

Prone Positioning: Examining a Key Supportive Strategy in ARDS



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ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION



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Objectives

- Discuss the physiologic rationale and the evidence for use of the prone position in patients with ARDS
- Identify evidence-based strategies for determining when to turn, how to turn, and how long to allow patients to remain in the prone position
- Outline strategies for preventing complications like ventilated associated pneumonia (VAP) and pressure Ulcers with evidence based strategies such as oral hygiene and protective dressings

Prone Positioning Incidence

Prone positioning (PP) was only used in 16.3% of patients with severe ARDS in the LUNG SAFE study

Bellaini G, et al. JAMA, 2016;315(8):788-800

European Prevalence Study (APRONET): Use of PP in mild 5.9%, moderate 10.3%, severe 32.9% ARDS

Guerin C, et al. Intensive Care Med, 2018;44(1):22-37



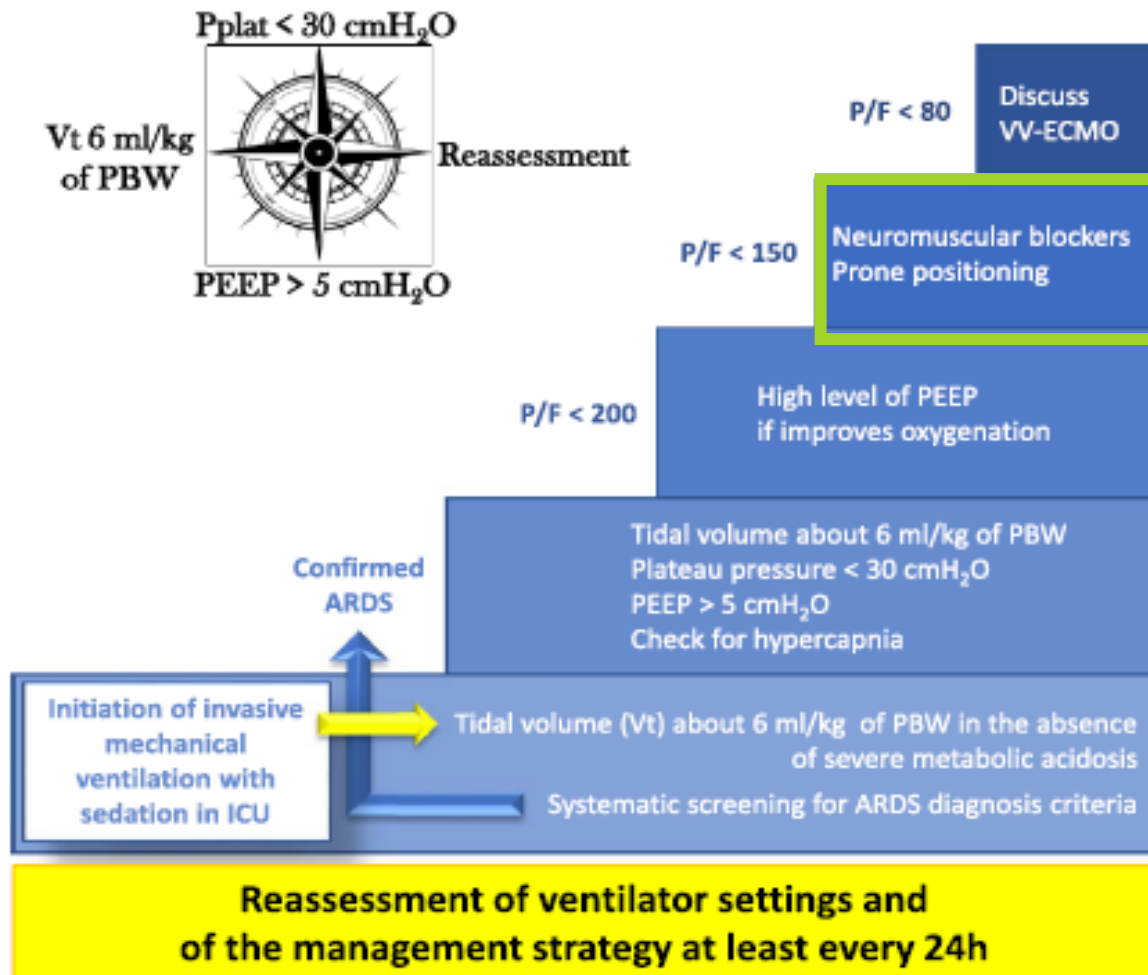
28% of ARDS COVID patients in the ICU are positioned prone.

Moore Z, et al. J Wound Care. 2020;29(6):312-320.

The Berlin ARDS Definition

TIMING	Within 1 week of a known clinical insult or new/worsening respiratory symptoms		
CHEST IMAGING (X-RAY OR CAT SCAN)	Bilateral opacities—not fully explained by effusions, lobar/lung collapse, or nodules		
ORIGIN OF EDEMA	Respiratory failure not fully explained by cardiac failure or fluid overload; need objective assessment (eg, echocardiography) to exclude hydrostatic edema if no risk factors present		
	MILD	MODERATE	SEVERE
OXYGENATION	<200 PaO ₂ /FiO ₂ or ≤300 with PEEP/CPAP ≥5 cm H ₂ O	<100 PaO ₂ /FiO ₂ or ≤200 with PEEP ≥5 cm H ₂ O	≤100 PaO ₂ /FiO ₂ with PEEP ≥5 cm H ₂ O
MORTALITY	27% (24% to 30%)	32% (29% to 34%)	45% (42% to 48%)

Early management of ARDS in 2019



ARDS severity

Veno-venous ECMO

- ☐ In case of refractory hypoxemia or when protective ventilation can not be applied
- ☐ To be discussed with experienced ECMO centres

Neuromuscular blockers: continuous intravenous infusion

- ☐ Early initiation (within the first 48h of ARDS diagnosis)

Prone positioning methods :

- ☐ Applied for >16h a day, for several consecutive days

Moderate or severe ARDS -> High PEEP test (> 12 cmH₂O)

- Use high levels if:
- ☐ Oxygenation improvement
 - ☐ Without hemodynamic impairment or significant decrease in lung compliance
 - ☐ Maintain Pplat < 30 cmH₂O, continuous monitoring

ARDS diagnosis criteria

- ☐ PaO₂/FIO₂ ≤ 300 mmHg
- ☐ PEEP ≥ 5 cmH₂O
- ☐ Bilateral opacities on chest imaging
- ☐ Not fully explained by cardiac failure or fluid overload
- ☐ Within a week of a known clinical insult

Might be applied

- > Inhaled Nitric Oxide (INO), when severe hypoxemia remains despite prone positioning and before considering VV-ECMO
- > Partial ventilation support after early phase to generate tidal volume about 6 ml/kg and less than 8 ml/kg

No recommendation could be made

- > ECCO₂R
- > Driving pressure
- > Partial ventilation support at the early phase

Should probably not be done

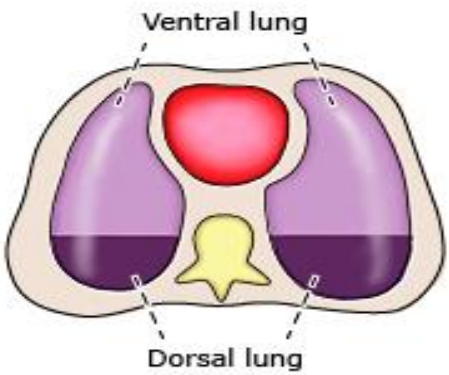
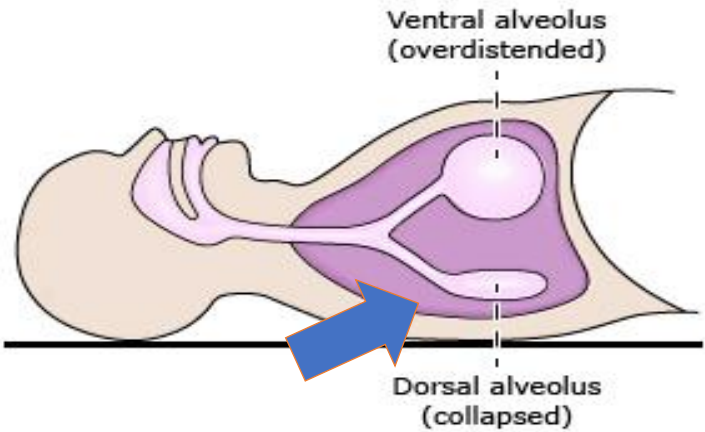

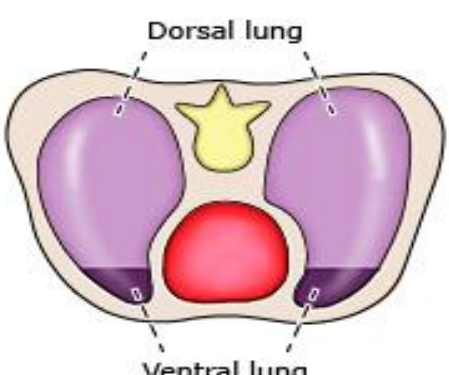
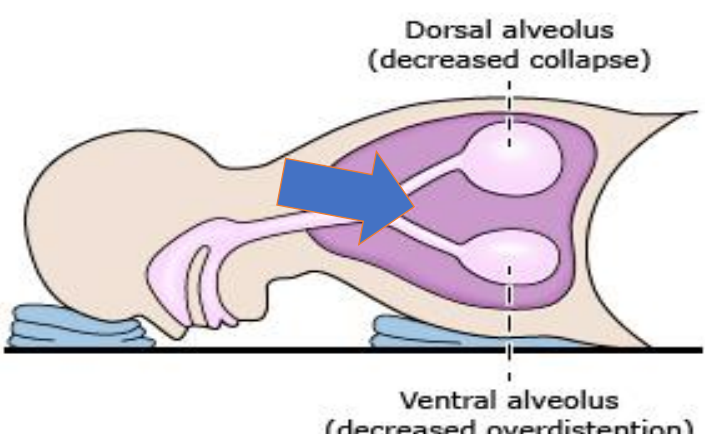

- > Systematic recruitment maneuvers

Should not be done

- > HFV

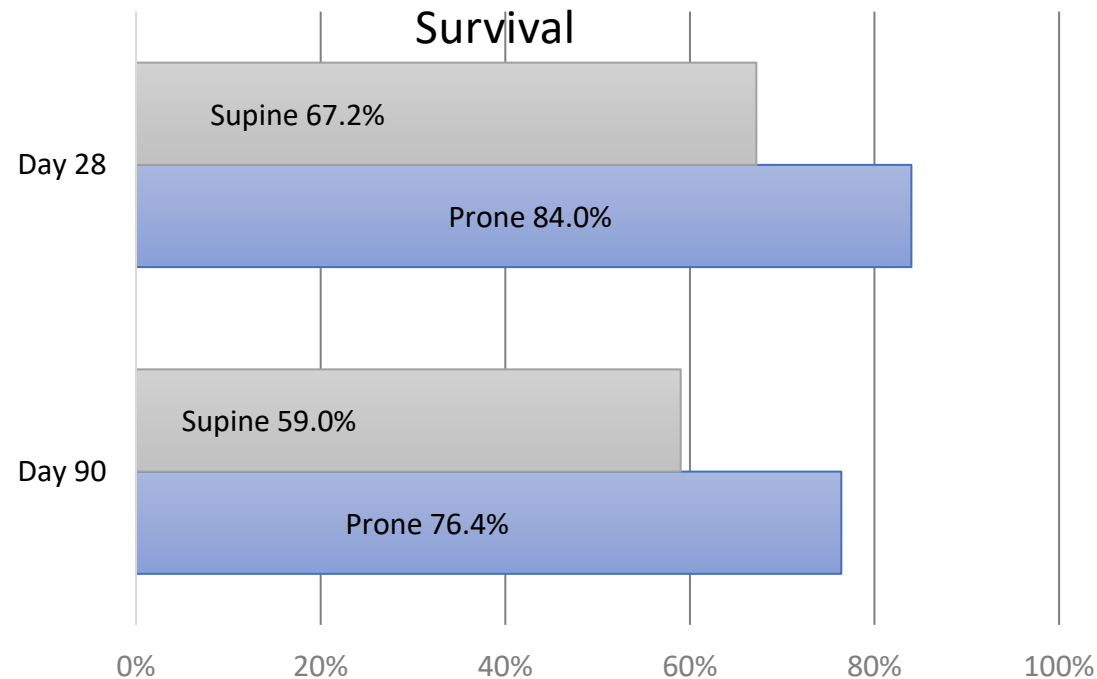
Why Prone Positioning?

- Improves dependent aeration recruiting alveoli
- Reduces hyperinflation of nondependent regions dramatically
- Results in more homogenous lung aeration which reduces regional shear strain...less ventilator-induced lung injury (VILI)
- Decreases barotrauma and atelectrauma by recruiting and reducing overdistension that occurs with higher positive end-expiratory pressure (PEEP)
- ↓ PACO₂ relates to net increase in recruitment / ↓ in dead space
- Drains secretions

		PTP	Blood flow
Supine position			
 <p>Ventral lung</p> <p>Dorsal lung</p>	 <p>Ventral alveolus (overdistended)</p> <p>Dorsal alveolus (collapsed)</p>	<p>+++</p> <p>---</p>	<p>↓</p> 
Prone position			
 <p>Dorsal lung</p> <p>Ventral lung</p>	 <p>Dorsal alveolus (decreased collapse)</p> <p>Ventral alveolus (decreased overdistention)</p>	<p>+</p> <p>-</p>	<p>↑</p> 

Q&A

Proning Severe ARDS Patients



In a randomized, controlled trial of 466 patients with severe ARDS, survival was significantly higher at 28 and 90 days in the prone position group

NNT=6

Prone Positioning Meta-Analysis

9 randomized controlled trials / 2,242 patients

OUTCOMES	DECREASED 30-DAY MORTALITY	REDUCED 60-DAY AND 90-DAY MORTALITY	REDUCED 28-30-DAY MORTALITY
PATIENT POPULATION	ARDS patients with a $\text{PaO}_2/\text{FiO}_2$ ratio ≤ 100 mmHg	ARDS patients ventilated with PEEP ≥ 10 cmH ₂ O	ARDS patients who had duration of proning >12 hours per day (n = 1,067, RR = 0.73, 95% CI = 0.54 to 0.99; P = 0.04)

Case Study

Mr. Green is a 65-year-old male 90kg male 5 feet 10 inches. Patient has a 2-day history of fever and chills. His past medical hx is Hypertension and coronary artery disease. He presents to the Emergency room with a fever 39.5°C complaining of inability to catch his breath.

His initial vital signs:

- △ HR 120/min
- △ RR 40/min
- △ BP 90/65
- △ O2 sat of 92% on room air.
- △ He is placed on 50% mask

△ ABG: (On 50% mask)

- pH 7.20
- PaCO₂ 28,
- PaO₂ 60,
- SaO₂ 93%
- Bicarb 13

△ Extremely labored breathing

△ Lactic acid: 3.5

△ WBC's: 24,000 with a left shift

△ Platelets: 75,000

△ Electrolytes WNL

△ Chest x-ray shows bilateral infiltrates

What should happen next?

Polling Question

 What should be the next step in Mr. Green's care?

1. Initiate non-invasive ventilation
2. Initiate intubation
3. Change to 100% non-rebreather
4. Initiate high flow nasal cannula (HFNC)

Case Study



- Intubated and transferred to the ICU
- Settings on mechanical ventilation
 - Vt 528, AC 28, FiO2 of 1.0, PEEP 8cm, Plat pressures 38cm H2O
- ABG's: 7.34, 35, 70, 94, 18
 - P/F ratio is 70
- PEEP increased incrementally over next 12 hours to 14cm
- FiO2 at 80%
- Plateau pressures 35cm H2O mmHg

ABGs:

- Ph 7.35
- PaCO2 34
- PaO2 60
- SaO2 91
- Bicarb 20
- P/F ratio 75

What should be our next step?

Polling Question

- 
- What should be the next step in Mr. Green's care?
1. Switch to High Frequency Oscillation Ventilation (HFOV)
 2. Initiate Extra Corporeal Membrane Oxygenation (ECMO)
 3. Initiate prone positioning
 4. Switch to Airway Pressure Release Ventilation (APRV)
- 

Who to Place in Prone Position?

- ▶ Patients with severe ARDS ($\text{PaO}_2/\text{FiO}_2 < 150$ mmHg)
 - △ Per ATS/SCCM Mechanical Ventilation for ARDS guidelines, a strong recommendation for prone positioning for >12 hours /day
- ▶ Patients early in the course (12–24 hours)

Who Not to Place in Prone Position?



1

Patients with facial/neck trauma or spinal instability

2

Patients with recent sternotomy or large ventral-surface burn

Patients with massive hemoptysis

3

Patients with elevated intracranial pressure

4

5

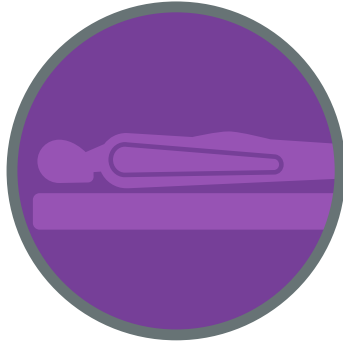
Patients at high risk of requiring CPR or defibrillation



Relative Considerations

- ▶ ENT: raised intraocular pressure or recent ophthalmic surgery, facial trauma, or recent oral maxillofacial surgery in last 15 days
- ▶ Cardiac: severe hemodynamic instability, unstable cardiac rhythms, ventricular assist device, intra-aortic balloon pump, recent sternotomy, new pacemaker < 48 hours
- ▶ Pulmonary: hemoptysis, unstable airway (double lumen endotracheal tube), new tracheostomy < 15 days, bronchopleural fistula, lung transplant
- ▶ Abdomen: second or third trimester pregnancy, grossly distended abdomen, ischemic bowel, abdominal compartment syndrome, recent abdominal surgery or stoma, extensive inguinal or abdominal soft tissue injury
- ▶ Musculoskeletal: chest wall abnormalities, kyphoscoliosis, or advanced arthritis
- ▶ Skin: burns on more than 20% body surface

Patients Who Have Been Placed in the Prone Position Successfully



1 Patients with open abdomens

2 Patients with intracranial pressure monitoring

3 Patients with hemodynamic instability

Patients with pelvic fractures

4

Patients with external fixators

5

Patients with multiple traumatic injuries

6

7 Patients with use of extracorporeal membrane oxygenation (ECMO)

8 Patients with continuous renal replacement therapy (CRRT)

Patients with morbid obesity

Pre-Prone Position Process

- Patient and family education
- Gather staff and supplies, obtain pre prone measurements
- Preoxygenate, empty stomach (1hr), suction endotracheal tube/oral cavity,
- Secure the endotracheal tube and lines (remove ET holders if in use)
- Position tubes inserted above the waist to the **top of the bed**
- Position tubes inserted below the waist to the **foot of the bed** (except chest tubes)
- Empty ileostomy/colostomy bags before the turn
- Placement of prophylactic dressings in high pressure/shear risk areas (forehead, chin, chest, elbow, pelvic, knees, dorsal feet)
- Ensure the tongue is inside patient's mouth and eyes are closed
- Develop an exit strategy for instability while in the prone position

AACN Procedural Manual-7th ed

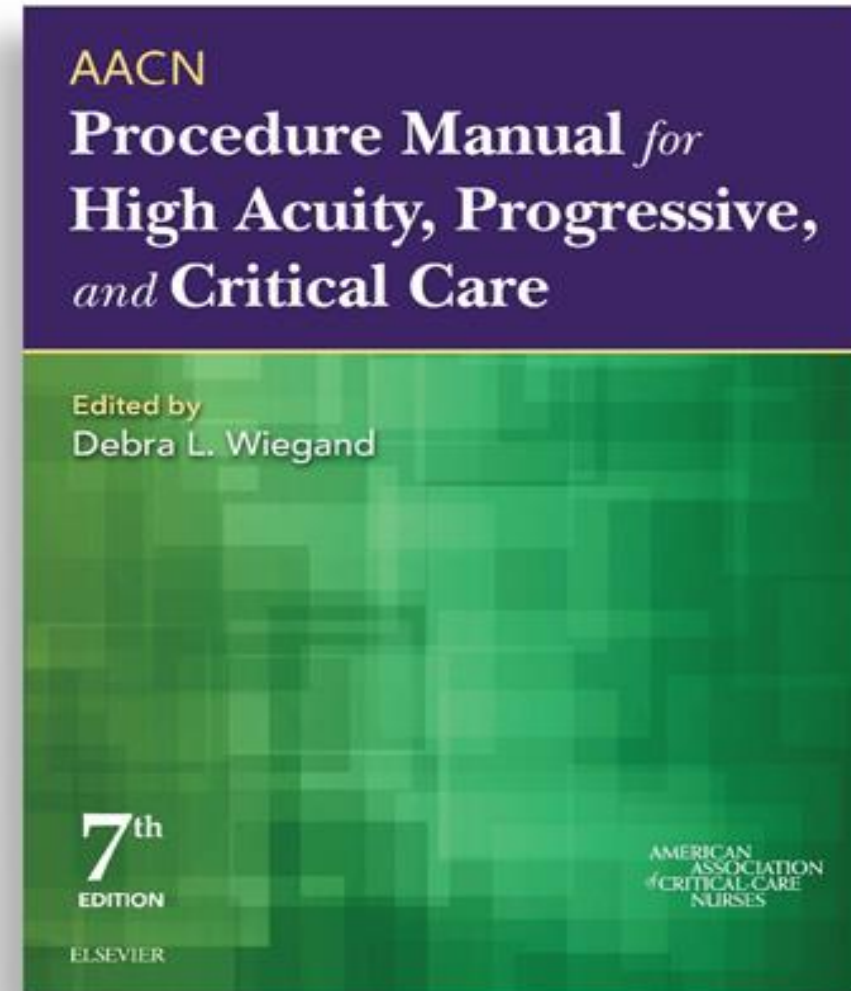
Chapter 18: Pronation Therapy

Authors

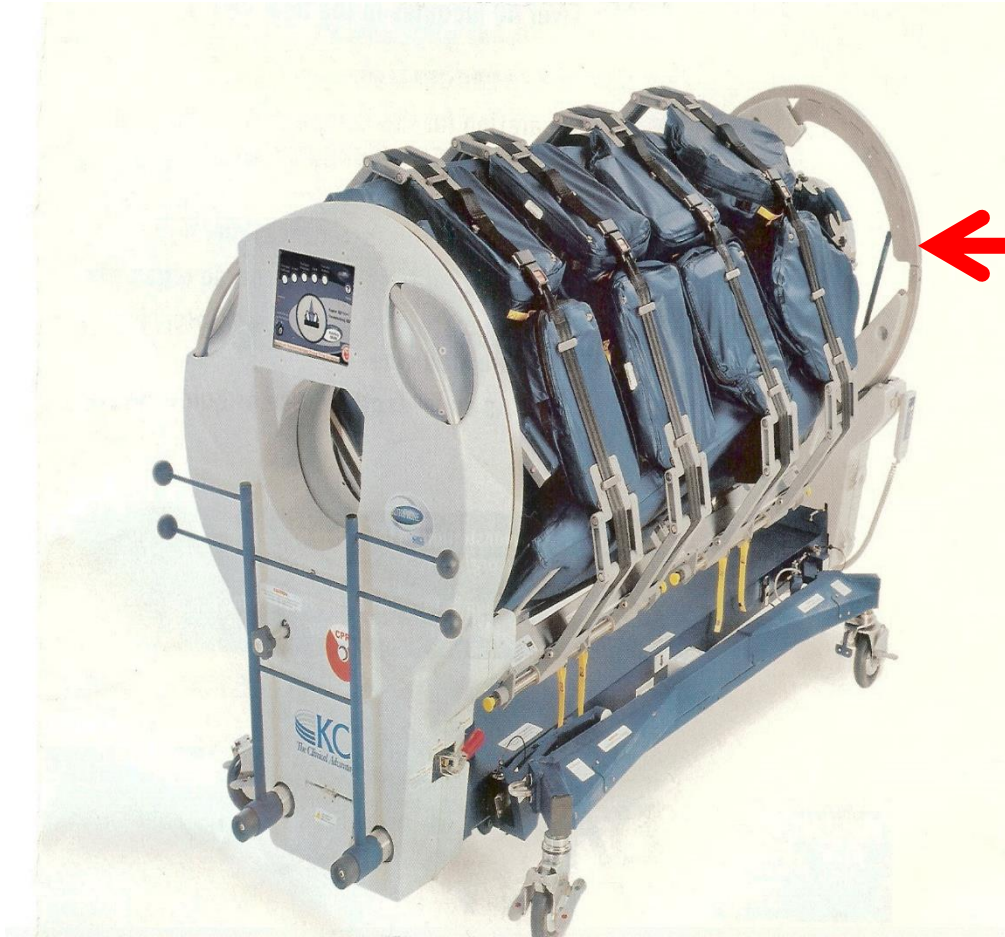
△ Kathleen Vollman

△ Jan Powers

△ Sharon Dickinson







Rotoprone



Prone positioner
No longer sold

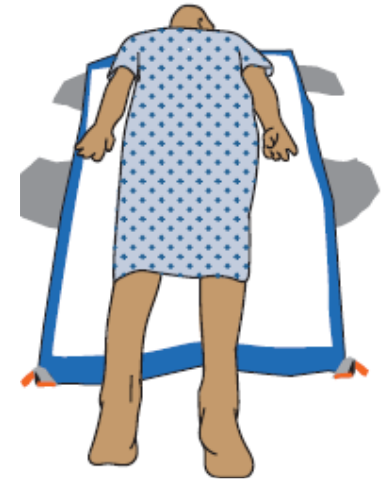
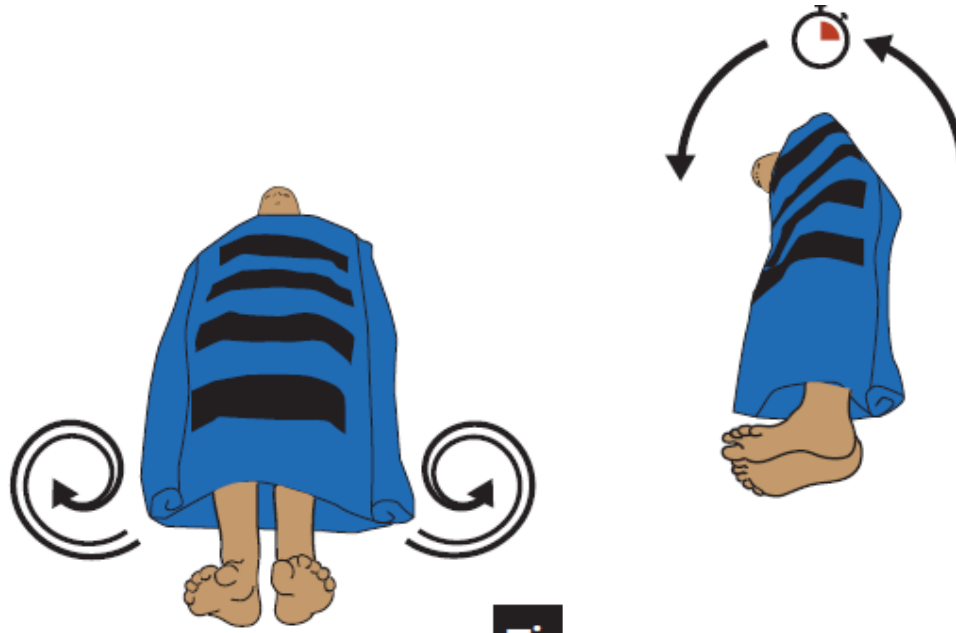
Manual Proning



List Assisted Prone Positioning with Positioning Sheet

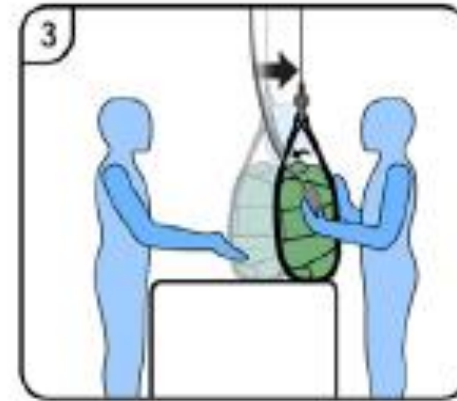
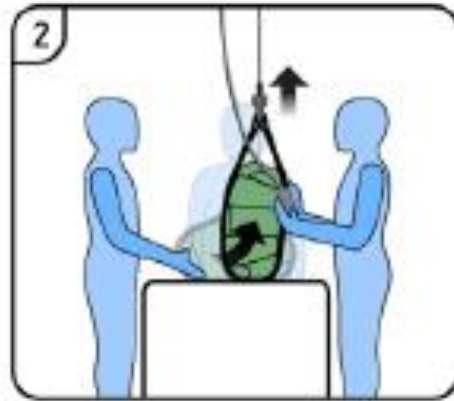
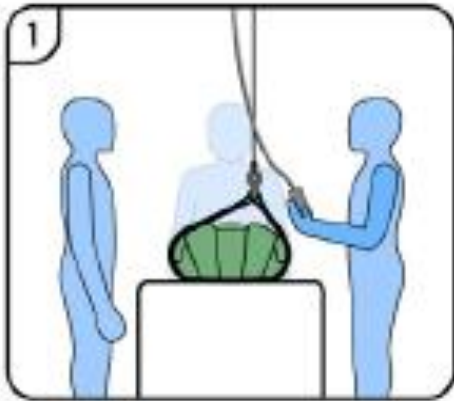
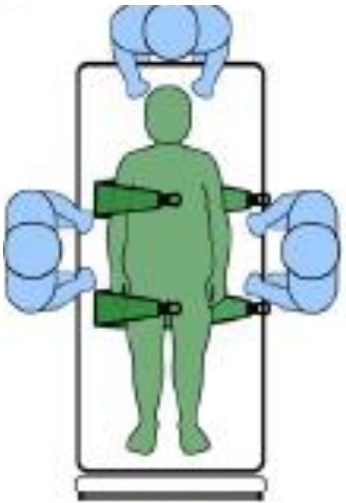


Disposable Slide Sheets

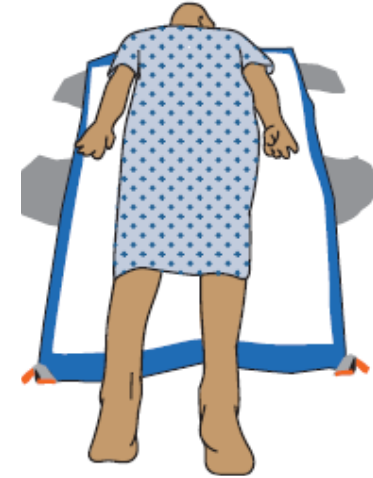


Prevalon AirTAP Patient Repositioning System

Lift Assisted Prone Positioning



Burrito Method Using a Transfer System



Chest and/or pelvic support can be done by placing a pillow/wedge before completing the turn.

Positioning Schedule & Maintenance Care



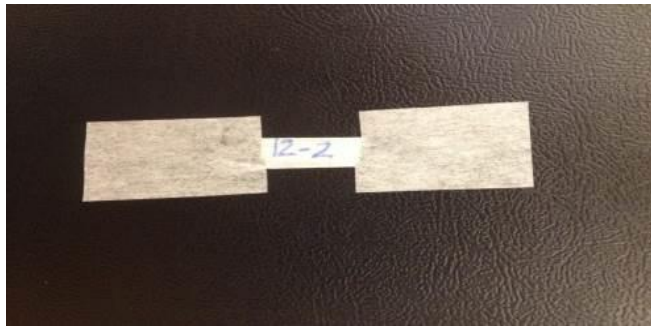
- ⚠ Consider every 16hrs uninterrupted (more frequent turn back may cause decruitment)
- ⚠ Obtain post prone measurements
- ⚠ Restart feeding
- ⚠ Move head slightly every hour or q 2-ensure ET tube is not kinked
- ⚠ ROM of arms every 2 hours/change position of the arms (Swim position)
- ⚠ Support feet in correct anatomical alignment
- ⚠ If hemodynamic monitoring, level the zero-reference point at the right atrium
- ⚠ Consider time periods in reverse trendelenburg to address facial edema and reduce risk of vomiting
- ⚠ Frequent oral hygiene and suctioning and as needed



Maintenance Care

Consider floating the nasogastric tube to prevent pressure injuries

- Taping
 - Obtain 3 inches of 1 inch wide paper tape
 - Make two ¼ inch cuts 1 inch apart on each side of tape



Step 1: Cut tape



Step 2 : Secure to Nose

Maintenance Care—Other Things to Consider

- Consider pillows, use of liter bags of IV fluids or fluidizer positioner to align the head and neck
- Use silicone preventive dressing under ECMO cannulas

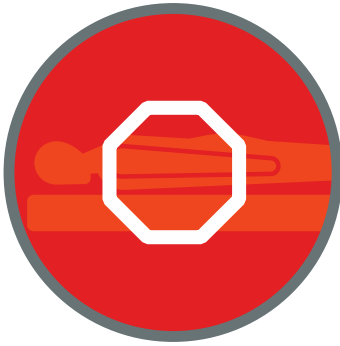


HEAD SUPPORT



Image courtesy of Sharon Dickinson

When to Stop Prone Positioning?



Research supports stopping prone positioning when $\text{PaO}_2/\text{FiO}_2$ has remained >150 mmHg 4 hours after supinating (with PEEP <10 cm H_2O and $\text{FiO}_2 <0.6$)

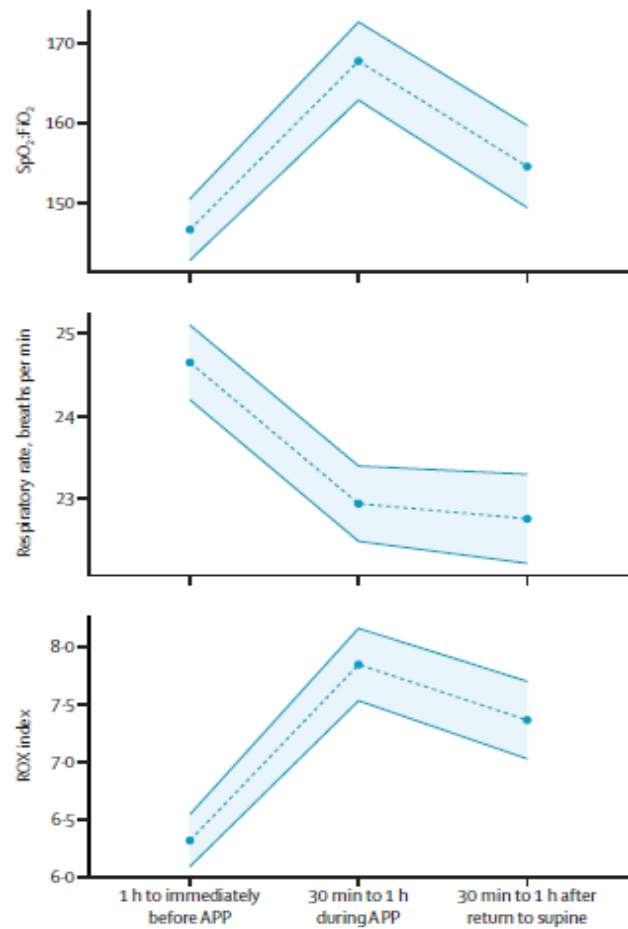
If there is no response after 48 hours, question whether prone positioning should continue

Awake Prone Positioning with COVID: Open Label RCT

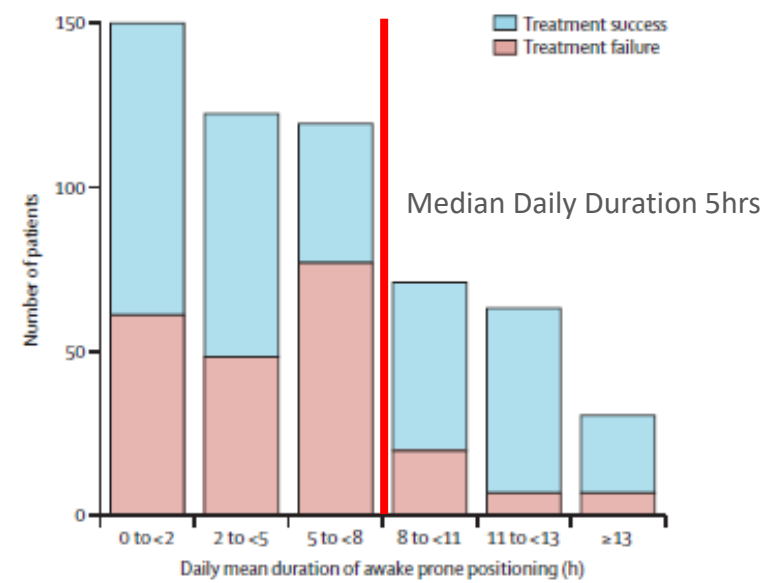
- Assess whether awake proning prevents intubation or death in patients with severe COVID 19 in RCT
- COVID 19 hypoxemic respiratory failure defined as: requiring respiratory support with HFNC & P/F ratio of ≤ 315 randomized to awake prone positioning or standard care
 - Awake prone (567)
 - Standard care (559)
- 6 countries
- Patient instructed to lie in PP as frequent and as long as can be tolerated each day
- Awake proning cease when weaning HFNC because of improve oxygenation
- Pre-defined criteria for intubation was used in both group
- Outcomes:
 - Tx failure define as intubation or dying within 28 days of enrolment
 - Secondary outcome: intubation, mortality, use of non-invasive vent, time to intubation, time to death, Hospital LOS

Awake Prone Positioning with COVID: Open Label RCT

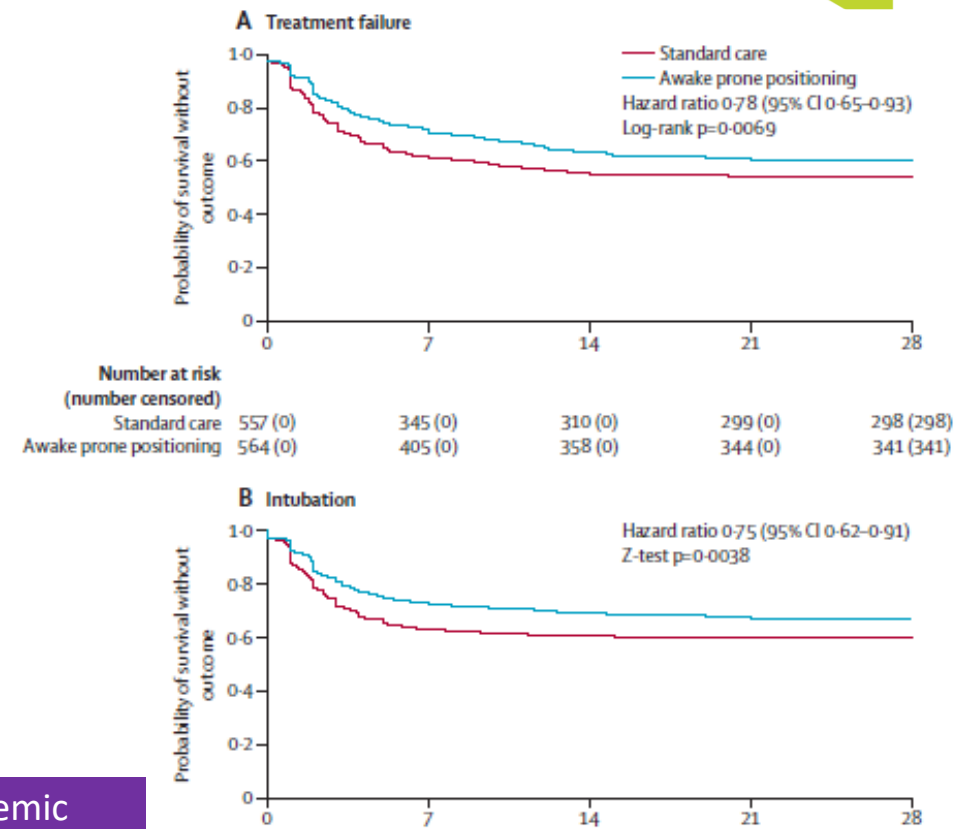
Physiologic Impact of Awake Prone Positioning



Time Spent in Prone Position



Outcomes



Awake prone position of patients with hypoxemic respiratory failure from COVID 19 reduces the incidence of treatment failure and need for intubation without any signal of harm - NNT 14

Safe Awake Proning Checklist

Preparation	Proning	After turning/during proning
Patient Identity Explanation procedure Document duration of procedure Consent Materials Pillows and slide sheet Crash cart Oxygen available Suction equipment available Monitoring: pulse oximetry if available Check Vital signs: SpO ₂ , RR, HR, and BP IV access Nurse call system Baby monitor in case of pregnancy Emergencies Emergency team for the supine position Crash cart (intubation equipment) available	Patient Self-proning Assisted proning Materials Sufficient room between the head and shoulders for oxygen supply In pregnant women, special attention to alleviate pressure on the gravid uterus Oxygen supply continued Emergencies Emergency team for the supine position Crash cart (intubation equipment) available	Patient Comfort Document chosen position (prone and lateral) Document position of arms Materials Provide emergency buzzer, mobile phone, and improvised rattle Check Vital signs: SpO ₂ , RR, HR, and BP IV access Nurse call system Additional external fetal monitoring Medication Pain: paracetamol 4 dd 1 g Anxiety: low-dose benzodiazepine Oxazepam 10 mg po Midazolam 1–2 mg po Emergencies Emergency team for the supine position Crash cart (intubation equipment) available and know where to find

BP = blood pressure; HR = heart rate; IV = intravenous; RR = respiratory rate; SpO₂ = peripheral oxygen saturation. Based on the WHO surgical checklist and Safe prone checklist.⁶⁸

Awake proning in 5 steps

1 Prepare

Explain the procedure to the patient and family and obtain consent. Gather as many pillows, towels and blankets as possible. Ensure at least 2 people are present to assist if required.

2 Position

Lay the bed flat. Ask the patient to turn themselves onto their tummy and provide assistance. Position a **first pillow** under their chest or chest and abdomen and a **second pillow** or a rolled towel under their forehead, leaving a gap to accommodate the face mask. Ask the patient to orient their head in whatever position they find most comfortable.

3 Oxygen supply & interface

Adjust the oxygen tubing so it is free at sight. Ensure that the reservoir bag is fully inflated, and the mask is not being pushed against the patient's face (may require additional padding)

4 Optimize position

Position the remaining pillows / bedding to minimise pressure on body parts and to maximize patient comfort. The knees should be slightly flexed and the arms supported at a comfortable angle, the elbow should be at an angle of ~80 degrees. The upper arm and shoulder in horizontal line. It is important to encourage the patients to reposition themselves when required or to call for help when they feel uncomfortable (give them a way to summon attention).


5 Monitor

Monitor oxygen saturation, respiratory rate and patient comfort. Target $SpO_2 > 90\%$ (>92% in pregnant patients).

Drawing Marco Rosetti



Polling Question

 What complications have occurred with use of the prone position at your hospital? Check all that apply

1. Airway obstruction
2. Accidental extubation
3. Pressure injuries
4. Loss of invasive lines
5. Loss of tubes
6. Cardiac arrest
7. Hemodynamic instability
8. Arrhythmias
9. pneumothorax
10. Ocular injuries
11. Brachial plexus injuires

Adverse Events	No. of Trials Reporting the Outcome	Events/Prone	Events/Supine	Treatment Effect (Random-Effect Model)		Number Needed to Treat/Number Needed to Harm	Heterogeneity	
				OR (95% CI)	p		I ² (%)	p
Ventilator-associated pneumonia	6	120/567	128/513	0.76 (0.44–1.33)	0.343	26	34.4	0.192
Pressure ulcers	6	294/698	218/646	1.49 (1.18–1.89)	0.001	12	0.0	0.617
Major airway problem ^a	9	255/1,104	180/1,063	1.55 (1.10–2.17)	0.012	16	32.7	0.167
Unplanned extubation	7	113/1,091	98/1,050	1.17 (0.80–1.73)	0.421	98	25.5	0.234
Selective intubation	2	12/642	5/615	2.73 (0.29–25.46)	0.378	95	55.9	0.132
Endotracheal tube obstruction	4	130/823	77/802	2.16 (1.53–3.05)	<0.001	16	0.0	0.580
Loss of venous or arterial access	4	36/407	22/397	1.34 (0.29–6.26)	0.712	30	75.5	0.007
Thoracostomy tube dislodgement or kinking	4	14/407	14/397	1.14 (0.35–3.75)	0.827	1,154	42.6	0.175
Pneumothorax	4	29/513	33/462	0.77 (0.46–1.30)	0.333	67	0.0	0.528
Cardiac arrest	3	104/718	119/675	0.74 (0.47–1.17)	0.197	32	30.3	0.238
Tachyarrhythmia or bradyarrhythmia	3	115/663	102/634	1.08 (0.78–1.50)	0.643	80	8.8	0.334

11.9% complication rate

Potential Complications



- Temporary increase in oral and tracheal secretions occluding airway
- Endotracheal tube (ETT) migration or kinking
- Vascular catheter kinking
- Elevated intraabdominal pressure
- Increased gastric residuals
- Facial pressure ulcers, facial edema, lip trauma from ETT
- Brachial plexus injury (arm extension)
- Hemodynamic instability



✓	Screen for ARDS severity
✓	
✓	
✓	
✓	
✓	



Does your ICU have a process for assessing P/F ratios routinely?

	Mild	Moderate	Severe
Oxygenation	$< 200 \text{ PaO}_2/\text{FiO}_2$ or ≤ 300 with PEEP/ CPAP $\geq 5 \text{ cm H}_2\text{O}$	$< 100 \text{ PaO}_2/\text{FiO}_2$ or ≤ 200 with PEEP $\geq 5 \text{ cm H}_2\text{O}$	$\leq 100 \text{ PaO}_2/\text{FiO}_2$ with PEEP $\geq 5 \text{ cm H}_2\text{O}$



✓	Screen for ARDS severity
✓	Prevent Injuries
✓	
✓	
✓	



Pressure Injury Risk in the Prone Patient

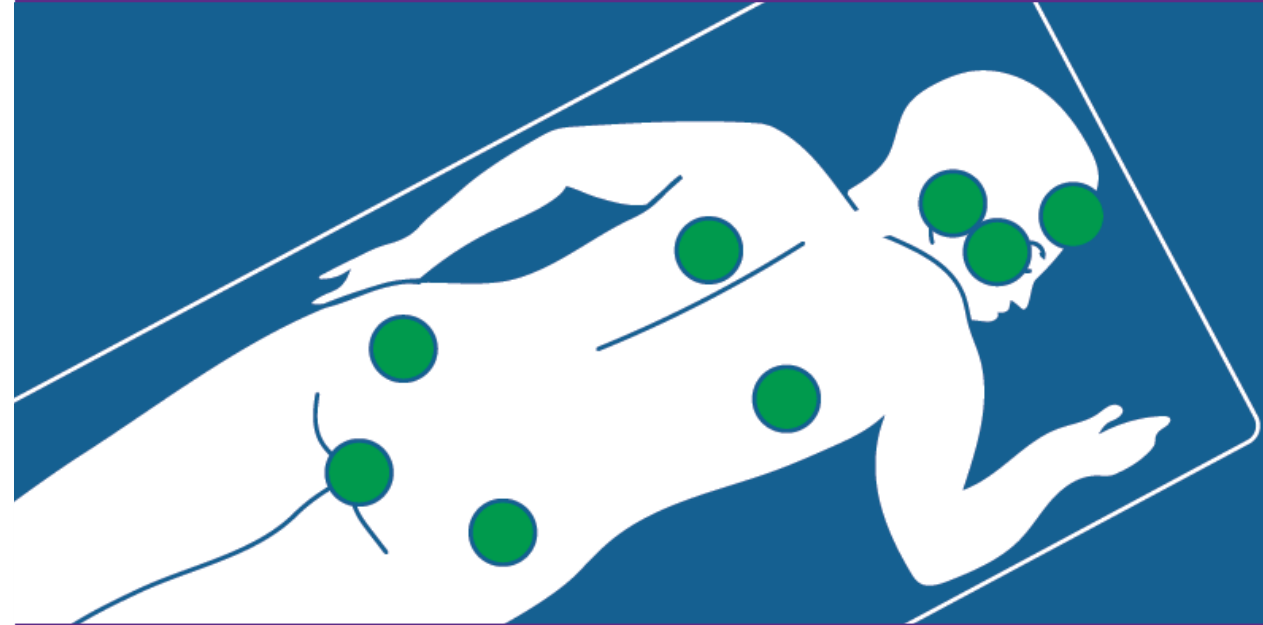
Incidence

- △ Prone position for ARDS increased odds of pressure injury
 - Ranges 1.22- 1.37 (95% CI 1.05 to 1.79)
 - PI 37% more common in prone pts
- △ High rates being reported in COVID patients



Pressure Injury Prevention: Prone Positioning

- ▲ Redistribution surface
- ▲ Positioning devices to offload pressure points (Do not use ring or donut-shaped positioning devices)
- ▲ Avoid shear and friction during the turning process
- ▲ Small micro turns while prone/swimmer position shifts q 2-4 hrs
- ▲ Assess skin with when doing small positioning shifts
- ▲ Placement of prophylactic dressings over all potential pressure injury risk areas



Green areas represent pressure sources while lying prone

Head Specific Interventions to Reduce PI while Proning

- 🌈 Apply soft silicone multilayered foam prophylactic dressings to pressure points on the face (cheeks, forehead, chin and consider strips around the corners of the mouth)
- 🌈 Manage moisture /oral & nasal secretions
 - △ Liquid skin protected or sealants on the face
 - △ Change form dressings PRN
 - △ Consider applying hydro fiber or calcium alginate dressings under prophylactic dressings to manage excess moisture (chin, mouth area and cheeks)
- 🌈 Consider removing commercial ETT holder and use tape or twill. Places patients at risk for pressure injuries
- 🌈 Apply thin foam dressings under medical devices—including ETT securement (tape-twill)



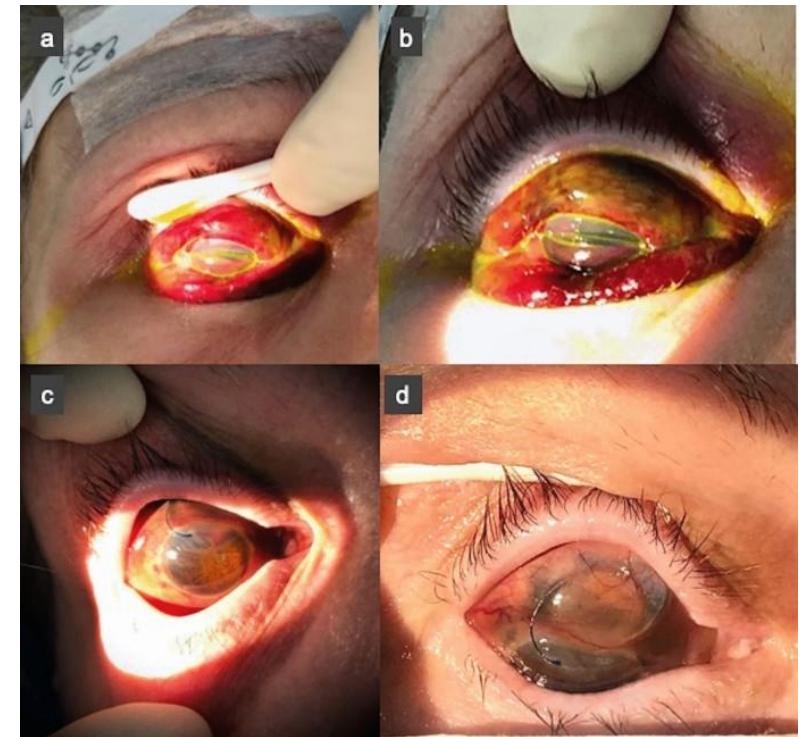
Jackson ME, et al. *Respir Care*. 2012;57(2):311-314

Kim RS, et al. *J Wound Ostomy Continence Nurs*. 2016;43(4):427-429

Ocular Injury

- Meta-analysis of prone positioning studies examining ocular injury occurrences, they found only a 1.3% incidence in prone patients while 1.9% in supine patients
- Corneas at most risk:
 - △ Blinking issues
 - △ Reduction in tear production
 - △ Failure of eye closure

Global Eye Rupture from Prolonged Prone Positioning



Leuzinger-Dias, M et al. *Ophthalmol Ther* **10**, 691–697 (2021)

Evidence –Based Strategies to Reduce Injury



- ▶ Perform eye assessment daily and prior to proning.
- ▶ Clean the eyes with saline soaked gauze, apply ointment then horizontally tape the eye lids closed.
- ▶ In the presence of conjunctival or corneal exposure increase the frequency of eye ointment application as per institutional policy.
- ▶ Use of reverse Trendelenburg to reduce eye conjunctival edema



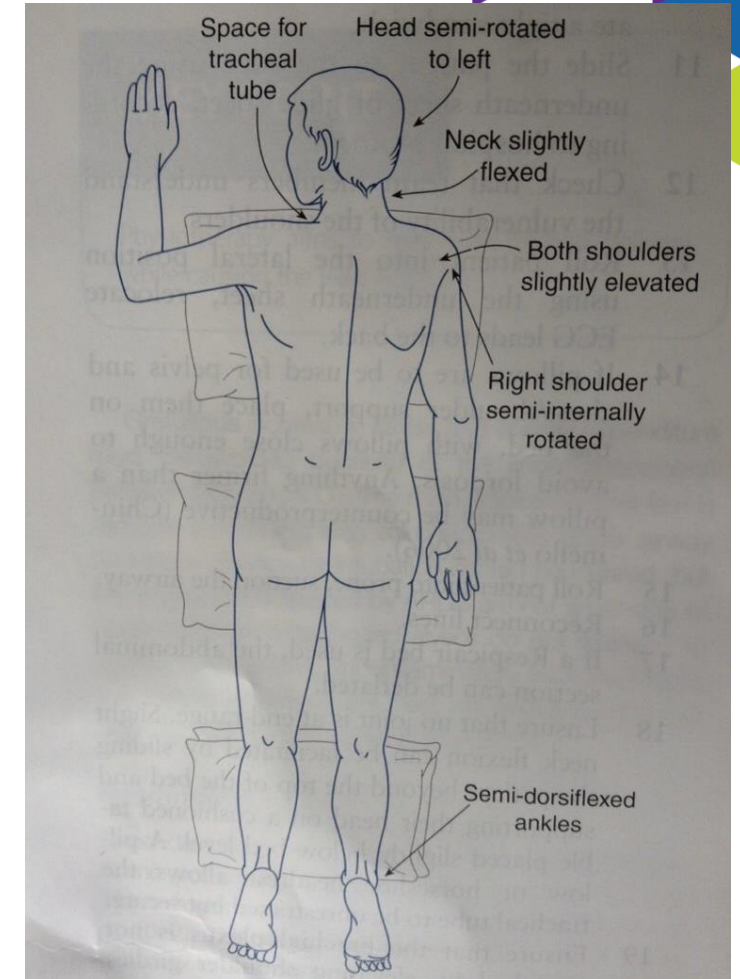
Torso

- ▶ EKG leads on the back while prone
- ▶ Apply prophylactic dressing to pressure points and high shear areas
- ▶ Secure all tubes and devices away from the skin
 - △ protect surrounding skin with prophylactic dressings & bridged areas with positioning devices
 - △ Create channels for tubes with positioning aids
- ▶ Breast & genitalia
 - △ Should be offloaded and protected



Brachial Plexus & Ulnar Safety

- 🌀 Maintain straight spine alignment & avoid excessive arm rotation
- 🌀 Avoid positions of extension of the shoulders and support the chest well to ensure shoulder is forward flexed or falling forward
- 🌀 Avoid positioning arm in abduction beyond 70 degrees with elbow extension and external rotation of the shoulder beyond 60 degrees
- 🌀 Avoid hyperextension of the neck by adjusting height of head chest and pelvic supports



Physio-pedia.com

Brugliera L, et al. Arch Phys Med Rehabil. 2021 Mar;102(3):359-362.

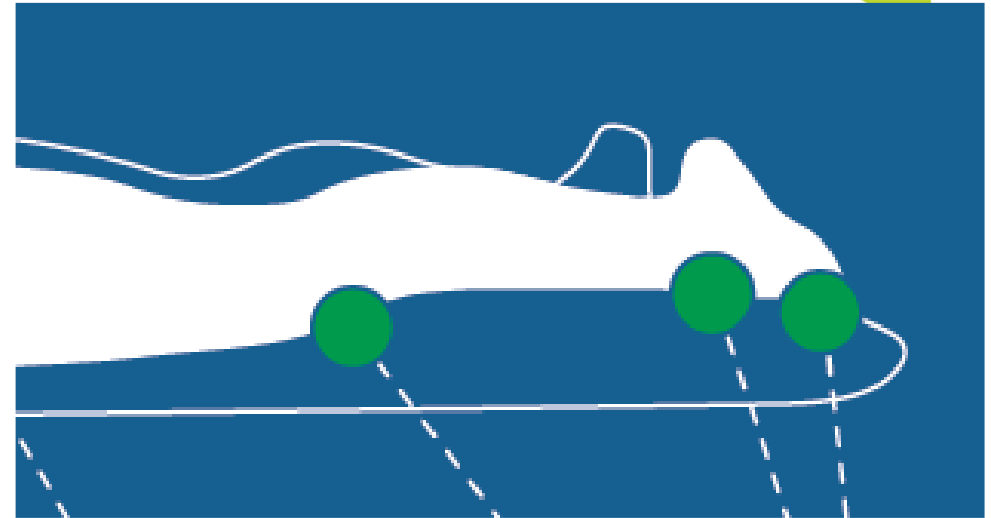
Miller C, et al. Phys Ther. 2021 Jan 4;101(1)

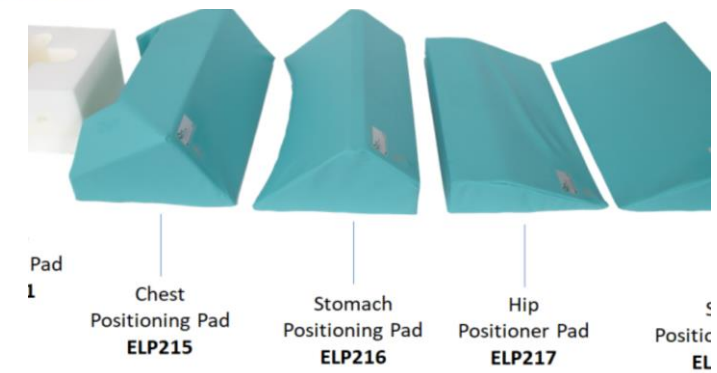
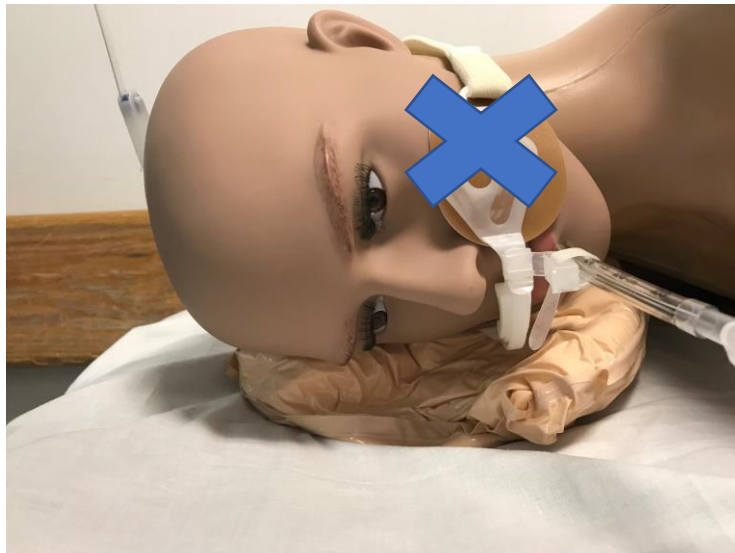
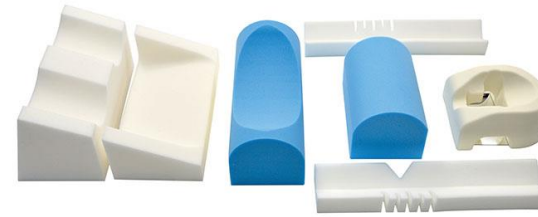
Bamford P, et al. Available from https://www.ficm.ac.uk/sites/default/files/prone_position_in_adult_critical_care_2019.pdf.

Simpson AI, et al. J Intensive Care Med. 2020;35(12):1576-1582

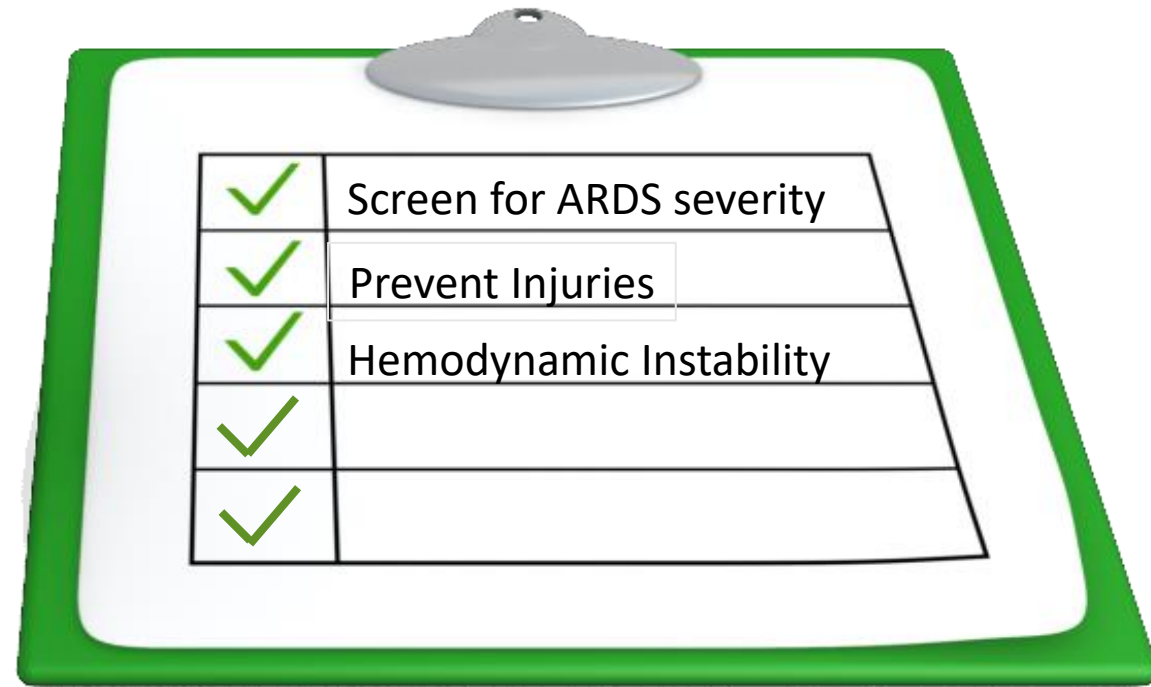
Legs & Feet

- ▶ Apply Prophylactic foam dressings to the Patella and pretibial area
- ▶ Remove securement devices and align urinary catheter & fecal management devices towards the foot of the bed
- ▶ Ensure there are no unsecured devices under the legs
- ▶ Offload the feet





List various equipment available for prone (Fourie A, et al. J Tissue Viability. 2021 Sep 23: in press)



The Role of Hemodynamic Instability in Positioning

- ▶ Lateral turn results in a 3%-9% decrease in SVO_2 , which takes 5-10 minutes to return to baseline
- ▶ Appears the act of turning has the greatest impact on any instability seen
- ▶ Minimize factors that contribute to imbalances in oxygen supply and demand
- ▶ Factors that put patients at risk for intolerance to positioning:

- △ Elderly
- △ Diabetes with neuropathy
- △ Prolonged bed rest
- △ Low hemoglobin and cardiovascular reserve
- △ Prolonged gravitational equilibrium

Right ventricular function improves in PP/ ↑ preload & CI

A green clipboard with a silver clip at the top holds a white sheet of paper with a checklist. The checklist has five rows, each with a checkbox on the left and a text label on the right. The first four rows are checked with green checkmarks, and the fifth row is empty. There are also some small, faint rectangular marks at the bottom left of the clipboard.

<input checked="" type="checkbox"/>	Screen for ARDS severity
<input checked="" type="checkbox"/>	Prevent Injuries
<input checked="" type="checkbox"/>	Hemodynamic Instability
<input checked="" type="checkbox"/>	NMBA use
<input type="checkbox"/>	

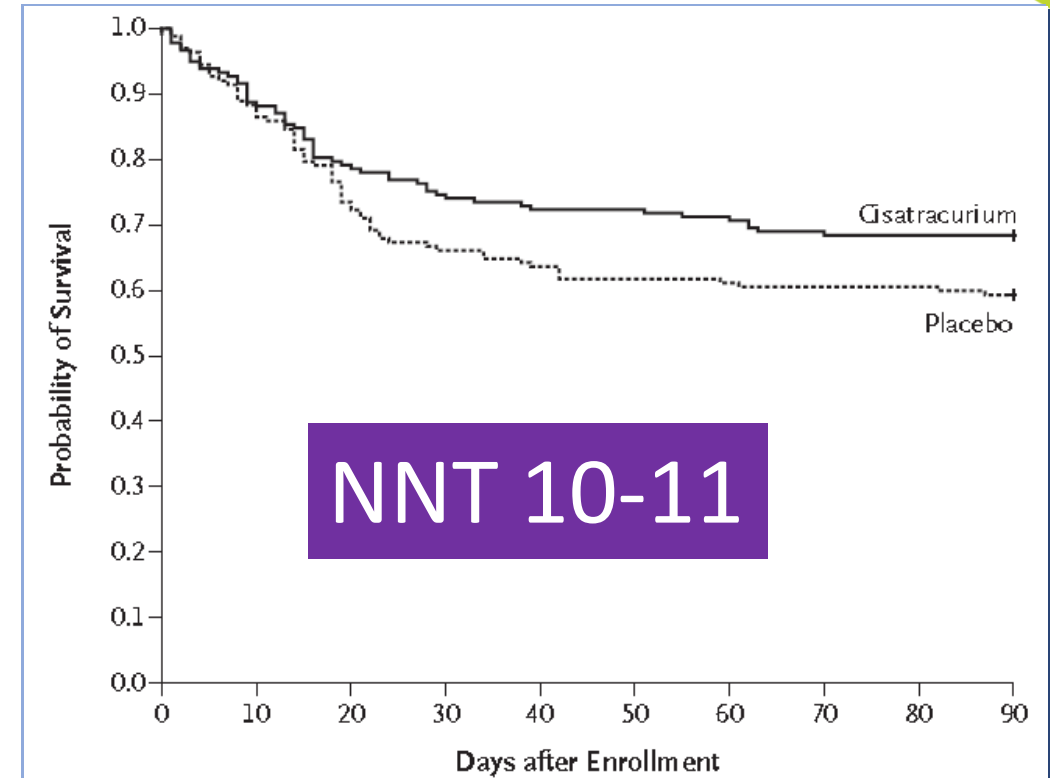


Neuromuscular Blockade in Early ARDS

- 🔗 Multicenter, double blind trial
- 🔗 340 patients with ARDS within 48hrs of admitted to ICU
- 🔗 ARDS defined as P/F ratio of $< 150 \geq$ PEEP 5cm & Vt of 6-8 ml/kg PBW
- 🔗 Randomized to receive 48hrs of cisatracurium or placebo
- 🔗 Study did not use train of 4

Results:

- △ After risk adjustment NMB group showed improved mortality at 90 days (31.6% vs. 40.7%)
- △ Also significant at 28 days
- △ ↑time off vent
- △ No difference in muscle weakness



ROSE Trial: Re-evaluation of Systemic Early Neuromuscular Blockade



- Protocol: moderate to severe ARDS < 48hrs / P/F ratio < 150 with \geq PEEP 8 cm
- Cisatracurium for 48hr or usual care
- Protocol changed mid-study, removed RM

The ROSE trial at 90-day follow-up in patients with moderate-to-severe ARDS, 42.5% of the intervention group and 42.8% of the control group died before hospital discharge (between group difference -0.3%, 95% CI -6.4 to 5, $P=0.93$), -study stopped early.

Angus D, et al NEJM May 19th 2019

Prone Positioning used 15.8%. Equal use in both groups



Summary

- 🔗 Use the prone positioning
- 🔗 Implement early—don't wait
- 🔗 Develop a process or protocol to minimize complication risk
- 🔗 Training all providers to mastery is critical





"HAPPY TURNING"





Kathleen Vollman

ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION



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