



IMPORTANT NOTE: this document is the KEY for class handout



**Continuing Education
February 2012**

CAPNOGRAPHY Case Studies


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Equipment Needed

1. Assisted vent capno sensor
– If ZOLL - adapter
2. Spont breathing capno cannula
3. Manikin head
4. BVM device
5. KLT airway
6. ET tube
7. RQP/ITD
8. NRB O2 mask
9. Neb device
10. CPAP mask
11. Monitor w/ capnography

Capnography Case Studies




Teaching Method

- Roundtable group discussion
–NOT powerpoint lecture

Content is not new, is review of material taught in “Introduction to Capnography” class


Capnography Case Studies



Pg 4 - A

- Pulse oximetry measures oxygenation, saturation of Hg
- Capnography measures ventilation, elimination of CO2


Capnography Case Studies



Pg 4 - A i

- Produced in tissues as a result of aerobic metabolism
- At cellular level, O2 used w/ glucose from digestion (Krebs cycle), to create energy in the form of ATP, CO2 produced as byproduct

Capnography Case Studies




Pg 4 - B

- Respiratory rate
- ETCO2 value
- Waveform

Capnography Case Studies

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Pg 4 - C



Capnography Case Studies

- ??? RR
- pts don't always breathe at a regular rate
- don't count for full minute, etc.


Pg 4 - D



Capnography Case Studies

- D
35 – 45 mmHg
- D i
HypERcarbia/hypERcapnia
- D ii
HypOcarbia/hypOcapnia


Pg 4 - E



Capnography Case Studies

- **Metabolism**
CO₂ produced by cellular metabolism
- **Perfusion**
CO₂ transport in vascular system
- **Ventilation**
CO₂ elimination by respiratory system


Pg 4 - E i



Capnography Case Studies

- **E i a**
Fever, Sepsis, Hyperthyroidism
- **E i b**
Hypothermia, Sedation, Hypothyroidism


Pg 4 - F



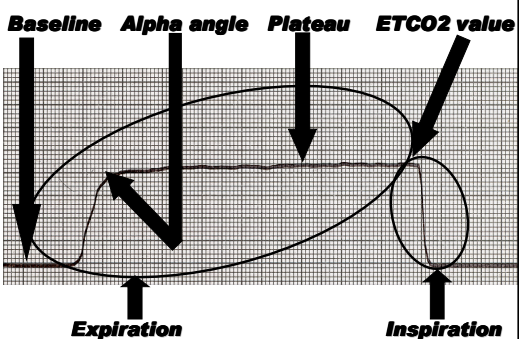
Capnography Case Studies

- Rectangular/squared


Pg 5 - G



Capnography Case Studies




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Pg 5 - H

**Capnography
Case Studies**


- H Assisted ventilation
- H i Yes
- H i a Prevent lethal hyperventilation
- H i b Will decrease
- H i c Will increase
- H ii Yes

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Pg 5 - H ii a

**Capnography
Case Studies**


- H ii a
 - To assure correct placement
 - Yes, area of high risk/liability
 - Yes
 - During pt movement
 - Yes

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Pg 6 - H ii b

**Capnography
Case Studies**


**Capnography
will not detect
R mainstem
intubation**

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Pg 6 - I

**Capnography
Case Studies**


- **Respiratory distress**
- **Altered mental status**

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Pg 6 - J

**Capnography
Case Studies**

- **Engineering control to remind PM's to use**
- **NWC EMSS QI results show capnography often NOT used**

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Pg 6 - J i & ii

**Capnography
Case Studies**


- 1 J i
 - Attach to BVM device pre-connect/tape to bag**
- 1 J ii
 - With O2 delivery devices NC, NRBM**

HANDS-ON DEMO

Place oral-nasal capnography cannula & pulse ox on volunteer PM and have PM:

- Hold breath as long as possible** – note:
 - Immediate loss of waveform
 - Delay in change of RR & ETCO2 value (device averages 30 sec for readings)
 - No change in pulse ox
- Hyperventilate** – note:
 - Immediate decrease in waveform height and closer distance between waveforms

Video



Pg 6 - 23

- 23**
*OP/NPA, BVM
capnography sensor, RQP/ITD*
- 23 A**
Yes
- 23 A i**
*Step-down adapter
Colormetric ETCO2 detector can
be used (if adapter not available)*

Pg 6 - 23 B

- Yes**
- RQP/ITD**
closest to pt
- Capnography**
closest to bag

HANDS-ON DEMO


**Capnography,
RQP & MASK
pass around room
(all take apart
& put together)**

HANDS-ON DEMO

**Capnography,
RQP & ET/KLT
pass around room
(all take apart
& put together)**

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Pg 7 - C



Capnography Case Studies

Initial capnography readings may be higher when arrest is due to resp etiology


Pg 7 - D



Capnography Case Studies

During CPR, ETCO2 is a measure of cardiac output


Pg 7 - D i – iii



Capnography Case Studies

- D i Decrease***
- D ii Increase***
- D iii Decrease***
- D iii) a Increase***


Pg 7 - E



Capnography Case Studies

- E***
 - Respiratory rate***
- E i***
 - To avoid hyperventilation***
- E ii***
 - Increases intrathoracic pressure***
 - Decreases venous return to heart***
 - Decreases coronary perfusion pressure***
 - Decreases survival***

Pg 7 - F



Capnography Case Studies


- F***

NO

Readings (high or low) unreliable
- F i***

Skin color – central (e.g., tongue)

Pg 7 - G



Capnography Case Studies


- G***

Less than 10 mmHg for 20 minutes
- G i***

Hypothermic pt

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Pg 7 - H



Capnography Case Studies

- **H**
Yes
- **Hi**
ETCO2 is indication of cellular level function


Pg 8 - I



Capnography Case Studies

- **Yes, often about 30-60 seconds prior to ROSC**
- **ETCO2 will suddenly & dramatically increase**
- **Usually increase of >10 mmHg (e.g., 30 increases to 40+)**


Pg 8 - Ii



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- **Cardiac arrest results in ↓ CO2 delivery to lungs, even if normal levels of CO2 produced in tissues.**
- **When ROSC occurs, CO2 delivery to lungs increases.**


Pg 8 - J



Capnography Case Studies

- **J**
NO
- **Ja**
Hyperventilation likely to cause hypotension and rearrest during this period of stunned myocardium


Pg 8 -K



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May decrease ~5 mmHg, unlikely to be seen prehospital; decrease is delayed & seen when desired temp is reached

Pg 8 - L




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- **ETCO2**
- **ECG**

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Video



Capnography Case Studies

Pg 8 – 24 A - B

- 24
Place pt on capnography
- 24 A
Waveform shape
- 24 B
Sharkin, increased alpha angle

Capnography Case Studies

Pg 8 – 9, 24 C-D

- 24 C
Anything causing obstruction to exhalation e.g., tongue, secretions, kinked ETT
- 24 D
Severe asthma attack


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Pg 9 – 24, E-F

- 24 E
Yes
- 24 F
Yes
- 24 F i
Administer albuterol via nebulizer-mask set-up, and place oral-nasal cannula on pt under mask

Capnography Case Studies

HANDS-ON DEMO



Capnography Case Studies


Pg 9 - 25

- 25
Increased
- 25 A
Pts w/ COPD often normally have increased ETCO2 values
- 25 B
*If value increasing – pt getting worse
If value decreasing – getting better*

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Pg 9 - 25 C



- 25 C
Sharkin
Increased alpha angle
- 25 C i
Demonstrates obstruction to exhalation

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Pg 9-10, 26 A - C



- 26
HF
- 26 A
Squared/rectangular
- 26 B
Fluid in alveoli impairing ventilation
- 26 C
O2 via CPAP, ASA, NTG q 3-5 min

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Pg 10 - D



- D
Yes
- D i
Apply oral-nasal cannula on pt under CPAP mask

Capnography Case Studies


HANDS-ON DEMO



on manikin
apply capnography
oral-nasal cannula
under CPAP mask

Capnography Case Studies


Pg 10 - E



- E
Values may increase - as ventilation is improved
- E i
Possible CPAP failure & need for intubation

Capnography Case Studies

Pg 10 - F




- F
ETCO2 values may decrease – as perfusion decreases
- F i
ETCO2 values are determined by metabolism, perfusion, and ventilation

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Pg 10 - 27



Capnography Case Studies

- 27 – *Capnography*
- 27 A – *waveform shape*
- 27 B – *exacerbation of HF*
- 27 C – *exacerbation of COPD*
- 27 D – *most likely shark fin*


Pg 11 - D i



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If shark fin waveform, and pt has PMH of HF consider co-existing pneumonia or COPD; may also require treatment for HF


Pg 11 - 28



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<u>A</u> lcohol, acidosis, anoxia	<u>T</u> rauma, temperature, toxin, tumor
<u>E</u> ndocrine, epilepsy, encephalopathy, electrolyte	<u>I</u> nfection
<u>I</u> nsulin	<u>P</u> psych, poisoning, polypharmacy
<u>Q</u> 2 deficit, overdose, opiates	<u>S</u> troke, seizure, SAH, sepsis, shock
<u>U</u> remia	


Pg 11 - 29



Capnography Case Studies

- 29
ETCO2 value
- 29 A
Respiratory failure


Pg 11 - 30



Capnography Case Studies

- 30
ETCO2 value
- 30 A
Capnography

Pg 11 – 30, B




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- *Pts can be apneic for 3 minutes before pulse ox levels fall*
- *May be even longer if on supplemental O2*

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Pg 12 - 31



- 31
HYPOTension or HYPERventilation
- 31 A
Only if ventilating faster than 10/m or deeper than “just to” chest rise

Capnography Case Studies


Pg 12 - 32



- 32
HYPERventilation
- 32 A
Probably
Assess ventilation rate & depth

Capnography Case Studies


Pg 12 – 32, B



- 11 B
Hyperventilation can cause or worsen cerebral ischemia and worse neurological outcome
- 11 B i
Low CO2 causes cerebral vasoconstriction

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Pg 12 – 32 C



- No
- *High CO2 results in cerebral vasodilation, increased cerebral blood flow and increased ICP*
- *Ventilation rates to achieve eucapnia are recommended.*

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Review



What is the most important thing you learned from this class?

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QUESTIONS?



Contact

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