VENTILATION
Physiology of Carbon Dioxide Production

Oxygen $\rightarrow$ lungs $\rightarrow$ alveoli $\rightarrow$ blood

breath

$\text{CO}_2$

lungs

$\text{CO}_2$

blood

energy

$\text{CO}_2$

cells

Oxygen + Glucose

Oxygen

muscles + organs
The Relationship Between PaCO$_2$ and EtCO$_2$

- EtCO$_2$ normal range is 35 - 45 mmHg
- Under normal ventilation and perfusion conditions, the PaCO$_2$ & EtCO$_2$ will be very close
  - 2 - 5 mmHg with normal physiology
- Wider differences found in abnormal perfusion and ventilation
Oxygen Desaturation Curve
Capnography

A Unique Solution for Non-intubated Patients

Small pin holes deliver oxygen around both nose and mouth

Uni-junction™ of sampling ports prevents dilution from supplemental oxygen

Increased surface area provides greater sampling accuracy in the presence of low tidal volume
Capnographic Waveforms

As Diagnostic as an ECG Waveform
Capnographic Waveform

- Normal waveform of one respiratory cycle
- Similar to ECG
  - Height shows amount of CO₂
  - Length depicts time
Phase I occurs during exhalation of air from the anatomic dead space, which normally contains no CO$_2$.

This part of the curve is normally flat, providing a steady baseline.
Phase II occurs during alveolar washout and recruitment, with a mixture of dead space and alveolar air being exhaled.

Phase II normally consists of a steep upward slope.
Capnogram: Phase III

- Phase III is the alveolar plateau, with expired gas coming from the alveoli.
- In patients with normal respiratory mechanics, this portion of the curve is flat, with a gentle upward slope.
- The highest point on this slope represents the EtCO₂ value.
Atmospheric air contains negligible amounts of CO₂.

Phase IV occurs during inspiration, where the EtCO₂ level normally drops rapidly to zero.
- Unless CO₂ is present in the inspired air, as occurs when expired air is rebreathed
- This part of the waveform is a steep, downward slope.
Hyperventilation

- RR $\uparrow$ : EtCO$_2$ $\downarrow$
Hypoventilation

- RR
- EtCO₂

Normal

Hypoventilation
Capnography Waveform Patterns

- **Normal**
- **Hyperventilation**
- **Hypoventilation**
Bronchospasm Waveform Pattern

- Bronchospasm hampers ventilation
  - Curves upstroke of Phase II
- Characteristic pattern for bronchospasm
  - “Shark Fin” shape to waveform.
Capnography Waveform Patterns

- Normal
- Hyperventilation
- Hypoventilation
- Bronchospasm
Capnography Applications on Intubated Patients

• Confirm correct placement of ET tube
• Detect changes in ET tube position immediately
• Resuscitation
  – Assess adequacy of chest compressions
  – Detect ROSC
  – Objective data for decision to cease resuscitation
• Optimize ventilation of patients
• Document, document, document
CPR: Assess Chest Compressions

Use feedback from ETCO2 to depth/rate/force of chest compressions during CPR
Adequacy of Compressions
CPR: Detect ROSC
Are there any issues present?
48 y/o male Narcotic OD. Code Summary

Are there any issues present?
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