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How to troubleshoot every complication on your monitor

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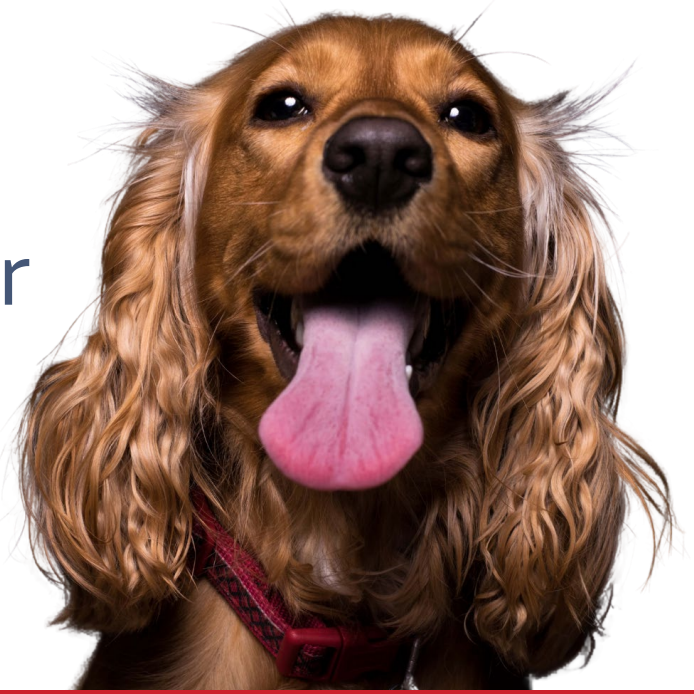


About Me

SIOP | SOCIETY for INDUSTRIAL and ORGANIZATIONAL PSYCHOLOGY

SCIENCE FOR A SMARTER WORKPLACE

AVTAA

ACADEMY OF VETERINARY TECHNICIANS IN ANESTHESIA AND ANALGESIA

Summary of Content

- Multiparameter monitor overview
- Evaluation of each parameter
- Morphology and characteristics
- How to resolve each complication

Monitors- how to triage complications

What to do

- Observe the entire patient
- Know what drugs are on board
- Know the scope of the procedure
- Prepare and anticipate

What not to do

- Panic

ECG

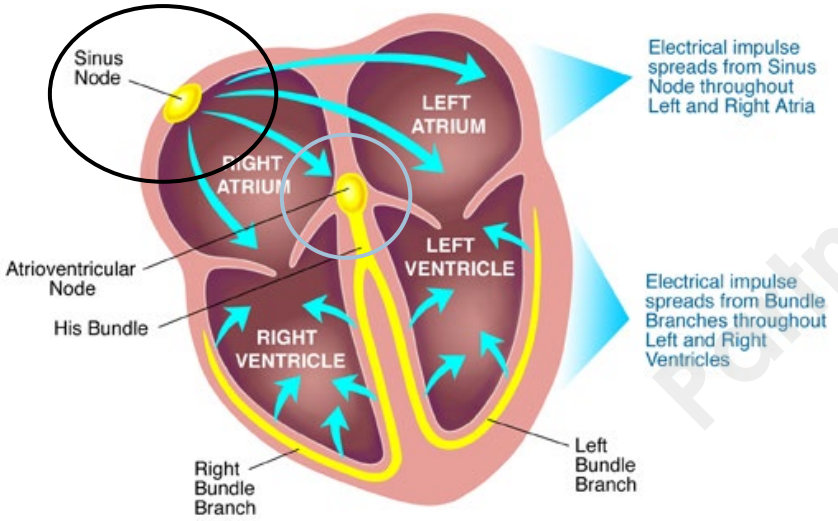
What is it

- Non-invasive method to observe the electrical activity of the heart to measure its rate and rhythm

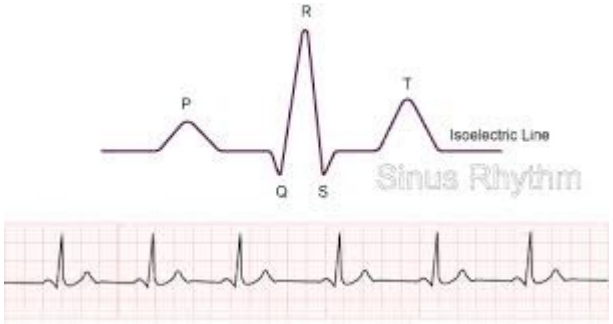
Why we need it

- We administer drugs that can have profound cardiac effects
  - Alpha-2s
- Conditions cause arrhythmias
  - GDV

ECG Review



- SA node= P wave
  - Atrial depolarization
- AV node= QRS
  - Ventricular depolarization
- Ventricular repolarization= T wave



Trouble shooting your ECG

Do

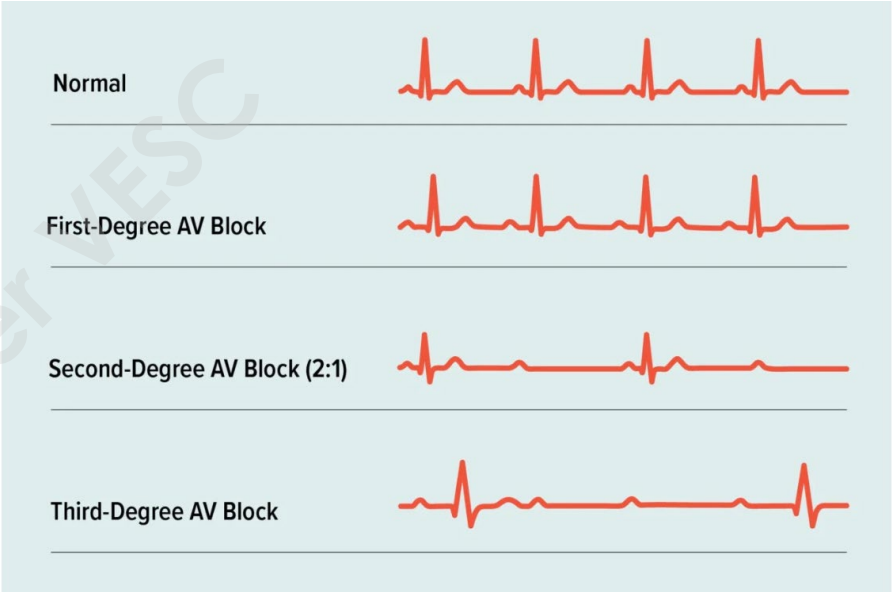
- Confirm lead placement
  - Move closer to the heart
- Change/confirm lead
  - I vs II vs III
- Confirm leads are saturated
- Confirm speed
  - 25 vs 50mm/sec

Do not

- Panic

Troubleshooting your ECG

- Atropine vs. glyco vs. atipamezole
- What dose?
- When do we see 3rd degree AV block



VPCs vs. Escape beats

Ventricular escape in the setting of sinus arrest:

Ventricular escape in the setting of complete AV block:

VPCs vs. Escape beats

VPCs

- Tachycardia with rates of 160+ bpm
- Originates in the ventricles instead of the SA node
- R on T phenomenon
  - The R wave of the beat falls on the T wave of the preceding normal beat
- Couples or triplets/multiform
- Treat with lidocaine
  - 2mg/kg

Escape beats

- Bradycardia with ventricular rate <40bpm
- Wide QRS complexes (120ms)
- Regular non-conducted P waves or no P waves
- Treat with atropine
  - 0.02-0.04mg/kg

ECG Troubleshooting Hacks

- ALWAYS look at your blood pressure
  - ALWAYS
  - Why?
- Confirm the pulse source
- If nervous, check the pulse
  - Sublingual vs. dorsal pedal

- What happens if you treat an escape beat like a VPC? Or vice versa?

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Questions about ECGs?

SPO_2

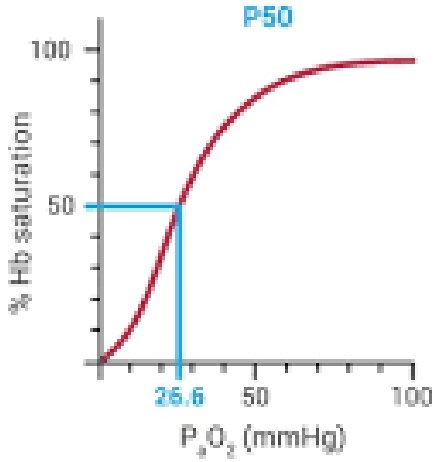
What is it

- Abbreviation for peripheral oxygen saturation

Why we need it

- Key indicator of how well the heart and lungs are working

SPO2 Review



- Graphical representation of the relationship between partial pressure of oxygen and the percentage of hemoglobin saturated with O2

SPO2 Troubleshooting

- Probes are parallel
- Toes vs. tongues vs. ears

- Is it really low?
  - Breathe!
  - PEEP

Figure 4: Normal vs. low perfusion pleth waveforms

SPO2 Hacks

But seriously no water

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Questions about SPO2?

$ETCO_2$

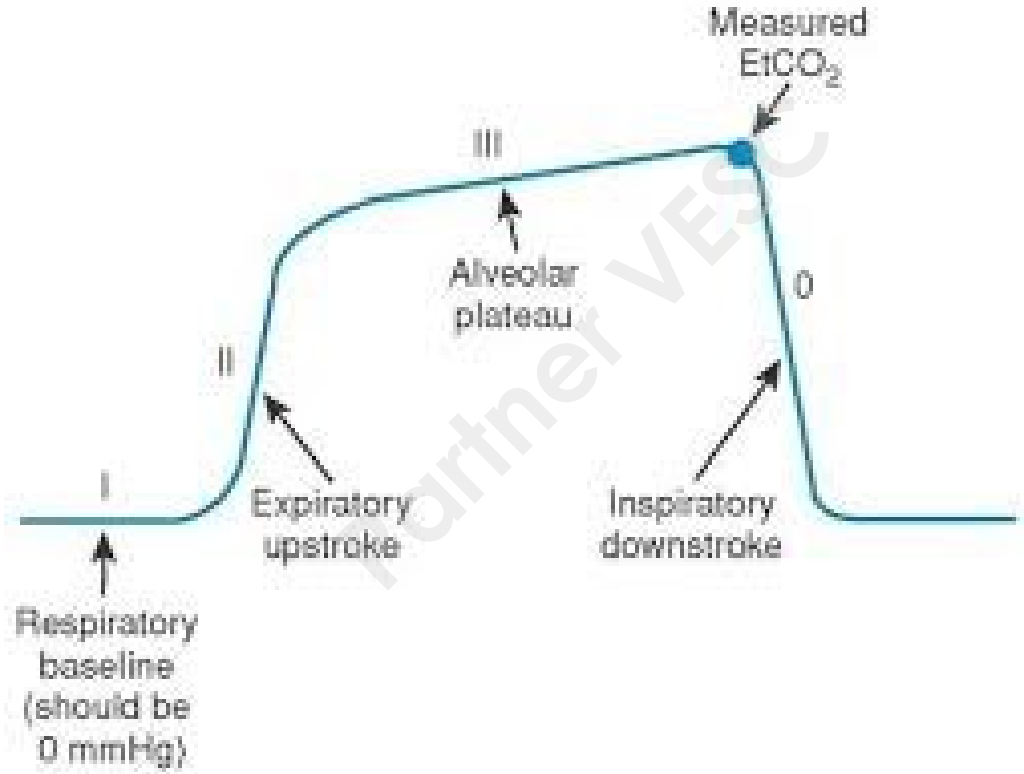
What is it

- The amount of CO_2 at the end of an exhaled breath reflecting V (ventilation) and Q (perfusion)

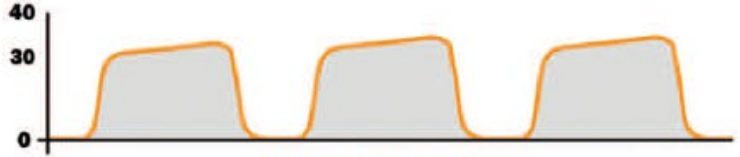
Why we need it

- The mosssst important parameter
- NEVER lies
- Real time information on cardiac output
- Real time information on tube placement and patency

ETCO2 Review

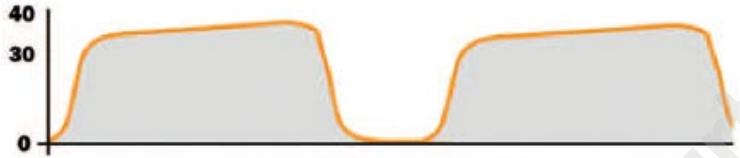


Troubleshooting your ETCO2

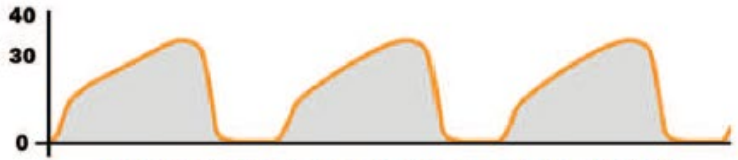


Normal waveform

Apnea

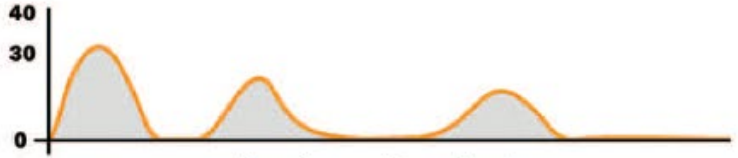


Hypoventilvation



Lower airway obstruction (Asthma, COPD)

Hyperventilvation



Esophageal intubation

$ETCO_2$ Hacks

- Adaptor placement
- Flush the line
- Replace the filter
- Side-stream vs. mainstream
- Calibrate

Mainstream and Sidestream

CAPNOSTAT® 3 Mainstream CO_2 Sensor

LoFlo™ Sidestream CO_2 Module

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Questions about $ETCO_2$?

NIBP

What is it

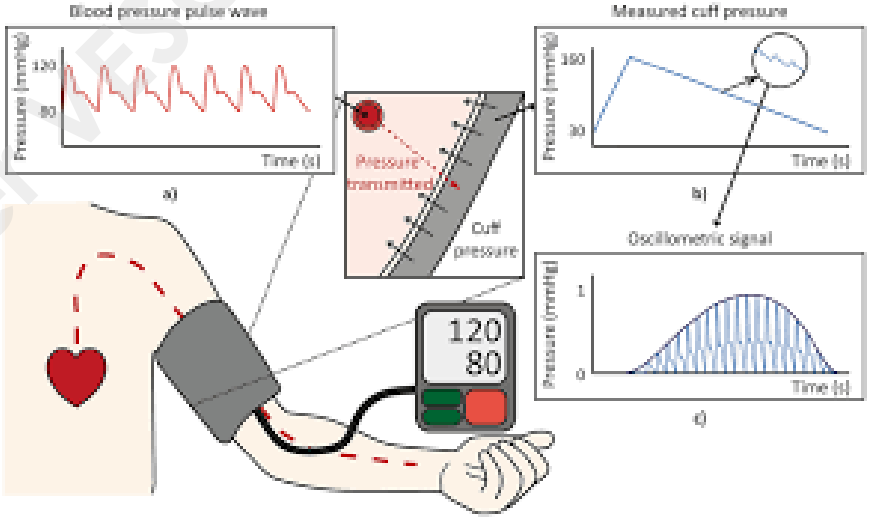
- Noninvasive oscillometric blood pressure that details SAP, DAP, and MAP

Why we need it

- To ensure adequate perfusion to vital organs such as the kidneys and brain

NIBP Review

- Cuffs are 40% of the circumference of the limb
- Reliable
- inflates a cuff to a pressure above systolic pressure, occluding the artery , then slowly deflates while the machine detects oscillations in the artery wall caused by blood flow
- Uses an algorithm to analyze the amplitude of oscillations to determine the systolic and diastolic pressure points



NIBP Troubleshooting

Hypotension

- What is the heart rate?
- Depth
- Fluids
- Pressors
- Confirm

Hypertension

- What is the heart rate?
- Depth
- Analgesia
- Confirm

NIBP Hacks

- Time for readings every 3 minutes
- Use the humerus in cats
- Error codes
  - Over pressure
  - Timing out

- Tape vs. no tape on the cuff?

Doppler

What is it

- A process of using high-frequency sound waves to listen for the sounds of blood flow through an artery as a cuff is inflated and deflated

Why we need it

- Safety net to oscillometric
- More reliable in cats

Doppler Review

- Uses an ultrasonic probe attached to a speaker to provide an audible sound for each pulse beat
- Use of a blood pressure cuff and a sphygmomanometer to obtain blood pressure readings
- Systolic? Or MAP? What about in cats?

Doppler Hacks

- Prep area
- Apply gel
- Place the crystal on the artery
- Tape the crystal in place by threading the cord through the paw
- THEN turn it on
- Voila! I guarantee you have it in the right place!

Temperature

What is it

- One of the most critical parts of anesthesia management and every patient needs heat support
  - But what if they are hot?
  - And what if the procedure is fast?

Why we need it

- Cold patients have longer recoveries, delayed healing, and poor drug metabolism

Temperature Review

- The higher a patient's oxygen flow rate, the colder they will get
- Inhaled gases are colder than room air
- Hypothermia causes a decrease in MAC- so cold pets get deeper faster
- Patients lose heat from the top

- Causes bradycardia, vasoconstriction, and prolonged recoveries
  - Bradycardia causes a decrease in cardiac output which is evident by a decrease in BP

Temperature Hacks

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Noses!

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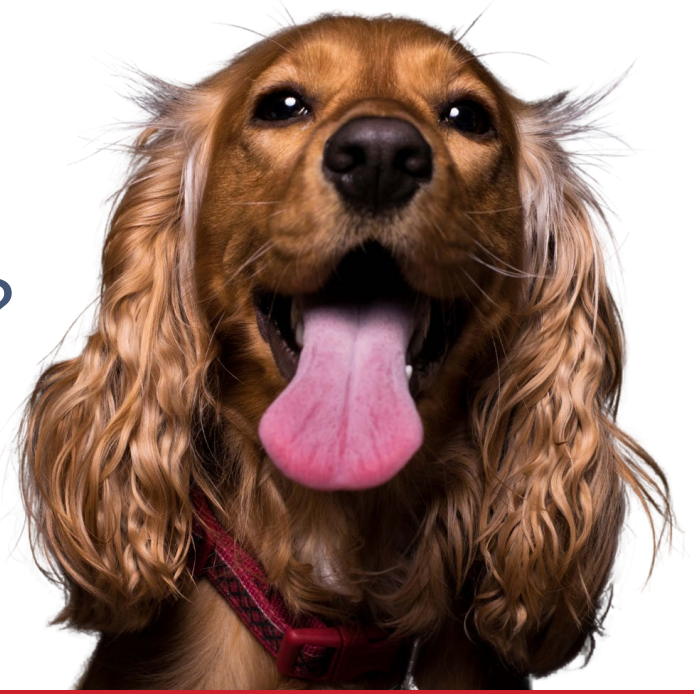
Questions about BP or Temp?



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Now let's apply what we learned!

Let's practice! 35kg dog

- HR= 177
- What do you want to do?
- BP= 61
- Now what do you want to do?

- Why fluids?
- Why not increase gas?
- Why not treat for pain?

Let's practice!

- 4kg, 1yr cat, OHE
  - Fentanyl, midazolam, and propofol
- HR = 88
  - No arrhythmia
- Iso at 1.5%
- MAP = 54

- What do you want to do?
- Do we turn down the gas?
- So, what do we do?
- Glyco!

Let's practice!

- 22kg dog
- ETCO2= 58
- Iso at 1.5%
- What do you want to do first?

- What not to do
  - Turn down the iso?

Let's practice! How do you fix this?

18kg dog

- HR= 90
- BP= 73
- ETCO2= 55
- Resp= 7
- Temp= 100.0
- SPO2= 92
- Iso at 1%

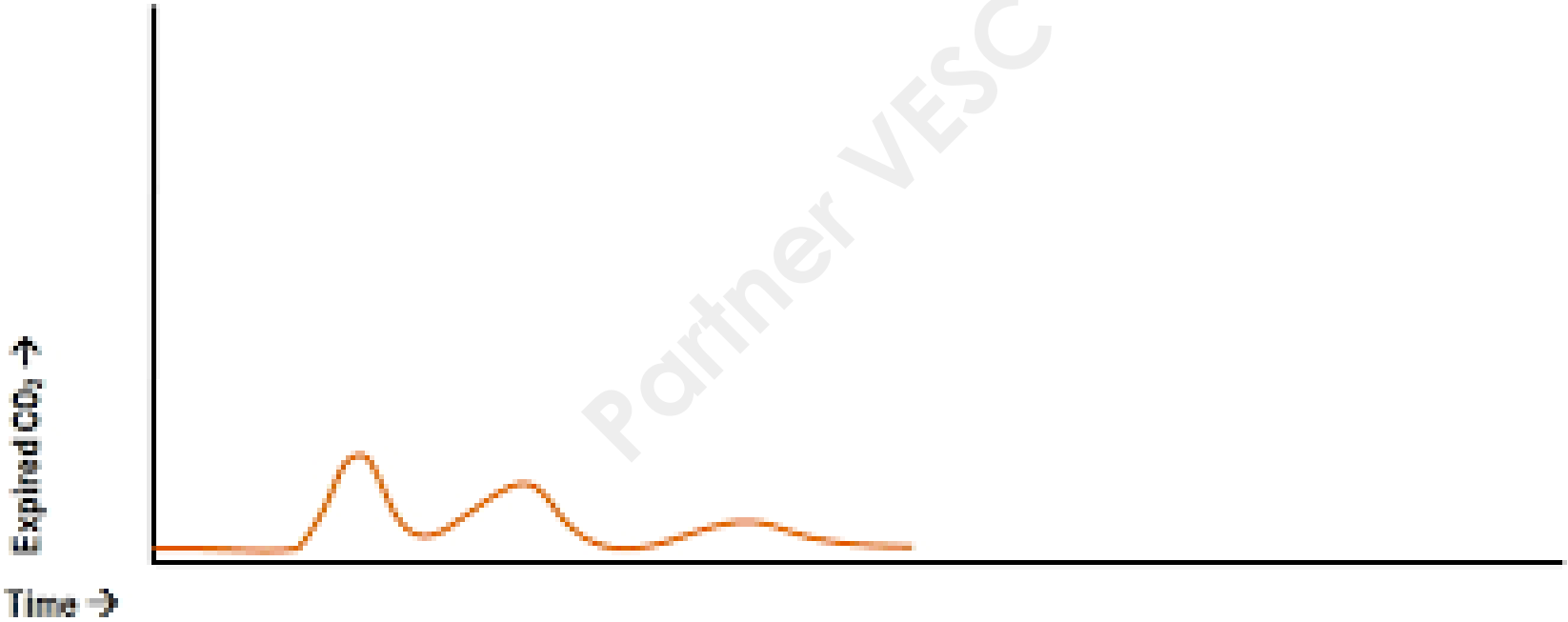
- What to fix?
- What order?

5yr, MN, 30kg dog

- HR= 130
- BP= 45
- ETCO2= 24
- Temp = 95.5
- Iso at 2%

- What do fix?
- What to fix first?

How do you fix this?



3yr, MN, 14kg dog

- HR= 60
- BP= 66
- SPO2= 99
- ETCO2= 49
- Temp= 99.0
- Iso at 2%

- Laceration repair
  - Hydro, dexdom, ketamine
  - Propofol

Key Takeaways

- Multiparameter monitoring is critical to preventing emergencies
- You need to maintain a surgical and anesthetic plane- DO NOT turn down the gas without a safety net
- Always use all the monitoring equipment

Shortcut Troubleshooting

- Bradycardia
  - Atropine
  - Glyco
  - NO changes in iso
- Tachycardia
  - Fluids
  - Analgesia
- Hypotension
  - Atropine or glyco
  - Fluids
  - Pressors
- Hypertension
  - Analgesia
  - Depth
- Hypocapnia
  - Depth
  - Decrease tidal volume
- Hypercapnia
  - Depth
  - Increase tidal volume
- Hypoxia
  - Manual respirations
  - PEEP
- Hyperthermia
  - Removal of heat
  - Fluids
  - Increased MAC
- Hypothermia
  - Heat support
  - Decreased MAC

Thank you!!!

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