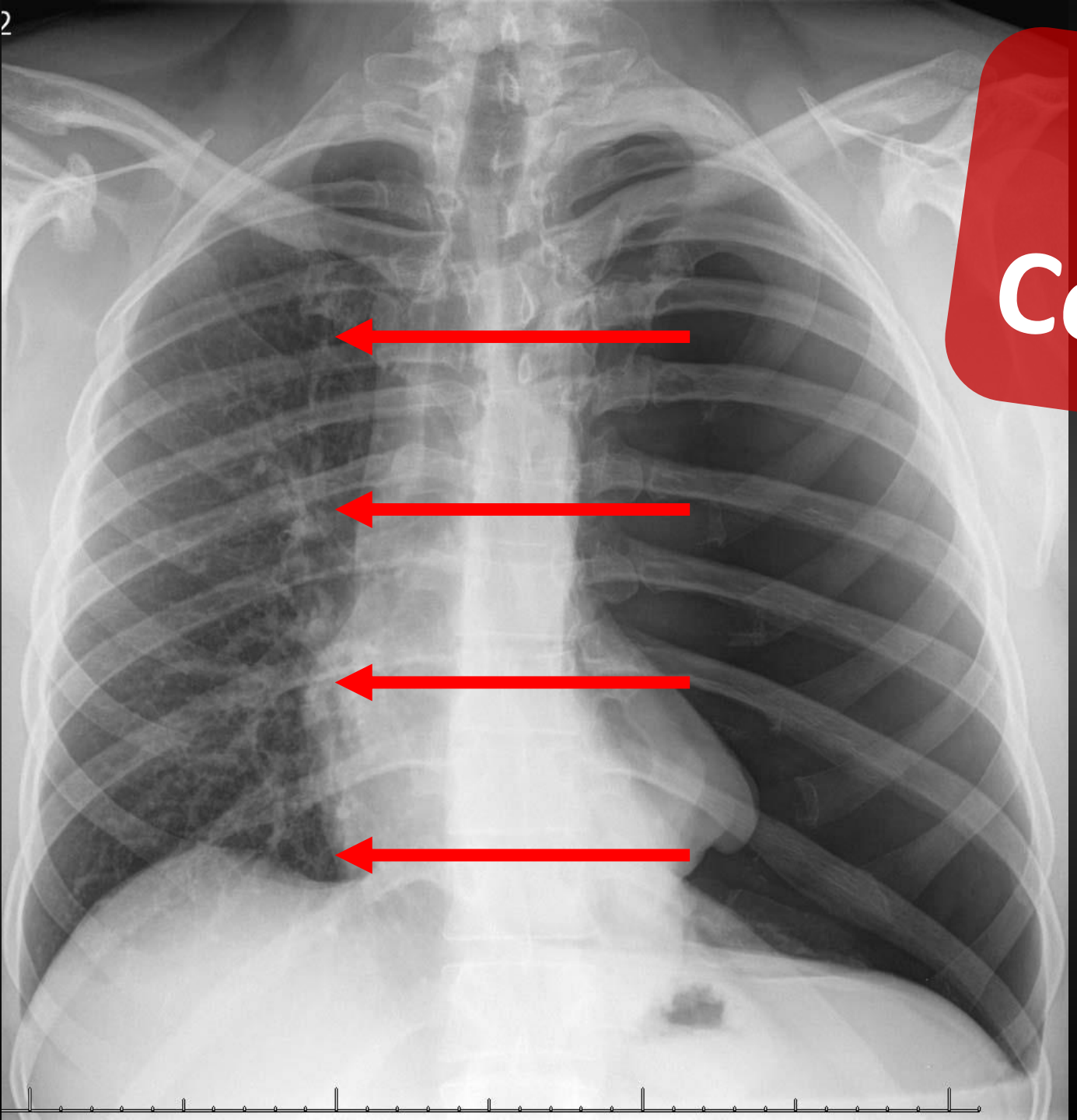
Patient Assessment, Contraindication, Complication, and Critical Care in HBO

Yoon-Seop Kim, MD

Department of Emergency Medicine

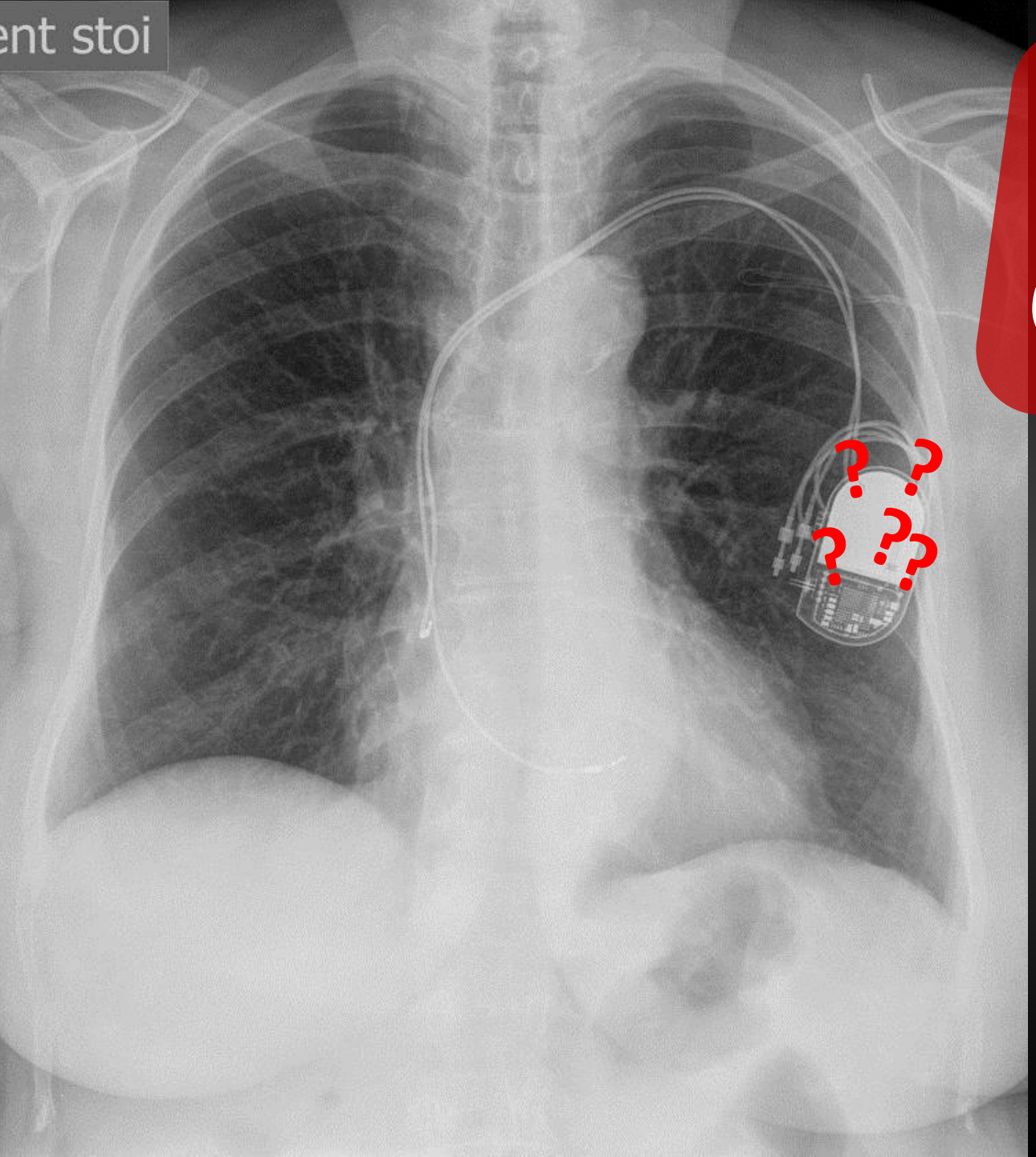
Yonsei University Wonju College of Medicine

Contraindications for HBO



Absolute Contraindications

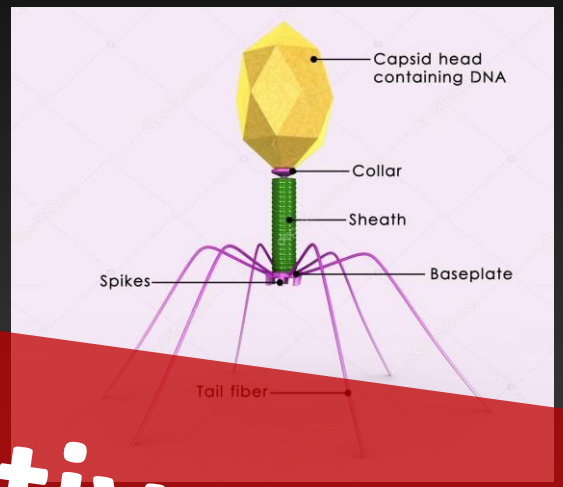
Untreated Pneumothorax



Absolute (?) Contraindications

Untested Pacemaker

Specific Medications



URI
Sinus infection

Relative Contraindications

Epilepsy

Uncontrolled fever

Absolute CIx

- ✓ **Untreated pneumothorax**
- ✓ Untested pacemaker
  (or other medical devices)

Relative CIx

- ✓ Epilepsy
- ✓ Specific medications
  (doxorubicin, bleomycin, …)
- ✓ Uncontrolled fever
- ✓ URI or sinus infection
- ✓ Claustrophobia

Assessment prior to HBO

Fundamental Things

Airway
Breathing
Circulation

Medical Information: Tailored Interrogation

- Chief complaint
- Past medical history
- Review of system
- Physical examination
- …

✓ ***Indication***

✓ ***Contraindication***

: absolute/relative

✓ ***Preparation for the urgency***

Past Medical History

Medical devices
- pacemaker, ICD, insulin pump, …

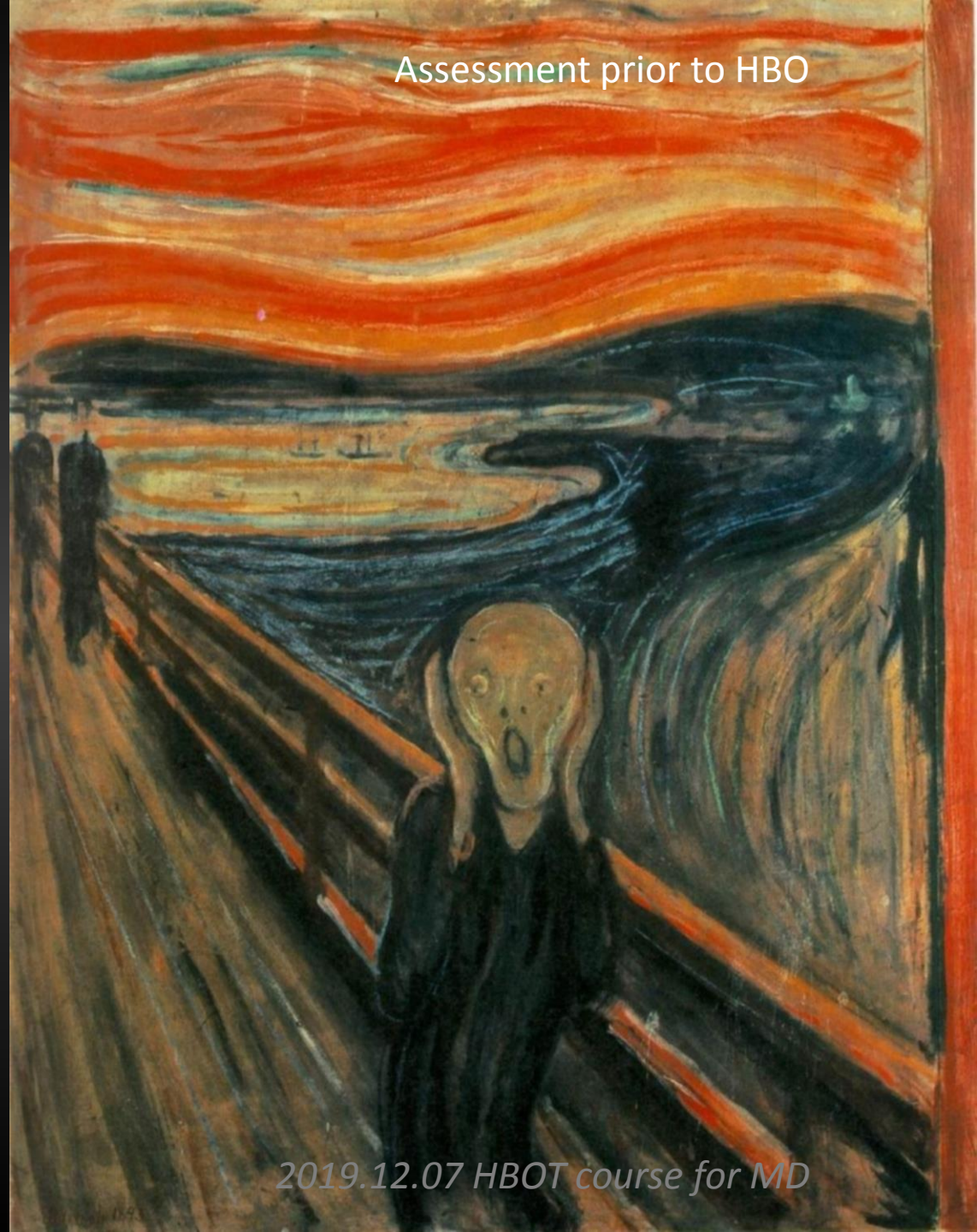
Cardiovascular disease
- heart failure, coronary artery disease, …

Pulmonary disease
- COPD, asthma, pneumothorax, …

Psychiatric disease
- anxiety disorder, psychotic disorder, …

Ophthalmologic disease
- glaucoma, …

Infectious disease
- contagious, multidrug resistant



Medical Information
Vital signs
Chest radiography

HBO

or

Not

SAFETY

- ✓ ***Protocol*** ***(Pressure, Time)***
- ✓ ***Mono vs. multi***
- ✓ ***Inside attendant***
- ✓ ***Preparation***

Complications of HBO

Complications of HBO

Barotrauma *ear, sinus, pulmonary*

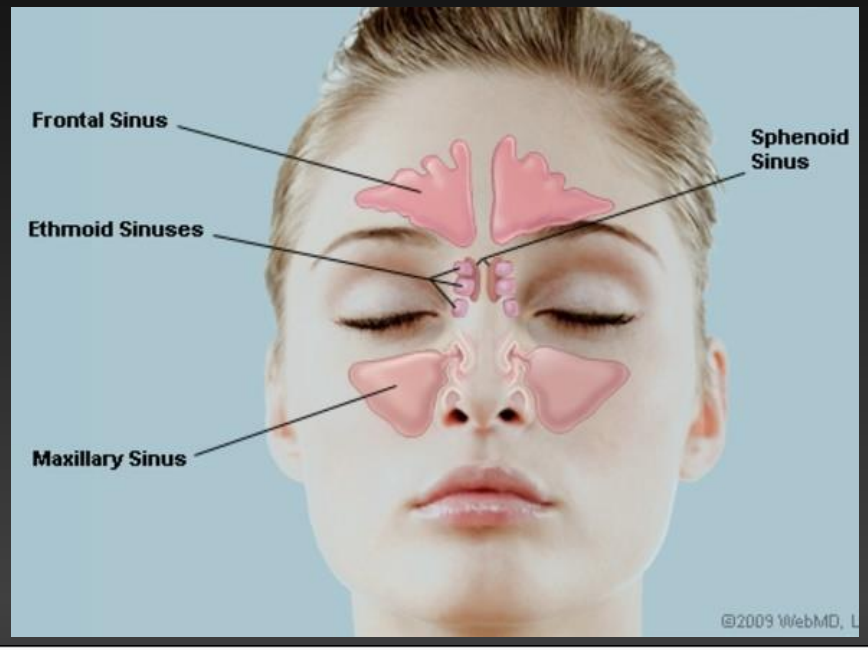
Oxygen Toxicity *CNS, pulmonary, ocular*

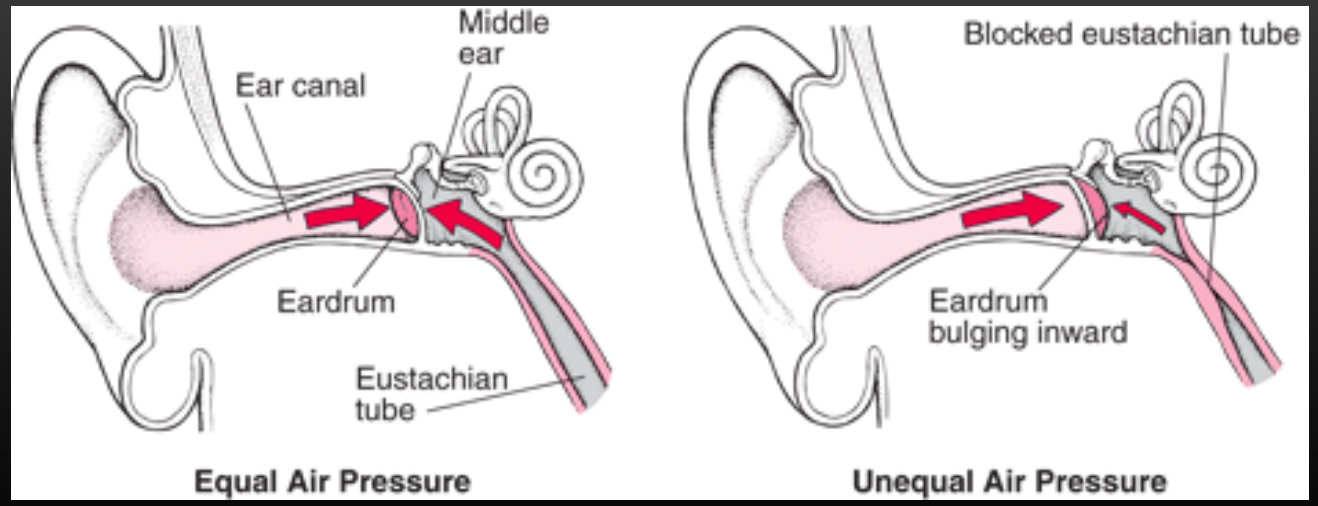
Hypoglycemia

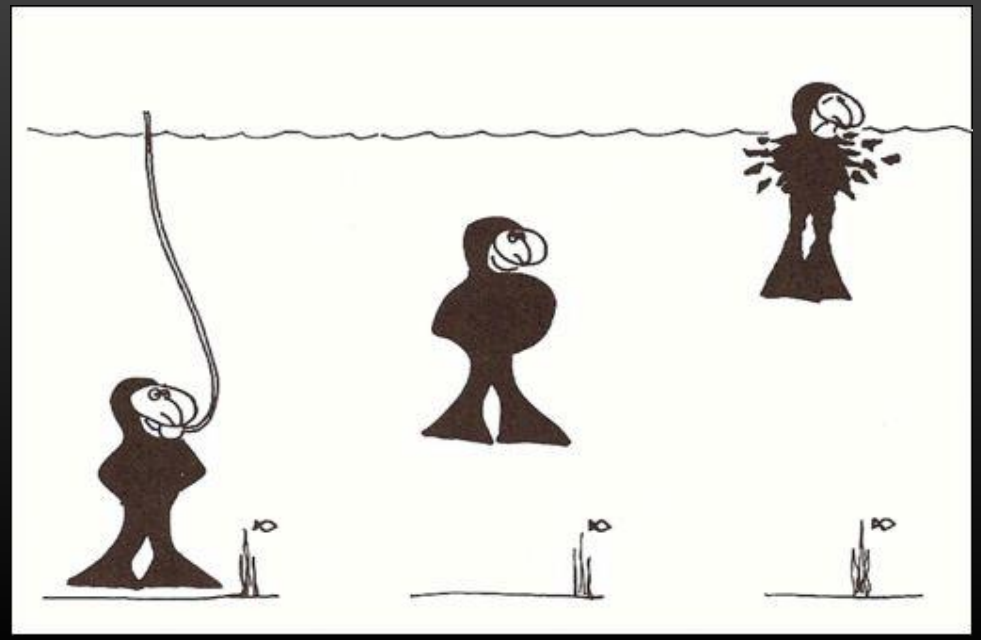
Confinement Anxiety

Barotrauma *ear, sinus, pulmonary*

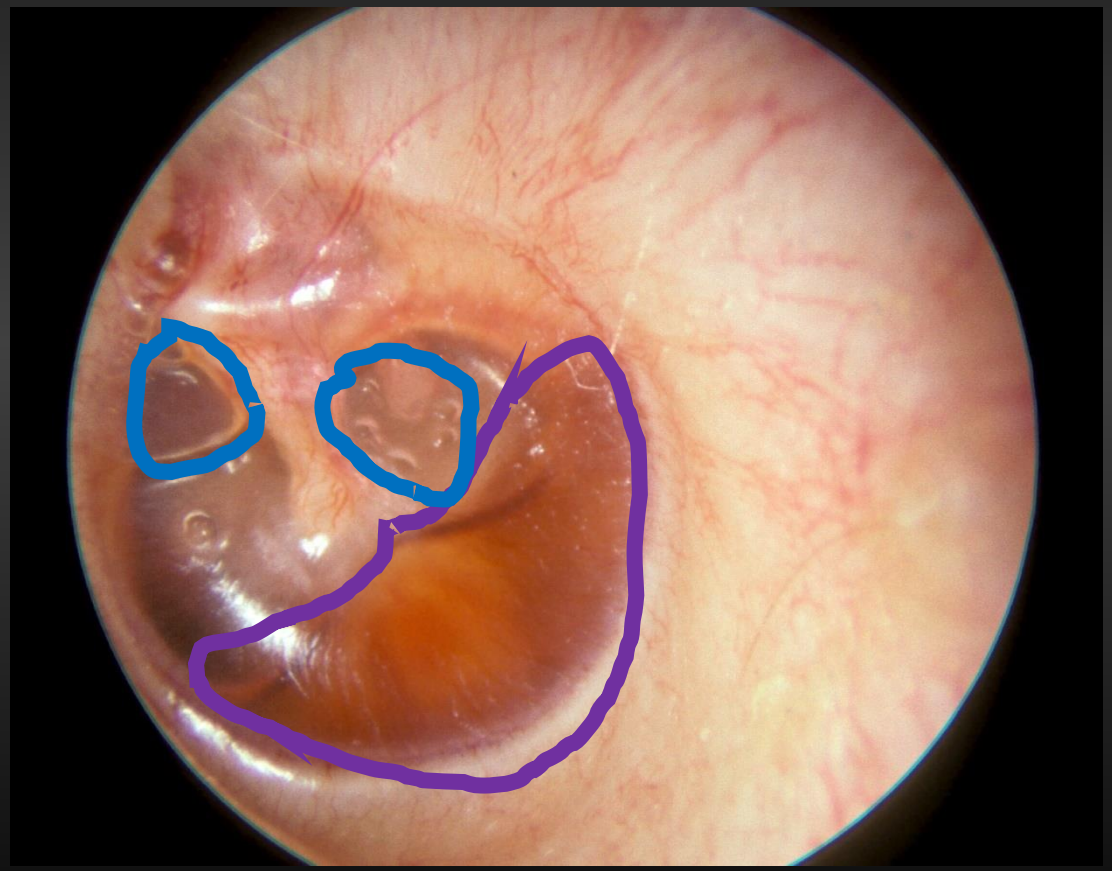
Most Common!







Barotrauma: Middle ear

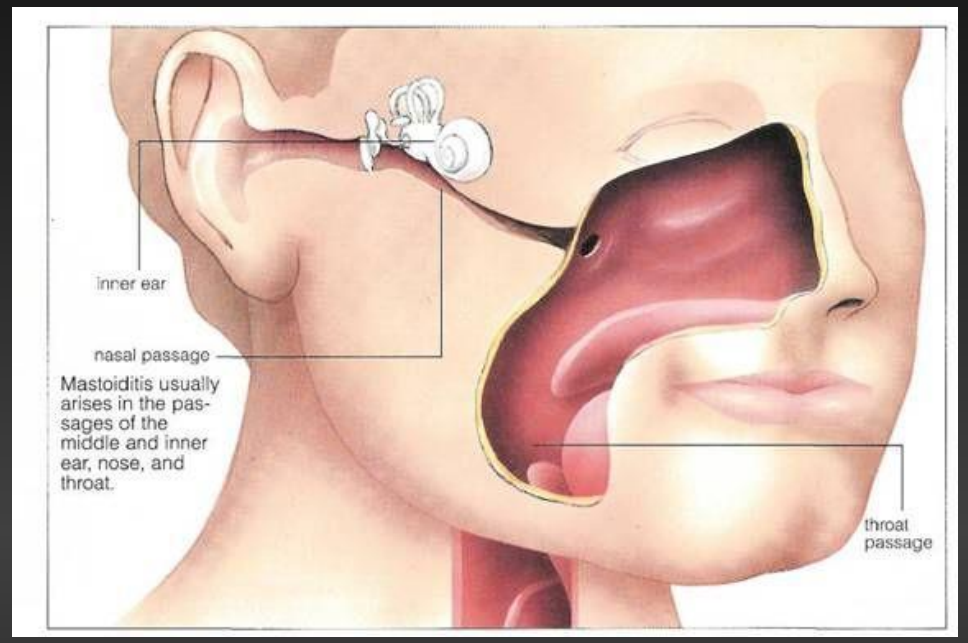


Tympanic Membrane

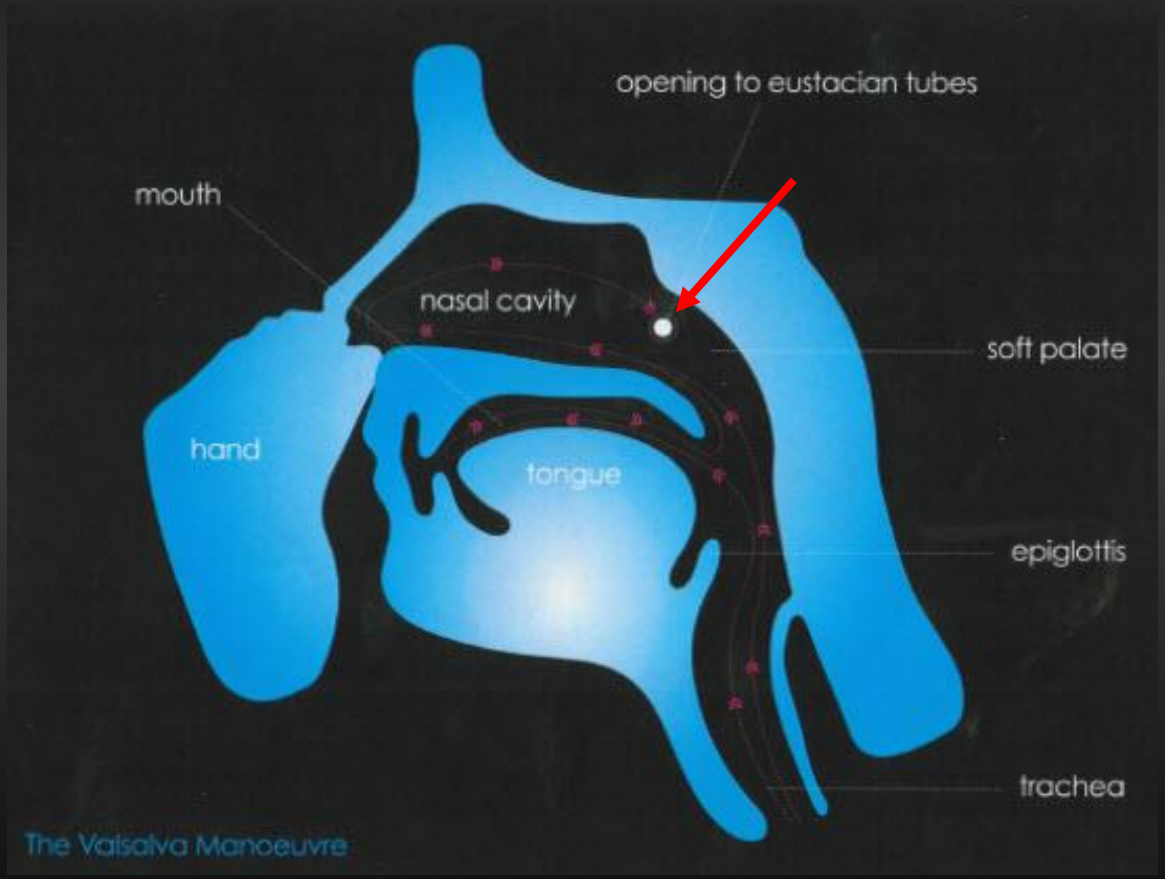
Barotrauma: Middle ear

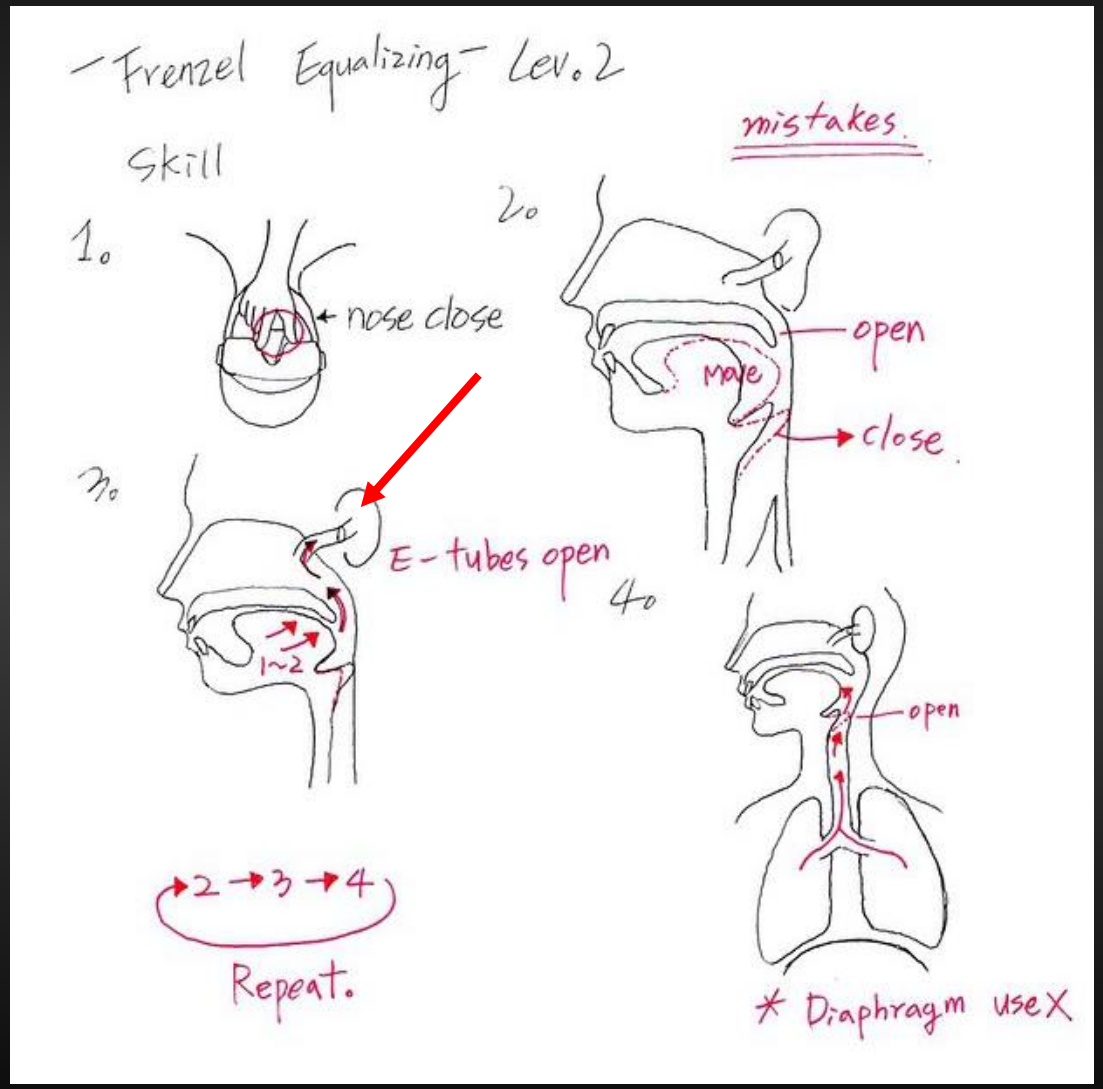
How to prevent?

- Pressure Equalizing
- Avoid patients with URI
- Decongestants, Anti-histamine



Barotrauma: Pressure equalizing

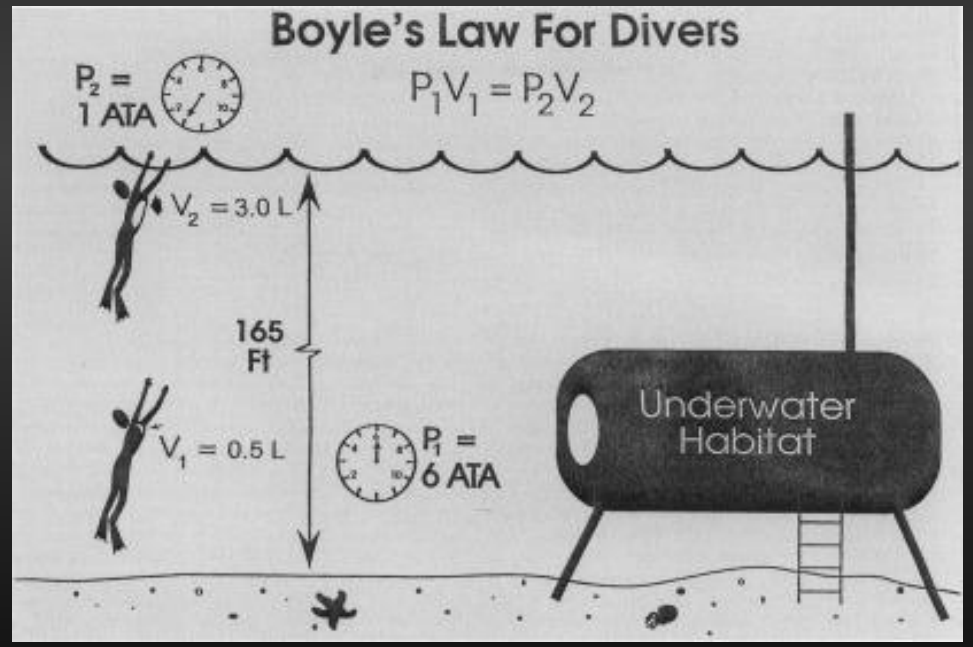


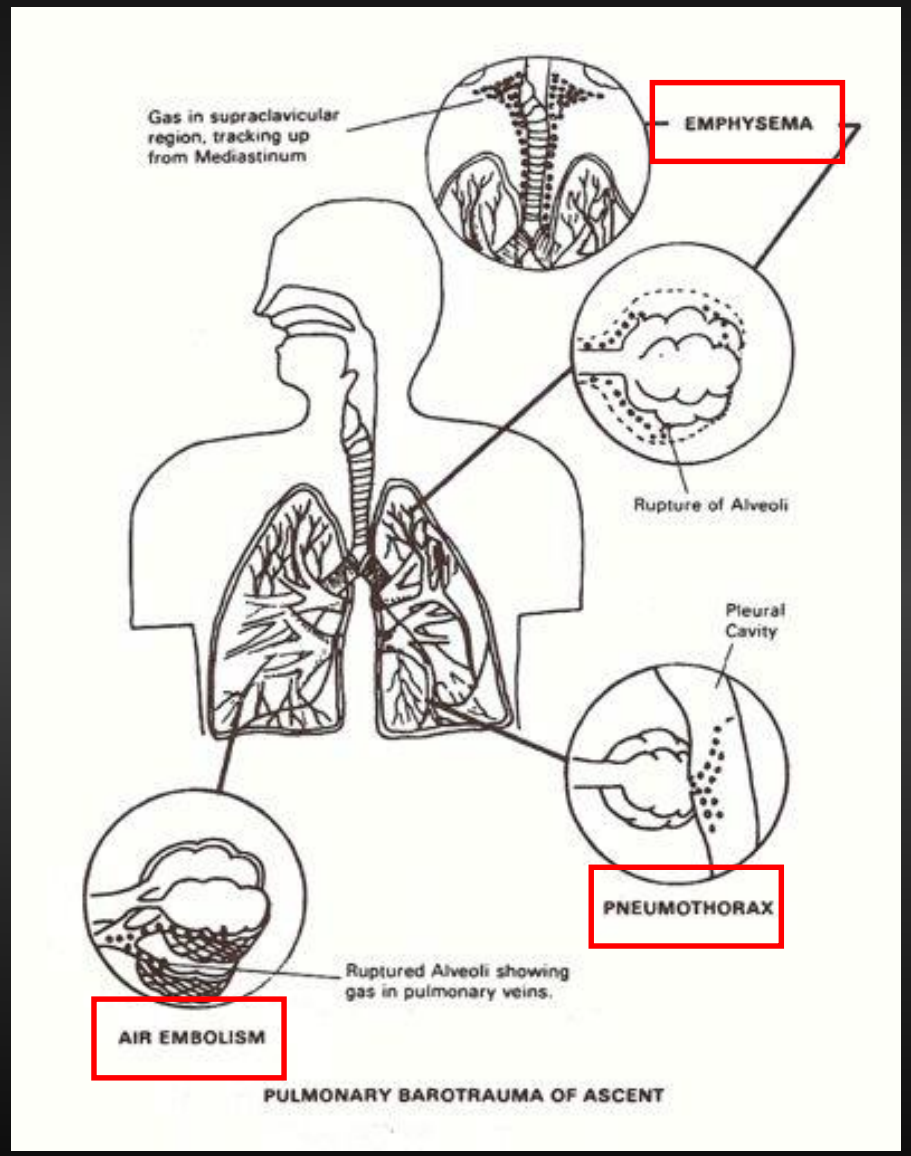


Barotrauma: Pulmonary system

Boyle's Law

- $P_1V_1 = P_2V_2$





(Tension) Pneumothorax

Needle decompression

or

Thoracostomy

Air Embolism

HBO_2

Barotrauma *ear, sinus, pulmonary*

Oxygen Toxicity *CNS, pulmonary, ocular*

Hypoglycemia

Confinement Anxiety

Oxygen Toxicity: CNS effects

- ***Seizure***
- *Nausea*
- *Twitching: lip, cheek, face, …*
- *Syncope*
- *Sweating*
- *Facial pallor*
- *…*

TABLE 3. FACTORS THAT MODIFY RATE OF DEVELOPMENT OF OXYGEN POISONING

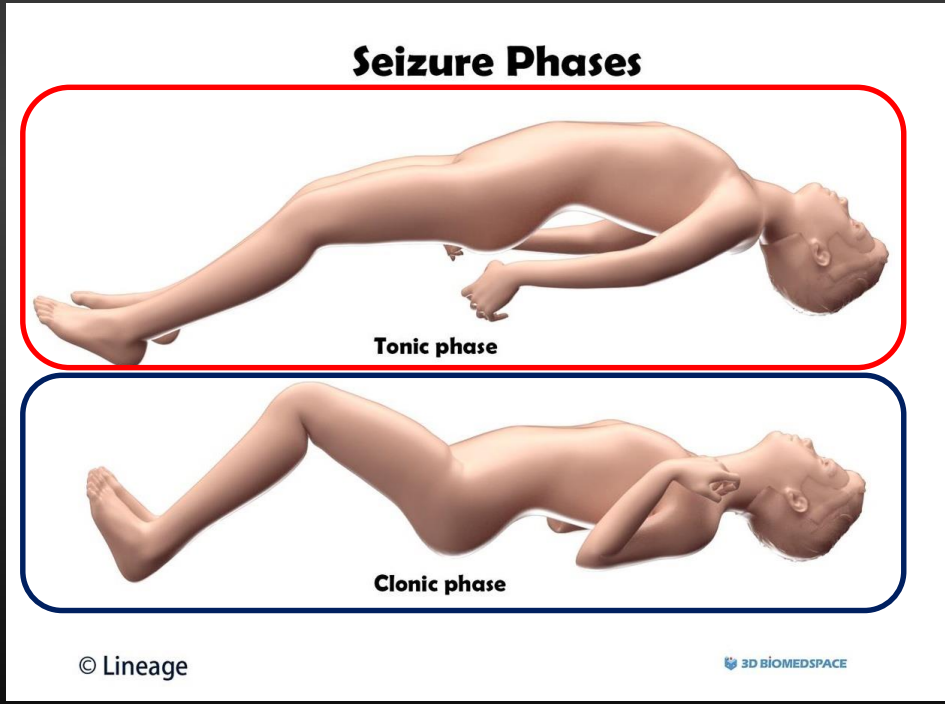
HASTEN ONSET OR INCREASE SEVERITY	DELAY ONSET OR DECREASE SEVERITY
Adrenocortical hormones	Acclimatization to hypoxia
CO_2	Adrenergic blocking drugs
Dextroamphetamine	Antioxidants
Epinephrine	Caffeine (low-dose)
Hyperthermia	Chlorpromazine
Insulin	Gamma-aminobutryic acid
Norepinephrine	Ganglionic blocking drugs
Paraquat	Glutathione
Hyperthyroidism	Hypothyroidism
Vitamin E deficiency	Propranolol
	Reserpine
	Starvation
	Succinate
	Trisaminomethane
	Intermittent exposure*
	Disulfiram*
	Hypothermia*
	Vitamin E*

*Potentially useful as protective agents (Adapted from Clark and Lambertsen)[17-19]

Oxygen Toxicity: CNS effects

Management of oxygen-induced seizure

- Self-limited, but removal patients from the oxygen



Decompression
during **tonic phase**
↓
Rupture of the lung
↓
Arterial gas embolism

Tonic-clonic movements
+
Resume a normal breathing pattern
↓
Decompression !

Oxygen Toxicity: Pulmonary effects

Intratracheal, bronchial irritation

- **Sx:** substernal burning, chest tightness, cough, dyspnea

ARDS (Acute Respiratory Distress Syndrome)

- **Rare**
- Capillary endothelial damage

→ Pulmonary edema

→ Protein exudation

→ Progressive respiratory failure

Oxygen Toxicity: Ocular effects

Progressive myopia (근시)

- Risk factor: DM, elderly
- Almost reversible within 6wks of terminating HBOT

Cataracts (백내장)

- Aggravation of pre-existing cataracts

Hypoglycemia

Contributing factors

- Dietary intake
- Anti-diabetic regimen
- Physiologic response to HBO environment

Prevention: check serum glucose prior to HBOT

Confinement Anxiety

Variable incidence

- Type of the chambers
- Prior experience
- Inside attendants
- …

Management

- Education
- Anxiolytics

Critical Care for HBO

Critically Ill Patient

Mental deterioration

- Advanced airway
- Bagging
- Mechanical ventilator

Hemodynamic instability

- Isotonic fluid
- Vasopressor
- Inotropics

ICU

Candidates in detail…?

- **Acute CO poisoning:** severe, co-ingestion of other drugs
- **Cyanide poisoning**
- **Arterial gas embolism**

- **Gas gangrene**
- **Brain abscess**

Septic shock

Multiplace Chamber

High-pressure tolerable device

- Monitoring device: BP, HR, SpO2
- Mechanical ventilator
- Infusion pump

Inside attendant

- IV access
- Dosage control
- Basic MV care
- Endotracheal suction

Monoplace chamber

Conclusion

A-B-C

Absolute CIx

- Untreated pneumothorax
- Untested pacemaker, ICD
- Selected medication (CTx)

Complication

- Barotrauma: ear, sinus, pneumothorax
- Oxygen toxicity: CNS, pulmonary
- Hypoglycemia

Decompression
during **tonic phase**
↓
Rupture of the lung
↓
Arterial gas embolism

Tonic-clonic movements
+
Resume a normal breathing pattern
↓
Decompression !

THANK YOU

FOR

YOUR ATTENTION!