RC-176

Course Orientation Q & A?

Oxygen Therapy Review and New

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Reinforcement

- Do no Harm!
- Look and <u>Act</u> like a Professional.
- Smile and work to make everyone like you.
- Look, listen and LEARN PROCESS AND CONTENT.
- Be honest and act ethically at **<u>all</u>** times.
- Norms in class and clinic

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Remember the Program Mission, Display:

CARING COMPETENCE

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Discussion Items

- Course orientation
  - Expectations
    - College
    - Clinical
  - **Course Syllabus**
    - **Tests & Dates**
    - **Objectives, thinking level, text, etc.**
  - Schedule, this week, next and beyond.
  - Preview of content and where to find it
    - Files on the network
    - Review of content

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Discussion Items

- Course orientation
  - Announcements
    - Job market
    - Luncheon
    - DataArc disks
      - Intro
      - Cost
      - Log on change username
    - Pictures next week?
    - Test dates
  - Review of content
    - Q & A
    - PPT
    - Files for next few weeks :
      - 176startO2.ppt, oxygendevices.ppt

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Discussion Items

- Course orientation
  - Announcements
    - CPR cards, background checks, drug screens
    - Luncheon ? Student Rep
    - DataArc disks
      - Log on change username-ok?
    - Pictures next week?!!!!!!!
    - Test dates
  - Review of content
    - Q & A
    - PPT
    - Text for homework!!!!!!

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Test Dates

- Test 1-Oxygen Therapy Equipment and Physiology:
  - March 7th 2007
- Test 2-Oxygen Therapy Equipment and Physiology
  - Marcch 28th 2007
- Test 3- Humidity & Aerosol Therapy:
  - April 18th 2007
- Test 4- SMI therapy:
  - May 9th 2007
- Final – Comprehensive: 06/06/07
  - Other tests/quizes/ extra points / TBA

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RC-176

Course Orientation:

Schedule: now and later

Quick reinforcement

Overview of Oxygen Therapy

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OXYGEN THERAPY

- REVIEW BASICS OF EQUIPMENT USED IN OXYGEN THERAPY.
- OXYGEN TRANSPORT-TATION.
- FICK EQUATION & O2 TRANSPORT.
- HAZARDS OF O2 THERAPY.
- MONITORING DEVICES IN O2 THERAPY.
- EVALUATING THE EFFECTIVENESS OF O2 THERAPY.

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O2 EQUIPMENT Quiz!

- BASIC EQUIPMENT:
  - **NASAL CANN. & CATH.**
  - **O2 MASKS:**
    - **SIMPLE**
    - **PARTIAL AND NON-REBREATHER.**
    - **TENT & CROUPETTE.**
    - **ISOLETTE.**
- VENTURI DRIVEN EQUIPMENT:
  - **MASKS**
  - **NEBULIZERS**
  - **IPPB DEVICES**
- IN EACH CASE LIST:
  - **FIO2 U.N.C.**
  - **FIO2 U.A.C**

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LMS1

Answer These :

- Mouth breathing will affect the PaO_2 of a patient receiving O_2 via a low flow device. **T or F**
- Patient receiving .30 FIO_2 via venturi mask, PaO_2 is 250. Dr. asks if this device could be giving more than .30, **you would say?**
- The red flag on isollette is up, maximum FIO_2 is .40. **T or F**

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LMS1 point out what will be said if it is functioning properly with no unusual circumstances
and
if it is a high concentration mask like 40% and pt is breathing deep and or fast.
Louis M. Sinopoli, 3/3/2004

Quiz continued…

- Patient receiving FIO2 of .40 from large reservoir nebulizer running at 10LPM, Vt 1000, RR 20, I:E 1 to 2, Dr. orders change from FIO2 of .40 to .70 because the patient's PaO2 is 60.
- The ? Is, What will the patient's PaO2 mostly be after you make the change in the venturi setting on the nebulizer?
- Same? Less than 60? Higher than 60?

LMS2

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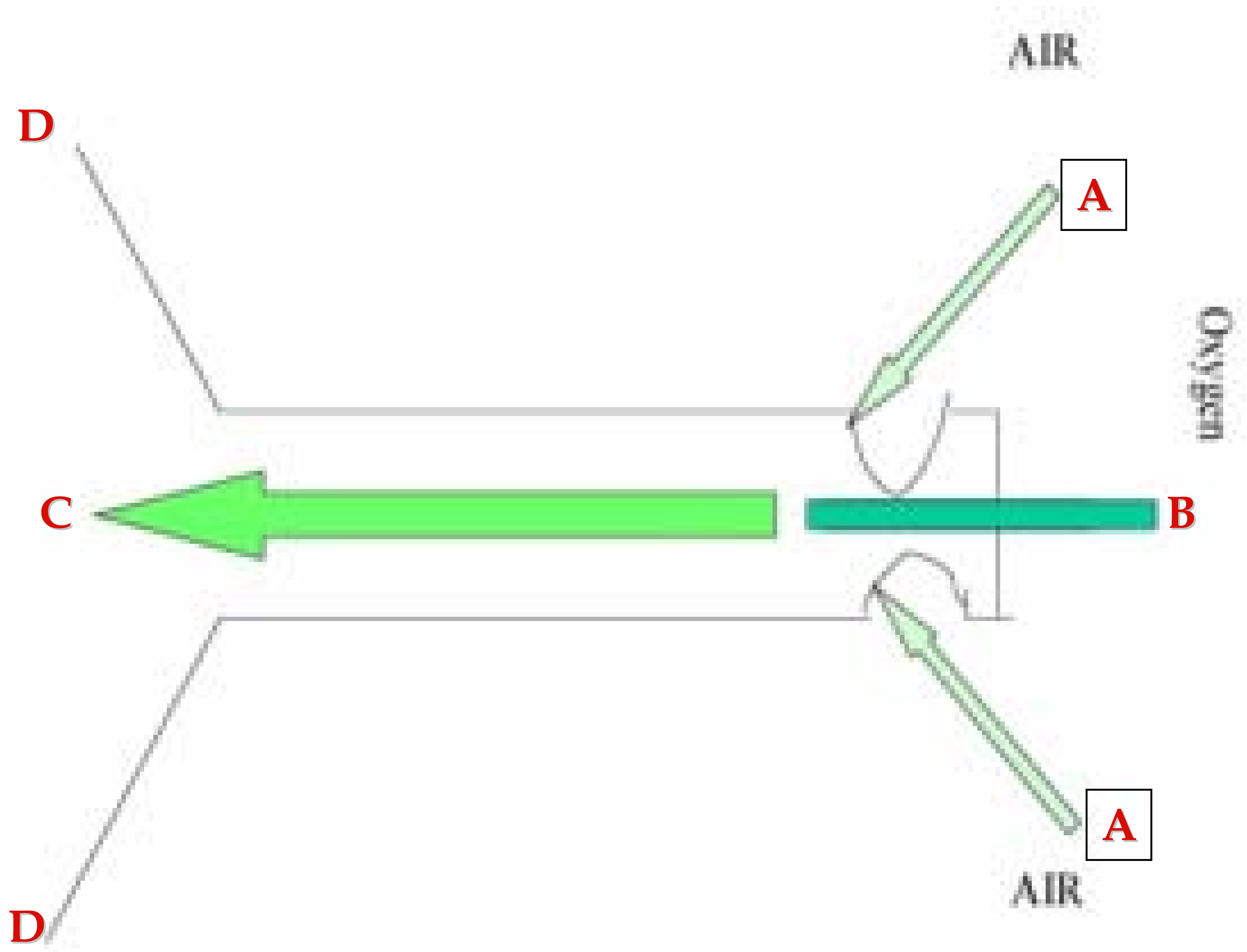
LMS2 What do you do about this, test wise calculatable and clinically, or what if the unexpected happens, it goes down instead of up, asummptions u can infer, mist must disappear for this to be happening, pt outbreathing device, so only like to see in pat, with high MV.

Louis M. Sinopoli, 3/1/2006


AIR
D
A
Oxygen
C
B
A
AIR
D

Louis M. Sinopoli:

This week need to discuss O2 curve, breathing control and see the three patients in the ED problem listed in outline.

Break then More...

10 mins.

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OXYGEN THERAPY

- PREVENT TISSUE HYPOXIA, NOT PREVENT HYPOXEMIA.
- O2 TRANSPORT NEEDED TO UNDERSTAND.
- QUICK REVIEW OF O2 TO TISSUES AND BACK.
- FICK EQUATION:
  - **MATHEMATICAL EXPLANATION OF O2 TRANSPORT:**

$$\textbf{CO} = \frac{\textbf{02 CONSUMPTION}}{\textbf{a-v O2 DIFF}} \quad \textbf{X 100}$$

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FICK EQUATION:

- O2 CONSUMPTION IS DIRECTLY RELATED TO C.O.
- a-v O2 DIFFERENCE IS INDIRECTLY RELATED.

$$\text{CO} \propto \frac{\text{02 CONSUMPTION}}{\text{a-v O2 DIFF}} \times 100$$

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FICK EQUATION:

- LET'S LOOK AT THE MATH BEHIND THE FORMULA.
- THESE ARE THE NORMAL VALUES.
- WHAT THINGS MAY CHANGE THE NORMALS?

$$CO = \frac{\text{02 CONSUMPTION}}{\text{a-v O2 DIFF}} \times 100$$

$$CO = \frac{\text{250 ML/MIN}}{\text{5 ML PER PASS}} \times 100$$

NORMAL C.O. = 5000 ML/MIN

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O2 TRANSPORT:

PAO2 = $(P_B$ - PH20) x FIO2 - PaCO2

- FIO2 AND P_B DETERMINE PIO2.
- ALVEOLAR AIR EQUATION NEEDED TO DETERMINE PA02.
- HB level and saturation to determine content.

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O2 TRANSPORT:

grams of Hb x 1.34 x % sat = O2 content

- HB level and saturation to determine content.
- Fick equation can then estimate O2 delivery per minute.
- PvO2 and lactic acid indications of tissue hypoxia.

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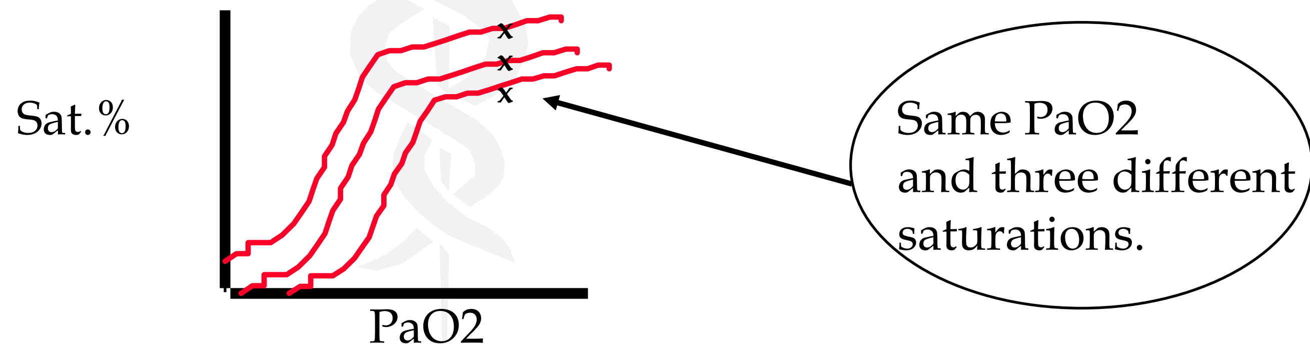
Discuss: Saturation vs PaO2 to determine if you need to raise the FIO2.

Tissue Hypoxia vs Hypoxemia

- Hypoxemia is easier to quantify:
  - Lower than normal arterial PaO2 or Sat%.
    - PaO2 below age corrected predicted.
      - -4mmhg from 95 for each decade above 20.
  - Sat may be better because it accounts for position of O2 dissociation curve.



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EVALUATION OF O2 RX:

- Review CONTEXT OF CAUSE:
  - 4 TYPES OF GENERAL HYPOXIA.
    - PULMONARY
    - CIRCULATORY
    - ANEMIC
    - HISTOTOXIC

- PAO2 vs PaO2
- C.O. look at PvO2
- Absolute vs Relative anemia, carrying capacity is the issue.
- Tissue dysfunction, PaO2 vs PvO2.

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Pulmonary Hypoxia

- Below normal PaO_2 caused by a "defect" in the lung's ability to transport O_2 from the air to the blood- external respiration issue.
- If PaO_2 is below age corrected for that FIO_2 patient is said to have Pulmonary Hypoxia.
- First course of treatment is to raise the FIO_2.

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Circulatory Hypoxia

- Below normal Cardiac Output caused by a change in the heart's ability to pump blood-i.e.M.I., CHF
- If CO is below required(according to Fick) than PvO_2 will drop.
- First course of treatment is to raise the PvO_2 by increasing FIO_2 or anything else decreasing O_2 carrying capacity, MDs will work on incresing CO.

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Anemic Hypoxia

- Below normal RBC/Hb level caused by either a decreased carrying capacity or a drop in the absolute amount of Hb.
- If decreased carrying because of defect like Carbon Monoxide, then relative anemic hypoxia, if do to decreased Hb then absolute anemic hypoxia.
- First course of treatment is to raise the carrying capacity, same as in circulatory hypoxia, only now MDs will work on incresing RBCs/Hb.

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Hystoxic Hypoxia

- Below normal tissue O2 consumption caused by a decreased O2 uptake due to abnormal tissue chemistry.
- If difference between PaO2 and PvO2 indicates abnormal uptake than it is called hystotic hypoxia.
- First course of treatment is to improve PaO2 if lower than 100% satuation, MDs must try to improve tissue utilization.

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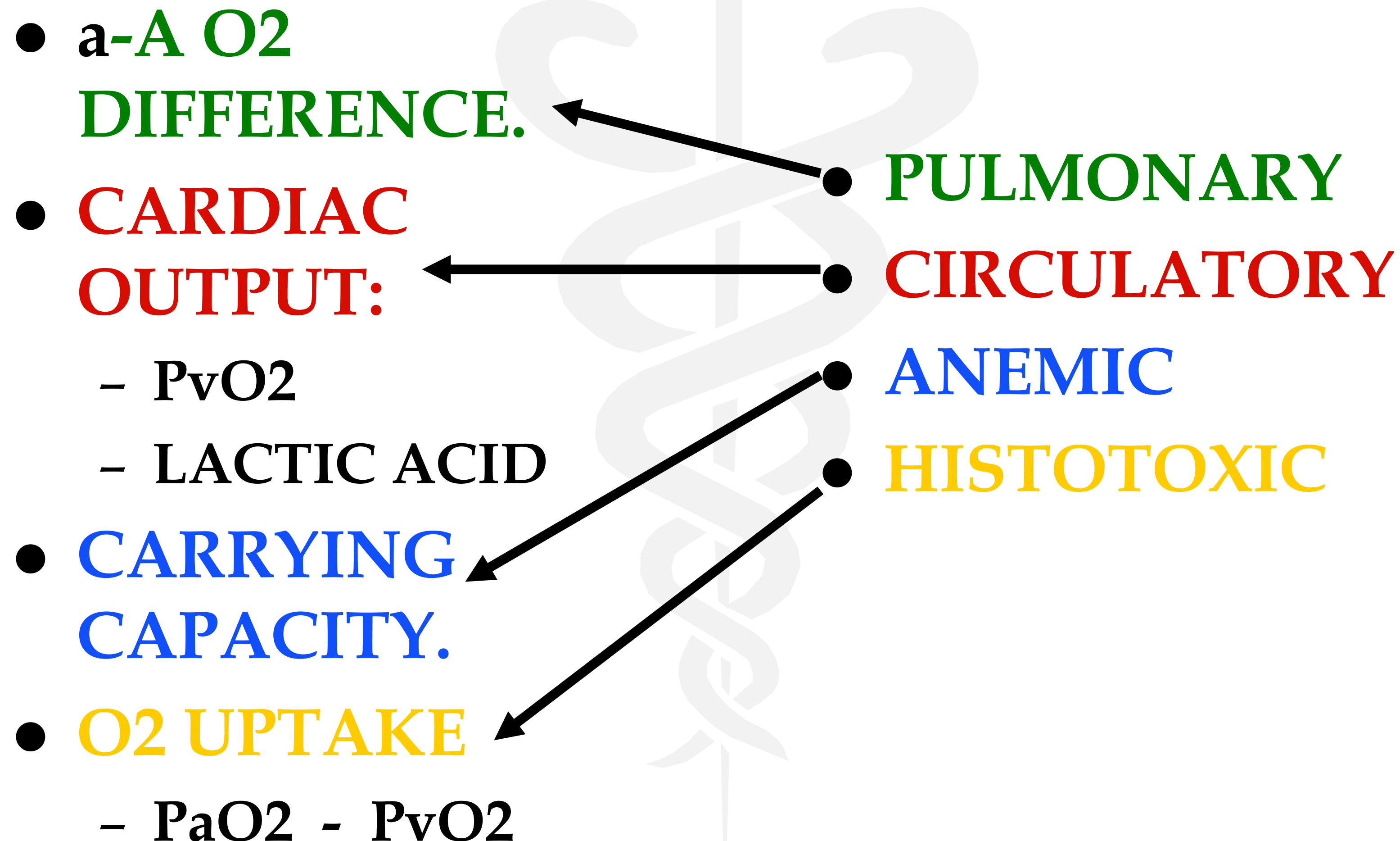
EVALUATION OF O2 RX:



- a-A O2 DIFFERENCE.
- CARDIAC OUTPUT:
  - PvO2
  - LACTIC ACID
- CARRYING CAPACITY.
- O2 UPTAKE
  - PaO2 - PvO2

- PULMONARY
- CIRCULATORY
- ANEMIC
- HISTOTOXIC

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Problem A:

- **Normal patient in distress. No history or physical signs of COPD. PaO2 is 75, Sat.% 90 patient is 50 years old. HR is 120 and strong. Hb level is 10 grams.**
  - **What type(s) of hypoxia are present?**
  - **What would be appropriate initial therapy?**
  - **Cyanosis?**

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Problem B:

- Normal patient in distress. No history or physical signs of COPD. PaO_2 is 75, patient is 65 years old. HR is 45 and strong. Hb level is 15 grams.
  - What type(s) of hypoxia are present?
  - What would be appropriate initial therapy?
  - Cyanosis?

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Three patients in the ED:

- All same age, etc.
- ABGs as follows:
    - See course syllabus

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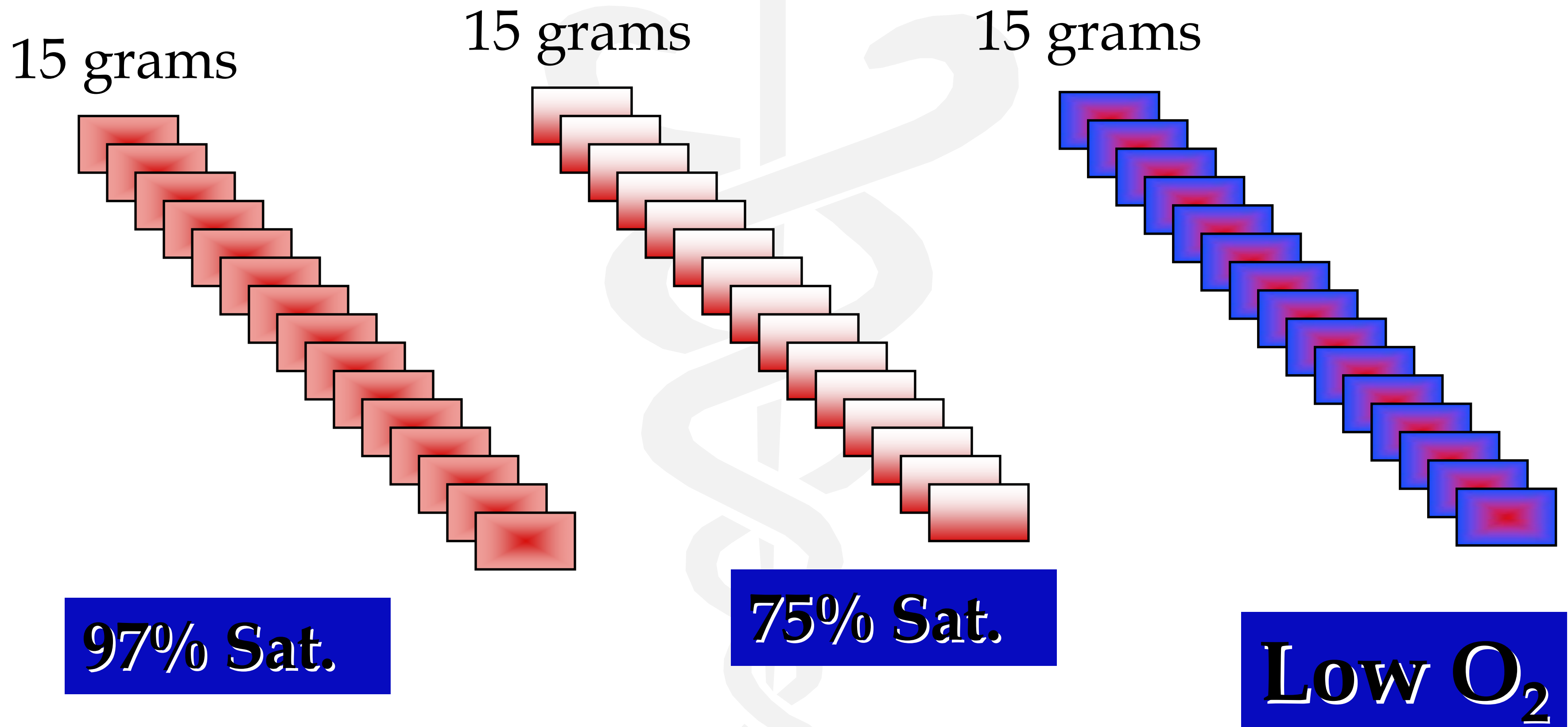
Hemoglobin…



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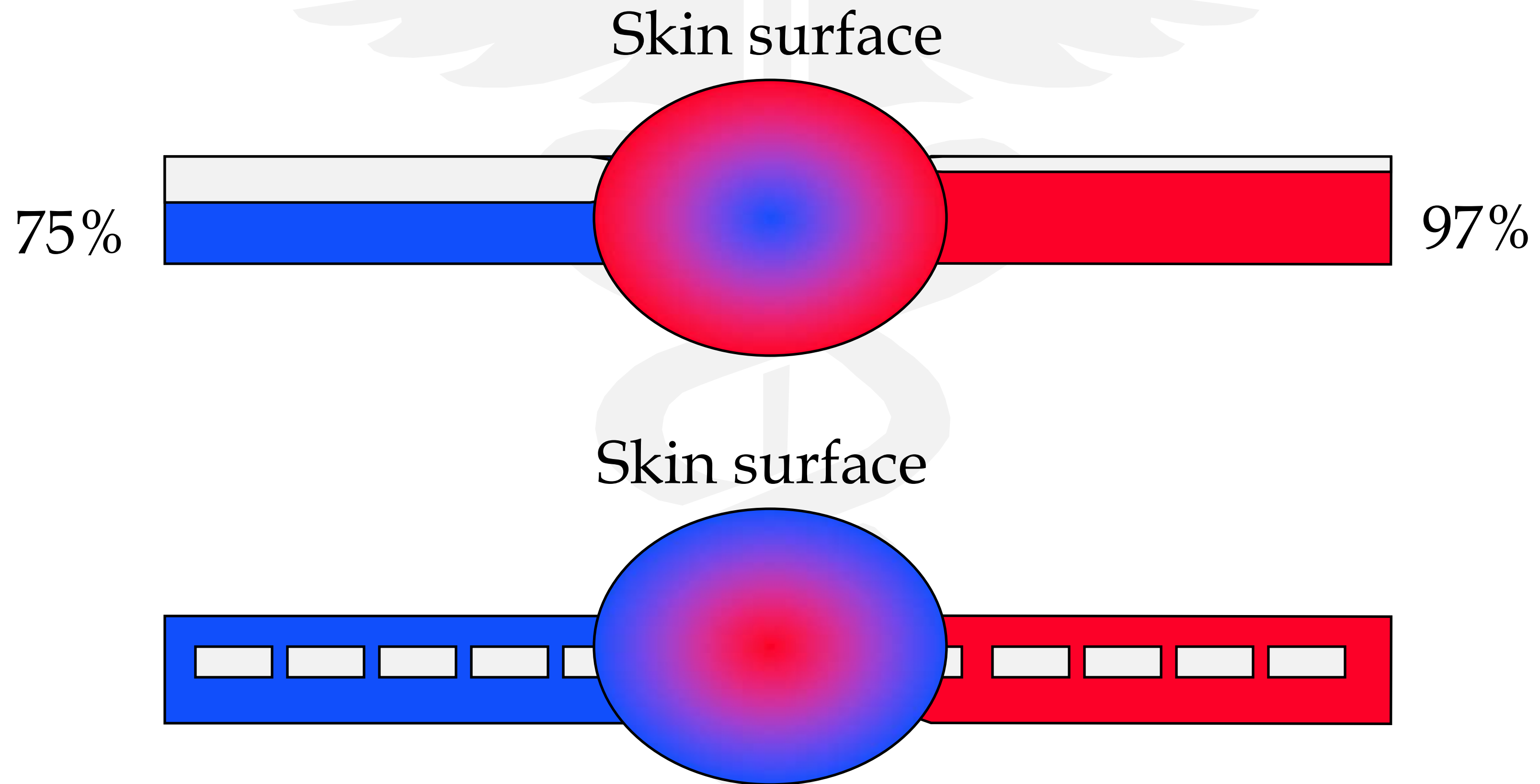
Cyanosis…



5 grams reduced in capillary bed, to produce cyanosis at skin surface. Average of art/ven desaturation.

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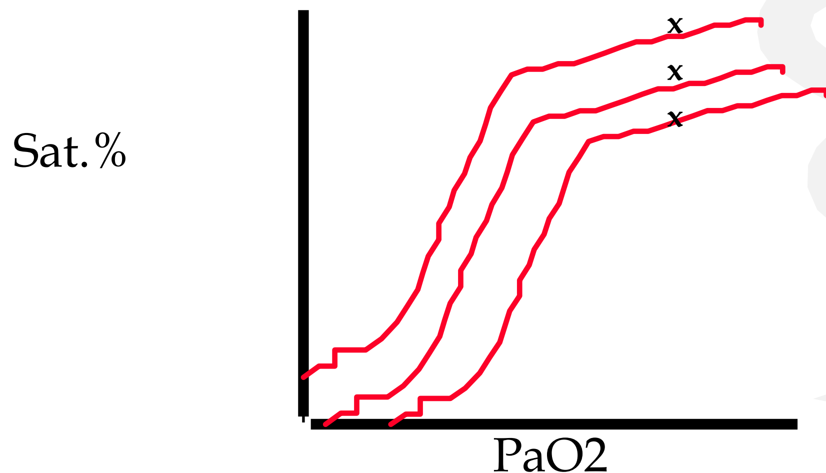
Cyanosis continued…

$$\frac{\text{Arterial desaturation grams + Venous desaturation grams}}{2} = \text{Cap Desat.}$$



Steps:

1. Calculate art. Desat. Grams
   1. Need pt Hb level
   2. Need pt Sat in Art/ven
2. Add together
3. Divide by 2 for average
4. Compare to 5

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OXYGEN TOXICITY:

- **An amount of oxygen, either in the gas the patient is breathing, or in the amount in the blood, causing damage or harm to the patient receiving it.**

"NEVER GIVE MORE THAN IS NEEDED"

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OXYGEN TOXICITY:

- Mucociliary depression.
- CO_2 narcosis.
- BPD
- RLF
- Absorption Atelectasis.

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OXYGEN TOXICITY:

- Mucociliary depression.
- CO2 narcosis.
- BPD
- RLF
- Absorption Atelectasis.

- PaO2 > 60
- PaO2 > 100
- FIO2 > .21
- FIO2 > .4 - .50
- FIO2 = 1.00

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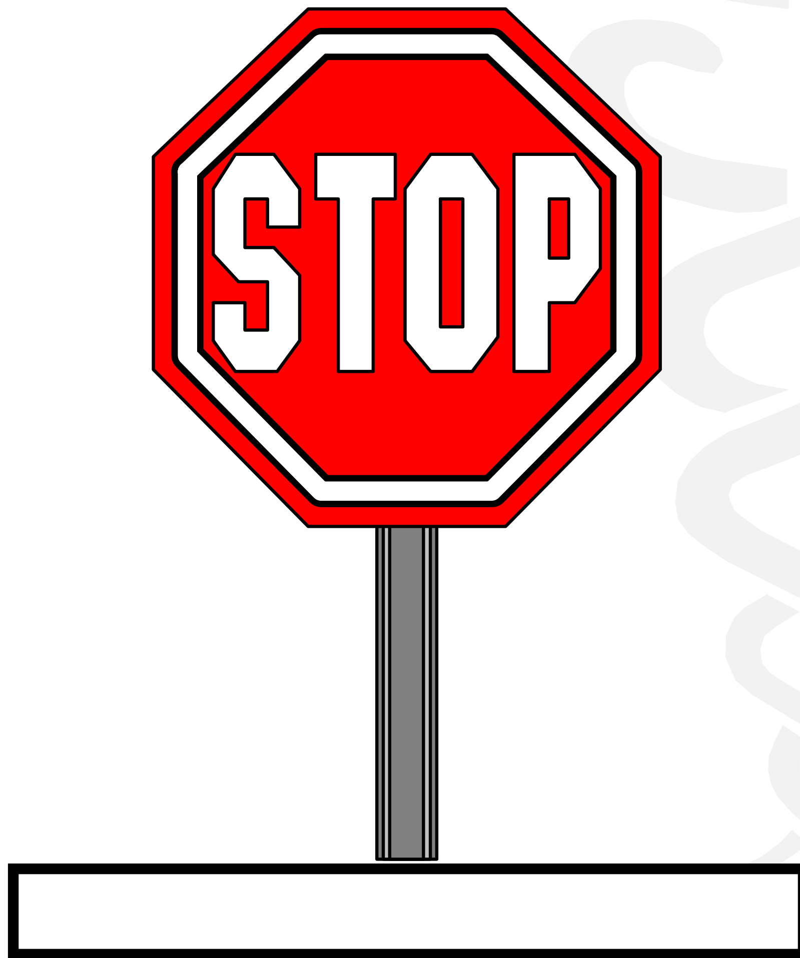
This is the last slide.........



- Class over...
- Reflect on the readings and the presentation you just saw.
- Think about the health care industry in general and RC specifically, how does this information relate.
- Read more, generate questions, bring to class next week.

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