Capnography

More than just tube placement confirmation.

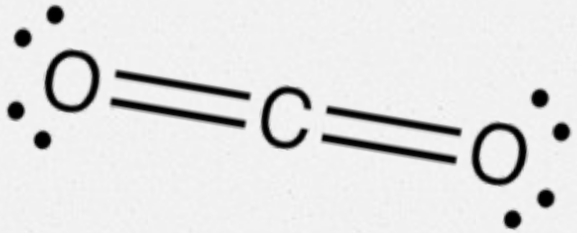
Jim Sage NREMT-P, FP-C

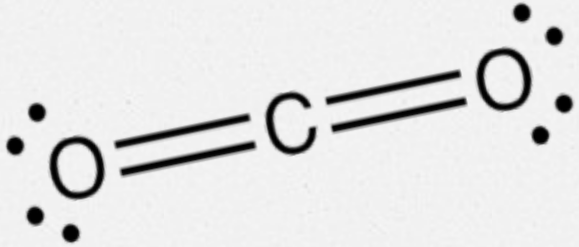
Objectives

- Lets look at what we are actually monitoring.

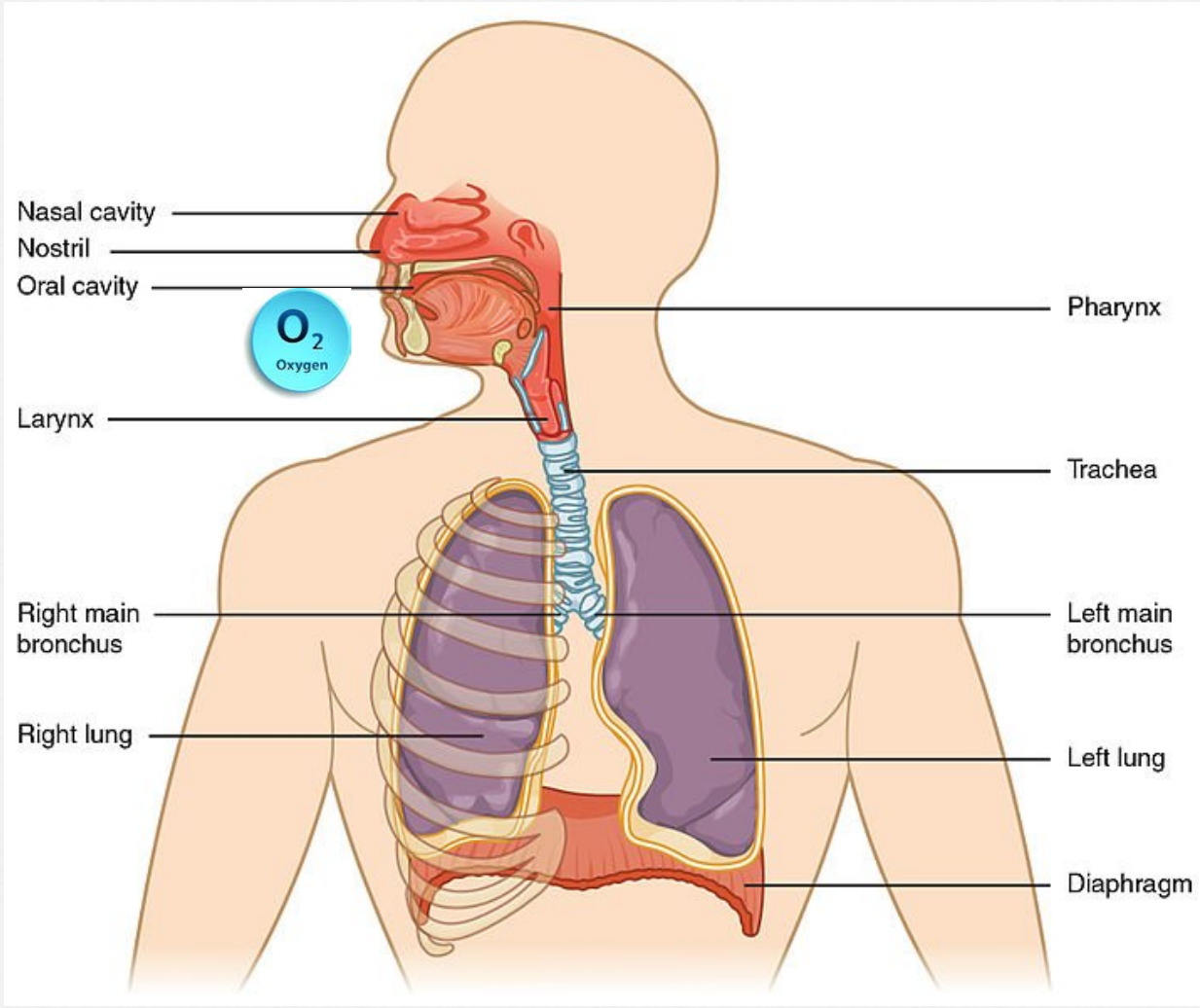
- Then how is it that we actually get to monitor CO2
- What is normal vs abnormal
- How do we tell the difference
- And finally what that can tell us about out patient.

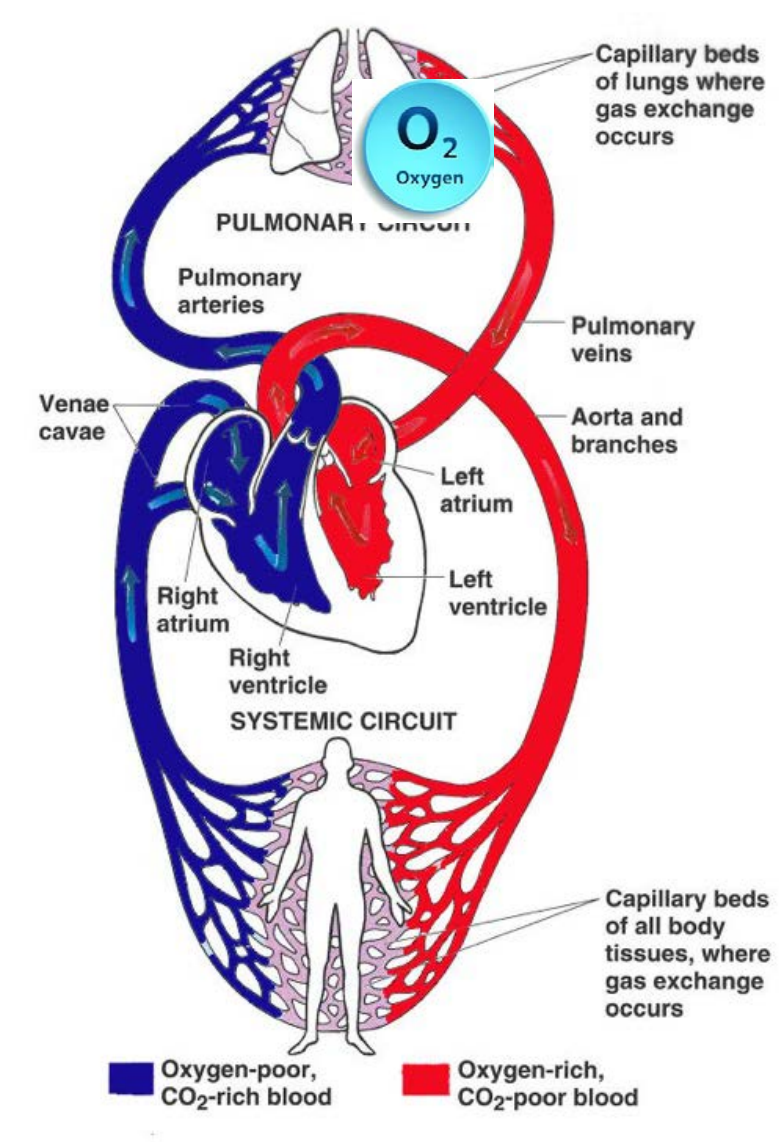
So…
What are we looking at??

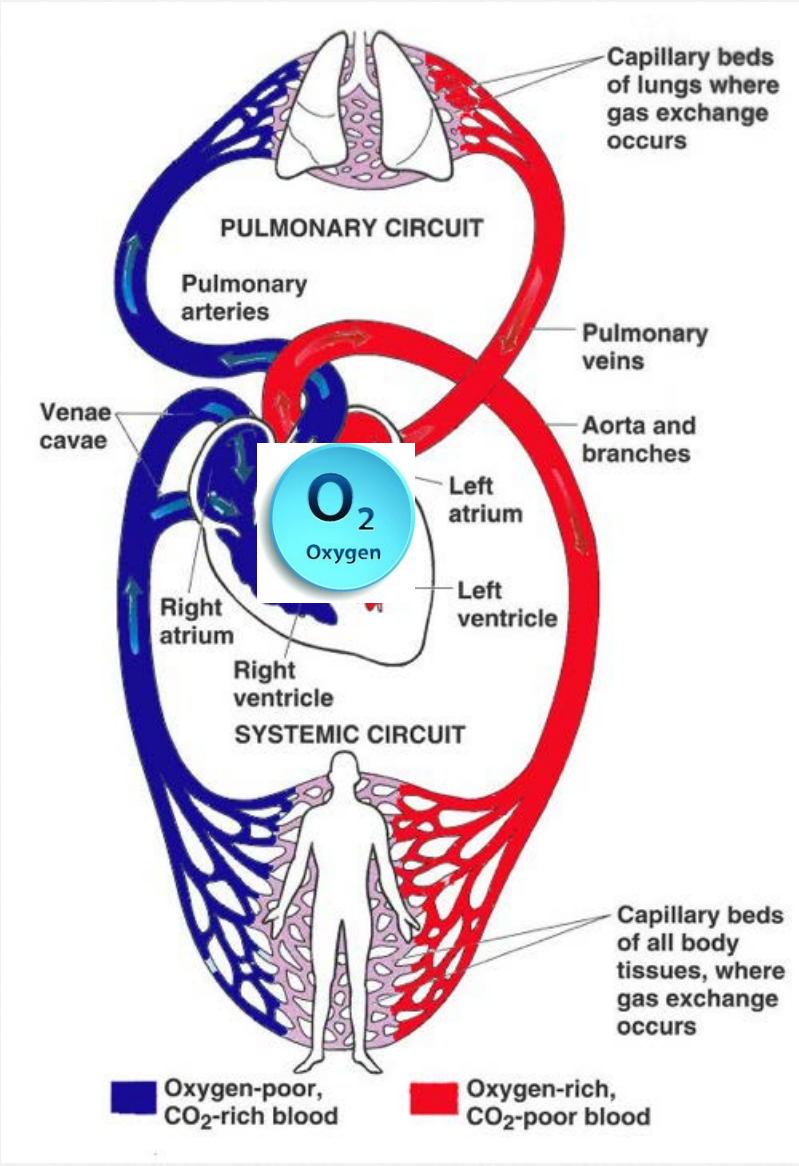




Where does CO_2 come from?


Nasal cavity
Nostril
Oral cavity
O_2
Oxygen
Larynx
Pharynx
Trachea
Right main bronchus
Left main bronchus
Right lung
Left lung
Diaphragm


O_2
Oxygen
Capillary beds of lungs where gas exchange occurs
PULMONARY CIRCUIT
Pulmonary arteries
Pulmonary veins
Venae cavae
Aorta and branches
Left atrium
Left ventricle
Right atrium
Right ventricle
SYSTEMIC CIRCUIT
Capillary beds of all body tissues, where gas exchange occurs
Oxygen-poor, CO_2-rich blood
Oxygen-rich, CO_2-poor blood


Capillary beds of lungs where gas exchange occurs
PULMONARY CIRCUIT
Pulmonary arteries
Pulmonary veins
Venae cavae
Aorta and branches
O_2
Oxygen
Left atrium
Left ventricle
Right atrium
Right ventricle
SYSTEMIC CIRCUIT
Capillary beds of all body tissues, where gas exchange occurs
Oxygen-poor, CO_2-rich blood
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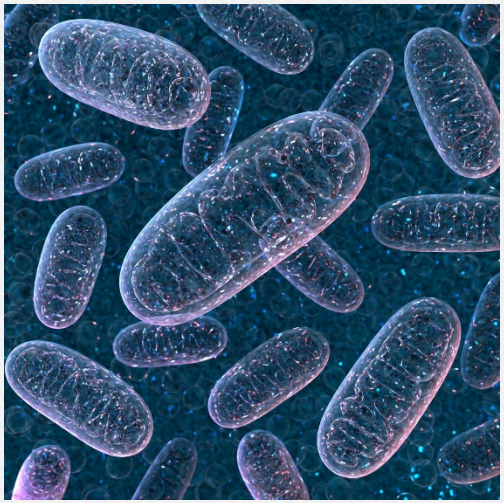
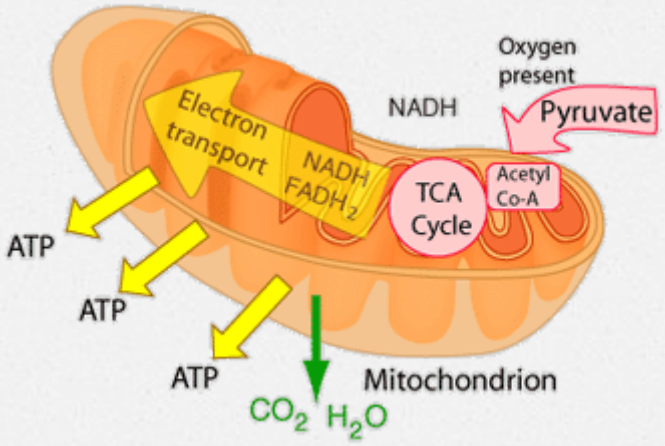
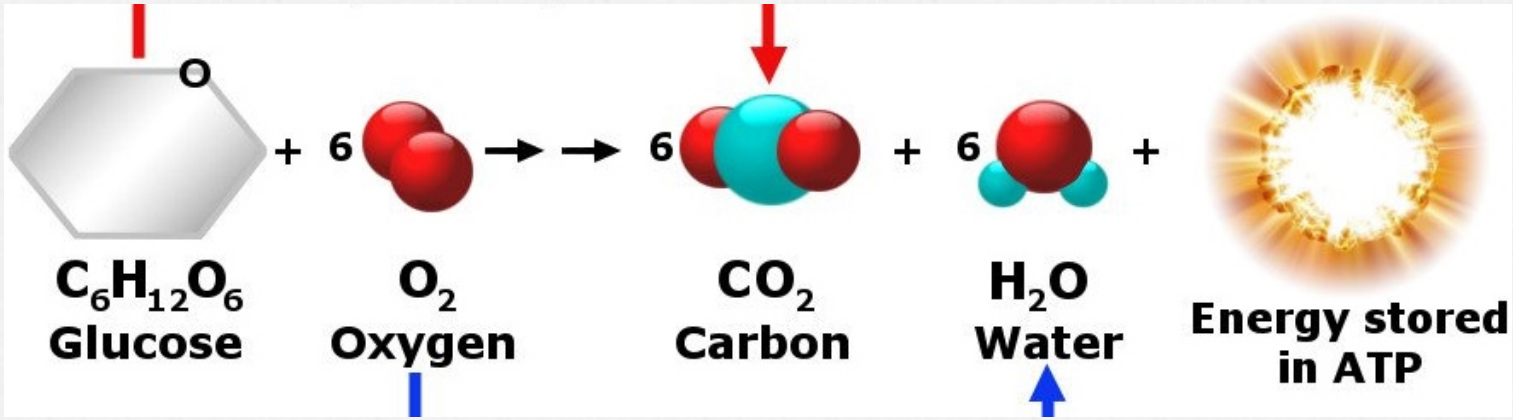
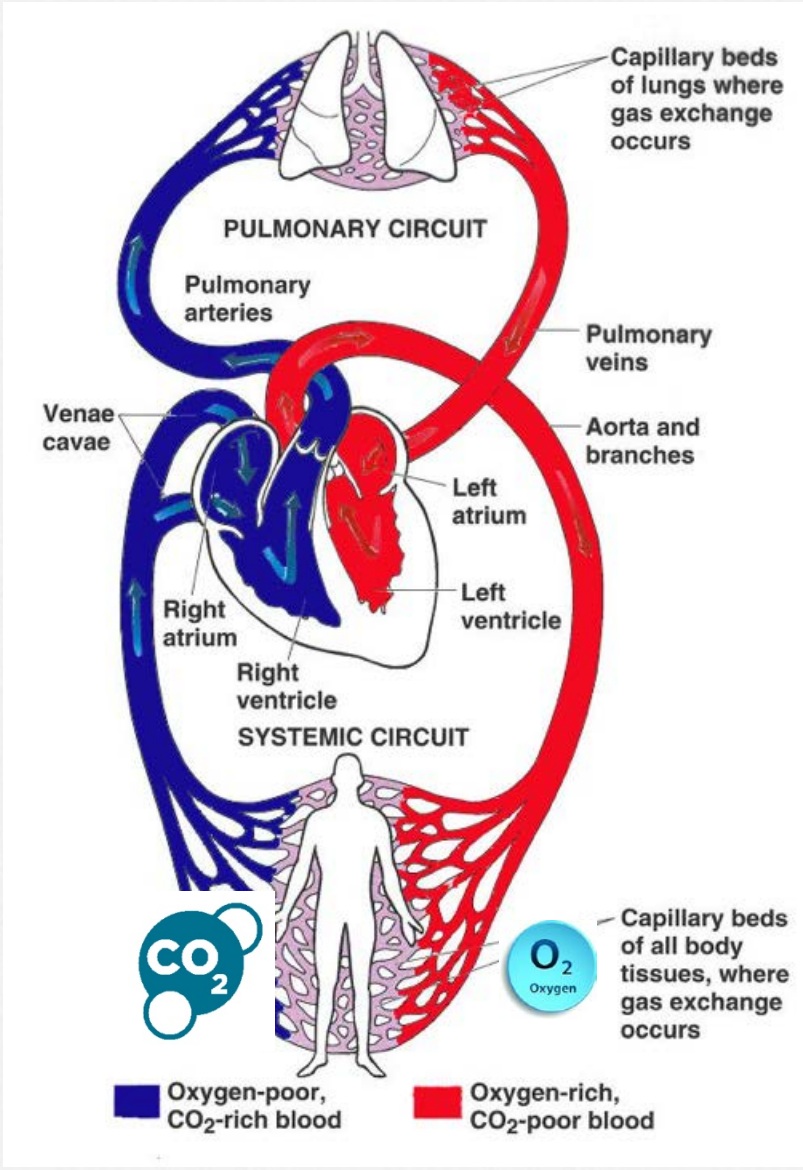


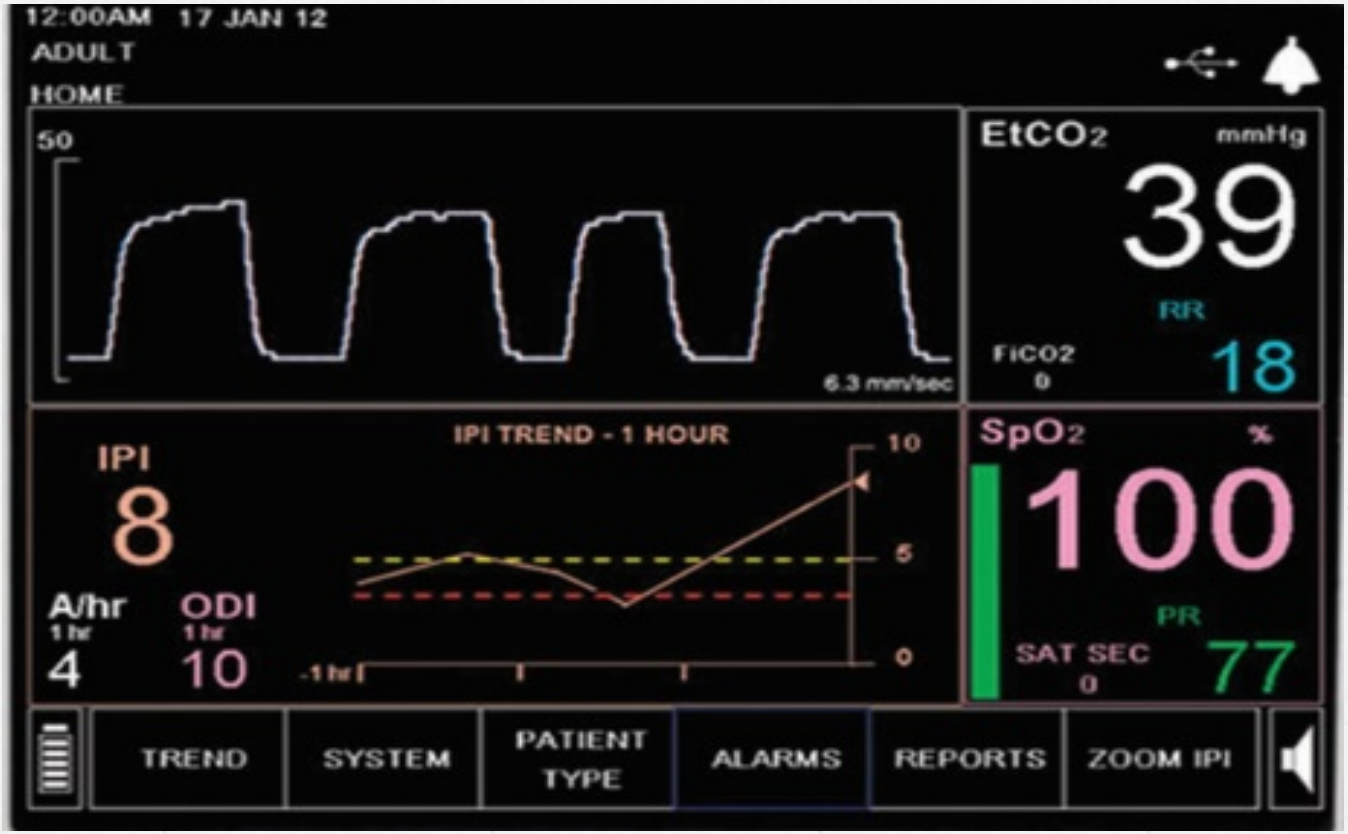

Oxygen present
NADH
Pyruvate
Electron transport
NADH
$FADH_2$
TCA Cycle
Acetyl Co-A
ATP
ATP
ATP
Mitochondrion
CO_2
H_2O


O
+ 6
6
+ 6
+
$C_6H_{12}O_6$
Glucose
O_2
Oxygen
CO_2
Carbon
H_2O
Water
Energy stored in ATP


Capillary beds of lungs where gas exchange occurs
PULMONARY CIRCUIT
Pulmonary arteries
Pulmonary veins
Venae cavae
Aorta and branches
Left atrium
Left ventricle
Right atrium
Right ventricle
SYSTEMIC CIRCUIT
CO_2
O_2 Oxygen
Capillary beds of all body tissues, where gas exchange occurs
Oxygen-poor, CO_2-rich blood
Oxygen-rich, CO_2-poor blood

Exhale

What is this telling us?

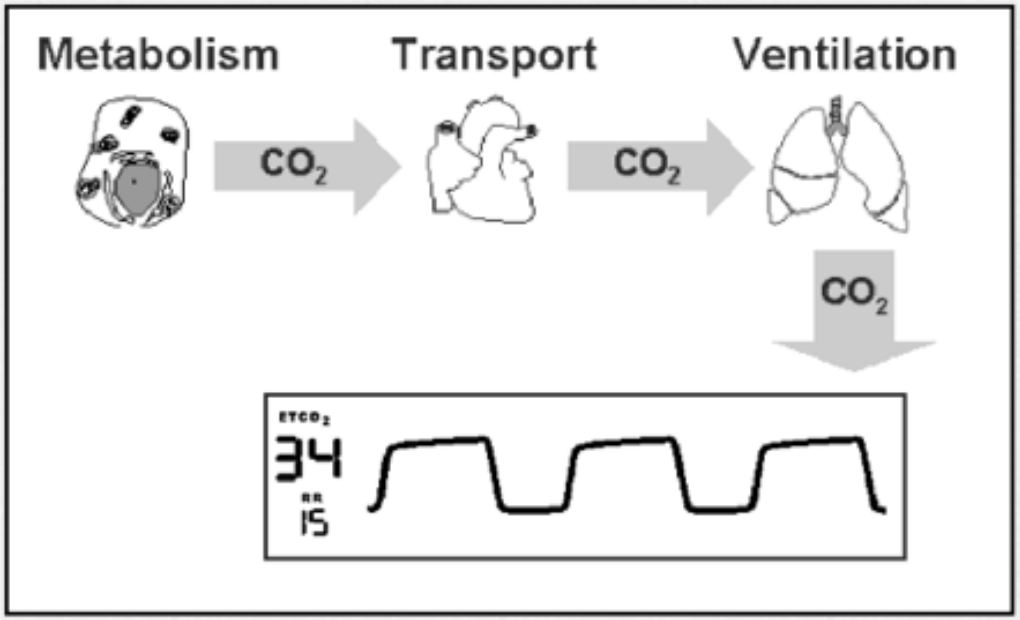


What is it
not
telling us?

Normal CO_2

35-45

What can we learn by monitoring CO_2?



What is high CO_2 telling us?

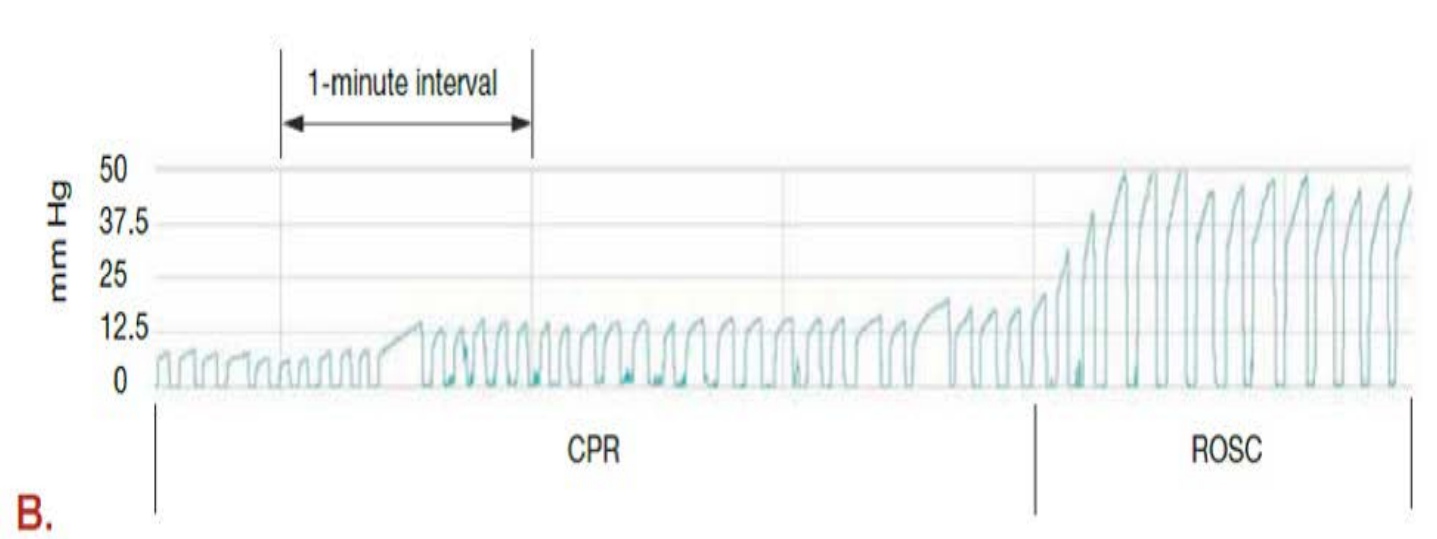
Is this bad?

Metabolic
vs.
Cardiovascular
vs.
Respiratory

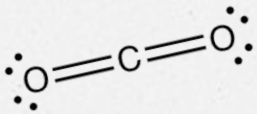
High CO_2

- Increased Metabolism
  - Increased Transportation
    - Decreased Ventilation

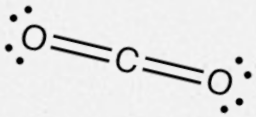
ROSC



What is low CO_2 telling us?



Is this bad?



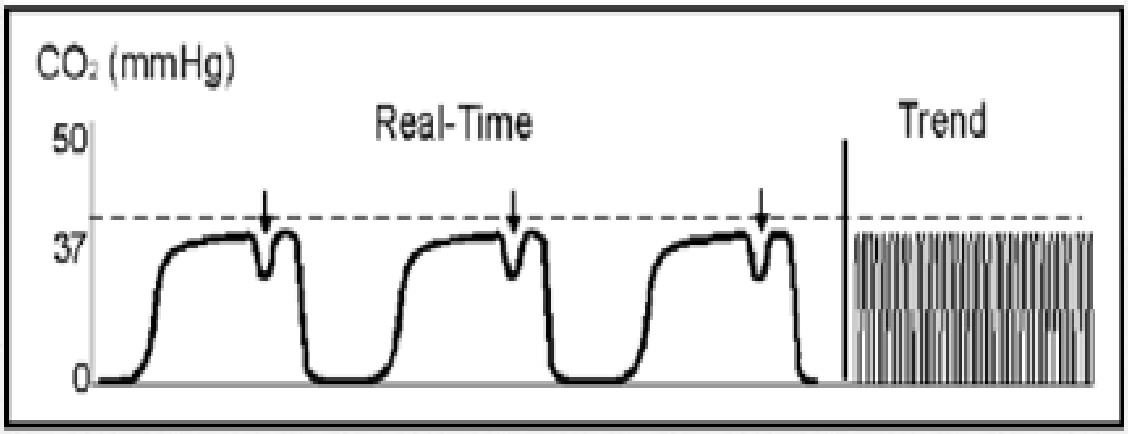
Metabolic
vs.
Cardiovascular
vs.
Respiratory

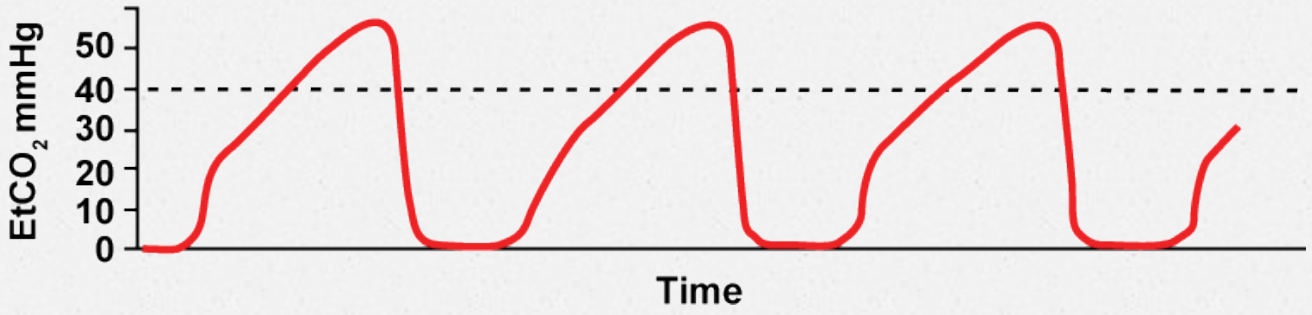
Low CO_2

- Metabolism
  - Transportation
    - Ventilation

Quick look at wave forms.

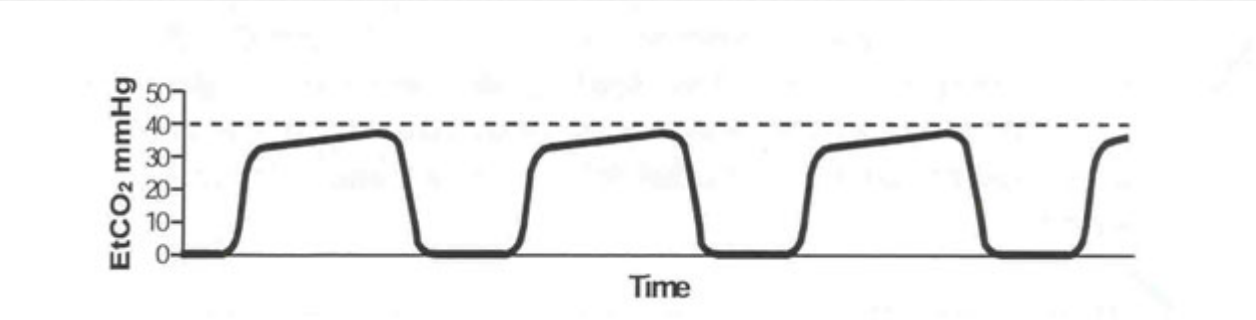
Decreasing Sedation/Paralytic



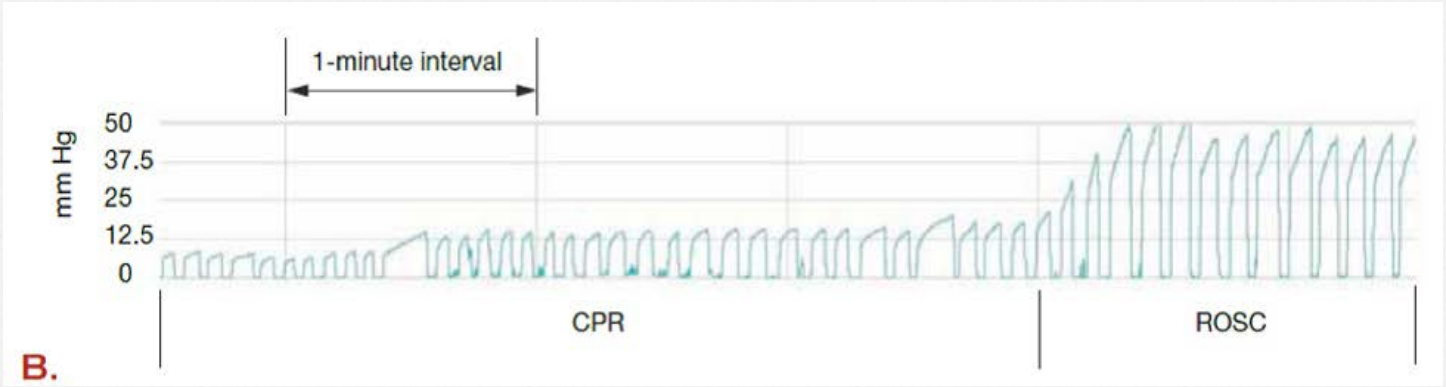

EtCO2 mmHg
50
40
30
20
10
0
Time

??????

Normal?



CPR



- Monitor Quality of CPR
- Identify ROSC
- Use during termination decision

Summary

ETCO2

Its only a tool but a good one.

35-45 is normal

But we don't have normal patients.

Know your patient

Not just your equipment.

Sources

- http://kidocs.org/2013/11/much-hot-gas-etco2-non-anaesthetists/
- http://www.lakeridgehealth.on.ca/en/ourservices/resources/ETCO2%20reading.pdf
- http://www.jems.com/article/patient-care/capnography-use-optimizes-ems-perfusion
- http://oem.respironics.com/Downloads/AHA%20Standards%20for%20Capnography.pdf
- file:///E:/Capnograpny/Capnography%20%20Medic%20Scribe.htm
- https://acls-algorithms.com/waveform-capnography

Questions?