CrackCast Episode 5 – Patient Monitoring

Episode Overview:

1) List 6 situations when pulse oximetry is not useful
2) List 10 situations when capnography is useful
3) Describe the ETCO2 curve
4) List four indications for invasive blood pressure monitoring

Wisecracks:

1) False pulse oximetry readings

1) List 6 situations when pulse oximetry is not useful

Pulse oximetry basics:

- pulse oximetry uses LED lights to assess blood oxygenation by assessing the fractional difference between the wavelengths of oxygenated and deoxygenated blood
- calculates the percent of hemoglobin in the oxyhemoglobin state (not Pa02)
    - pulse oximeters are accurate between 80-100%
    - below that range large changes in **Sa02** can occur with small changes in **Pa02**

Limitations to pulse oximetry:

- pulse oximeters are unable to distinguish oxy/deoxyhemoglobin from MetHb and COHb
    - Methemoglobin (MetHb)
        - caused by exposure to an oxidizing agent which changes hemoglobin to its ferric form that is unable to bind 02
        - classically the cyanotic patient who doesn't respond to O2 therapy
    - Carboxyhemoglobin (COHb)
        - carbon monoxide poisoning can occur from smoke inhalation, automotive exhaust, propane heaters, wood stoves, gasoline motors etc.
        - classically the patient is one with "hypoxia, lactic acidosis, and hypotension"
        - often have headache and altered LOC

With both MetHb and COHb the SpO2 will **falsely** read as high

So when is pulse oximetry not useful?

Three settings:
1) Methemoglobinemia

- cyanide poisoning
- antimalarials
- benzocaine
- post methylene blue infusion

2) Carboxyhemoglobinemia
- CO poisoning

3) Poor light penetration
- dark nail polish
- low perfusion states
- dark skinned patients

2) List 10 situations when capnography is useful

Capnography can be qualitative or quantitative:

End-tidal CO2 measurement

Colorimetry (qualitative)

Uses a breath by breath assessment

purple = <4 mmhg CO2
tan = 4-15 mmhg CO2
yellow = >20 mmhg CO2

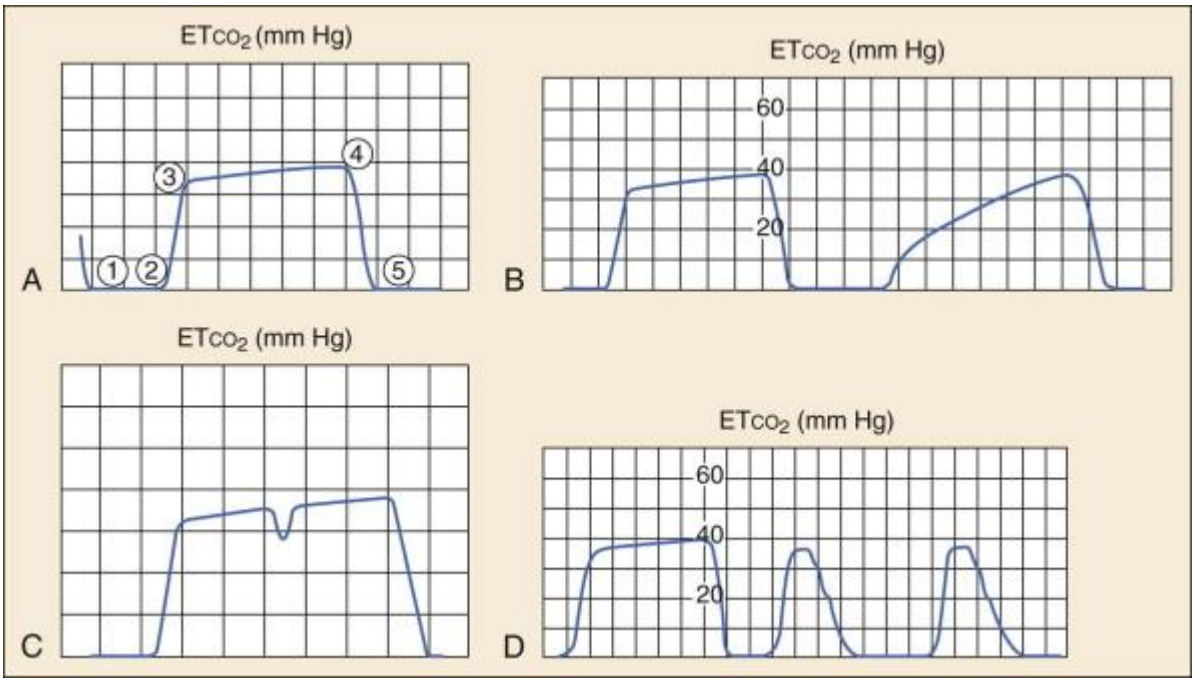
- used mainly for confirming endotracheal tube placement post-intubation
- quantitative waveform capnography is gold standard

Waveform capnography (quantitative)

Uses:

1) confirms ventilation/respiration and tube placement (gold standard)
2) a sudden rise during cardiac arrest may indicate ROSC
3) the most sensitive way of detecting apnea during procedural sedation
4) useful in the postictal/intoxicated/overdose patient to determine if they have adequate ventilations
5) acidotic patients develop a compensatory resp. alkalosis and therefore often have a dropping ETc02.
6) to roughly correlate between alveolar CO2 and arterial CO2 in people with normal lung physiology

3) Describe the ETCO2 curve



A, Four phases of a normal capnogram. *1-2,* The carbon dioxide–free portion of the respiratory cycle. *2-3,* The rapid upstroke of the curve, representing the transition from inspiration to expiration and the mixing of dead space and alveolar gas. *3-4,* The alveolar plateau, representing the alveolar gas rich in carbon dioxide and tending to slope gently upward with the uneven emptying of the alveoli. *4-5,* The respiratory downstroke, which is a nearly vertical drop to baseline. **B, C,**and **D,** See text for explanation.

The shape of the capnogram can give you information about obstructive airway disease (shark-finning), spontaneous respiratory efforts, or ET cuff leaks.

4) List four indications for invasive blood pressure monitoring:

Intra-arterial catheter is the most accurate

Indicated when:

1) hemodynamic instability is anticipated
2) when dynamic monitoring of the patient's condition or treatment effects is needed in real time (volume shifts)
3) frequent arterial sampling
4) inaccurate BP due to obesity or dysrhythmias

Wisecracks corner:

1) False Pulse Ox Readings

Another way to think of the causes for a false pulse ox reading is use the letters “SPO2”

- S = structural change to the hemoglobin molecule due to a dyshemoglobinemia
    - methhemoglobinemia or carboxyhemoglobinemia
- P = post-methylene blue
- O2
    - pOlish
    - lOw perfusion states