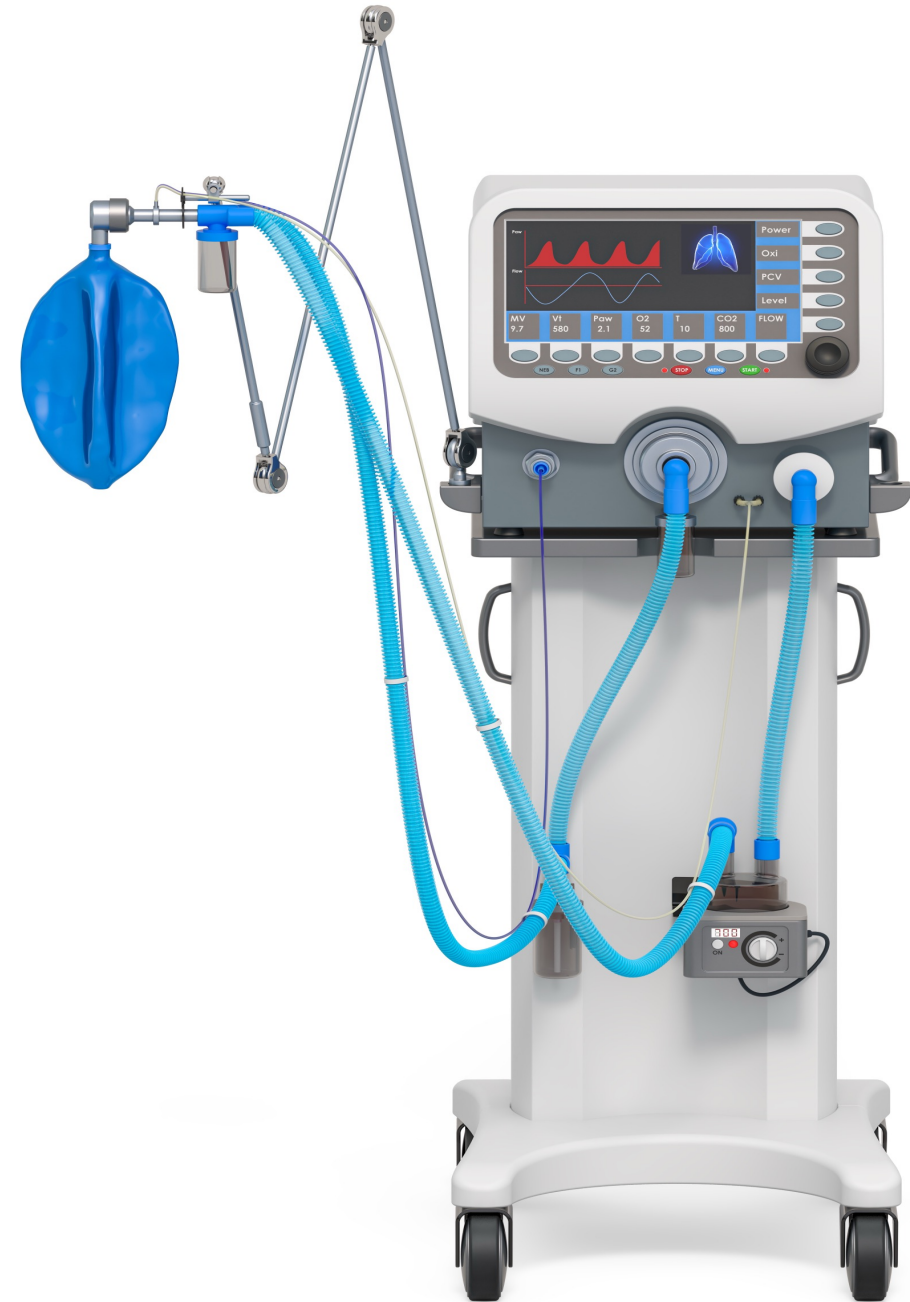


# VENTILATOR MANAGEMENT IN THE CRITICAL TRAUMA PATIENT



25M unknown PMH high speed rollover MCV

Initial BP 80/40 and GCS 14

Intubated in the ED for hypoxemia

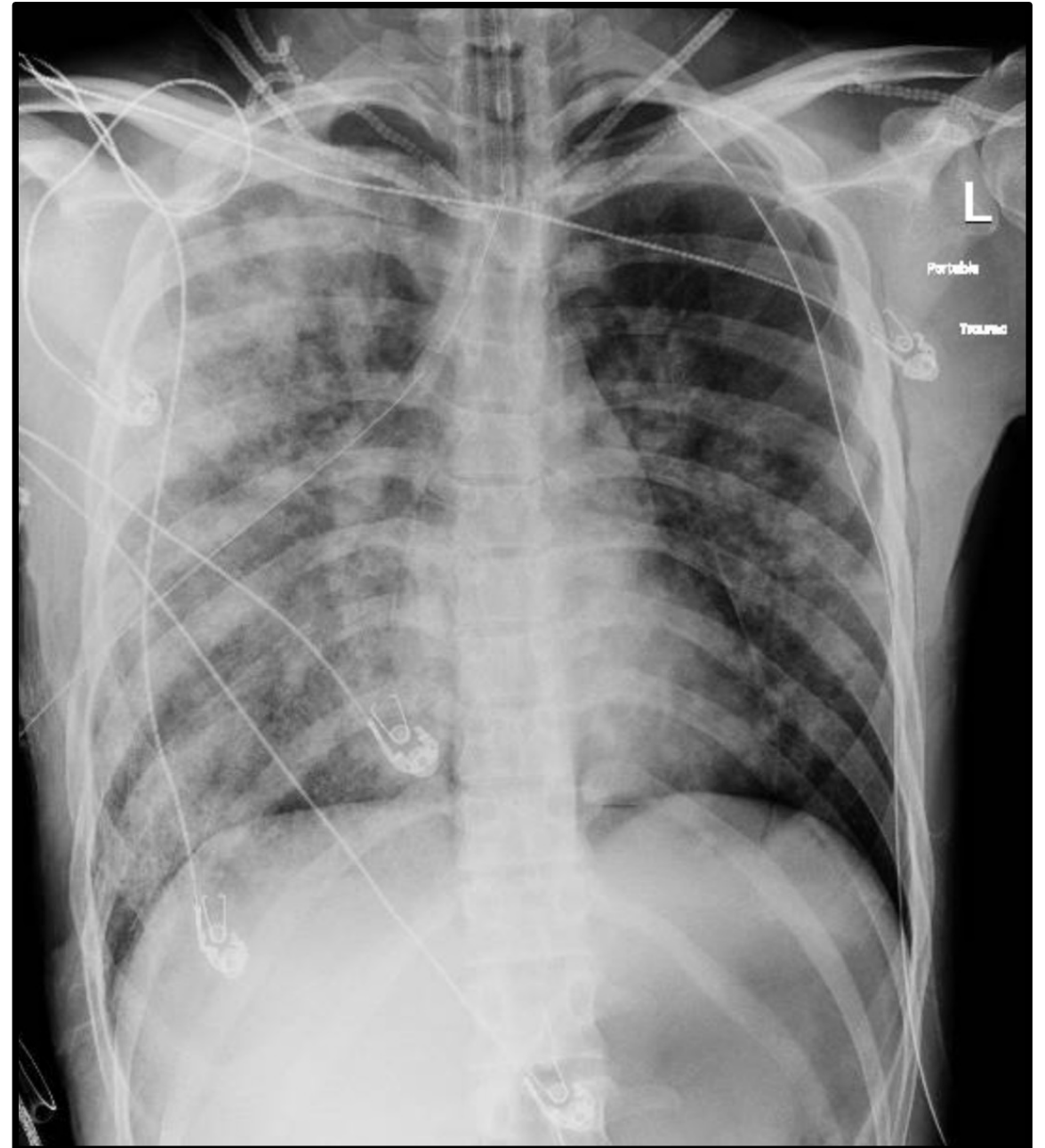
Small SAH, normal C-spine

Pulmonary contusions R>L

Hemoperitoneum with active extrav in pelvis

BP 90/42 after 4u pRBC

SpO<sub>2</sub> 72% on PEEP 10 + FiO<sub>2</sub> 100







#1

# READING THE TRAUMA VENT



# VENT READING

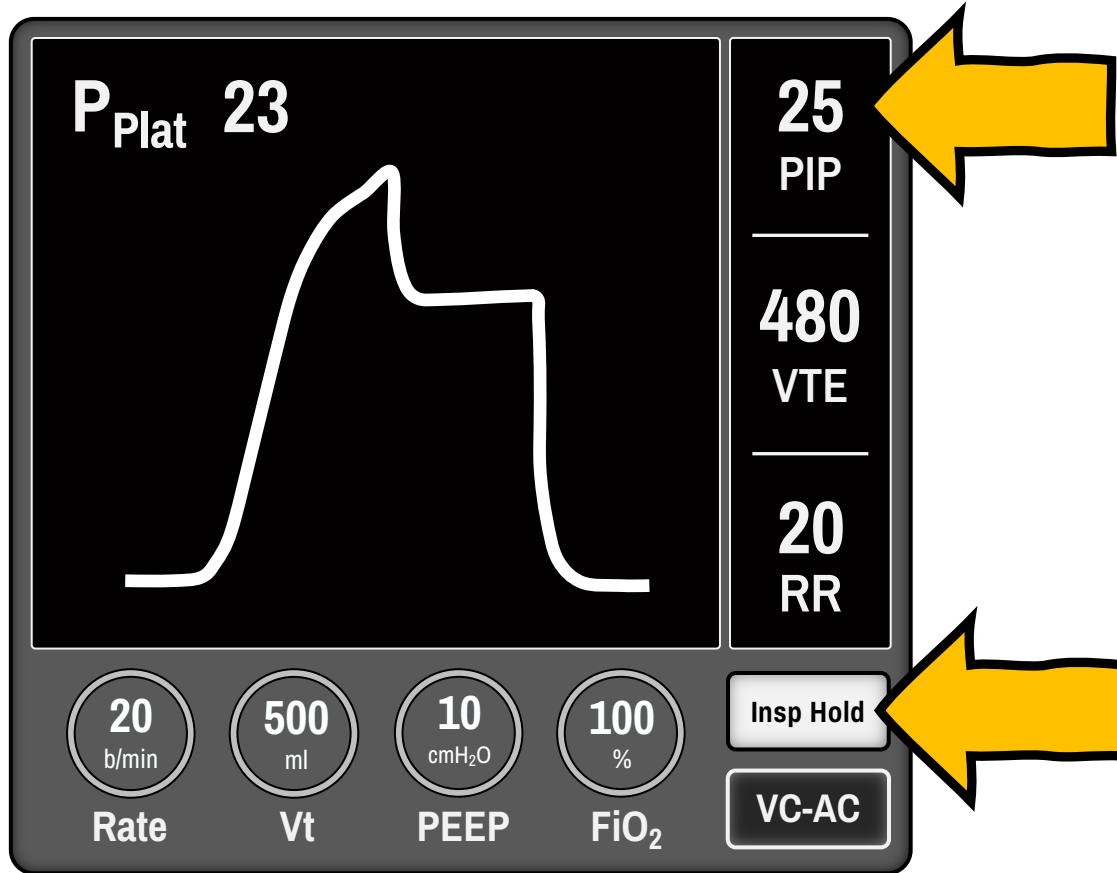
The image shows a ventilator control panel with a large black display screen on the left. To the right of the screen, three numerical values are displayed: 25 PIP, 480 VTE, and 20 RR. Below the screen, four circular dials represent target settings: Rate (20 b/min), Vt (500 ml), PEEP (10 cmH<sub>2</sub>O), and FiO<sub>2</sub> (100%). To the right of these dials are two buttons: 'Insp Hold' and 'VC-AC'. A red bracket on the right side of the panel groups the 25 PIP, 480 VTE, and 20 RR values under the text 'WHAT'S ACTUALLY HAPPENING'. A red bracket below the four dials groups them under the text 'WHAT YOU WANT TO HAPPEN'. A yellow arrow points from the right towards the 'VC-AC' button.

Parameter	Target (What you want to happen)	Actual (What's actually happening)
PIP	-	25
VTE	-	480
RR	-	20
Rate	20 b/min	-
Vt	500 ml	-
PEEP	10 cmH <sub>2</sub> O	-
FiO <sub>2</sub>	100 %	-

WHAT'S  
ACTUALLY  
HAPPENING

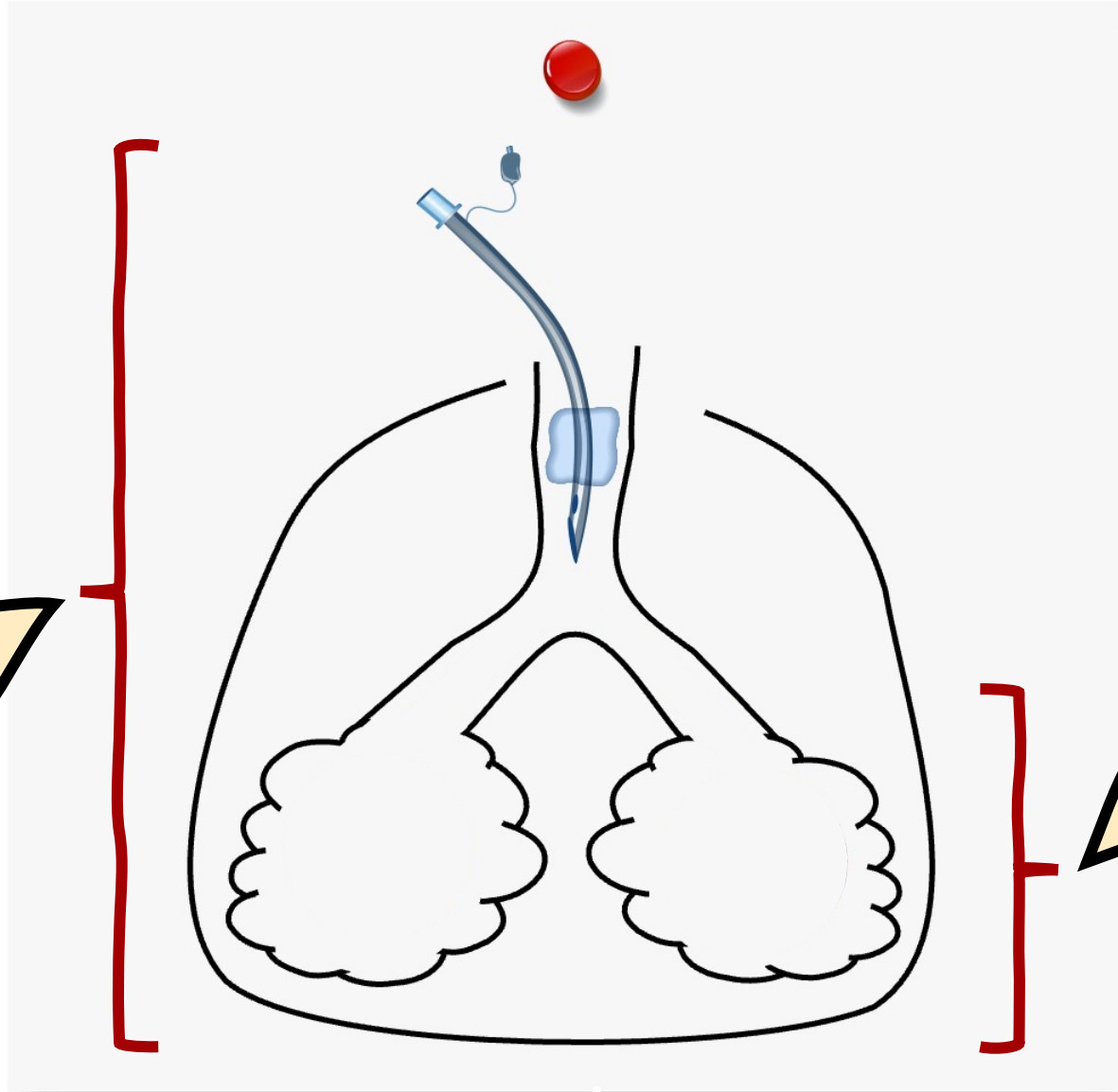
WHAT YOU WANT TO HAPPEN

# VENT READING



## PEAK PRESSURE (PIP)

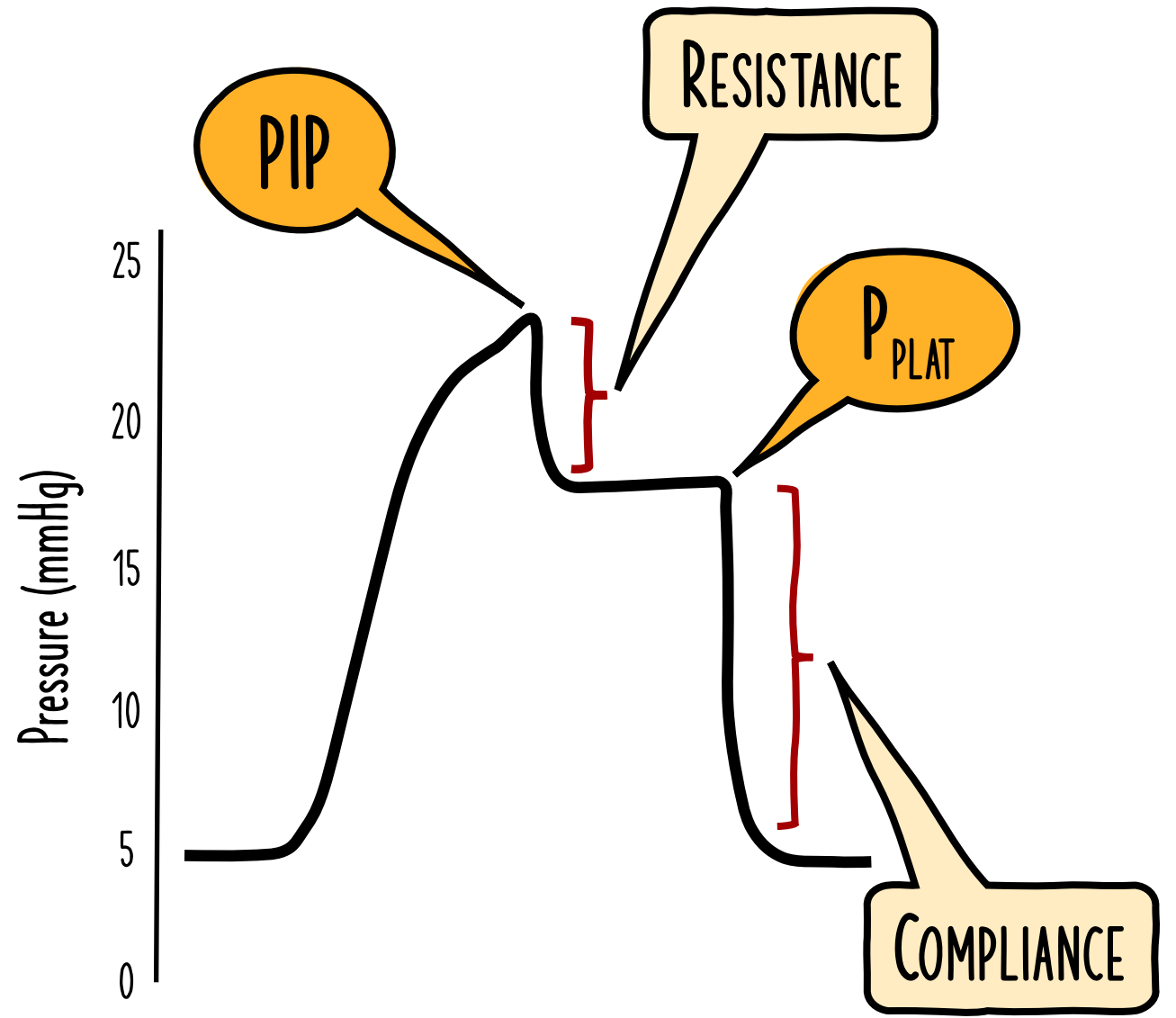
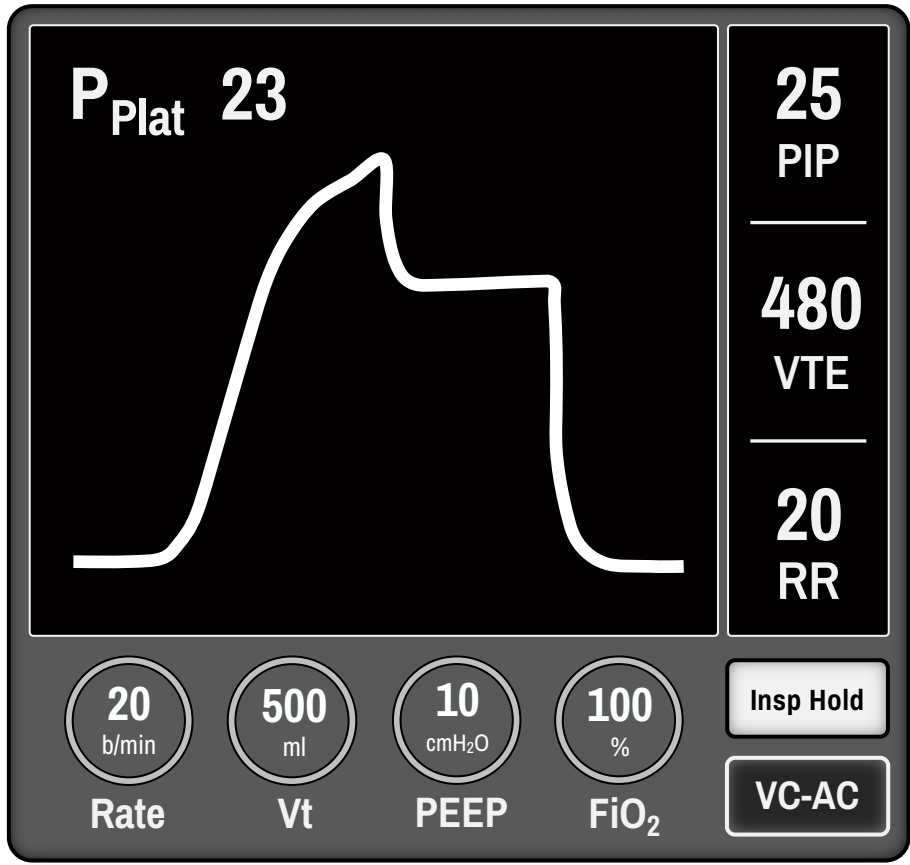
Highest pressure  
detected in the  
entire system



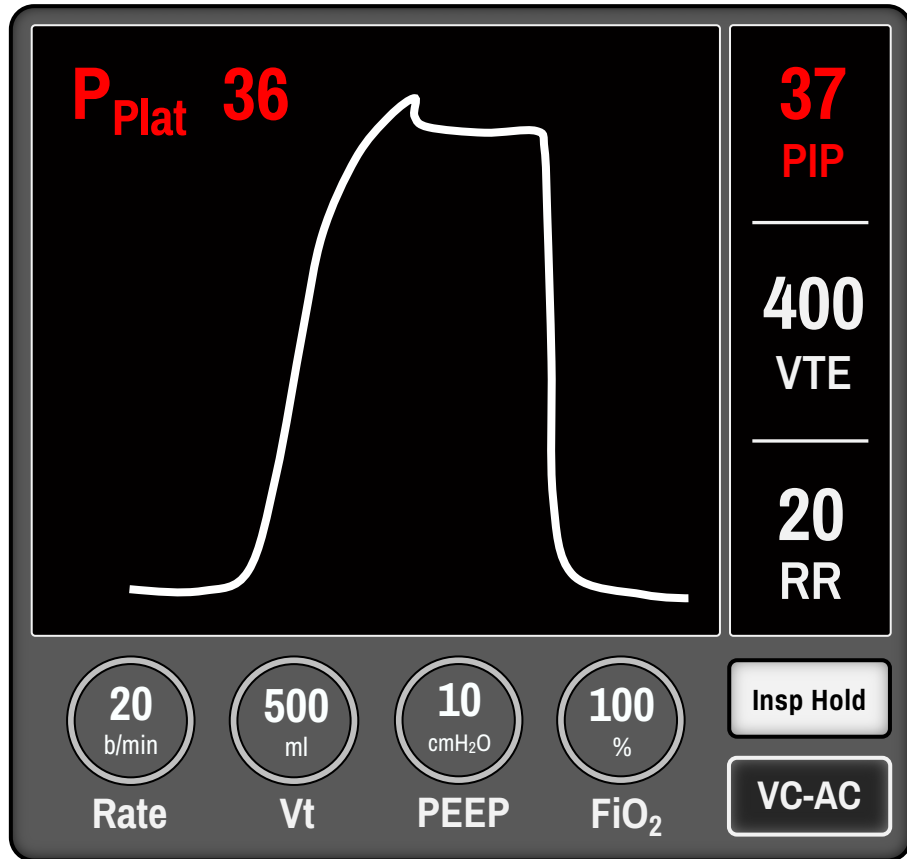
## PLATEAU PRESSURE ( $P_{PLAT}$ )

Highest pressure  
alveoli are seeing

# VENT READING



# HIGH PIP + HIGH $P_{PLAT}$

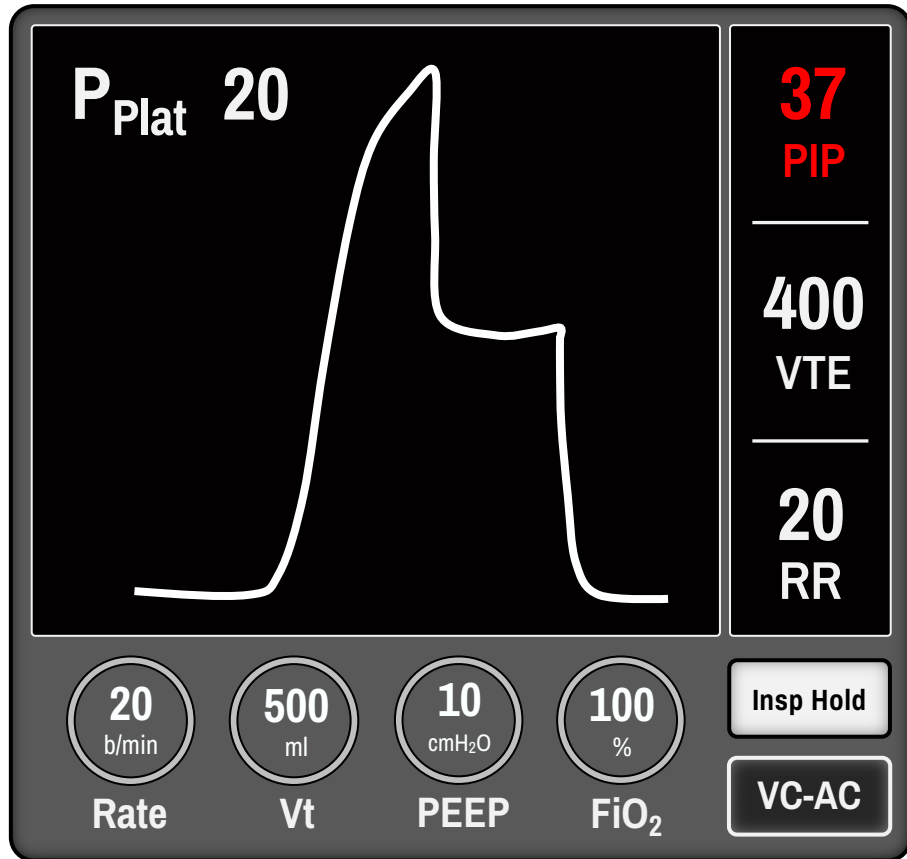


Pneumothorax

Abdominal  
compartment syndrome

Lung injury  
(contusions +/- aspiration)

# HIGH PIP + LOW P<sub>PLAT</sub>

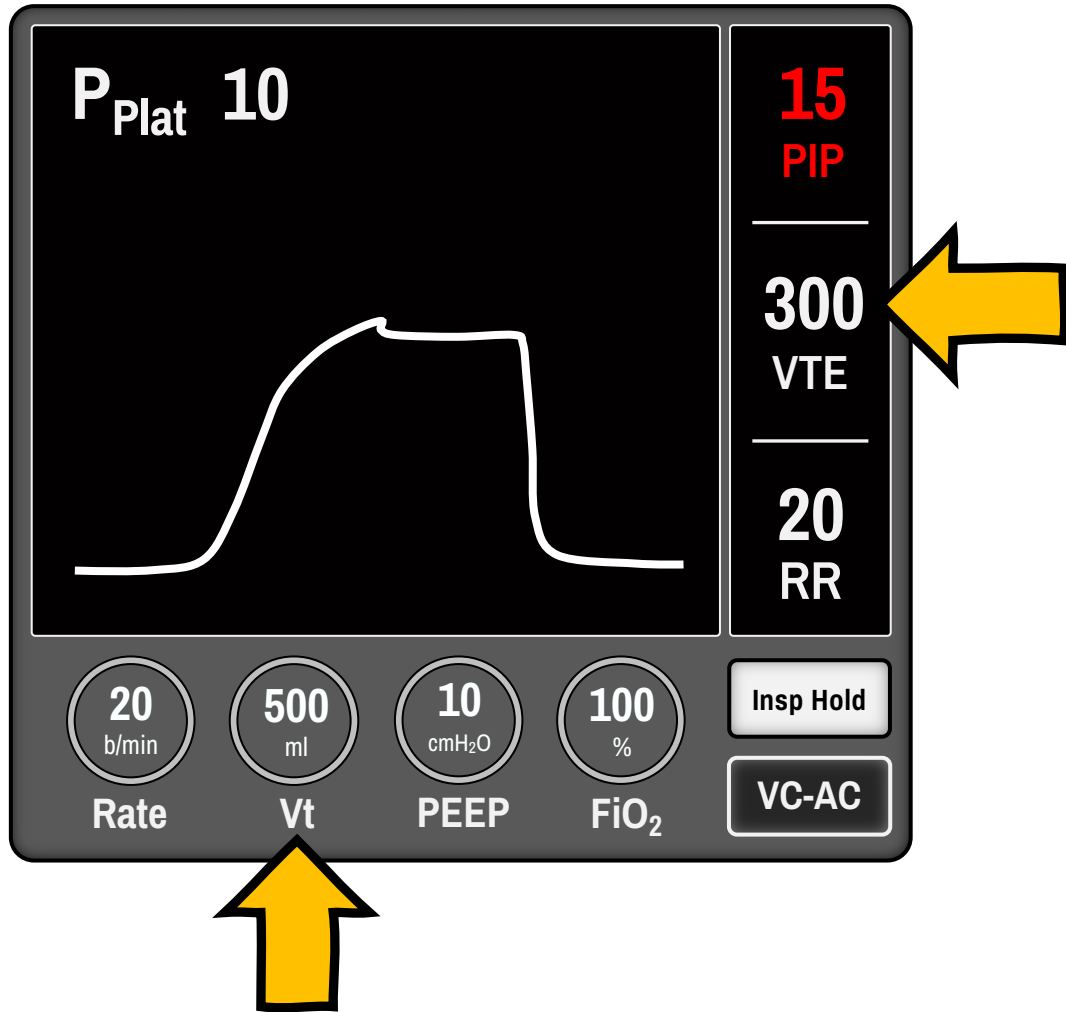


Baseline asthma or COPD

Blood clots

Bronchoscopy:  
Remove clots and Localize bleeding

LOW PIP + LOW  $P_{\text{PLAT}}$

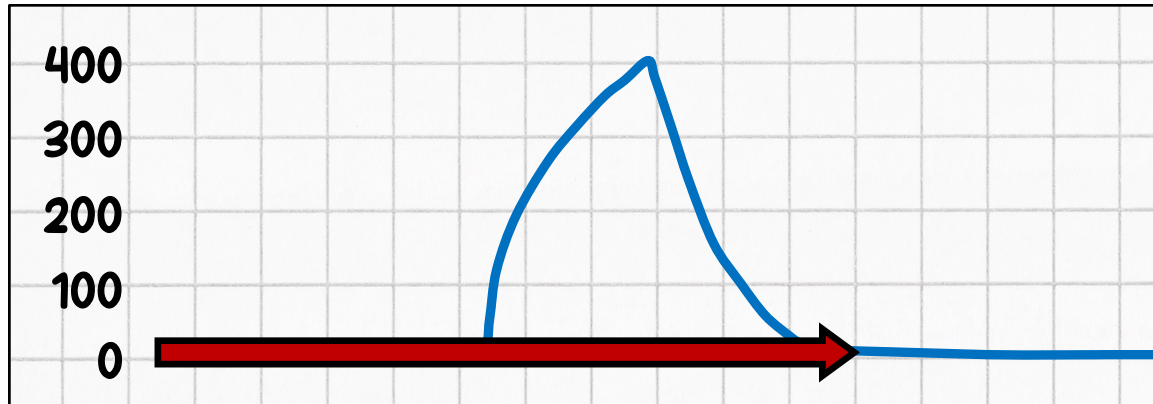


Large air leak from  
the chest tube

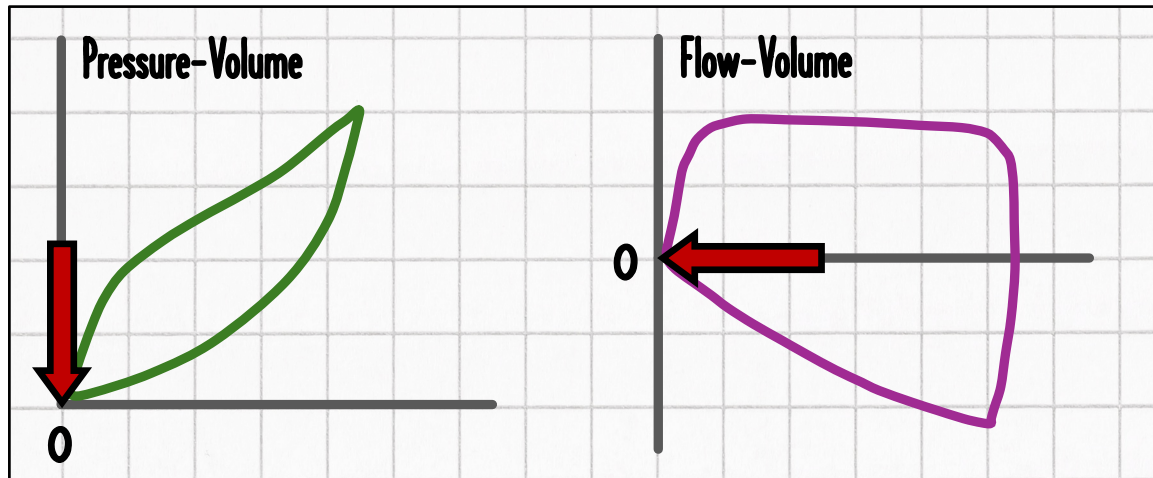
What's the VTE  
compared to set Vt?

# AIR-LEAK VENT WAVEFORMS

Volume (ml)



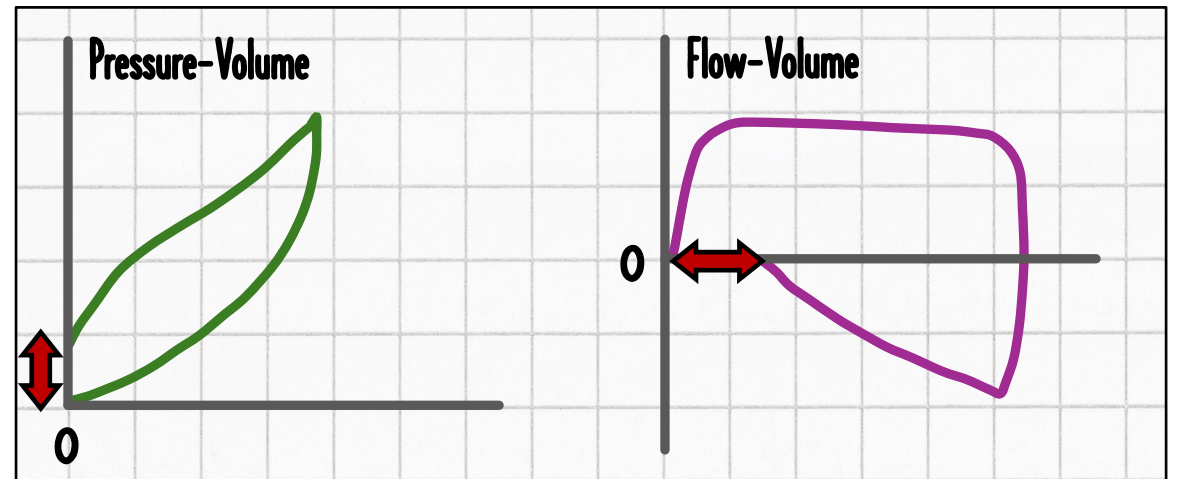
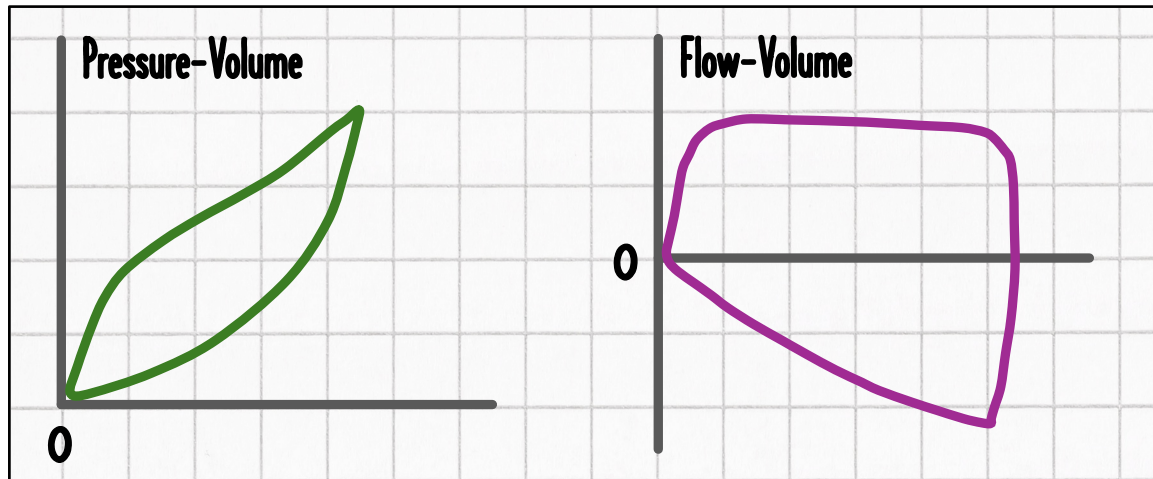
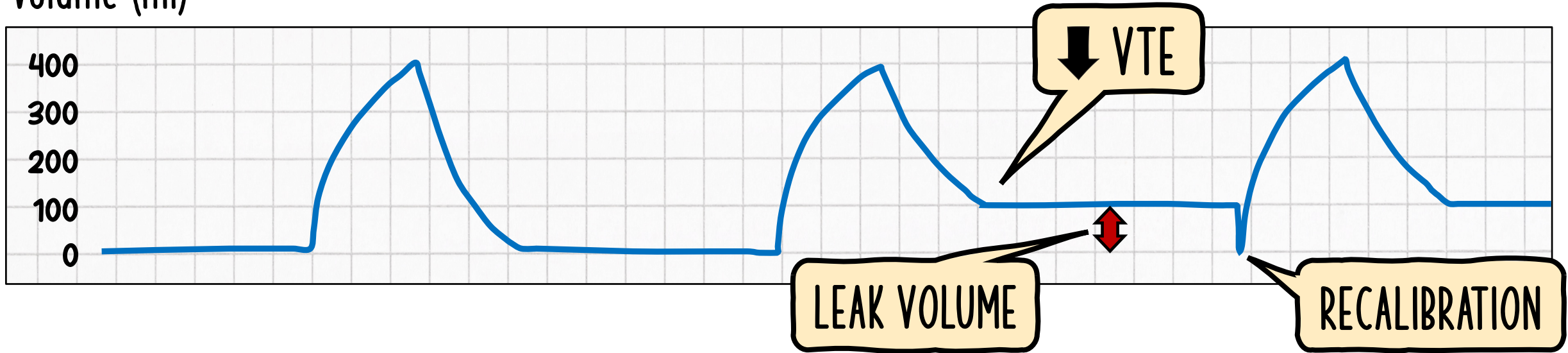
VTE CURVE RETURNS TO ZERO



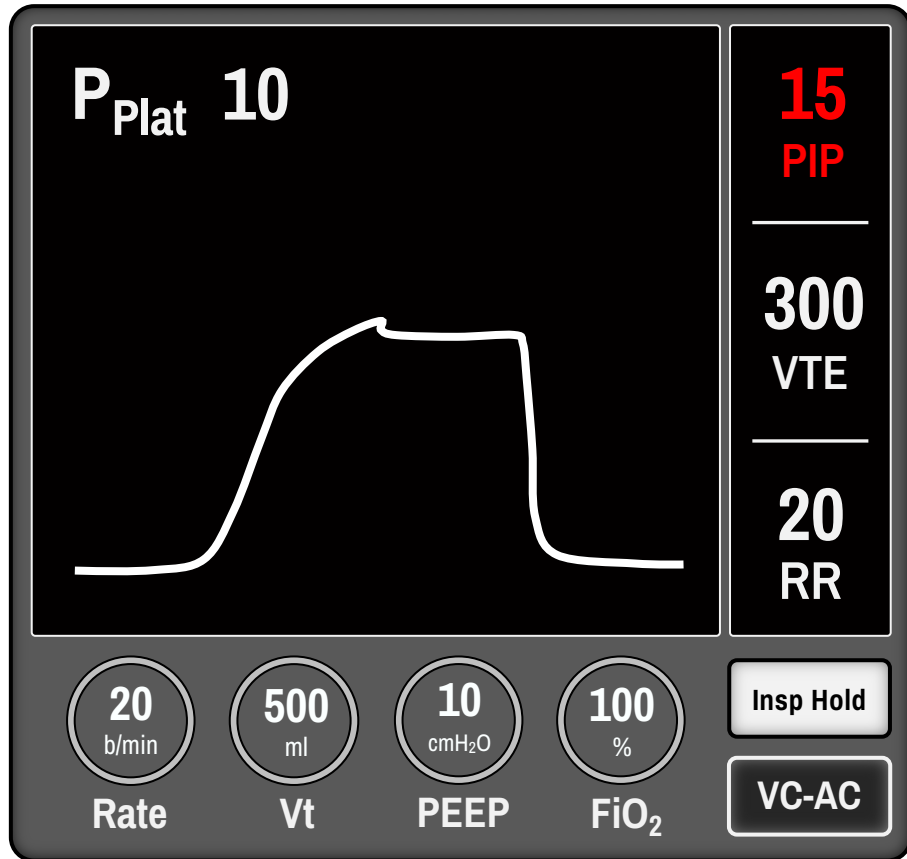
PRESSURE-VOLUME & FLOW-VOLUME  
LOOPS ALSO RETURN TO ZERO

# AIR-LEAK VENT WAVEFORMS

Volume (ml)



LOW PIP + LOW  $P_{\text{PLAT}}$



Large air leak from  
the chest tube



Use a volume  
targeted vent mode

# TRAUMA VENT: DIFFERENTIAL DIAGNOSIS

High PIP + High P<sub>Plat</sub>

Pneumothorax

Abdominal  
compartment syndrome

Lung injury

High PIP + Low P<sub>Plat</sub>

Baseline asthma or COPD

Blood clots

Low PIP + Low P<sub>Plat</sub>

Large air leak from  
the chest tube





#2

# HYPOXEMIA STRATEGIES

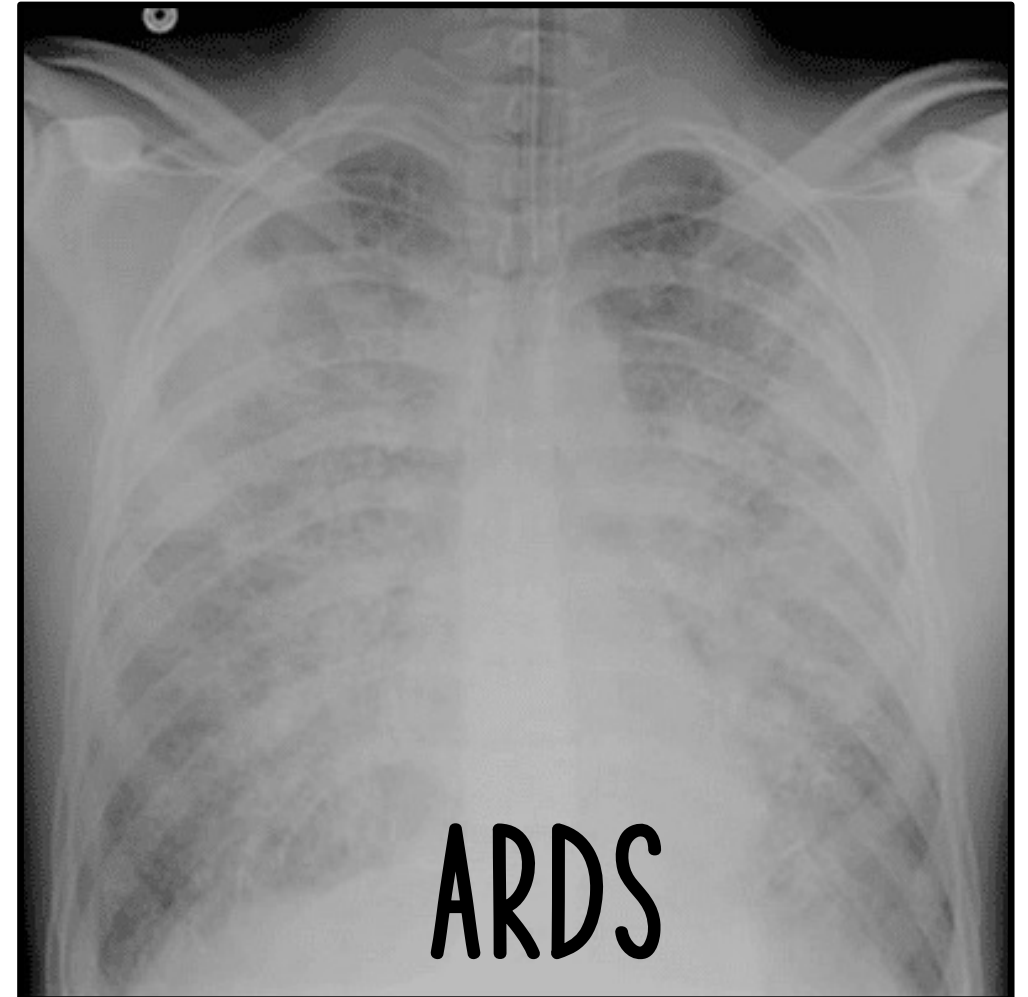


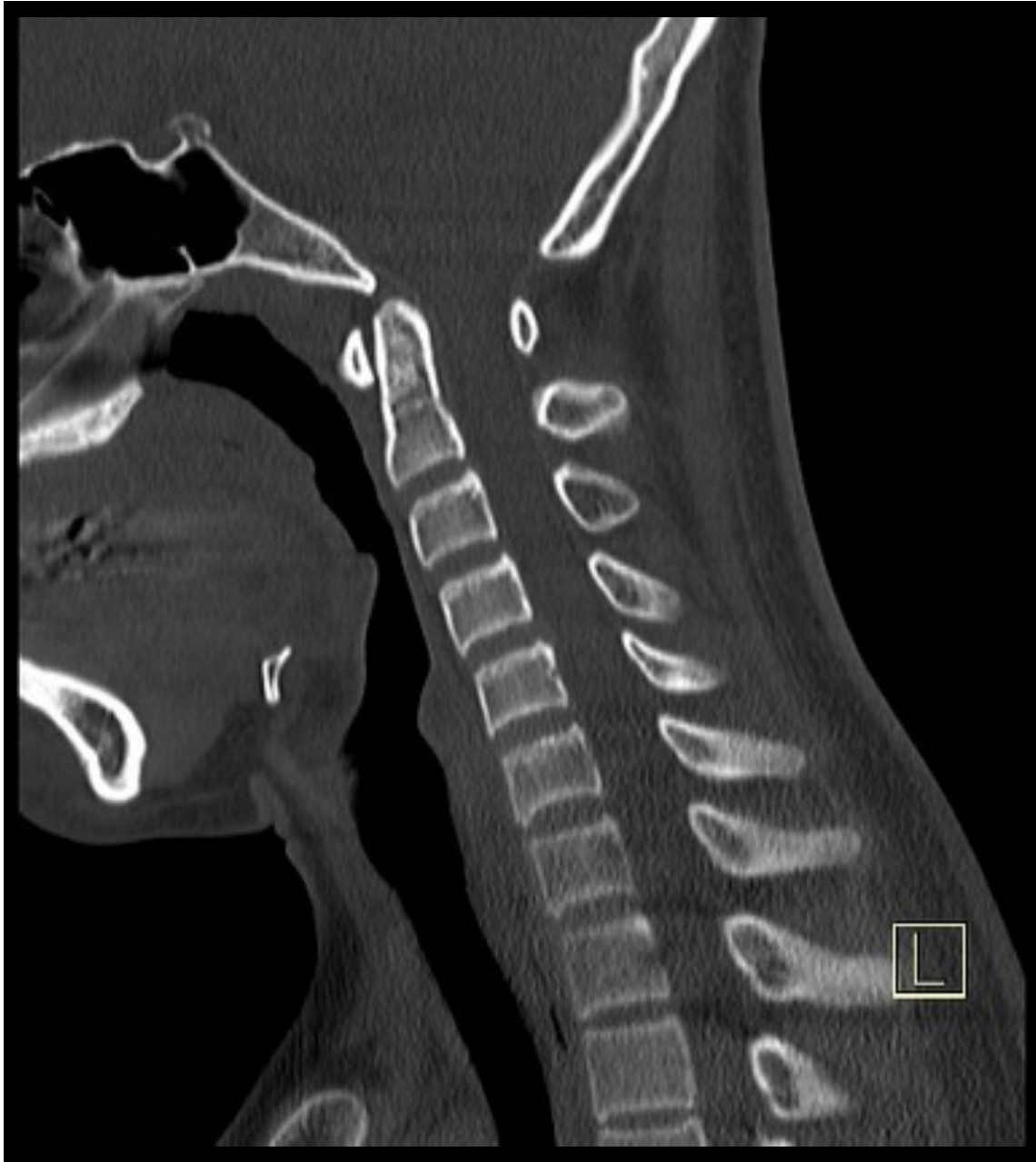
# VENTILATOR SYNCHRONY

Good sedation and  
sometimes paralysis



# NON-HOMOGENOUS LUNG INJURY





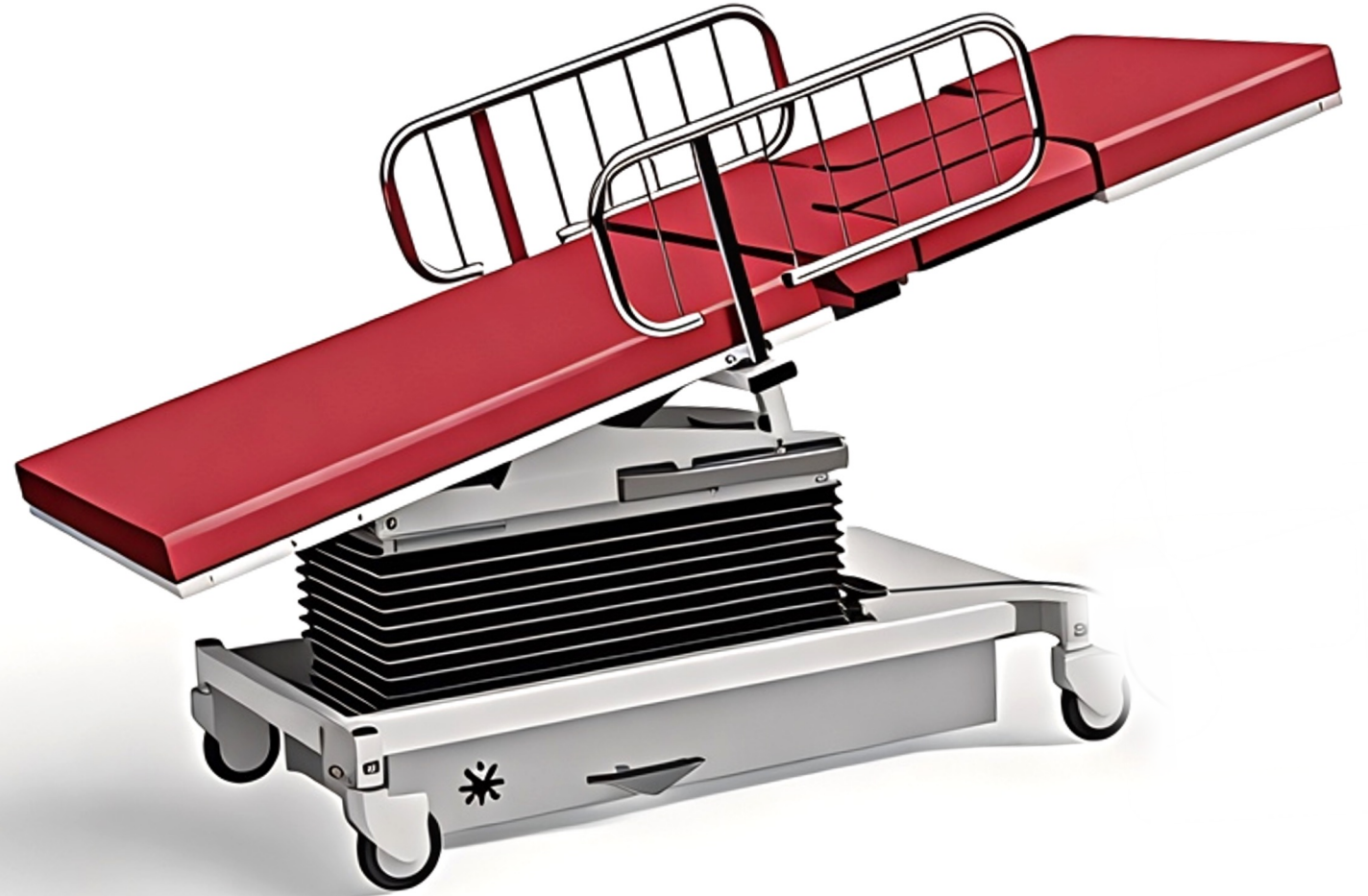
# PATIENT POSITIONING

Degrees of freedom?

Get your CT spine reads  
as soon as possible!

# PATIENT POSITIONING

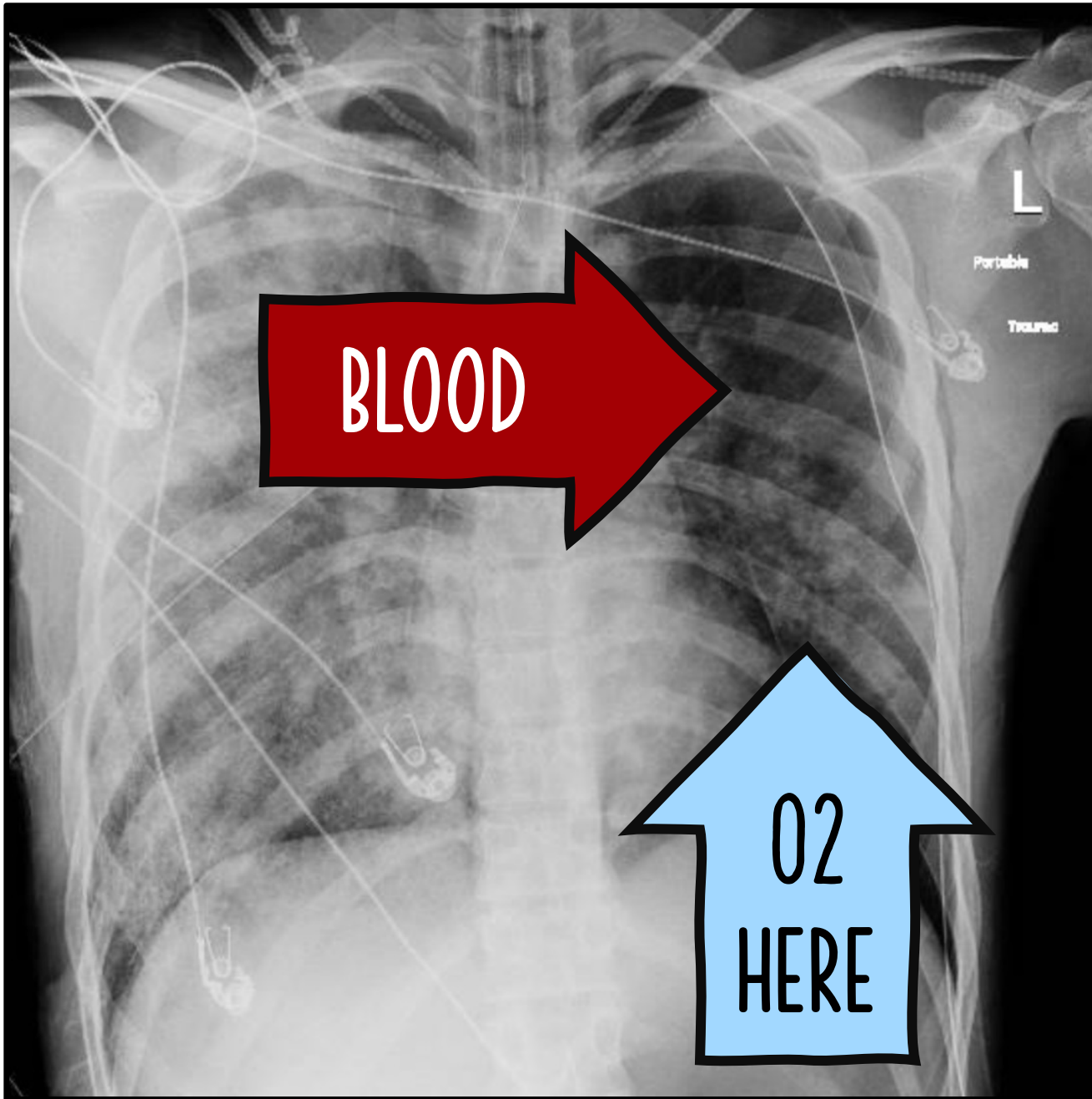
Reverse  
Trendelenburg



# PATIENT POSITIONING

Good side down

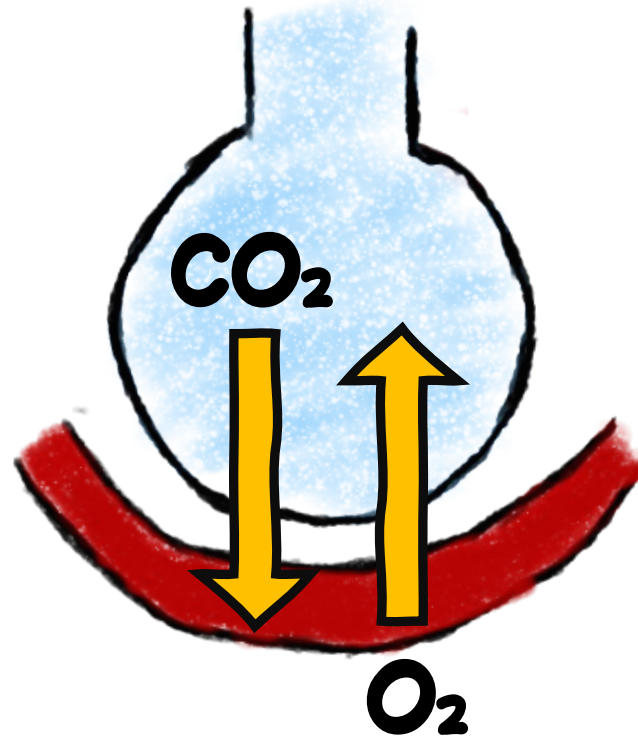




Why good side down?

Use gravity to send  
the blood to where  
the oxygen is!

# IMPROVE VQ-MATCHING WITH AN INHALED PULMONARY VASODILATOR



# IMPROVE VQ-MATCHING WITH AN INHALED PULMONARY VASODILATOR

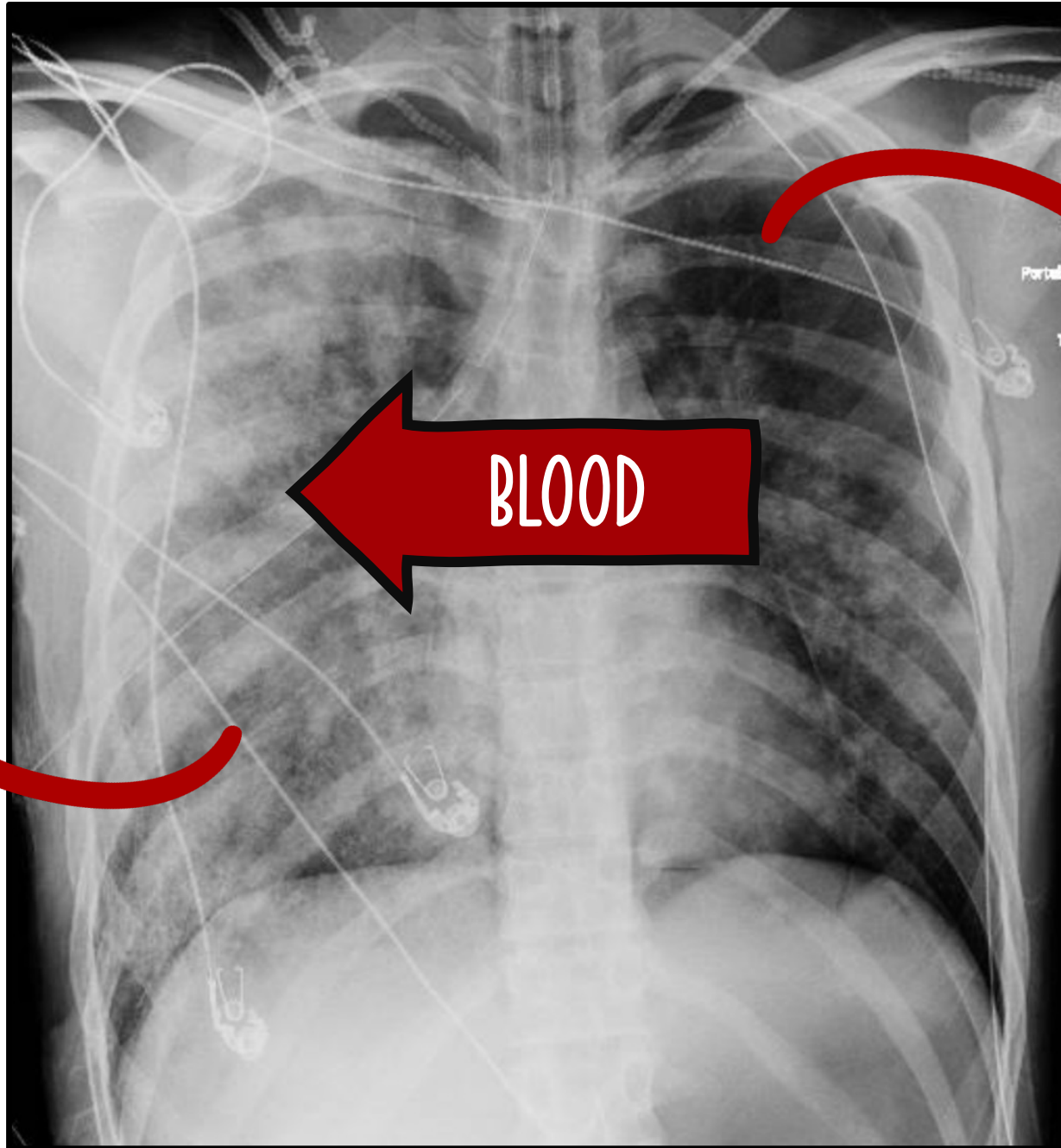
Epoprostenol @ 0.05mcg/kg/min

Nitric Oxide @ 20ppm

# PEEP OPTIMIZATION



RECRUIT  
THESE  
ALVEOLI



WITHOUT  
OVER-  
DISTENDING  
THESE  
ALVEOLI

PEEP + PNEUMOTHORAX?



WHAT ABOUT  
LUNG PROTECTIVE  
TIDAL VOLUMES?



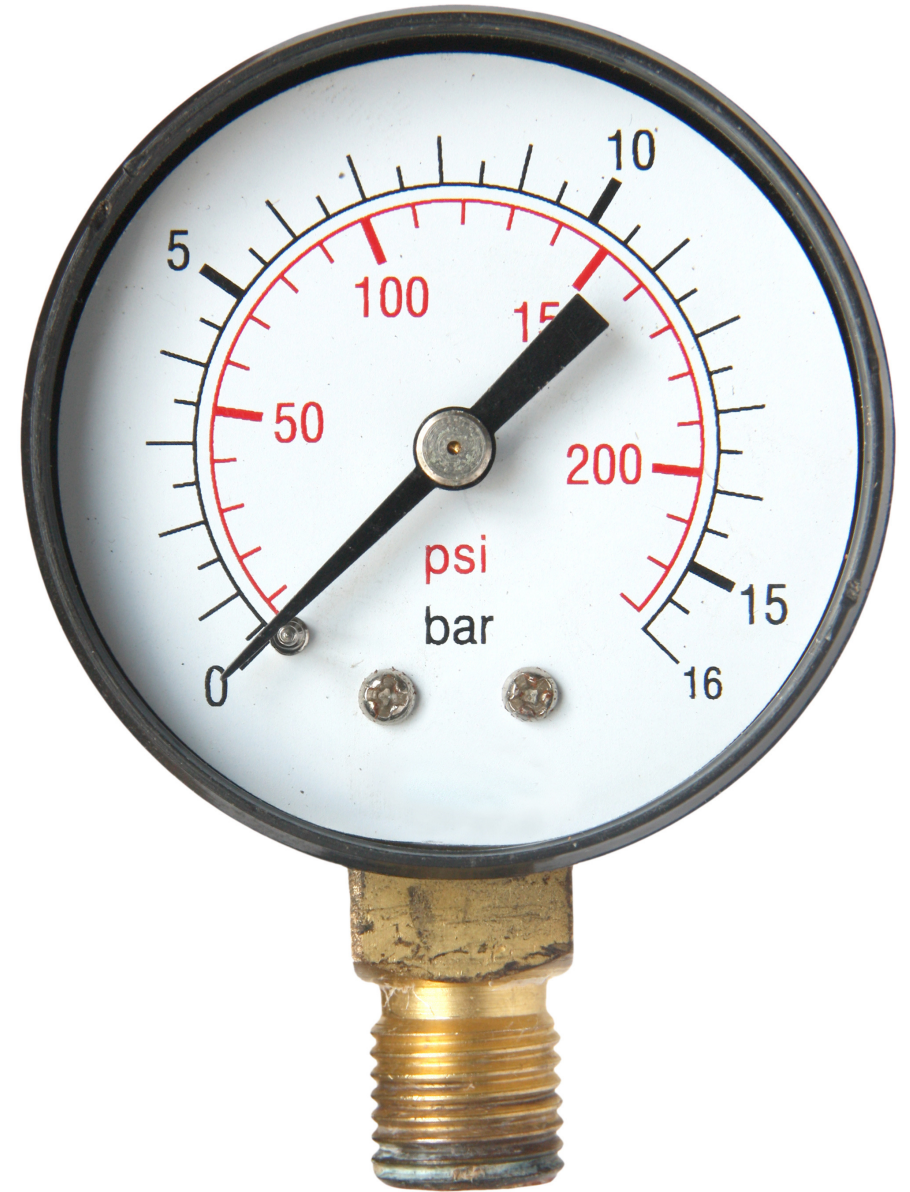


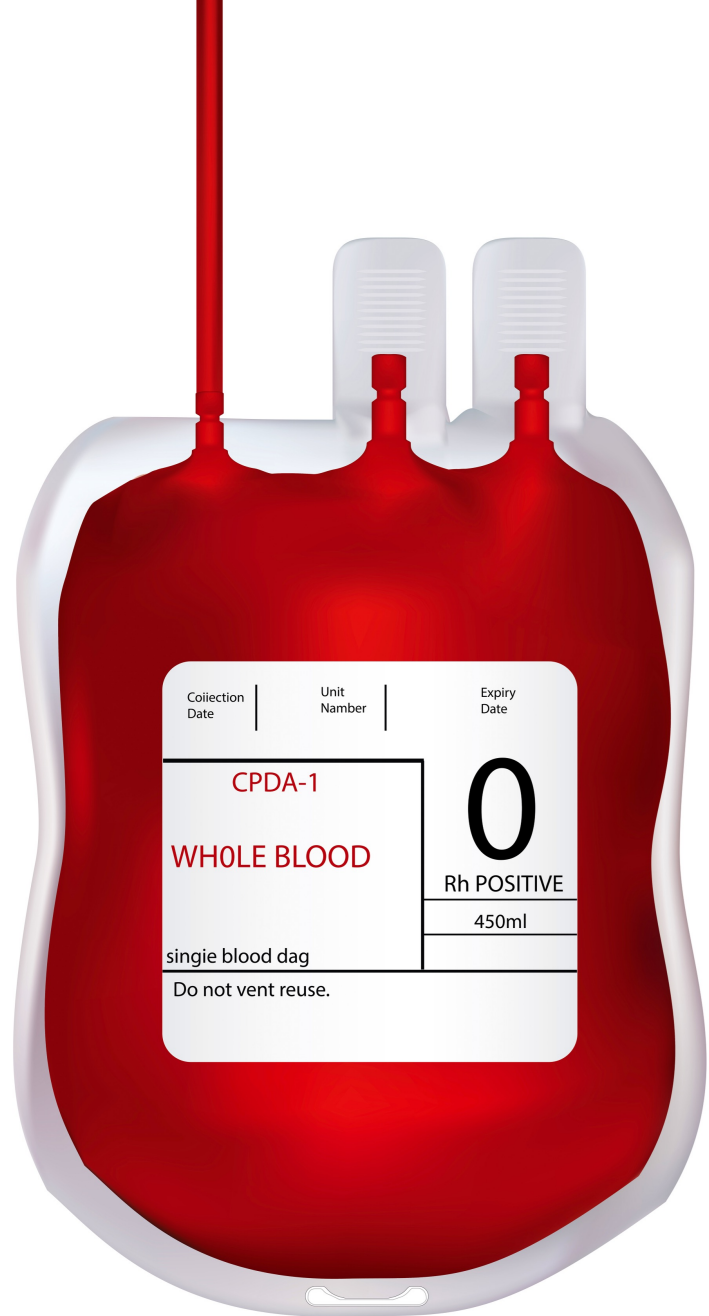


#3

# COMPETING PRIORITIES

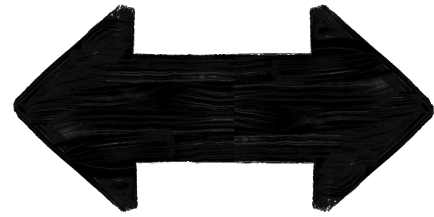
POSITIVE PRESSURE  
HAS HEMODYNAMIC  
CONSEQUENCES



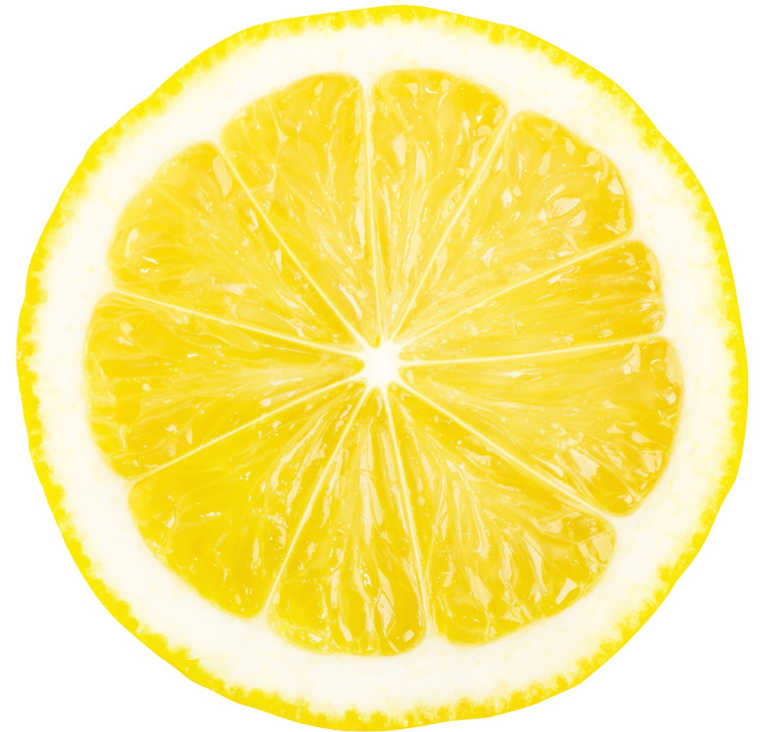
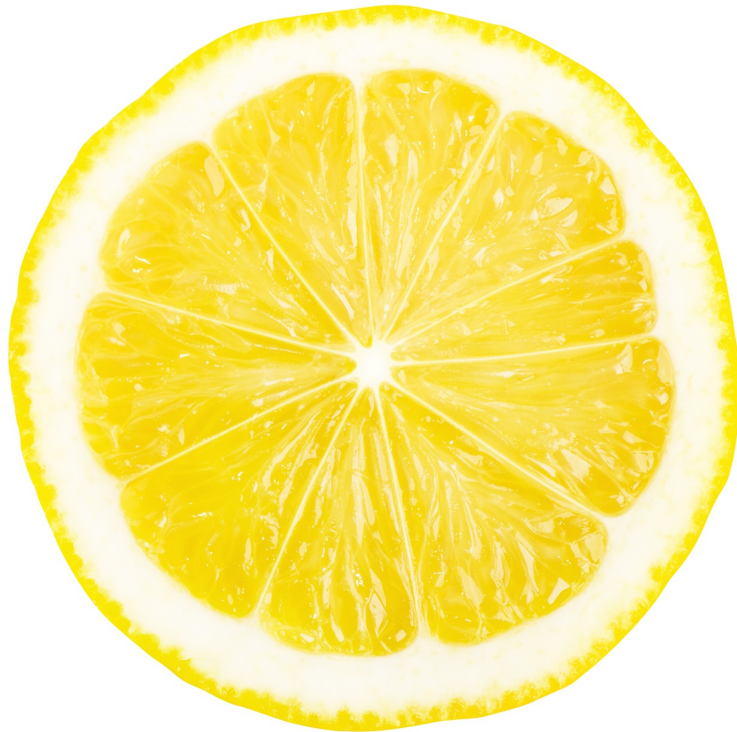


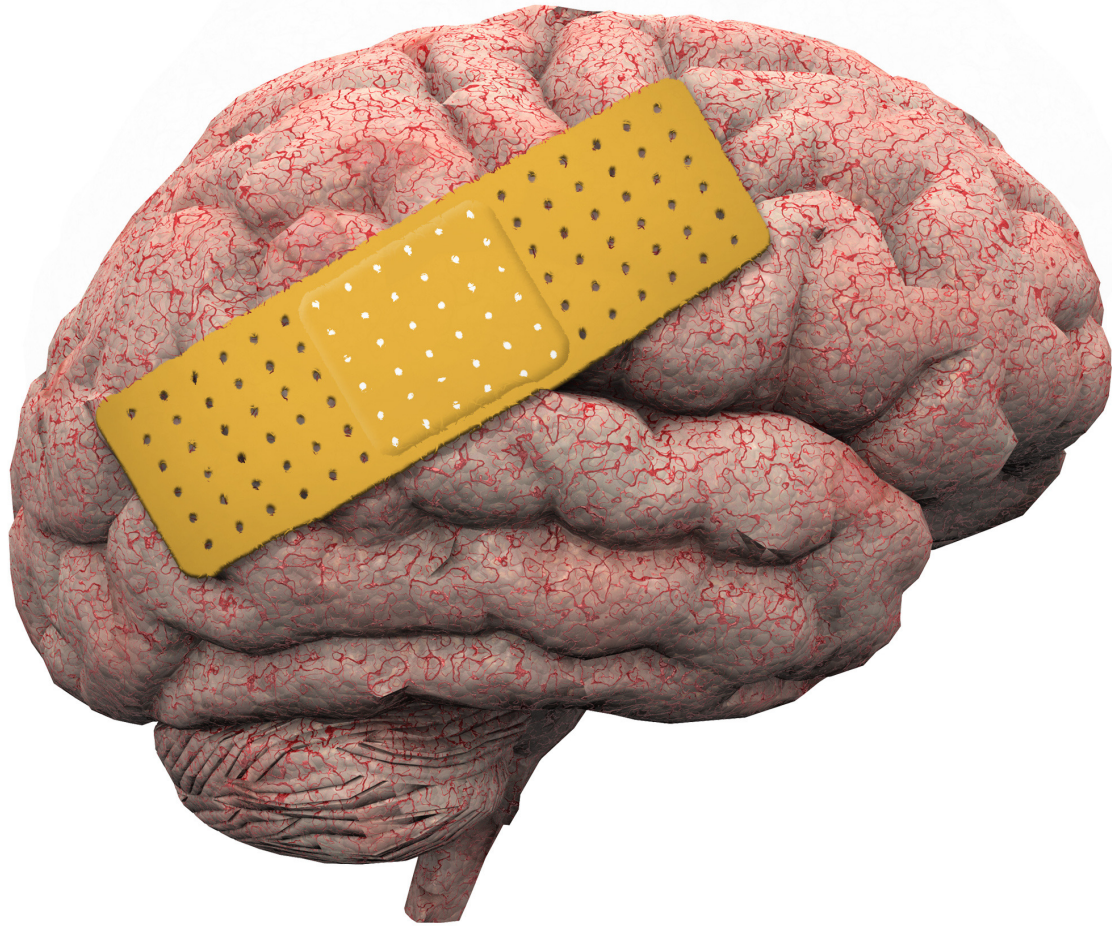
VOLUME = DOUBLE  
EDGED SWORD

**ACIDEMIA**



**BLEEDING**





# TRAUMATIC BRAIN INJURY



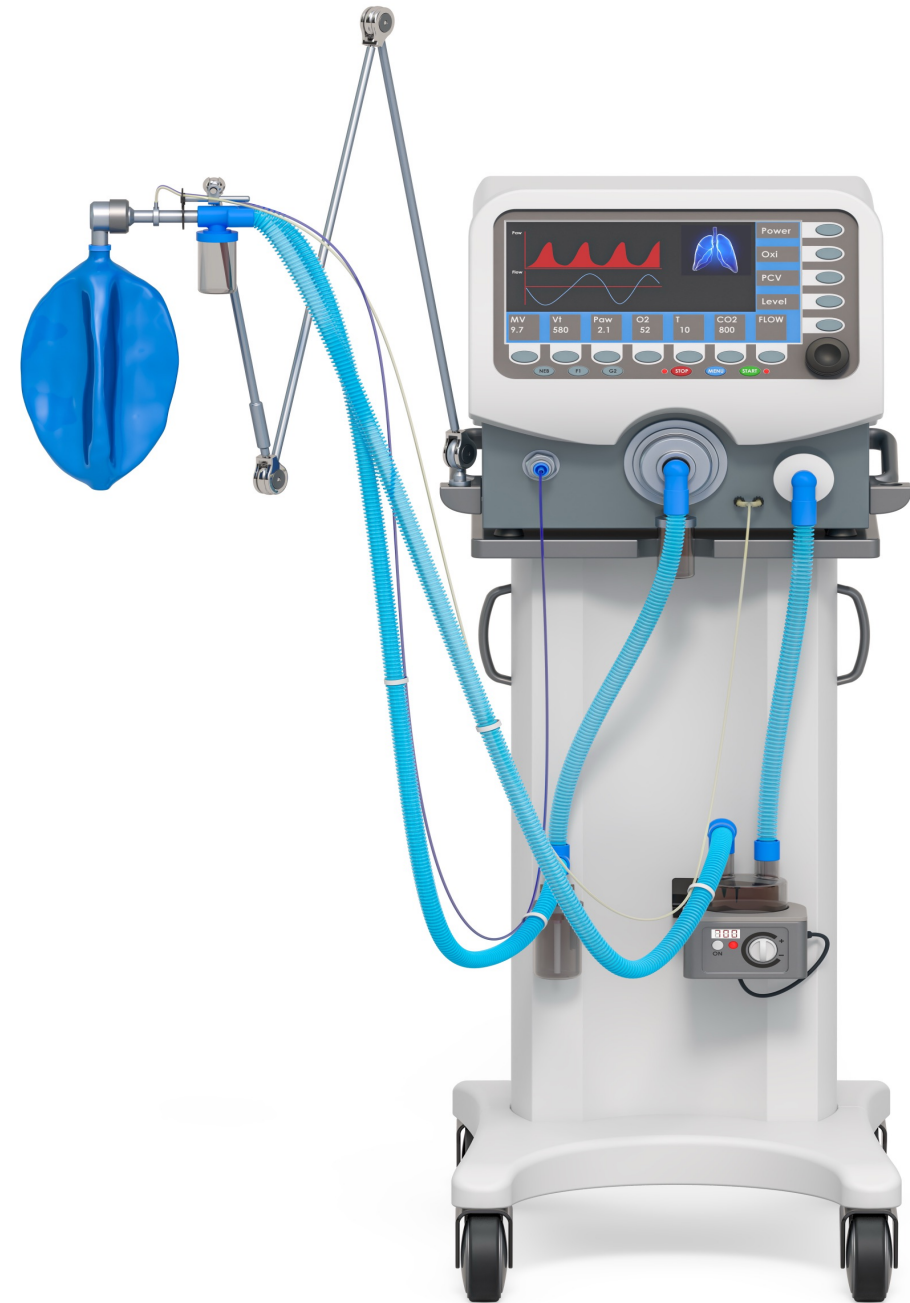


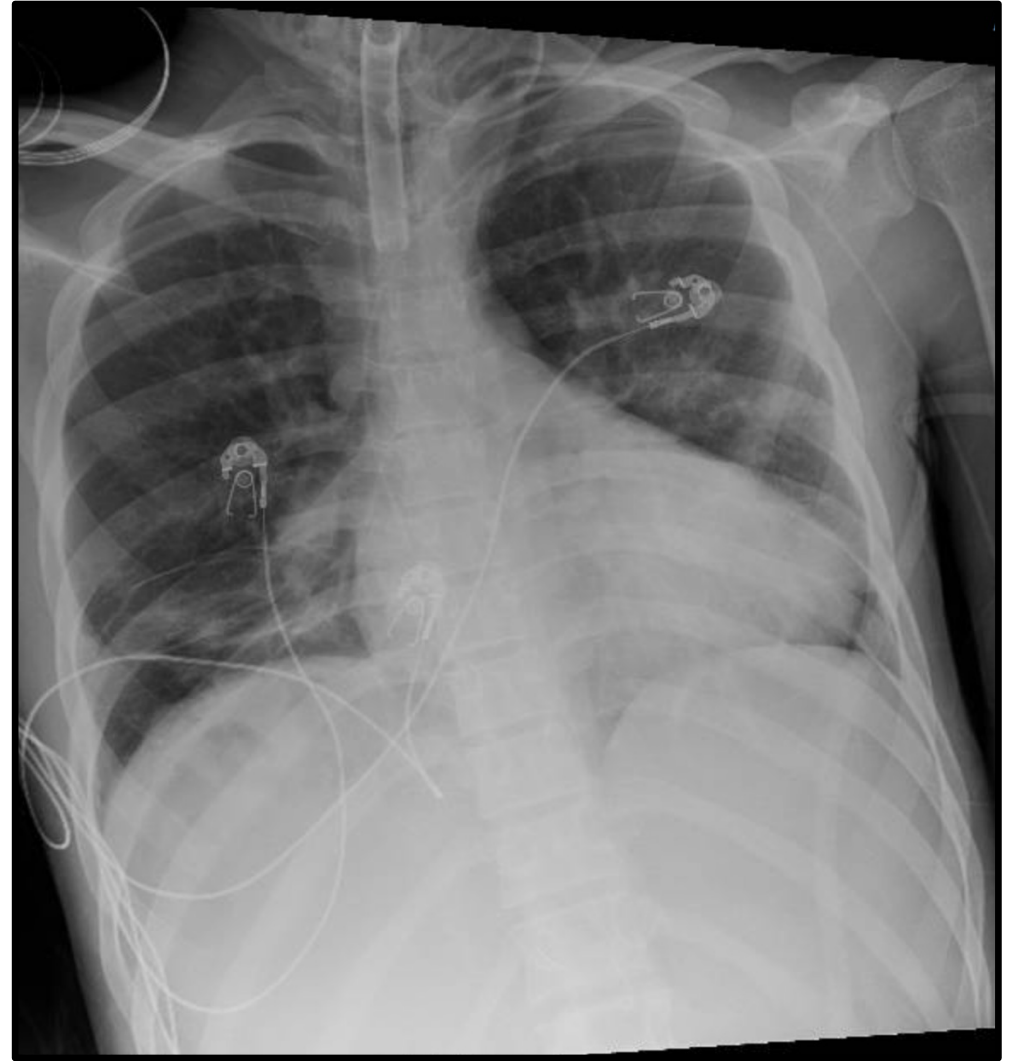
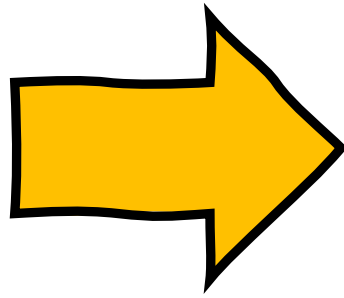
#4

VV-ECMO  
RESCUE?



# VENTILATOR MANAGEMENT IN THE CRITICAL TRAUMA PATIENT





**PATIENT LEFT  
THE ICU,  
NEURO INTACT**

