Shortness of Breath

And Rapid Respiratory Rescue

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Dyspnea

- Types of Dyspnea - What Happens
- Diagnostic Tricks of the Trade
- Treatments Available
- Rapid Respiratory Rescue (ALS and BLS)
Types of Dyspnea

- Mechanical (Trauma)
- Medical
Mechanical

- The Mechanics of Breathing
  - Structures
  - Inspiration
  - Expiration
Rib cage moves up and out

Diaphragm contracts and moves down

Pressure in lungs decreases, and air comes rushing in
Rib cage moves down and in

Diaphragm relaxes and moves up

Pressure in lungs increases, and air pushed out
Breathing

- Inspiration is an ACTIVE process
- Expiration is a PASSIVE process
Pneumothorax

- Tachycardia
- Tachypnea
- Reduced expansion of chest
- Hyper-resonance to percussion
- Quiet or absent breath sounds
- Subcutaneous emphysema
Chest tube

Pneumothorax

Re-expanded lung
Mechanical

- Can complicate any patient with dyspnea
  - Seen in both trauma and non-trauma patients
  - Clinical diagnosis
  - Tension = 6 breaths from death
Asthma/CHF/COPD

- Asthma - Spasm of the airways/Inflammation of the airways
- CHF - Fluid fills up the alveoli
- COPD - Lose ability of alveoli to function. Spectrum of problems
CHF

• Normal - Heart pumps blood thru the lungs (right side of heart). Then pumps blood thru the body (left side of heart)

• In CHF

  • If the left side loses function then the blood backs up into the lungs

  • Can be due to heart (pump) failure or the heart having to pump against more resistance
CHF

- Can also occur if the patient just has too much fluid in the body that leaks out to all the tissues including the lungs

- Why do we see so much CHF at Thanksgiving?
Why is it hard to breath in CHF?

Accumulation of fluid in the air sacs (alveoli) in the lungs
Fluid in the Alveoli....

• Causes
  • Greater distance for oxygen to travel into blood
  • Thicker fluid for oxygen to diffuse over
  • Alveoli lose ability to stay open
Rales

• What is a rale (crackle)?

• Fine rales are due to the alveoli collapsing shut because the surfactant is disrupted. They then stick shut and you have to take a deep breath in to open them up. When they open - they crackle
Rales

• Why is it more common to hear rales at the lung bases?
The CHF patient

• Sitting upright........if they lay down what happens?
• Tripod position
• Distended neck veins
• Peripheral edema
• ***High Blood Pressure***
Basic Treatment

• Position

• Oxygen - Increases the gradient

• Prevent the alveoli collapsing?

• Push the fluid back into the blood?

• Stop the blood pushing fluid into the lung?

• Dry out the fluid somewhere else?
CPAP

• Continuous Positive Airway Pressure

• For the alveoli to collapse the pressure in the alveoli must drop - CPAP prevents this happening

• For collapsed alveoli - delivering oxygen at pressure helps pop them open - CPAP does that

• To push the fluid in the alveoli back into the blood the fluid must be subjected to pressure - CPAP does that
CPAP

- Holds open alveoli - decreases the work the patient has to do
- Pops open alveoli that were closed - allows more lung to be used (reduces dead space)
- Pushes fluid into the blood stream - decreases the distance that oxygen has to cover to get to the blood
CPAP

- CPAP is like sticking your head out of a window in a moving car and facing into the wind with your mouth open......
Removing the Fluid

- Diuretics
- Dialysis
- Nitroglycerin
Asthma

- Asthma is a 2 part process
  - The airways spasm - causing wheezes
  - The airways inflame - causing rhonchi
Flash Back

• Inspiration is an ACTIVE process
• Expiration is a PASSIVE process
If the airways spasm...

• Do the patients have a problem getting air in or getting air out?
Alveoli Pressure

- If the patient has problems getting the air out.....
- More air remains in the alveoli......
- So there is more pressure in the alveoli......
- So the alveoli are more likely to burst open......
- And if they burst open they can form a..........
The Asthmatic Patient

- Wheezing (or maybe not!)
- Distended neck veins
- Generally NOT hypertensive
- Saturations are normally 100% (it is not an oxygen problem it is a ……….)
The Asthmatic Patient

- ........CO2 problem.........why?
The Asthmatic Patient

• CO2 is expired, asthmatics have a problem breathing out (it is not an oxygenation problem, it is a ventilation problem).

• A rising CO2 level is a bad sign in an asthmatic
The Asthmatic Patient

• As asthma progresses........patient breaths faster, so despite having problems breathing out CO2 they compensate by breathing faster, so sometimes CO2 drops

• As the asthma gets worse they can no longer compensate........and the CO2 rises
The Asthmatic Patient

• How can they be treated.........
The Asthmatic Patient

• By opening the airways

• This can be done by BLS is 4 ways…….
The Asthmatic Patient

• Albuterol
• Atrovent
• EpiPEN
• and.........
The Asthmatic Patient

• CPAP - which works by pressing open all of the airways (the pressure generated by CPAP is not just exerted on the alveoli but on all the airways)
"My CPAP makes me feel like a man."

Brett Favre
• Epinephrine is quickly becoming a standard way of treating severe asthma because...........
Epi is delivered via the blood, albuterol/atrovent rely on being delivered by breathing

- BLS - EpiPen
- ALS - EpiDrip
The Inflammation

• Treated with steroids

  • Now being routinely given by ALS providers.
COPD

- COPD is a mixture of lots of pathologies all related to destruction of lung tissue typically by smoking
What Happens When You Smoke?

• Cilia are paralyzed - debris remains in lungs

• Debris (Tar) remain in the alveoli - and disrupt the surfactant......causing.......and the alveoli are more likely to collapse

• Debris causes inflammation (bronchitis) and breakdown of the alveoli, causing them to join together, lose function and be more likely to collapse (emphysema)
COPD

- Wheezes - from airway irritation and spasm
- Rhonchi - from inflammation of the airways
- Rales - from destruction of the airways
COPD

• How to treat
  • Decrease inflammation
  • Improve oxygen exchange
  • Decrease work of breathing
COPD and CHF

- What happens if you dry out a COPD patient (one of the treatments for CHF)?

- What happens if you give news to a CHF patient (one of the treatments for COPD)?
Telling the Difference

• Often you can’t - so you treat what you see and hear.
COPD

- Treatment includes.....
  - Nebs
  - Steroids
  - EpiPEN
  - and..........
COPD

- CPAP
  - Holds open the airways and the alveoli (and thus decreases the work of breathing)
CPAP
Treats Everything
Oxygen

• “Oxygen is one of the most harmful drugs we carry on the ambulance”

• Topic will be covered by Bebee on Sunday AM

• Oxygen has been shown to be detrimental in MI, Stroke and Trauma Patients
What Does It Mean for Oxygen?

- You will see more “titrate” oxygen protocols
- It will be acceptable to allow sats down to 88-92% without giving oxygen
- ALS are already removing more NRBs than they are placing
Rapid Respiratory Rescue

- Respiratory Complaints are a Done Deal by the time they get to hospital
  - All respiratory treatments have made it to EMS
  - Aggressive treatment in the field leads to improved outcomes in the hospital (less ICU days, shorter hospital stays).
Rapid Respiratory Rescue

- BLS
  - Albuterol/Atrovent
  - Oxygen when needed
  - Aggressive use of CPAP
  - EpiPen
Rapid Respiratory Rescue

• ALS
  • All BLS interventions
  • Asthma - Magnesium, Steroids
  • **Option of the EpiDrip**
  • **RSI/DSI - Ketamine vs Etomidate**
EpiDrip

• The Easiest Drip to Set Up
  
  • 1mg of Epi 1:10,000 into 1 L NS.
  
  • Concentration is 1mcg/ml - Titrate to effect
Takotsubo Cardiomyopathy

- Transient cardiac syndrome that involves left ventricular apical akinesis and mimics acute coronary syndrome.
- Present with chest pain, have STEMI on ECG but clean coronaries on cath
- Also known as Broken Heart Syndrome
Takotsubo Cardiomyopathy

• 2.2% of AMI

• Mean age 67

• 90% are post menopausal females

• The most commonly discussed possible mechanism for TCM is stress-induced catecholamine release, with toxicity to and subsequent stunning of the myocardium.
Intubation - Old Way

- Brutane
  - Held mask on, held down patient, intubated patient, pushed down gas pedal
- Sedation not an option due to dropping LOC and losing airway
- “Facilitated intubation” - Visiting death!
New Way

- Ketamine
  - Dissociative anesthesia agent
  - Bronchodilatory effect
  - Does not cause hypotension
  - Intubating medication of choice in sepsis and asthma/copd
Sequence Intubation

• Rapid Sequence Intubation
  • Patient is given sedative and paralytic, wait until effect seen, then patient is intubated

• Newer still - Delayed Sequence Intubation (DSI)
  • Patient is given sedative that does not suppress respiratory effect and then managed with non-invasive methods to increase saturation, at that point is given paralytic and then intubated
Newest

• Facilitated Non-Invasive Ventilation with optional DSI

• Ketamine is given and when it takes effect patient is managed in a non-invasive way

• Reevaluation is done and a determination is made to continue current plan or proceed to paralytic and intubation
Respiratory Rescue

- Phase 1 - Traditional Response
- Phase 2 - Alternative Response
- Phase 3 - Decompensating Response
- Phase 4 - Failed Response
If **Hypoxia** Present
Titrate oxygen to maintain sats >87%
Initiate CPAP

If **Wheeze** Present
Albuterol 2.5mg Neb Q15 minutes
Atrovent 0.5mg Neb Q15 minutes
Magnesium 1-2g IV over 10 minutes

If **Stridor** Present
Epinephrine 1:1000 5ml Neb Q15 minutes

If **Anaphylaxis** is present then manage accordingly

If **Asthma/COPD** is suspected by history
Methylprednisolone up to 125mg IVP (1.5mg/kg)
If hypotension is present (MAP<60) or Clinical Presentation Suggests COPD/Asthma/Pneumonia
  - Rapid IV Fluid bolus 30cc/kg NS

If Clinical Presentation Suggests CHF and Mean Arterial Pressure>70
  - NTG 0.4mg SL Q5mins and 1 inch nitropaste to chest
  - Hold/remove if MAP drops below 70

If nebulizer application is failing
  - Epinephrine 0.3mg 1:1000 IM Q10mins
  or
  - 1mcg/min IV and titrate up to effect.
    (1mg 1:10000 Epi in 1L NS at 1ml/min)
If able to tolerate CPAP and Asthma/COPD/Sepsis is clinically suspected then
- Continue CPAP with continuous nebs
- If worsening then Ketamine 1.5mg/kg IV over 30 seconds. Rebolus as needed. If no IV then Ketamine 5mg/kg IM.

If unable to tolerate CPAP and Asthma/COPD/Sepsis is clinically suspected then
- Ketamine 1.5mg/kg IV over 30 seconds. Rebolus as needed. If no IV then Ketamine 5mg/kg IM.
- Then apply CPAP and give continuous nebs

If CHF is clinically suspected then proceed directly to intubation
If **Asthma/COPD/Sepsis** is clinically suspected
- Continue Ketamine for sedation, re-bolus as needed
- Succinylcholine 1-2 mg/kg IVP for paralysis
- Intubate the patient

If **CHF** is clinically suspected
- Give etomidate 0.3mg/kg IV for sedation
- Rocuronium 1mg/kg IV for paralysis
- Intubate the patient
Thank You

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