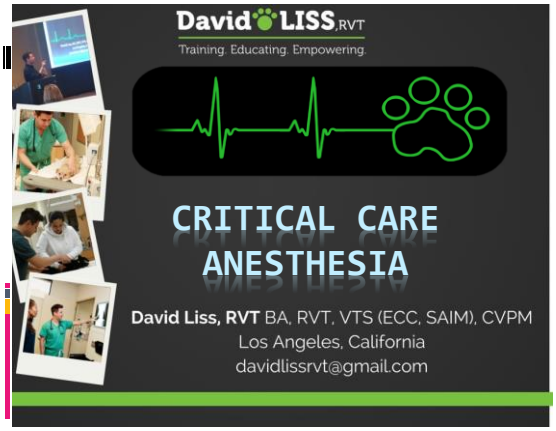


1

Number one motto!

- Be Prepared

2

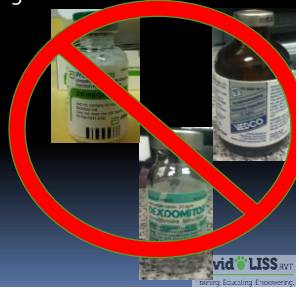
Overview

- Intro/general suggestions
- Specific cases

3

Tip #1: Choose cardiovascularly sparing agents

- Avoid drugs with negative cardiovascular side effects
  - Propofol
  - Iso/Sevoflurane
  - Acepromazine
  - Dexmedetomidine



4

Tip #2: Pre-oxygenate

- Adds oxygen to functional residual capacity
  - Amount of air in lungs after exhalation
- Provides extra O_2 when intubating
- Enhances oxygen delivery
  - DO_2 = Cardiac Output x Arterial Oxygen Content

5

Tip #3: Reduce MAC of gas anesthetic

- Typically done through use of cardiovascularly sparing drugs AND/OR locals
  - Adding a pre-med
  - Switching from Buprenex/Torb to Pure mu opioid
  - Local block
  - Sedative (Diazepam)
  - Intra-op CRI

6

Tip #4: Know how to calculate a CRI- USE them!

- Ketamine
- Lidocaine
- Pure Mu Opioid

7

How to calculate a CRI

- Information needed:
  - Patient weight
  - Drug dose
  - Drug concentration
  - Volume of fluids to add into/rate
- Step 1: Patient weight x drug dose (mg/hr)
- Step 2: Drug dose / drug concentration (mls/hr)
- Step 3: Figure out how long fluids last (hours)
- Step 4: Multiply hours x mls/hr (mls to add to IVF)

8

Fentanyl CRI:
- Dose: 5ug/kg/hr
- Drug concentration: 50ug/mL
- Patient Weight: 10 kg
- IV Fluids: 900 ml at 10 ml/hr

Step 1- Calculate the drug dose (mg or ug)

$$\frac{5ug}{kg/hr} \times 10\ kg = \frac{50ug}{hr}$$

Step 2- Calculate the drug volume (ml's)

$$\frac{50ug}{hr} \times \frac{1\ mL}{50\ ug} = \frac{1\ mL}{hr}$$

Step 3- Calculate the amount of hours IVF will last

$$900\ mL \times \frac{1\ hr}{10\ mL} = 90\ hrs$$

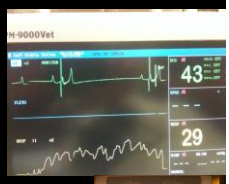
Step 4- Calculate the volume of drug to add for total hours

$$90\ hrs \times \frac{1\ mL}{1} = 90\ mL\text{'s add}$$

9

Tip #5: SpO2 and ECG are NOT your friends

- Monitoring
  - SpO_2
  - BP
  - ECG
  - End-tidal CO_2
  - Temperature
  - Ancillary
    - Blood Glucometer
    - Blood Gas Machine



10

Why not?

ECG

- Pulseless electrical activity
  - ECG says nothing about mechanical function

PULSE OX

- Oxygen level DOES NOT correlate directly with Spo_2 %
  - On 100% O_2: Patient SHOULD have oxygenation around 400-500 with SpO_2 of 98-100%
  - Patient with SpO_2 of 94-96% has oxygen content = 80-100 mmHg

11

Limitations of Pulse ox technology

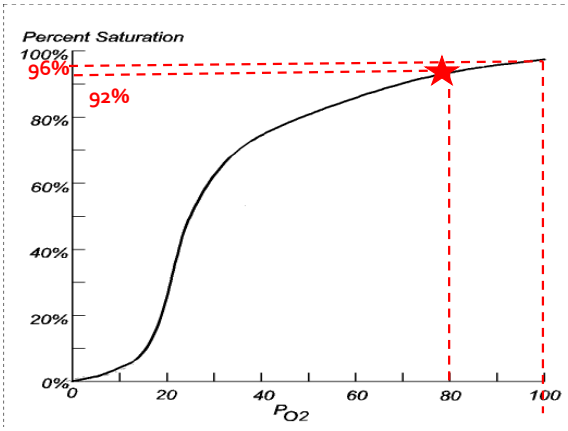
Pulse ox lag	• Most oximeters report data from 30 seconds prior to real-time
Needs decent waveform to function	• Pigment, poor perfusion
Only reports saturation of hemoglobin	• Not oxygen "level" in blood

12

Pulse oximetry

- Saturation of hemoglobin
- Light is sent through an artery and is detected on the other side
- Observes oxyhemoglobin wavelengths if present
- Correlates to dissolved O_2 gas in blood stream

13

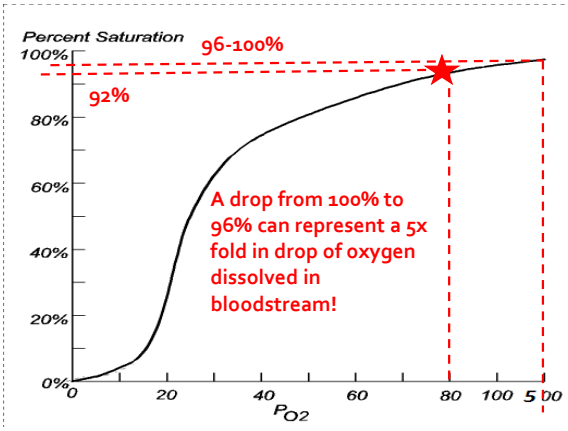


14

Important info

- Arterial oxygen level (PaO_2) SHOULD be 5x inspired O_2 (FiO_2)
- So if breathing 100% oxygen(inspired O_2 = 100%):
- Fi O_2 = 1
- PaO_2 SHOULD BE:
- 500 PaO_2 (mmHg)

15



16

Ventilation

- Chest wall compliance/movement
- CO_2 levels (arterial or venous)

17

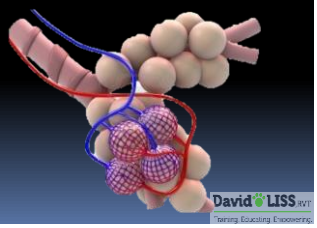
Measuring ventilation

- CO_2
  - Arterial blood gas
  - End-tidal CO_2
- End-Tidal CO_2 monitor important tool in cutting edge critical care

18

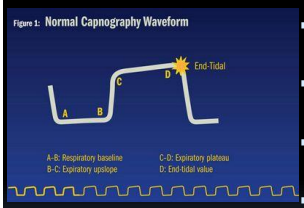
End-Tidal CO2 monitoring

- Measures the CO_2 at END-expiration
- Closely correlates with alveolar (and arterial) CO_2



19

Normal waveform/values

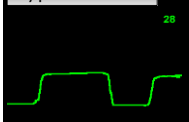


- Values are lower than arterial CO_2
- Normal is about:
  - 30-40 mmHg
- $ETCO_2 < 30$ = hyperventilation
- $ETCO_2 > 40$ = hypoventilation

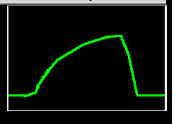
20

Some abnormal waveforms

Hypothermia

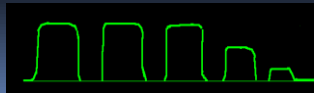


Bronchospasm



Rebreathing

Impending cardiac arrest

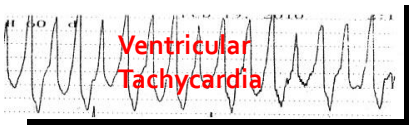


21

ECG's

- Arrhythmias are common in critical patients
- Have to be able to recognize them
- ECG's are a great "life"monitor- gives you a HR, and is fairly non-invasive
- Can buy pediatric ECG pads and tape them onto the patient

22



23

Another common one

- "Slow" V-tach
- Accelerated Idioventricular Rhythm

24

Basics of Arrhythmia interpretation- The 5 Q's

1- Is there a P-wave for EVERY QRS complex?

2- Is there a QRS complex for EVERY P wave?

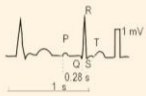
3- Assess HR
- Atrial vs. ventricular rate

4- Rhythm regular or irregular?

5-
- Look at PR interval
- Width of QRS complex
- Premature beats

25

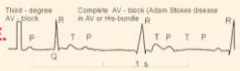
If the **R** is far from **P**,
then you have a **FIRST DEGREE**.



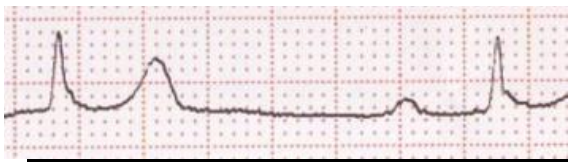
Longer, longer, longer, drop!
Then you have a **WENKEBACH**.

If some **P**s don't get through,
then you have **MOBITZ II.**

If **P**s and **Q**s don't agree,
then you have a **THIRD DEGREE.**



26



- 1- Is there P-wave for every QRS?
- 2- QRS for every P-wave?
- 3- HR:
  - 34 little boxes between beats:
    - 1500/34 = 44 BPM
- Rhythm: Regular or irregular
- P-R interval, QRS complex, Premature beats

SINUS BRADYCARDIA
- 1ST DEGREE AV BLOCK

27

- 1- Is there P-wave for every QRS?
- 2- QRS for every P-wave?
- 3- HR:
  - 1500/# of boxes
- Rhythm: Regular or irregular
- P-R interval, QRS complex, Premature beats

SECOND DEGREE AV BLOCK

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28

"Good" monitors

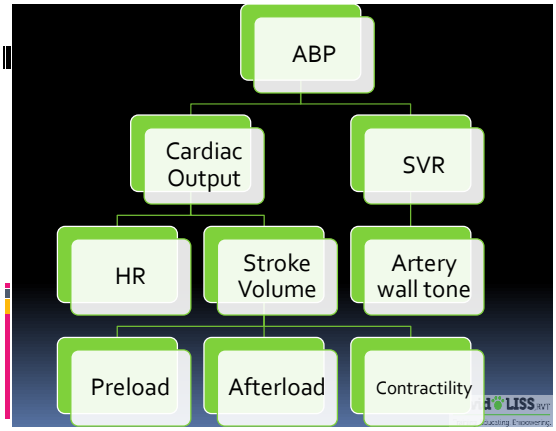
- BP
  - Prioritize arterial catheter > Doppler > Oscillometric
    - Tips: Arterial Catheter and Manometer
    - Tips: Doppler cuff held at 90 mmHg
- End-Tidal CO_2
  - Real-time (second to second) measurement of ventilation and perfusion
  - Sensitive to detect hypoperfusion/ hypothermia/impending cardiac arrest

29

Blood Pressure

- Macro-perfusion parameter
- Very important trend
- Reflects cardiac function AND blood vessel wall strength

30



31

How do we use blood pressure?

- An indirect measure of cardiac function/vascular tone:
  - 1- Enough fluid in vasculature?
  - 2- Cardiac output sufficent?
  - 3- Tubes too tight or too dilated?

32

Major troubleshooting- Hypotension

Reasons

1- Vasodilation- anesthetics

2- Volume depletion- fluid loss, hemorrhage

3- Bradycardia

Action steps

- Administer crystalloid fluid bolus
- Administer colloid fluid bolus
- Attempt to reduce MAC of isoflurane
- Administer vasopressor/inotropic medication
  - Dopamine
  - Dobutamine
  - Norepinephrine

33

Major troubleshooting, cont.

Hypothermia

- Warmed surgery table
- Warmed IV fluids
- Warmed abdominal flush
- Forced air warmers/ circulating water blankets
  - Avoid heating blankets

34

In conclusion

- Take home tips
  - 1- Avoid certain meds in critical patients (Ace, Alpha-2's)
  - 2- Use all monitors available
  - 3- Pre-oxygenate/ensure IVC access
  - 4- Maintain homeostasis
    - BP/HR/Temp
  - 5- Be prepared to reduce OR time

35

Thank You!

David LISS, RVT

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36