

# COVID-19 CRITICAL CARE: WHAT PROVIDERS NEED TO KNOW

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# CME Information

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# Learning Objectives

- Describe the rationale behind prone positioning
- Discuss the clinical benefits of prone positioning
- Explain the Berlin criteria for diagnosis of ARDS

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# Thank You

This program is brought to you through the generous support of DKBmed, Postgraduate Institute for Medicine, and the Institute for Johns Hopkins Nursing.

Please see **COVID19.DKBmed.com** for additional resources and educational activities



# PRONING: What is it and how does it work?

## Today's Agenda

Why prone?

Normal pulmonary physiology and gas exchange

Physiologic benefits of proning

When do we use it & when do we not?

Alternative therapies to improve oxygenation & ventilation

Proning and COVID-19 considerations

# Proseva Trial

- ❑ 466 Patients
- ❑ ARDS criteria: P:F ratio < 150 mmHg, FiO<sub>2</sub> 60%, PEEP 5+, Vt 6ml/kg pbw.
- ❑ 16 hours in Prone (237) vs. Supine (229)
- ❑ Intubated < 36 hours
- ❑ MAP > 65
- ❑ No Inhaled pulmonary vasodilator
- ❑ Other...

See Alternate to #8

## PRONE

- ❑ Ventilator free days within 28 days-14% (p<0.001)
- ❑ **Successful extubation- 81% (p=<0.001)**
- ❑ 28 day mortality-16% (P<0.001)



Versus

## SUPINE

- ❑ Ventilator free days within 28 days-10% (P<0.001)
- ❑ Successful extubation-65% (p=<0.001)
- ❑ 28 day mortality-32% (P<0.001)



Geurin C., *N Engl J Med.*, 2013  
Farkas J., *EmCrit.*, 2020





# Proseva Trial

Alternate to #8

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- ARDS criteria: P:F ratio < 150 mmHg, FiO<sub>2</sub> 60%, PEEP 5+, Vt 6ml/kg pbw.
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- Other...



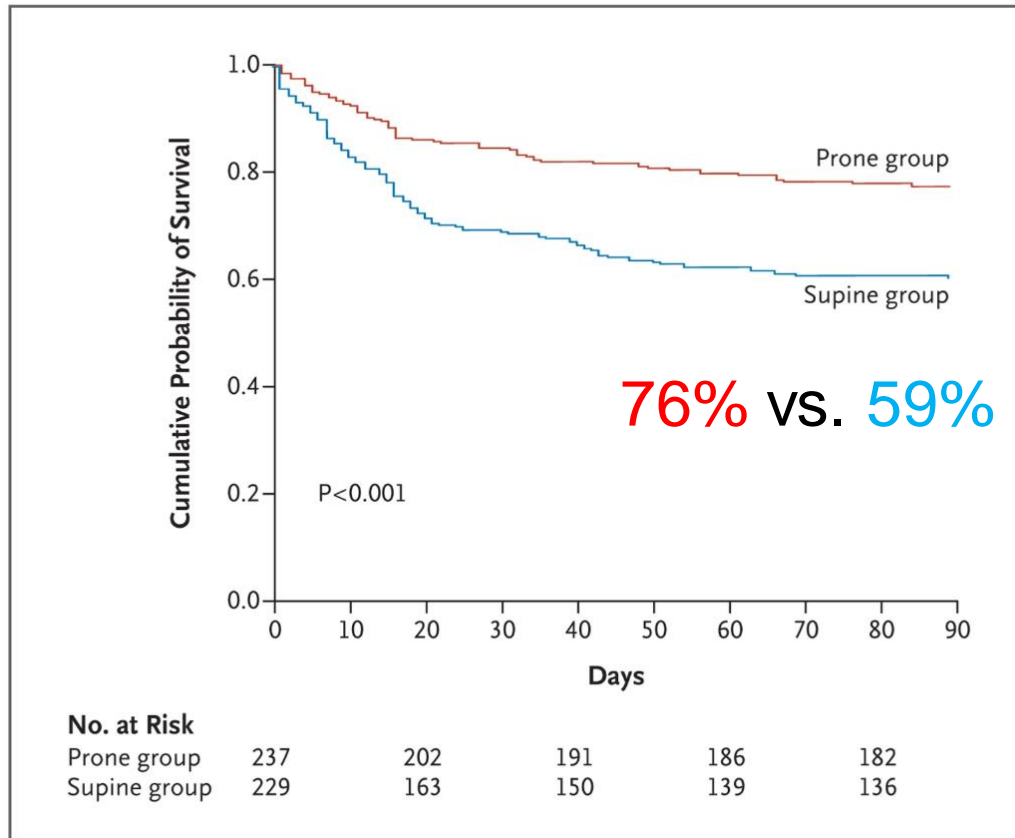
	PRONE	SUPINE
Ventilator-free days within 28 days	14%	10%
Successful extubation	81%	65%
28-day mortality	16%	32%

All  $P < .001$

Geurin C., *N Engl J Med.*, 2013  
Farkas J., *EmCrit.*, 2020



# 90-Day Mortality

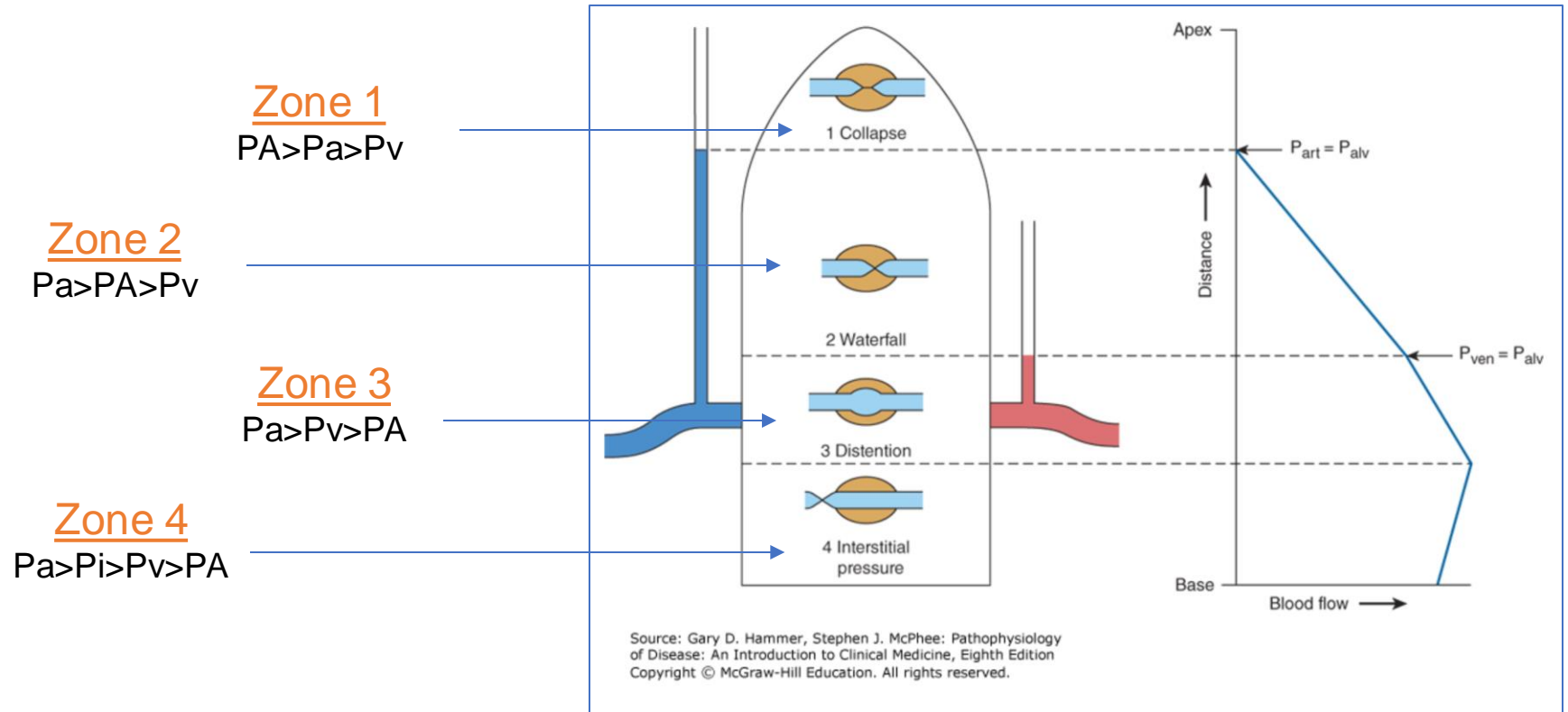


NNT= 6

Geurin C., et al. *N Engl J Med.* , 2013



# Normal Pulmonary Physiology



Hammer G.D., *Pathophysiology of Disease*, 2019



# Principles of Gas Exchange

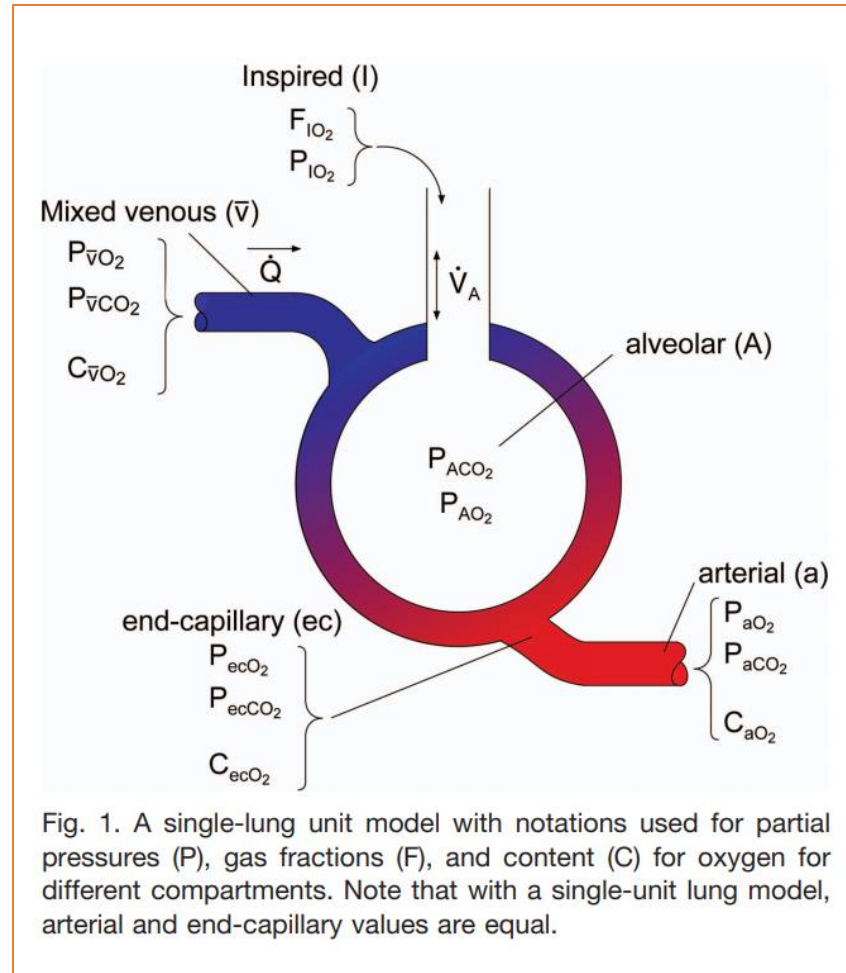


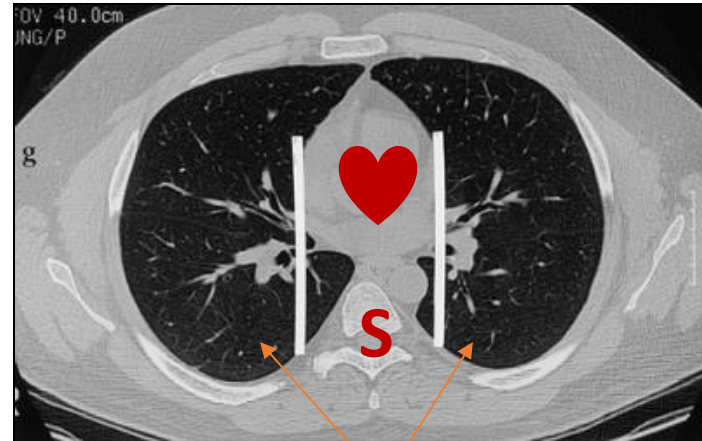
Fig. 1. A single-lung unit model with notations used for partial pressures (P), gas fractions (F), and content (C) for oxygen for different compartments. Note that with a single-unit lung model, arterial and end-capillary values are equal.

Johnson N. et al. *Respir Care*, 2017



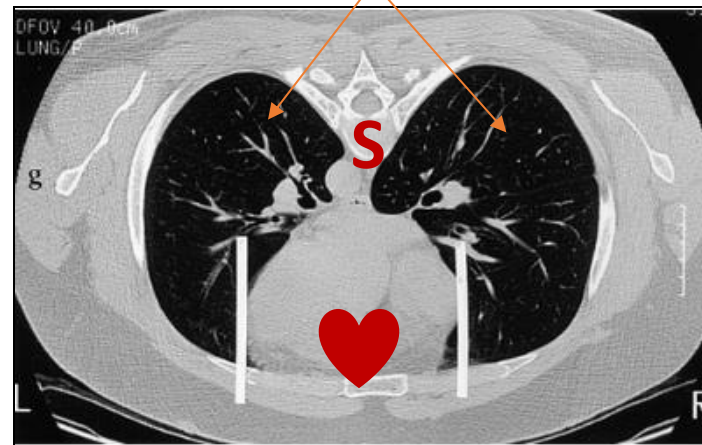
# Ventilation and Perfusion V/Q

Supine  
7-42% L  
11-13% R



Zone 3

Prone  
< 1% L  
< 4% R





# Proning – How Does It Work

## GAS EXCHANGE IN THE PRONE POSTURE

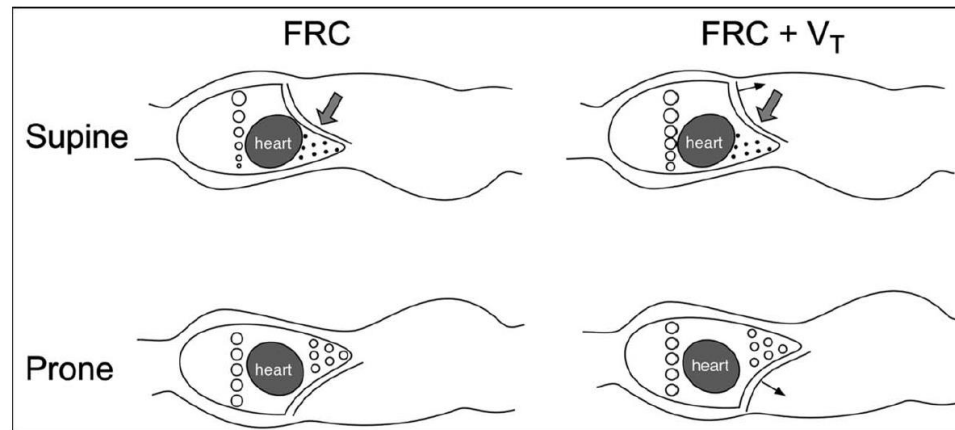


Fig. 3. The effect of prone posture on alveolar size at functional residual capacity (FRC) and FRC plus tidal volume ( $V_T$ ). In the supine posture, at FRC, the most dependent alveoli are small due to higher pleural pressures, compression from the heart, and extrinsic compression from abdominal contents as compared with the prone posture. During tidal breathing, the distribution of local ventilation is more uniform in the prone posture because the alveolar volumes are more uniform at the initiation of each breath.

Johnson N. et al. *Respir Care*, 2017



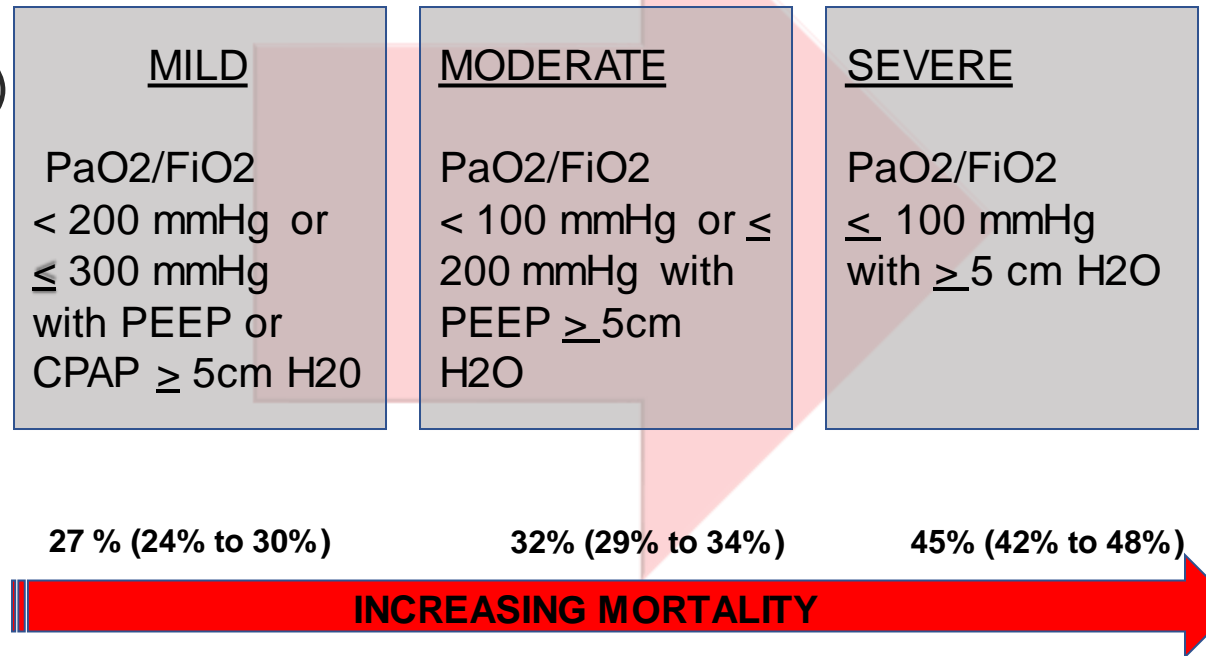
# Additional Benefits

- Improve R ventricular function by decreasing R ventricular afterload
- Improved postural drainage
- Promote clearance of edema in alveolar space
- Decreased pulmonary vascular resistance
- Increased venous return + decreased RV afterload (decreased trans-pulmonary press) = improved R ventricular function



# BERLIN CRITERIA

- Acute onset (within 1 week of known insult or worsening respiratory symptoms)
- Bilateral opacities- not fully explained by effusions, lung collapse or nodules
- Non-cardiogenic respiratory failure



Ferguson N.D., et al. *Intensive Care Med*, 2012  
Dharia A., et al. *ICU Director*, 2012





# Proning – When Do We Use It?

- Acute respiratory distress syndrome (ARDS)
- Refractory Hypoxemic Respiratory Failure
- Poor compliance with diffuse alveolar damage
- Covid+
  - Not classic signs
  - Various stages
  - Preserved compliance
  - Substantial atelectasis
- Early
  - Persistent P/F ratio < 150mmHg
  - Failed optimization efforts after 48 hours
- Institutional variance



# Proning – When Do We Not Use It?

## No Absolutes

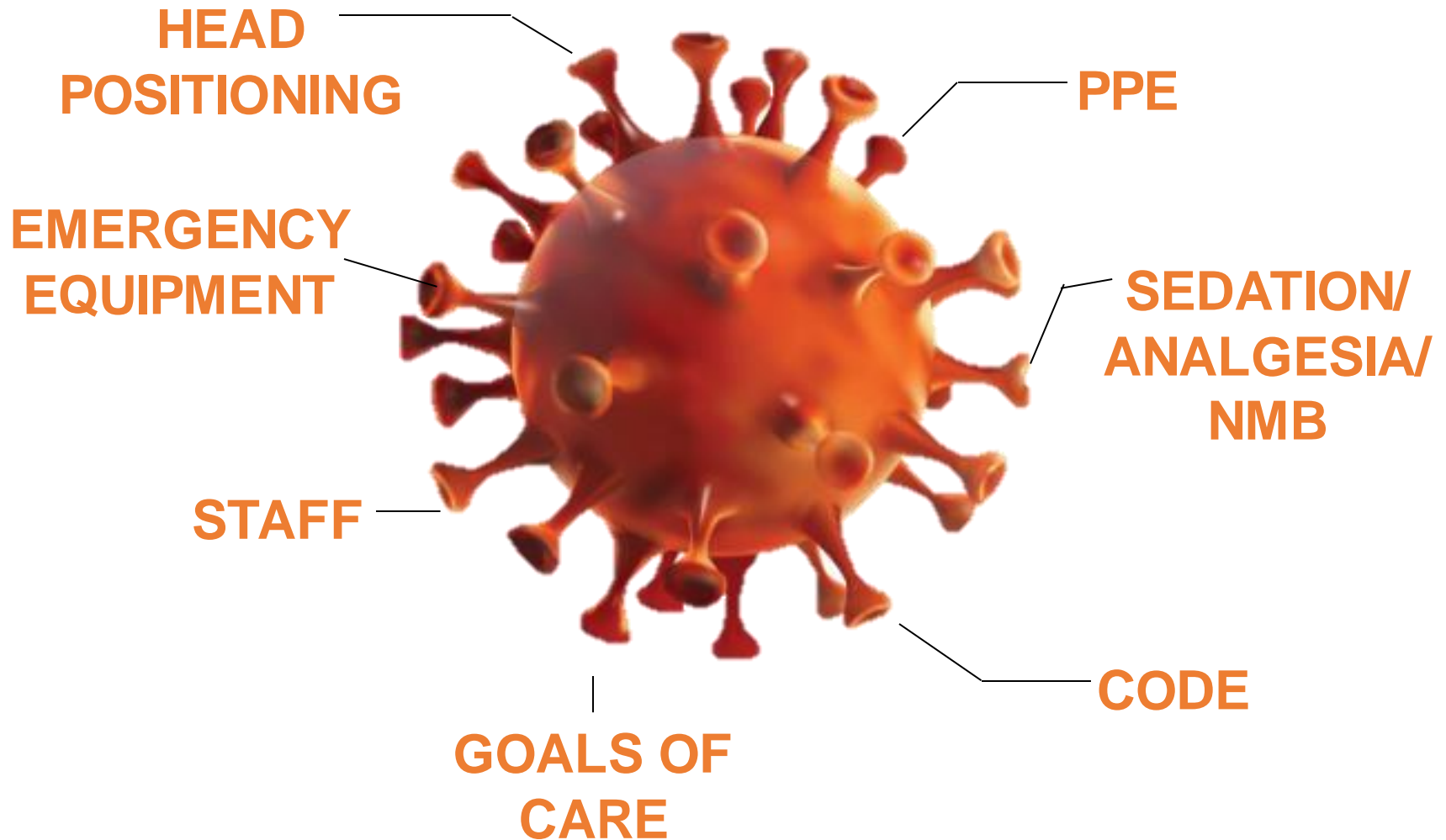
- Pregnancy
- Recent sternotomy
- Increased intracranial pressure
- Tracheostomy < 24 hours old
- Facial or neck trauma
- Open abdomen
- Unstable spine



# Additional Adjuncts & Rescue Therapies

- Inhaled NO
- Flolan
- Steroids
  - Methylprednisolone
- Neuromuscular blockade (NMB)
- ECMO
- Awake proning

# Covid 19 Considerations





To submit your own question for Sue, please email  
[QA@dkbmed.com](mailto:QA@dkbmed.com)



**What types of complications are you seeing with proning patients?**



**Is your institution manually proning or using  
a mechanical proning device?**



**How are you preventing pressure ulcers?**





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- Access our resource hub at [COVID19.DKBmed.com](https://COVID19.DKBmed.com)

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- Email [QA@dkbmed.com](mailto:QA@dkbmed.com)