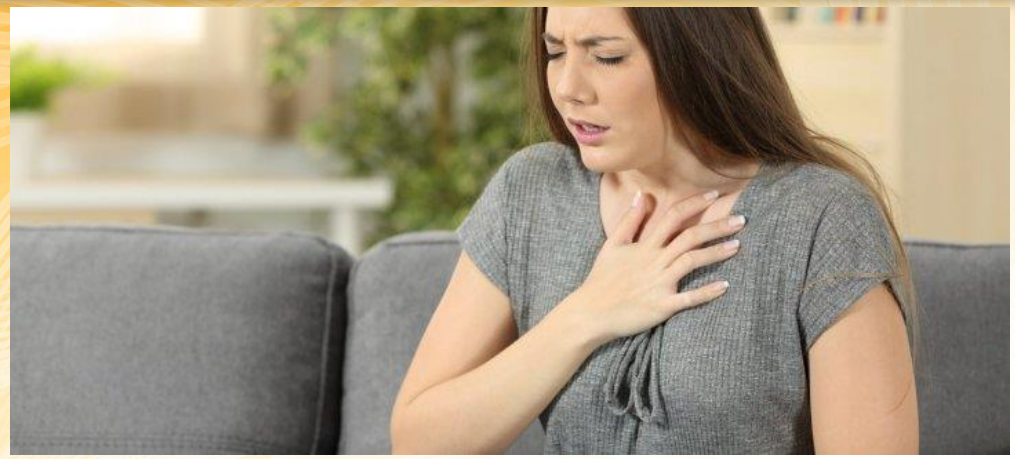

Current Trends In Asthma
Part II

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Clinical Educator
Wellness Champion
Lehigh Valley Health Network
Allentown, Penna.

Learning Objectives

- Describe non-conventional or alternative asthma therapies
- Review recent asthma findings
- Define life threating asthma and the clinical interventions to treat it

Non-Conventional or Alternative Asthma Therapies

Garlic

Herbs

Alternative methods

Ginger
Ginger is a well-known natural treatment for various ailments including asthma. Researchers have found that it can help reduce airway inflammation and inhibit airway contraction.

Figs

Mustard Oil
When having an asthma attack, massaging with mustard oil can help clear the respiratory passages and restore normal breathing.
Heat some mustard oil with a little camphor.
Transfer it in a bowl and when it is comfortably warm, gently rub it on the chest and upper back and massage.
Do this several times a day until the symptoms subside.

Role of Vitamin D

- High doses of V-D have demonstrated a reduction in airway responsiveness
- May increase the immune system and prevent Mast Cell release of histamine like enzymes

RECENT ASTHMA FINDINGS

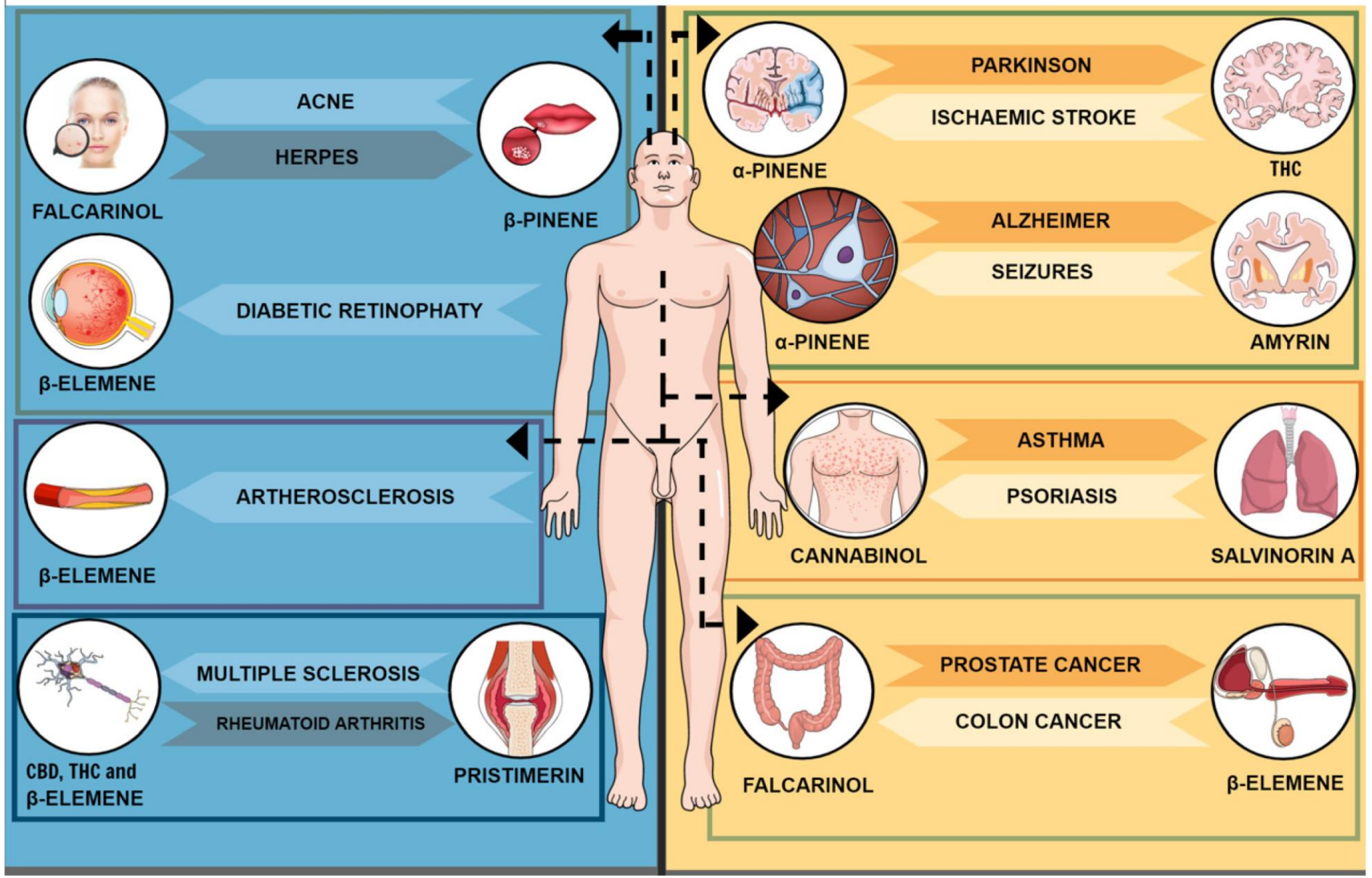
*It's known that cannabis is a powerful anti-inflammatory.

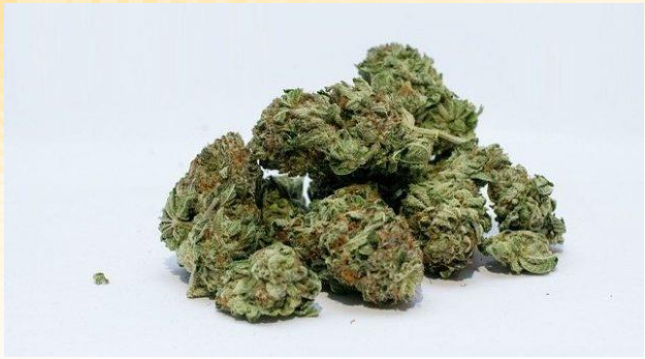
*One of the main ways cannabis treats asthma symptoms is by discouraging inflammation and opening the passages of the respiratory system. This, in turn, decreases coughing and shortness of breath. While many people may imagine the effects of smoking marijuana and smoking cigarettes to be similar, the effects of marijuana on the bronchial passages are actually the *opposite* of tobacco cigarettes - which constrict the passages of the airway, causing asthma symptoms to worsen.

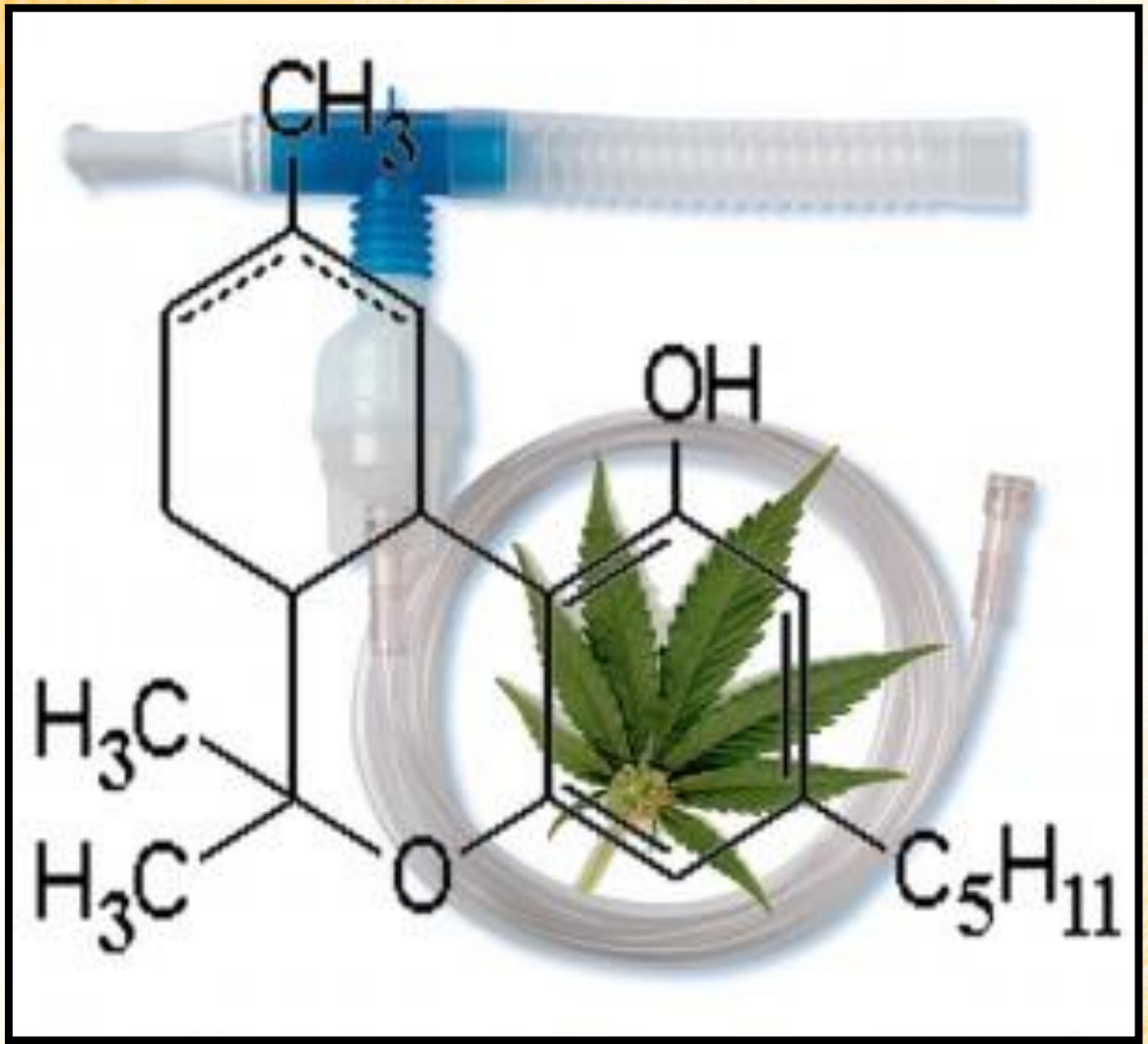
***A 2012 study published in *The Journal of the American Medical Association* found that people who suffered from asthma and smoked marijuana on a moderate basis actually *increased* their lung function, without suffering the lung damage associated with tobacco cigarettes.**

*These results have surprised almost everyone, from consumers to doctors who specialize in the diagnosis and treatment of asthma. It's clear the effectiveness of medical marijuana on asthma symptoms has the potential to revolutionize how the condition is treated in the future.

ROLE OF *CANNABIS SATIVA* COMPOUNDS IN DISEASES






CH3
OH
H3C
H3C
O
C5H11

Treatment for Status Asthmatics???

Breast Feeding and Asthma=33% Reduction in Male Asthma

Receive Mother's immunity and antibodies??

Children between the ages of 7 and 9 may be at greater risk for developing asthma if they consumed high amounts of fructose in early childhood or their mothers drank a lot of sugar-sweetened beverages while pregnant, according to new research published online in the *Annals of the American Thoracic Society*.

In "Prenatal and Early-life Fructose, Fructose-containing Beverages, and Mid-Childhood Asthma," researchers report on 1,068 mother-child pairs participating in Project Viva, a longitudinal study based in Eastern Massachusetts designed to find ways to improve the health of mothers and their children.

"**The study found:**

•In mid-childhood, 19% of the children had asthma.

•Mothers in the highest quartile of sugar-sweetened beverage and fructose consumption during pregnancy were 63% and 61% more likely, respectively, than those in the lowest quartile to have mid-childhood-age kids with asthma, when adjusted for pre-pregnancy body mass, age, race/ethnicity and other factors that may have affected results. The difference between the top and bottom quartiles was about 2 vs. 0 servings per day of sugar-sweetened beverages and 46 vs. 21 grams per day of fructose.

•Kids in the highest quartile of fructose consumption during their early childhoods were 64% more likely than those in the lowest quartile to have asthma in mid-childhood, when adjusted for maternal sugar-sweetened beverage consumption, remained the same after adjusting for mid-childhood-age body mass. The difference between the top and bottom quartiles was about 44 vs. 15 grams per day of fructose.

The authors noted that other studies have found links between obesity and asthma and between sugar-sweetened beverage and high fructose intake and increased asthma risk. Recent studies, they wrote, suggest that in addition to increasing asthma risk through obesity, fructose itself may cause inflammation in the lungs.

.

Asthma and Sugary Drinks May Have Links

Severe Asthma Linked to Less Physical Activity

- Study data showed that preschool-aged children with asthma spent significantly more time watching TV than their healthy peers and that poor asthma control was linked with less frequent physical activity.
- The patient group reported higher daily TV viewing than controls, with 59% of patients with asthma watching 1 to 3 hours of TV daily vs. 42% of controls, and 47% of controls watching less than 1 hour per day vs. 26% of patients ($P < .05$ for both).
- Children with poor asthma control were more physically inactive, with 75% taking part in no or occasional physical activity vs. 20% of those with controlled asthma ($P < .0001$) and 25% of controls. However, patients with good asthma control participated in more physical activity, with 62% active three or more times per week and 18% active one to two times per week.
- Differences in daily TV viewing findings according to asthma control did not reach significance, with 81% of children with uncontrolled asthma watching more than 1 hour per day compared with 78% of those with partially controlled asthma and 70% of those with controlled asthma.

Impact of Asthma on Severity and Outcomes in COVID-19

- Twenty-six studies with 185,711 subjects with COVID-19, of whom 11,427 (6.2%) had asthma, provided information on hospitalization due to COVID-19.
- Subjects with asthma and COVID-19 had a marginally higher risk of hospitalization (summary relative risk 1.13, 95% CI 1.03–1.24) but not for severe disease ICU, and mechanical ventilation or mortality (summary relative risk 0.92, 95%) as compared to subjects with COVID-19 without asthma
- Conclusion: Asthma increases risk of COVID-19-related hospitalization but not severe disease or other adverse outcomes in subjects with COVID-19.

Asthma Risk Increases with Exposure to Larger Air Particles found in Pollution

Johns Hopkins researchers report on the links between pollution-related air particles and childhood asthma prevalence.

Children exposed to airborne coarse particulate matter—a mix of dust, sand and non-exhaust tailpipe emissions, such as tire rubber—are more likely to develop asthma and need emergency room or hospital treatment for it than unexposed children.

A report of the findings, published Dec 15 in the American Journal of Respiratory and Critical Care Medicine, **highlights the long-term negative effects of such relatively large airborne pollutants—a common fact of everyday inner-city life—on lung health, especially in children under 11 years of age.**

Cleaner Ship Fuels Will Reduce Childhood Asthma by 3.6% Globally

Published on February 12, 2018

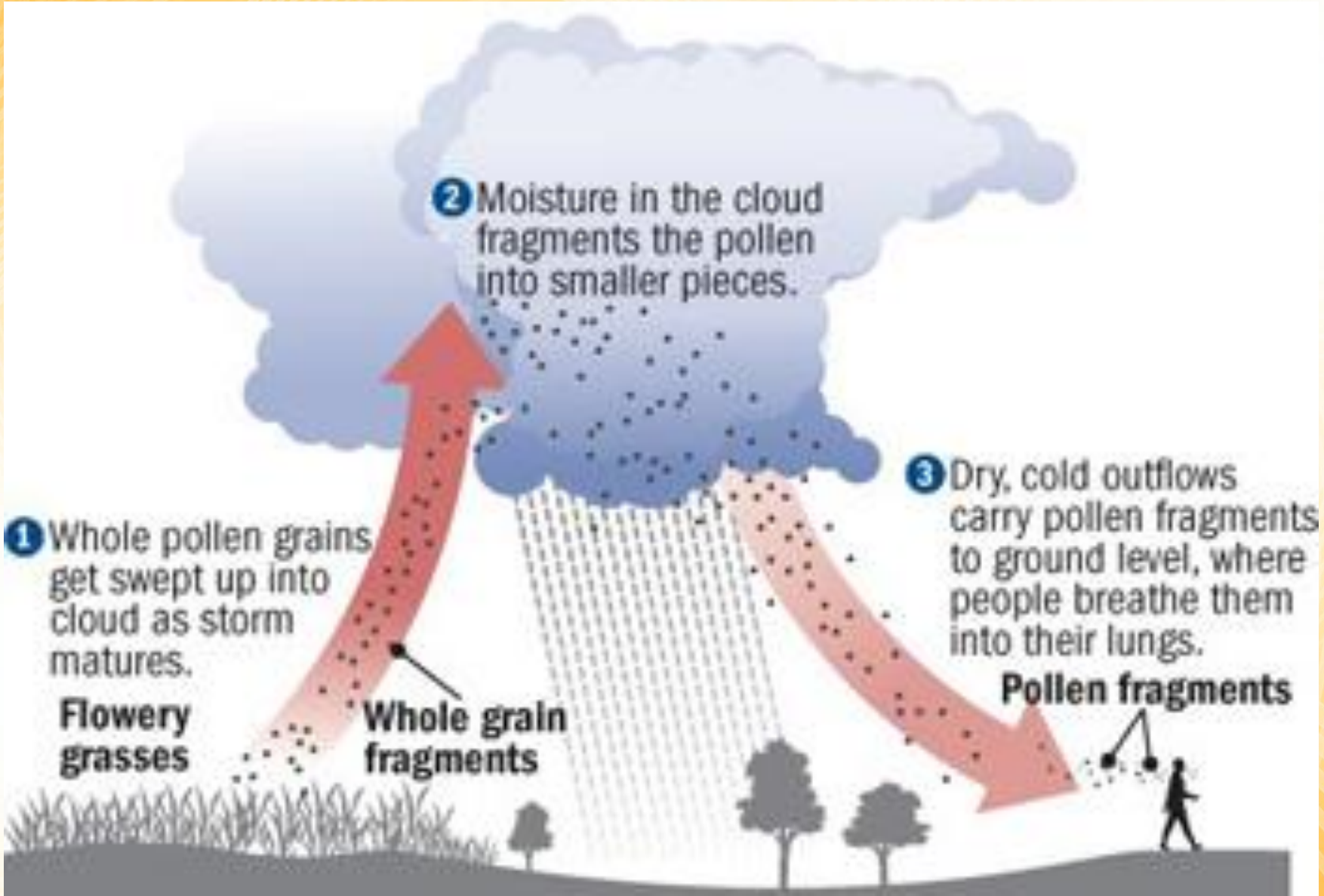
A new study in *Nature Communications* quantifies global health benefits and finds cleaner shipping fuels will result in a 3.6% reduction of childhood asthma globally.

The study was led by University of Delaware's James Corbett, and included an international team of researchers from the Finnish Meteorological Institute (FMI), Rochester Institute of Technology (RIT) in New York and Energy and Environmental Research Associates.

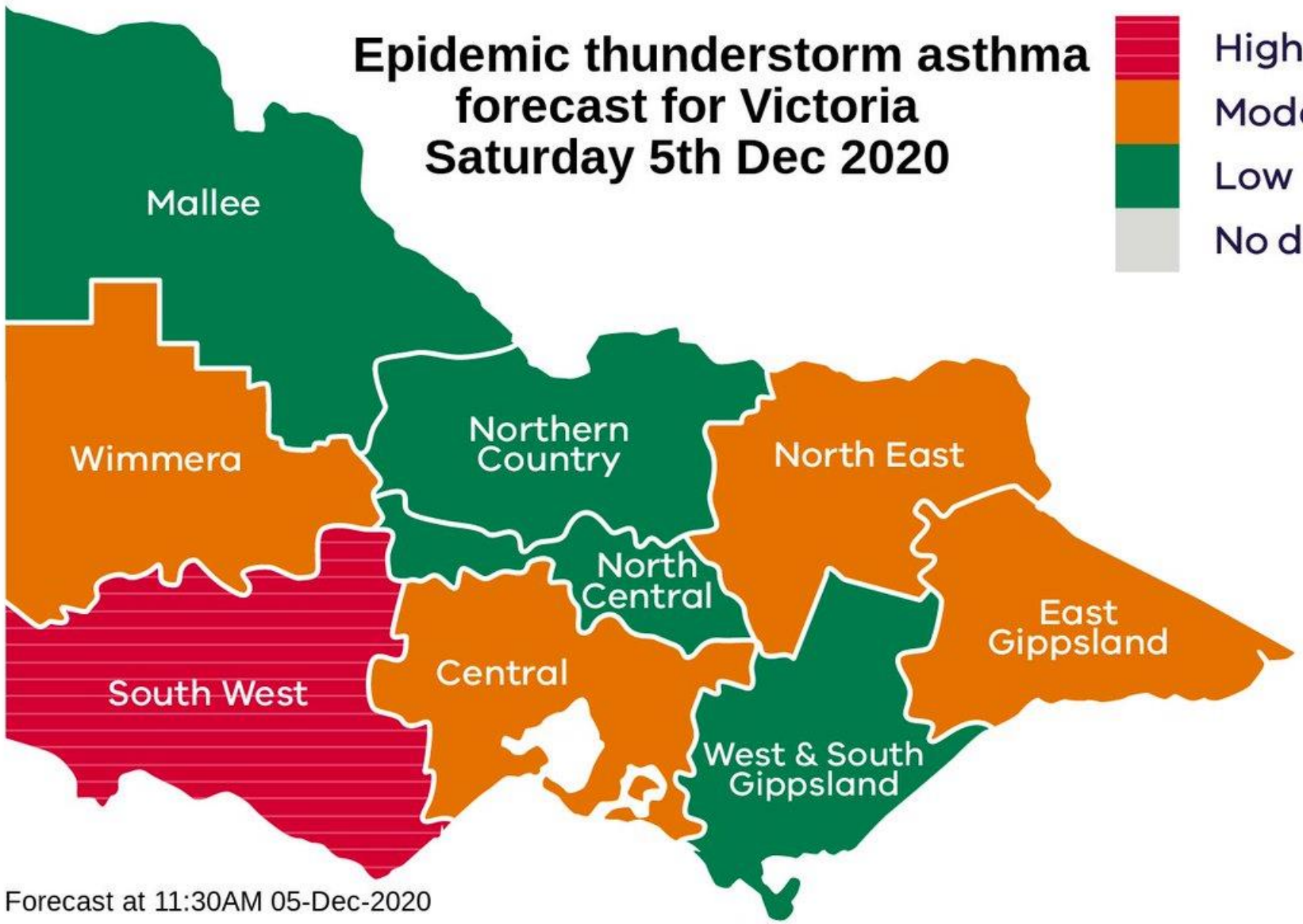
The team studied the impacts of sulfur emitted by ships using current marine fuels, which produce air pollution particles that are small enough to be breathed deeply into the lungs and are considered harmful to human health.

Thunderstorm Asthma on the Rise

Recently in the *Journal of Allergy and Clinical Immunology,* Dr Gennaro D'Amato and colleagues explored the nature of this phenomenon and implications for the future. The authors these events are expected to occur more often with anticipated climate change. According to the authors, the evidence for this so far is limited to pollen and outdoor mold seasons—but even in the northeastern United States, that is about three quarters of the year which results in increased ED visits


2 Moisture in the cloud fragments the pollen into smaller pieces.
1 Whole pollen grains get swept up into cloud as storm matures.
3 Dry, cold outflows carry pollen fragments to ground level, where people breathe them into their lungs.
Flowery grasses
Whole grain fragments
Pollen fragments

Thunderstorm asthma: 8 dead in Australia from freak illness


Epidemic thunderstorm asthma forecast for Victoria Saturday 5th Dec 2020
High
Moderate
Low
No data
Mallee
Wimmera
Northern Country
North East
North Central
East Gippsland
Central
South West
West & South Gippsland
Forecast at 11:30AM 05-Dec-2020

Researchers Investigate How a Stressed Brain Can Make Asthma Worse

Researchers at the University of Wisconsin–Madison are investigating cross-talk between the brain and lungs of people with asthma in a four-year, $2.5 million study to understand how psychological stress can make asthma symptoms worse.

Through a clinical study called AsthMatic Inflammation and Neurocircuitry Activation, or MINA, **the team hopes to decipher exactly how mind and body connect when people with asthma experience stress and find ways to alter brain-lung communication to help them manage their disease.**

Experts say that asthma patients facing cold weather can cut their chances of an asthma attack if they wear a scarf over their nose and mouth.

Breathing in cold, damp air can make the airways tighten and trigger an attack in three out of four people, charity Asthma UK says. This can leave people coughing, wheezing and gasping for breath.

"…cold weather is impossible to avoid over winter, but if people have asthma, simply wrapping a scarf around their nose and mouth can warm up the air before they breathe it in, reducing their risk of having an asthma attack," experts say.

UK asthma death rates among the worst in Europe

Britain's asthma death rate is now among the worst in Europe with a 20 per cent rise in deaths in five years, research shows.

Experts said a lack of basic checks was leading to hundreds of deaths in Britain, two in three of which could have been prevented with the right care.

The analysis shows the UK rates are the fourth worst in the European Union, with 1, 434 deaths a year.

The rate is almost 50 per cent higher than the EU average, with only Estonia, Spain and Cyprus faring worse.

Experts said Britain's figures were "truly shocking" and had deteriorated by 20 per cent in five years.

Asthma UK said their research found 65 per cent of people with the condition are not receiving the basic care they need, such as yearly review, checks to ensure they are using their inhaler properly and an asthma action plan.

Asthma kills and we are urging the NHS to invest in better frontline asthma services
Dr Samantha Walker, Asthma UK
In 2014, a national review found that two thirds of asthma deaths – and nine in ten of those involving children – could have been prevented with the right care.

Data from 15 randomized trials show that while long-acting muscarinic antagonists reduced exacerbation risk by a third, there was no significant improvement compared with long-acting beta-agonists.

No Significant Difference between LAMAs and LABAs in Treating Persistent Asthma

Life Threatening Asthma

Classification of Life-threatening Asthma

- Gradual deterioration over an extended period
  - often associated with an infection
- A mild attack that turns into a severe attack **(asphyxia asthma)**
  - often associated with an event or reaction
  - **can occur with any asthmatic!!!!!**

MILD/MODERATE

- SpO_2 >92%
- RR:
  <30 (over 5's)
  <40 (under 5's)
- No or minimal accessory muscle use
- Feeding well or talking in full sentences
- Wheeze (may only be audible with stethoscope)

SEVERE

- SpO_2 <92%
- PEFR 33-50% predicted
- RR:
  >30 (over 5's)
  >40 (under 5's)
- Too breathless to feed or talk
- HR:
  >125 (over 5's)
  >140 (under 5's)
- Use of accessory muscles
- Audible wheeze

LIFE THREATENING

- SpO_2 <92%
- PEFR <33% predicted
- Silent chest
- Poor respiratory effort
- Altered consciousness
- Agitation/confusion
- Exhaustion
- Cyanosis

Phenotypes of Acute Severe Asthma

	Gradual Onset	Sudden Onset
Course	Days	Hours-asphyxic
Incidence	10-33%	45-88%
Airway pathology	Mucus plugging	None
Inflammatory cell	Eosinophil	Neutrophil
Response to treatment	Slow	Quicker
Hospitalization course	Long	Short
Prevention	Possible	Underdetermined?

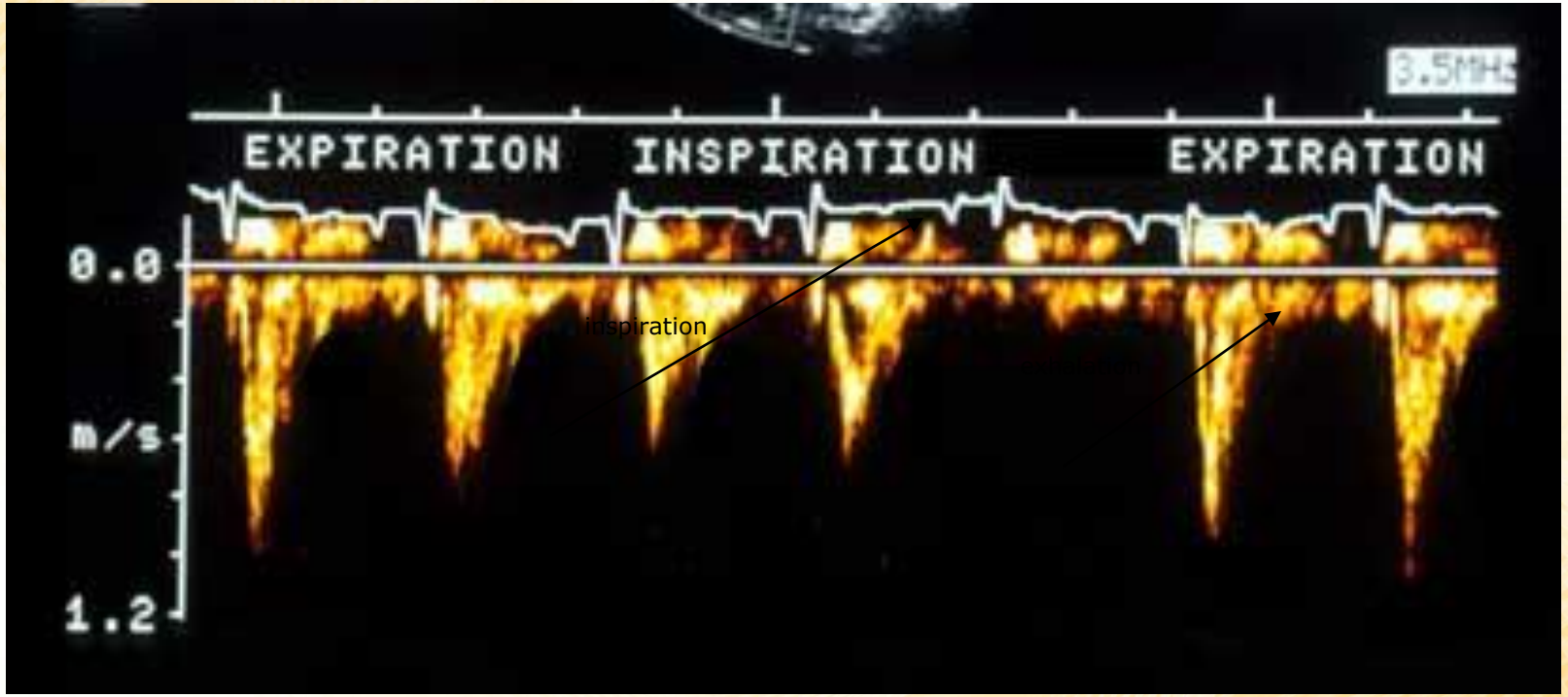
Important Considerations of Hospitalization vs. ICU Admission

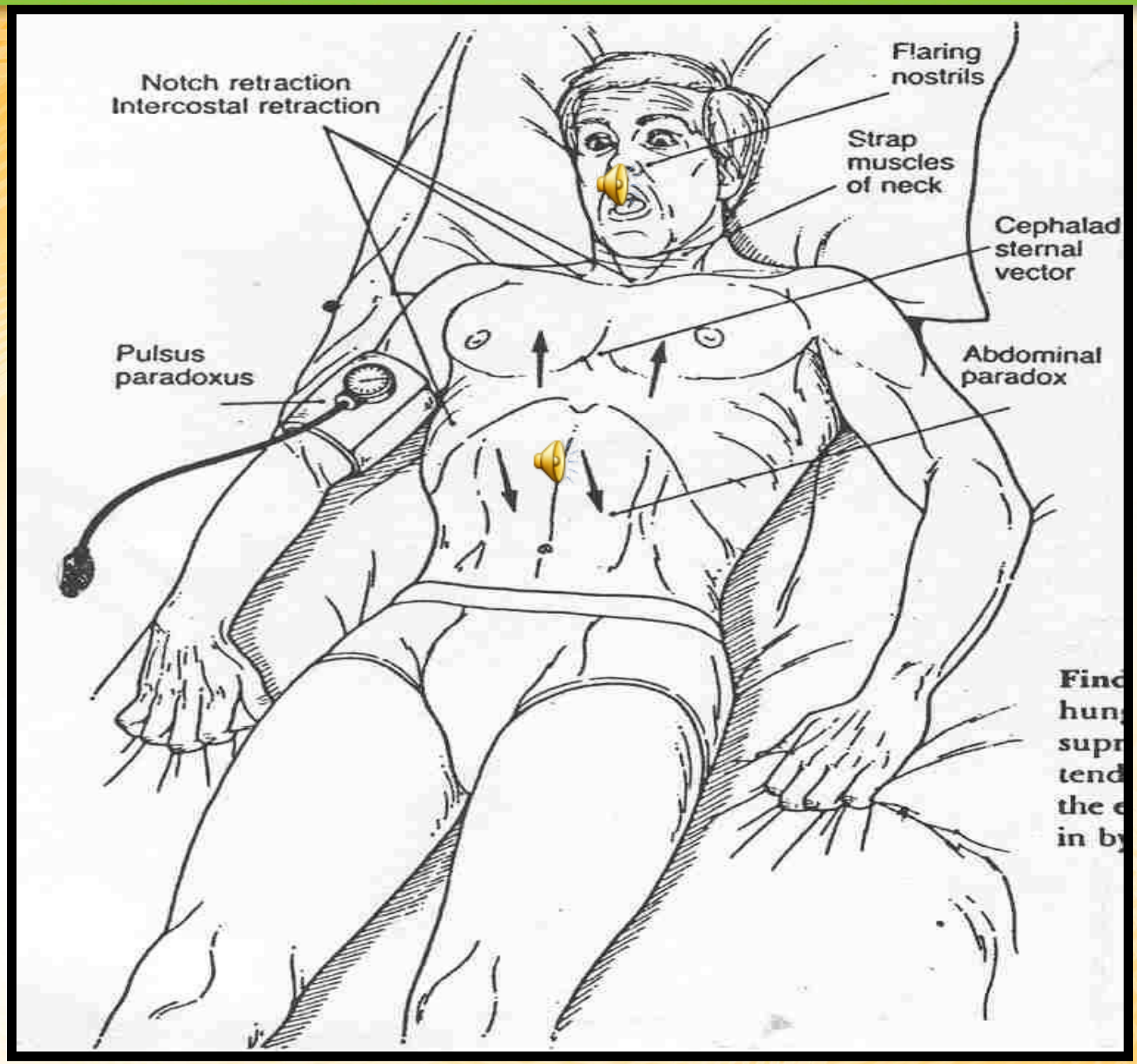
Hospitalization	ICU Admission
Duration and severity of symptoms	Drowsy or confused
Severity of airflow	Paradoxical thoraco-abdominial movement
Severity of prior exacerbations	Absence of wheezing
Medication utilization at time of exacerbation	Bradycardia
Access to medical care and medications	PEPR<25%
Presence of psychiatric illness	SpO2<90%
Home support and conditions	Pulsus paradoxus

Pulse Paradoxes

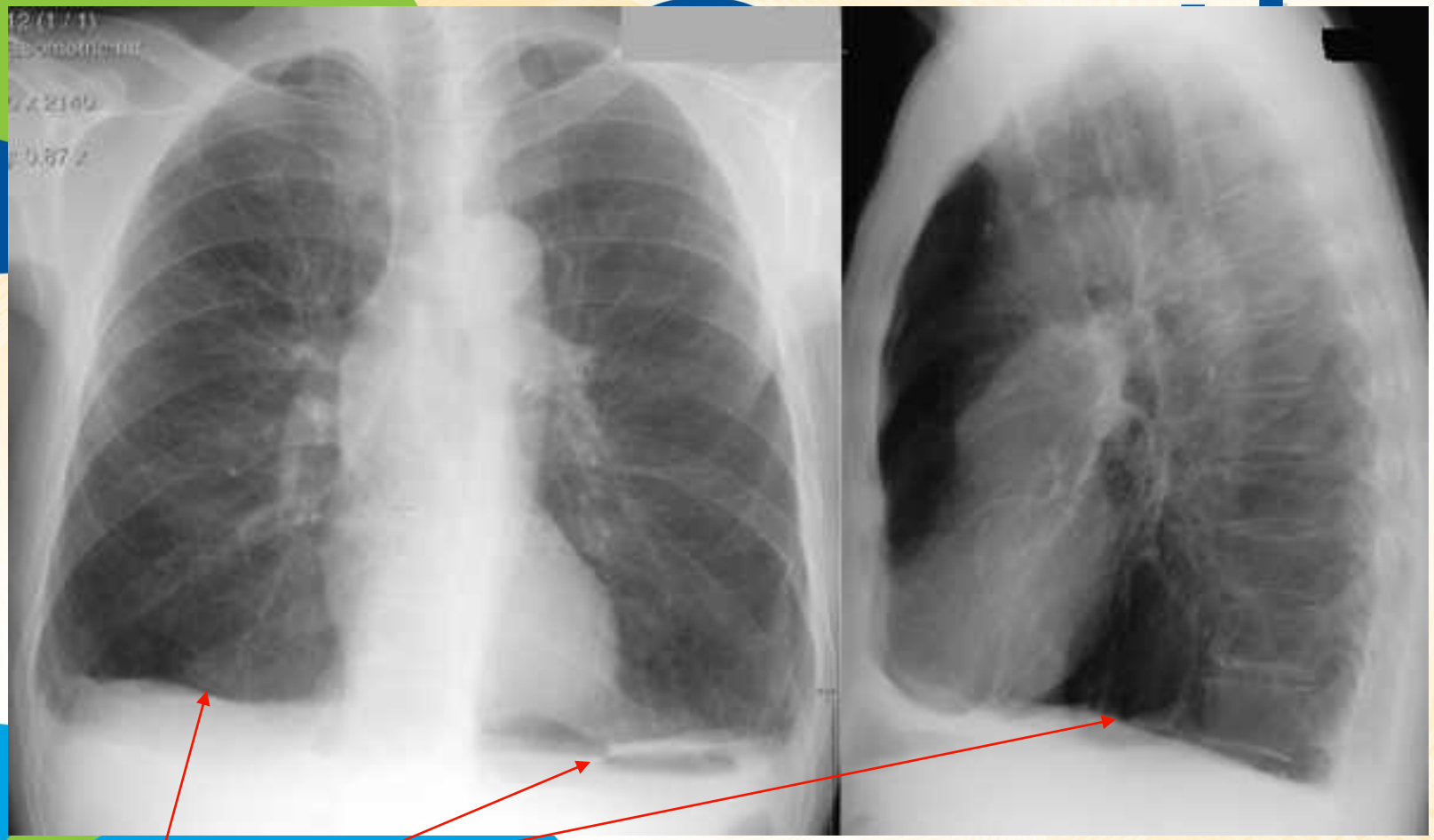
BP varies more than 10 mm/hg between inspiration and exhalation

Reflective of airway obstruction and air trapping



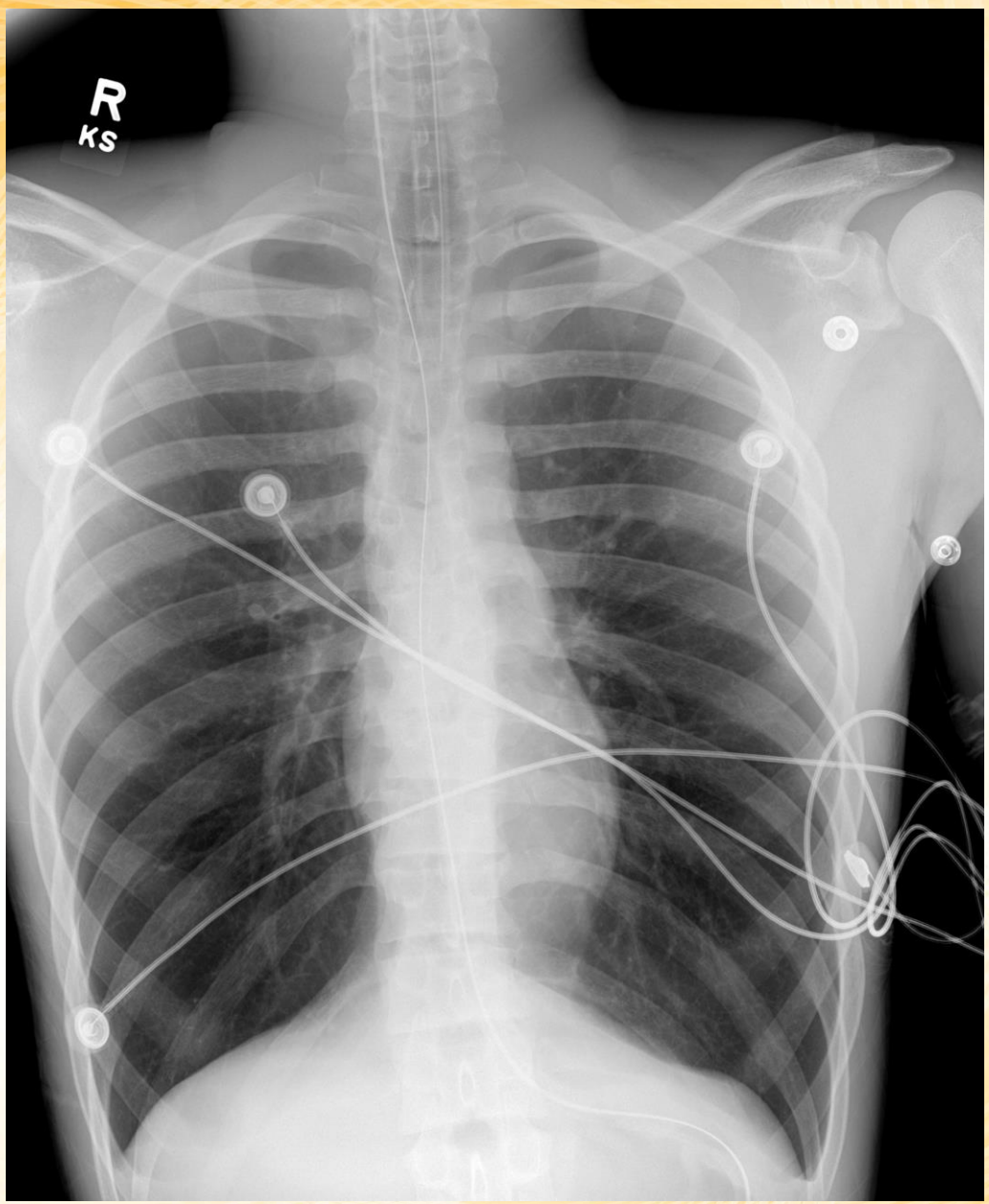

Notch retraction
Intercostal retraction
Flaring nostrils
Strap muscles of neck
Cephalad sternal vector
Pulsus paradoxus
Abdominal paradox

ns?

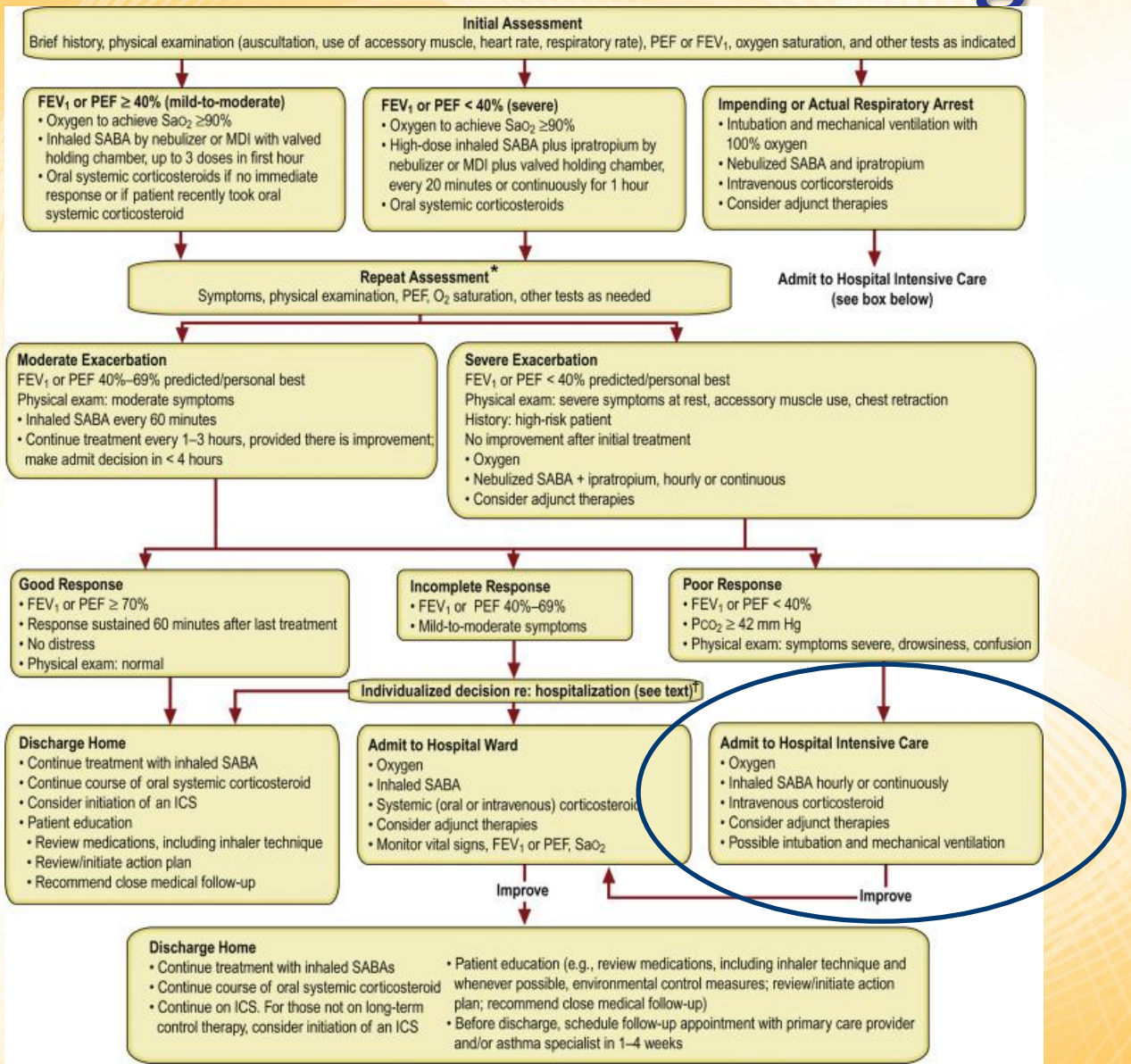


Flatten Diagrams

22 yr. old
Status



Treatment of Life-Threatening Asthma



Indications for Mechanical Ventilation In Asthma

- $PaCO_2$>40 mm Hg
- Refractory hypoxemia
  - PaO_2<60 on FIO_2>50%
- Mental status deterioration
- Loss of breath sounds
- Excessive accessory muscle work

Goal of Mechanical Ventilation

- Provide ***acceptable*** gas exchange while avoiding ***ventilator induced trauma*** secondary to hyper-inflation and baro-trauma

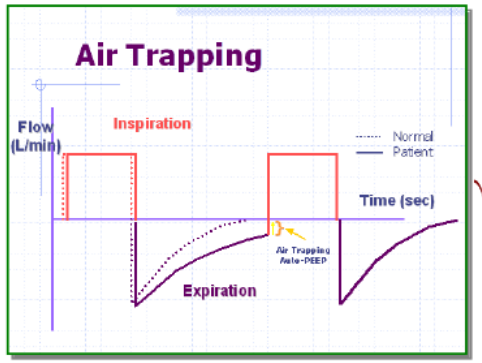
Ventilator Parameters

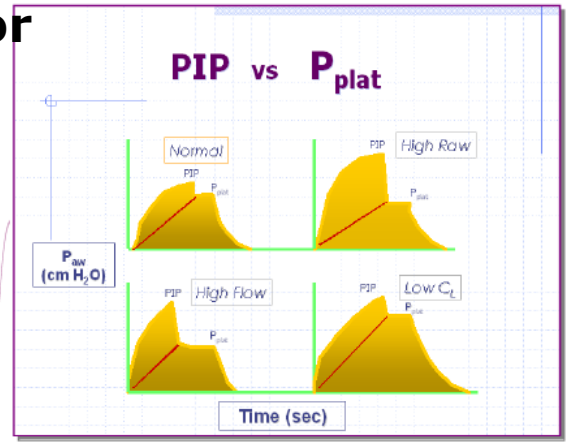
- Mode of ventilation
  - Volume targeted
- Tidal volume
  - 8-10cc/kg IBW
- PEEP
  - 6-12cm
  - To stent airways
  - Monitor PLT and auto-PEEP
- I/E ratio
  - 1:3-4
- Rate
  - ≤12

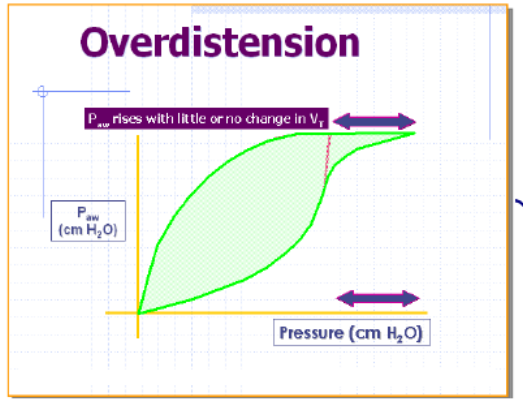
9/22/2021 12:00
pH: 7.18 (LL)
pCO2: 70 (HH)
pO2: 66 (L)
HCO3: 26
TCO2: 28
sO2: 92 (L)
Base Deficit: 4.2 (H)
O2, Therapy Mode: Unknown CMV 400 x22 6 PEEP
PLT 33
Blood Gas Comment: ET45cm

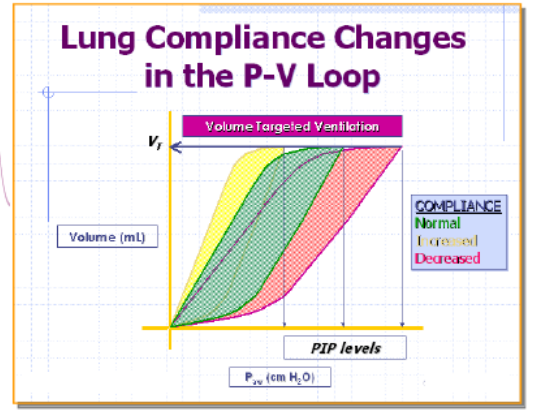
9/22/2021 14:27
pH: 7.27 (L)
pCO2: 50 (H)
pO2: 99
HCO3: 23
TCO2: 25
sO2: 99
Base Deficit: 4.4 (H)
O2, Therapy Mode: Unknown
Blood Gas Comment: ET32 CMV 500 x 12 PLT 22cm 10PEEP

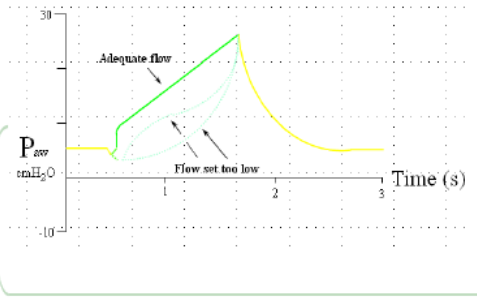
Using Ventilator Graphics





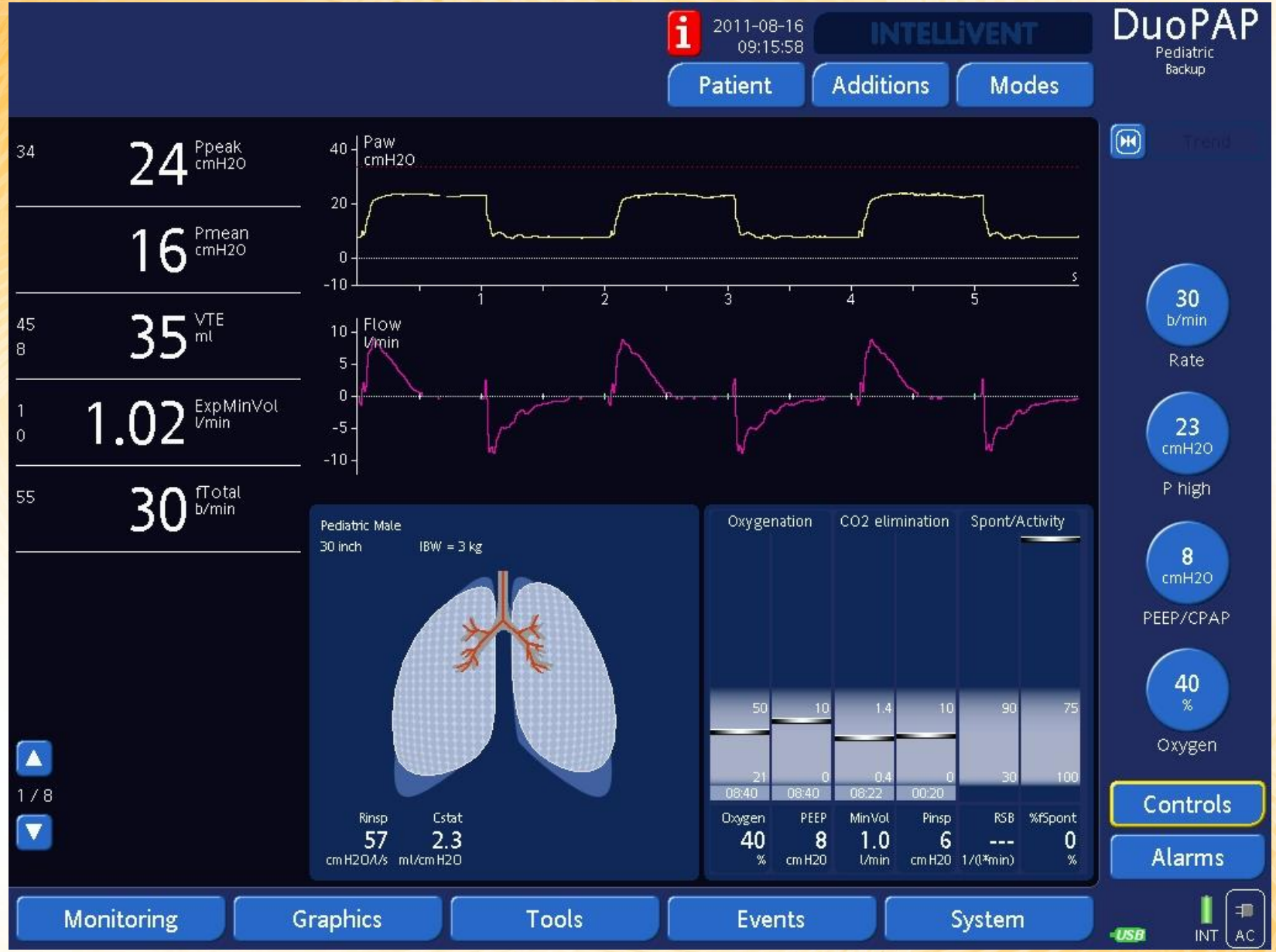







P CIRC
cmH2O
50
40
30
20
10
0
-10
0
2
4
INSP
V
L/min
EXP
40
30
20
10
0
10
20
30
40

Severe Bronchospasm with Air Trapping



Signs of airway obstruction

Auto-PEEP Measurements

- **Advantages**
  - trend values
  - est. of airway obstruction
  - easily performed
- **Disadvantages**
  - under-estimate
  - can lead to more air-trapping
  - ventilator limitations
  - incorrect interpretation

Auto-PEEP Measurements

Average P_{ALV} = +15

AutoPEEP (Static) = +10

AutoPEEP (Dynamic) =+5

Continuous Beta-agonist Therapy

Continuous nebulization with SABA, albuterol 10–25 mg per hour or 0.5–1 mg per kg per hour

Side Effects

- Tachycardia
- Hyperkalemia
- Tachyphylaxis
- Tremor (may be difficult to see in patient who is on a paralytic)

Alternative Interventions

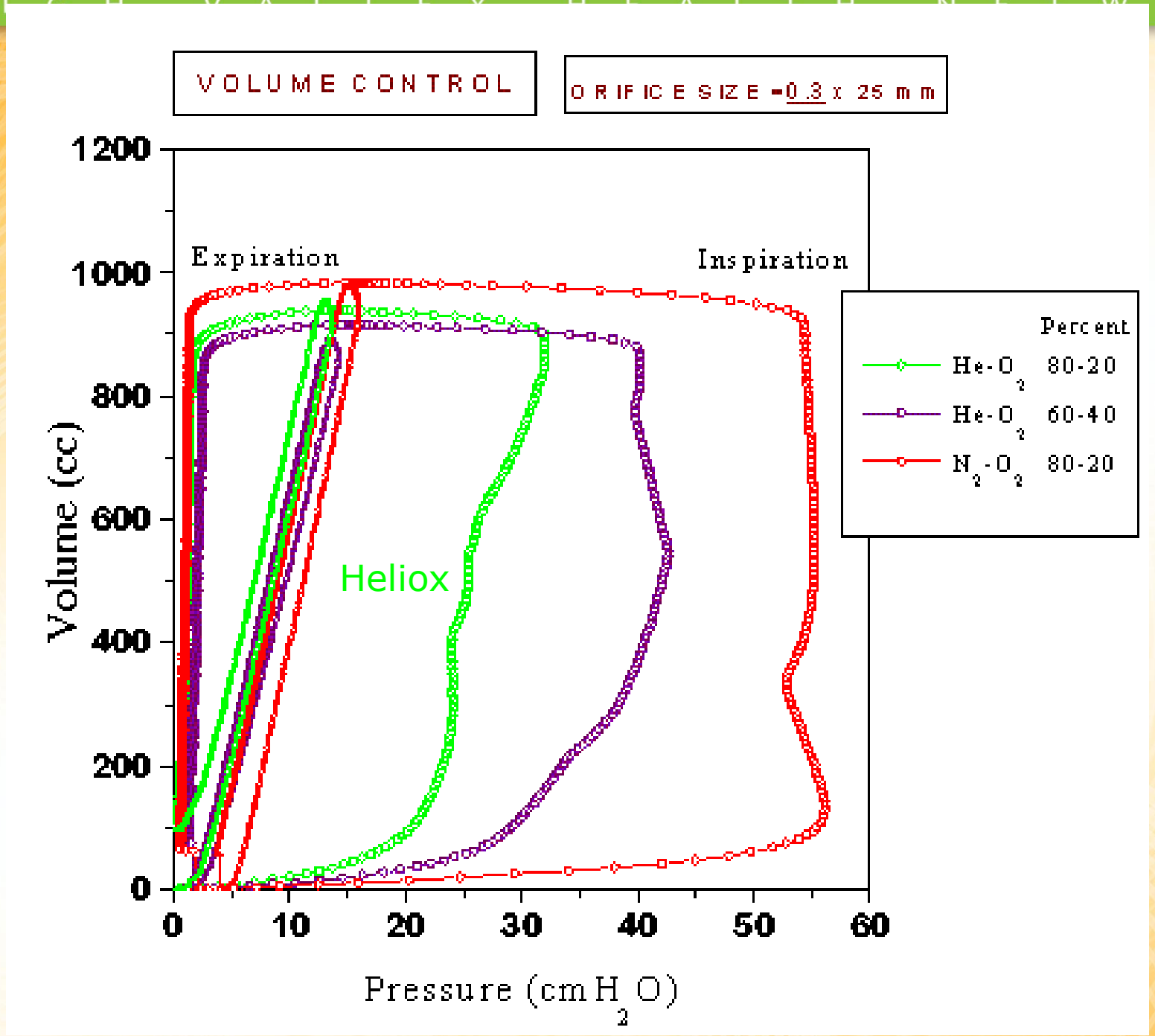
- Permissive hypercarbia
- Heliox
- V-V ECMO
- Magnesium Sulfate

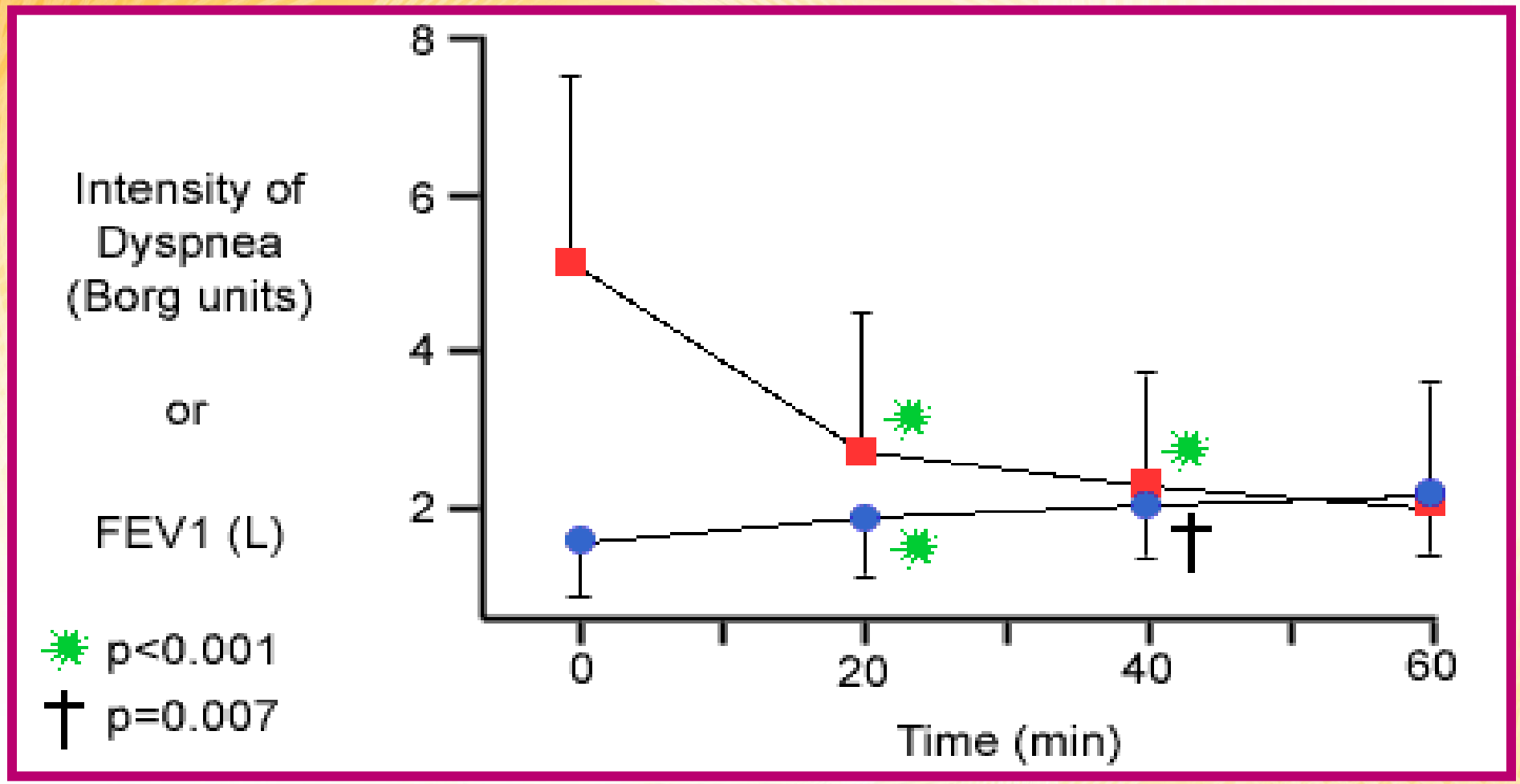
Permissive Hypercarbia

- Allow $PaCO_2$ to rise in order protect the lung for injury from high PIP/P_{LT}
- Maintain pH > 7.25
- Buffer pH with THAM or HCO_3
- May cause cardiac ischemia
- Not to be used in head injured patients

Heliox

- Lower density than oxygen
- Produces a lower Reynolds Number
- Clinical studies have demonstrated a reduced of WOB by 35%
- Decreases pulses paradoxes
- Reduction in $PaCO_2$
- ?reliable ventilator monitoring


VOLUME CONTROL
ORIFICE SIZE -0.3 x 25 mm
Expiration
Inspiration
Heliox
Percent
He-O2 80-20
He-O2 60-40
N2-O2 80-20
Volume (cc)
Pressure (cm H2O)
0
200
400
600
800
1000
1200
0
10
20
30
40
50
60


Intensity of Dyspnea (Borg units)
or
FEV1 (L)
p<0.001
† p=0.007
8
6
4
2
0
20
40
60
Time (min)

Pre Heliox

Raw

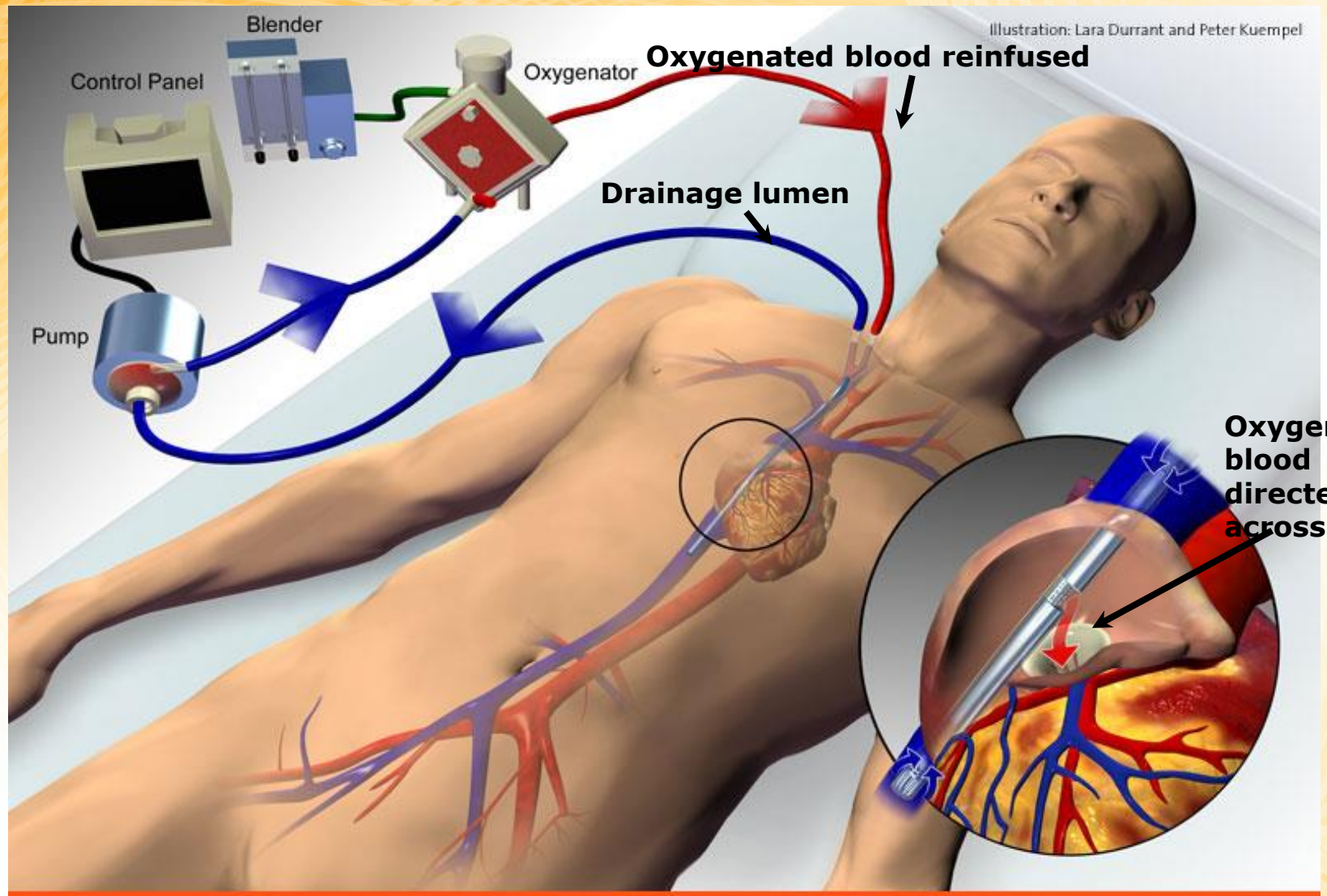
Settings P-CMV 38/12 I/E 1:3.3

Post heliox administration 70/30

V-V ECMO

- Utilized in severe situations often associated with mucus plugging
- Plt>35cm
- $PaCO_2$>90 and pH<7.20
- FIO_2>60%
- Ability to allow the lung to rest until bronchodilator/steroids/etc. reverse bronchospasm and inflammation

Dual Lumen Cannula for VV ECMO



Single-site approach to venovenous ECMO cannulation:
A dual-lumen cannula is inserted in the internal jugular vein (extending through the right atrium and into the inferior vena cava). Venous blood is withdrawn through one "drainage" lumen with ports in both the superior and inferior vena cava. Reinfusion of oxygenated blood occurs through the second lumen, with a port situated in the right atrium. Inset: The two ports of the "drainage" lumen are situated in the superior and inferior vena cavae, distant from the reinfusion port. The reinfusion port is positioned so that oxygenated blood is directed across the tricuspid valve and directly into the right ventricle. This arrangement significantly reduces recirculation of blood when the cannula is properly positioned.

ECMO Cannula

ECMO

- Allows the sweep to remove CO2
- Allows for oxygenation
- Allows for Heliox administration in hypoxemic patients
- Minimizes VILI

ECMO

- Associated with many hazards
- Typical duration: 3-5 days
- Quick ECMO and ventilator wean

THE UTILIZATION OF VENOUS-VENOUS EXTRACORPOREAL OXYGENATION MEMBRANE FOR THE MANAGEMENT OF STATUS ASTHMATICUS

KENNETH MILLER, MSRT, MED, RRT-ACCS, FAARC
JENNIFER STOWE DO
ALISON BEDEKOVICH MSN, RN

Introduction

- **Life threatening refractory asthma:**
  - Requires intubation and mechanical ventilation
  - Often presents with high level of arterial $PaCO_2$ which require both a high minute ventilation and airway pressures despite lung protective ventilation and the administration of Heliox gas mixture
  - Ventilator induced trauma (VILI) is common
  - Has a mortality rate of around eight percent

Intervention

- Another approach to meet gas exchange goals and to provide maximum lung protective is to place these patients on venous-venous extracorporeal oxygenation membrane (ECMO) support.
- The clinical rational for this management would be to protect the lung from any additional VILI and provide a stable level of ventilation and acid-base balance.
- Allows for other clinical interventions to be administered in a more systematic manner.

Methods

- During a two year time frame we placed six status asthmaticus patients with refractory gas exchange on V-V ECMO.
- Five of the six patients were management on V-V ECMO until the asthma exacerbation was stabilized and progressed to both ECMO and ventilator liberation.
- One patient expired secondary to multi-system organ failure unrelated to asthma.

Methods

- All patients were ventilated via pressure or volume target modes to achieve an exhaled tidal volume between 4-5cc/kg/IBW and PEEP was set via either a pressure/volume tool or via transpulmonary monitoring.
- ECMO parameters were set to achieve a SpO2>88% and a PH>7.25. There was no additional occurrences of additional VILI post ECMO intervention.
- All patients receive pharmacological paralytics, heliox, and continuous beta-agonist therapy for the first forty hours of mechanical ventilation and ECMO support.

ECMO Device

Transpulmonary Monitoring

Heliox Administration

P/V tool

Results

Patient #	Age/G	S/E	Vent Mode/settings	V-V ECMO LOS	ECMO settings	Ext time from decannulation	Heliox
1	51/M	S	PCMV 4cc/kg	7	100/ 5lpm	120 hrs.	Y
2	28/M	S	CMV 4cc/kg	8	100/9lpm	70 hrs.	Y
3	49/M	S	PCMV 5cc/kg	5	100/4.5lpm	42 hrs.	Y
4	31/F	E	CMV 5cc/kg	15	80/3lpm	NA	Y
5	18/M	S	CMV 4cc/kg	8	80/4 lpm	209 hrs	Y
6	31/F	S	PCMV 4cc/kg/IBW	9	100/1.5lpm	42 hrs	Y

All received continuous Proventil
PEEP settings were guided by transpulmonaryE -2 to 2 cm
PEEP range 10-16cm
Patient 4 and 5 developed barotrauma prior to cannulation

Conclusion

- Based on our clinical experiences
  - V-V ECMO along with lung protective ventilation can provide a safe management of the status asthmaticus with refractory gas exchange.
  - Lower minute ventilation and airway pressures can be achieved minimizing the risk of VILI.

Conclusion

- Asthma can be life threatening
- Asthma mortality is increasing
- Invention must be quick
- Have lots of weapons in your treatment arsenal
- Despite all our interventions Asthma deaths continues to rise

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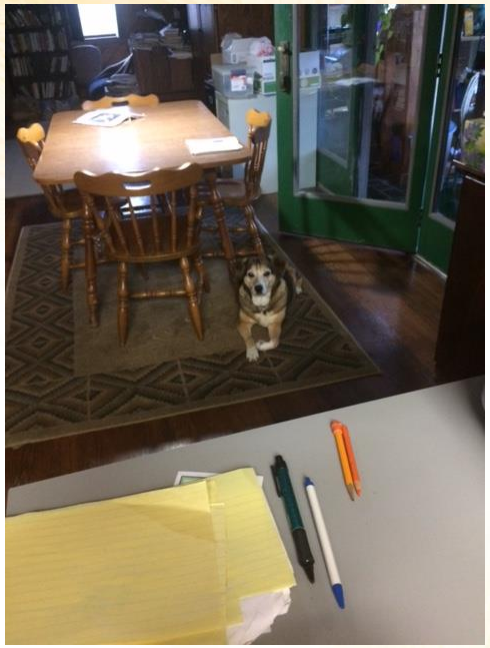
QUESTIONS!



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