

# VENTILATORS FOR PEOPLE WHO DON'T LIKE THEM

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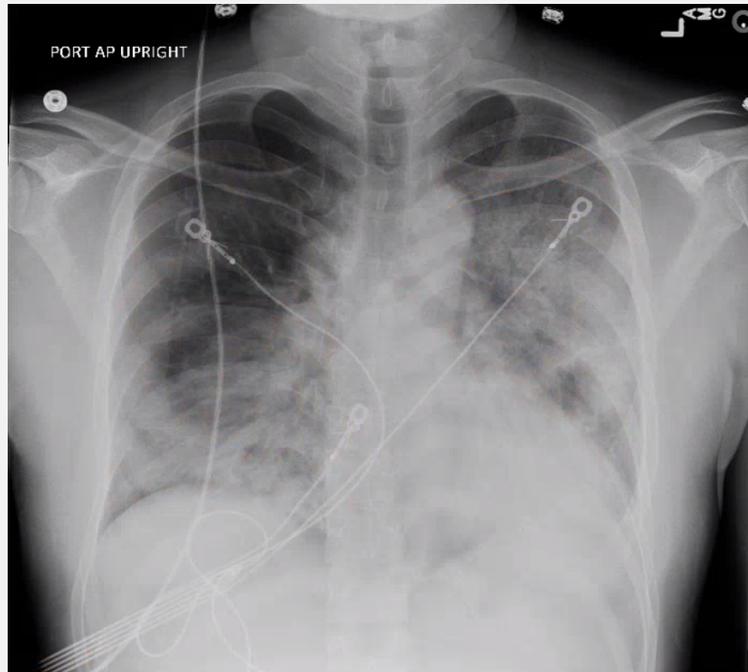
## CONFLICT OF INTEREST

- We have no conflicts of interest to disclose

# OUTLINE

- **Interactive Case**
- **Ventilator Basics**
  - **Modes**
  - **Settings**
- **Troubleshooting: Peak and Plateau pressures**

## 32M WITH DYSPNEA X3 DAYS



### On arrival to the ER:

- 86% on RA, placed on 4L NC
- Temp 102.4

### 2 hours later:

- O<sub>2</sub> increased to 12L (salter NC), RR 28
- COVID-19 NP swab pending
- 90kg, 5'11", BMI 27.8, h/o HTN
- Decision made to intubate

**What should his ventilator settings be?**

## WHAT WOULD BE A GOOD INITIAL VENT STRATEGY?

(There may be more than one “right” answer)

- A) VC+                      RR 12    TV 500    PEEP 5    F<sub>i</sub>O<sub>2</sub> 100%
- B) Volume control        RR 24    TV 425    PEEP 10    F<sub>i</sub>O<sub>2</sub> 80%
- C) Pressure control       RR 12    P<sub>insp</sub> 20    PEEP 5    F<sub>i</sub>O<sub>2</sub> 100%
- D) APRV                    T<sub>low</sub> 0.5    T<sub>high</sub> 5    P<sub>low</sub> 0    P<sub>high</sub> 25    F<sub>i</sub>O<sub>2</sub> 100%
- E) Ask someone else

# SETTINGS

## Step 1: Pick a Mode

Volume  
Control

Pressure  
Control

“Hybrid”

VTFC, VC+, PRVC

- Most studies in ARDS w/ VC
- Other modes are for weaning or salvage therapy

## Step 2: Set your parameters

- Respiratory Rate
  - Consider pre-intubation minute ventilation
  - Avoid RR >35 (risk of air trapping/autoPEEP)
- Tidal Volume
  - 6 mg/kg predicted body weight (range 4-8 mg/kg)
- PEEP
  - “Enough” – more on this later
- $F_iO_2$ 
  - 100% and titrate down. Goal  $PaO_2 >60$  (probably)

*Advanced:* I:E ratio, trigger, waveform – ask a pulmonologist or RT for more info!

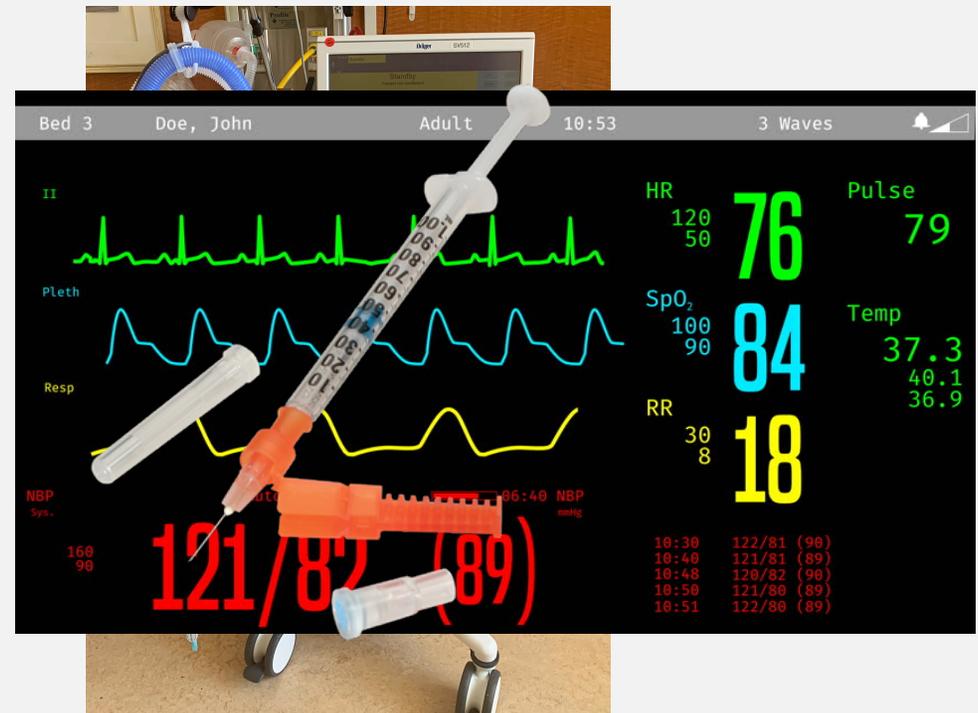
## Tip #1:

Don't just "set and forget" the vent. Evaluate the response!

## SETTINGS CONT.

### Step 3: Evaluate the response

- Look at the patient
  - Cough? Irregular breathing? "Fighting" the vent?
- Look at the vent
  - Peak & plateau pressure
- Look at the monitor
  - SpO<sub>2</sub>, Blood pressure, HR, +/- EtCO<sub>2</sub>
- Look at the blood gas
  - pH, pCO<sub>2</sub> and pO<sub>2</sub>



## CASE CONTINUED

- The vent is set on VC, RR 22, TV 425, PEEP 5 and  $F_iO_2$  50%
- Blood gas in 30 minutes : 7.20/54/52

### **What now?**

- A) Increase the respiratory rate
- B) Increase the tidal volume
- C) Increase the PEEP
- D) Increase the  $F_iO_2$
- E) Panic

## ABG: OXYGENATION

### Tip #2:

Make vent changes based on the whole patient, not just on the blood gas.

- RT reports that patient still appears paralyzed, no alarms, actual RR = set RR
- Oxygenation ( $O_2$ ): PEEP &  $F_iO_2$ 
  - $F_iO_2$  = fast
  - PEEP = slow
- ARDSnet PEEP ladder

### Lower PEEP/higher $F_iO_2$

$F_iO_2$	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

$F_iO_2$	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24

### Higher PEEP/lower $F_iO_2$

$F_iO_2$	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5
PEEP	5	8	10	12	14	14	16	16

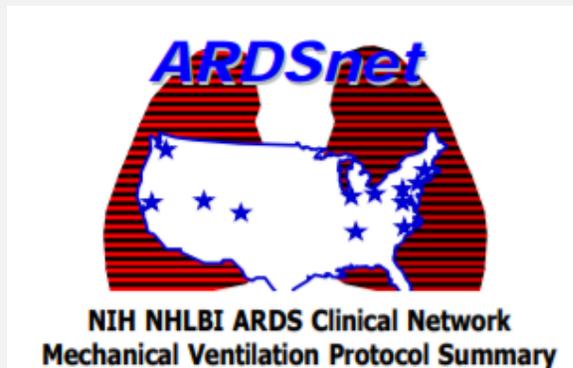
$F_iO_2$	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	18	20	22	22	22	24

## ABG: VENTILATION

$\Delta RR$  and  $V_T \rightarrow \Delta CO_2$   
(mostly)

Mild acidemia ( $7.15 \leq \text{pH} < 7.30$ ):

- i. Increase ventilator rate up to maximum of 35 or until  $\text{pH} > 7.30$  or  $\text{PaCO}_2 < 25$  mm Hg.



[http://www.ardsnet.org/files/ventilator\\_protocol\\_2008-07.pdf](http://www.ardsnet.org/files/ventilator_protocol_2008-07.pdf)

## CASE CONTINUED

- You set the vent to the following:
  - VC, RR 26, TV 425, PEEP 12 and FiO<sub>2</sub> 70%
  - Repeat ABG: 7.32/46/73, SpO<sub>2</sub> on monitor is 95%
- An hour later you are called to bedside because the patient is desaturating
- Looking through the door, you see that he is satting 83%
- What next?
  - A) Increase PEEP
  - B) Increase FiO<sub>2</sub>
  - C) Change to prone position
  - D) Get more information

**PUT ON YOUR PPE!**



Going in without PPE puts you, your other patients and all of the staff at risk



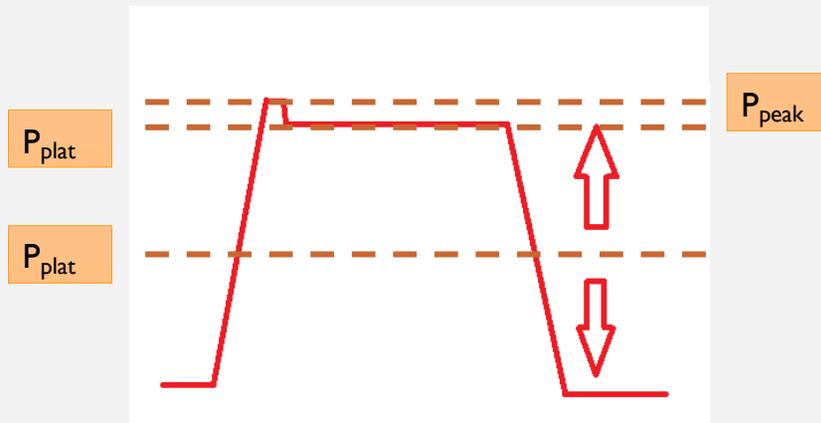
## PEAK & PLATEAU PRESSURE

### Tip #3:

High peak pressure but normal plateau  
= Airway or tubing problem

High peak and high plateau  
= Alveolar, pleural or chest wall problem

Peak pressure alarm going off



**DDx:** ~~Massive ptng, lung compliance,~~  
~~Bronchospasm~~ all rigidity and more

More on troubleshooting hypoxemia  
next week!

# HOW NOT TO KILL PEOPLE WITH VENTS

1. Don't just "set and forget" the vent. Evaluate the response!
2. Make vent changes based on the whole patient, not just on the blood gas.
3. High peak pressure but normal plateau = airway or tubing problem.

High peak and high plateau = alveolar, pleural or chest wall problem.

Thank you to Laura Crotty Alexander for facilitating and inviting me to present!

- Some slides/info borrowed from Mark Hepokoski & Atul Malhotra