Prone Positioning in 2021: Doing it Awake and Preventing Injury

Kathleen Vollman
ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION

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Objectives

- Discuss indications for use of awake prone position
- Determine safe strategies for awake and vented prone positioning
- Outline strategies preventing skin injury and other complications in the prone position.

Notes on Hospitals: 1859

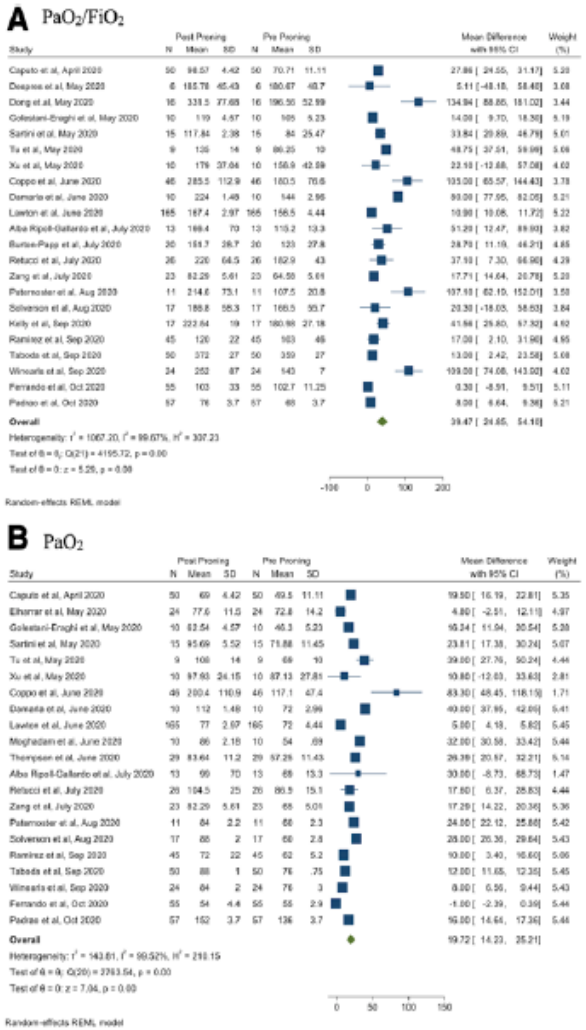
"It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick no harm."

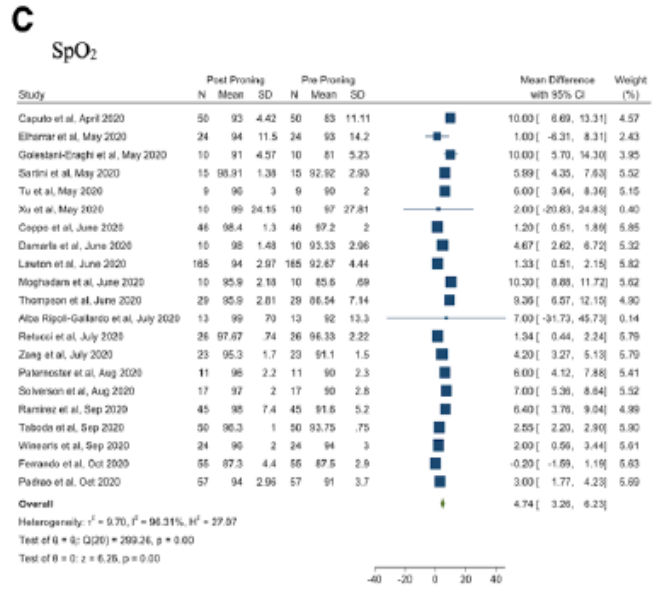
- Florence Nightingale

Advocacy = Safety

Does Awake Proning Impact Patient Outcomes? Systematic Review and Meta-Analysis

- Studies reporting prone position in hypoxemic, non-intubated adults with COVID 19
- 25 observational studies, 758 patients
- Median dose 120 min, 1 to 3x per day
- 40% in ICU, 60% outside ICU
- Examine impact on p/f ratio, PaO2, SpO2, intubation rate & mortality
- Significant heterogeneity in location, dose & frequency & respiratory support

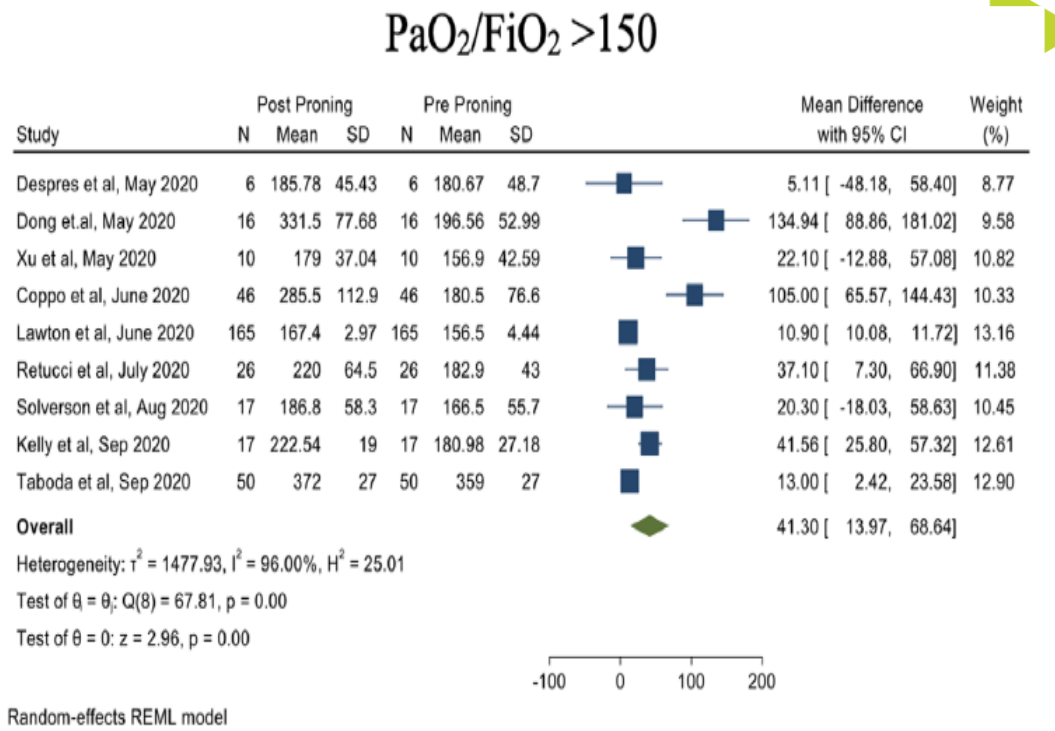


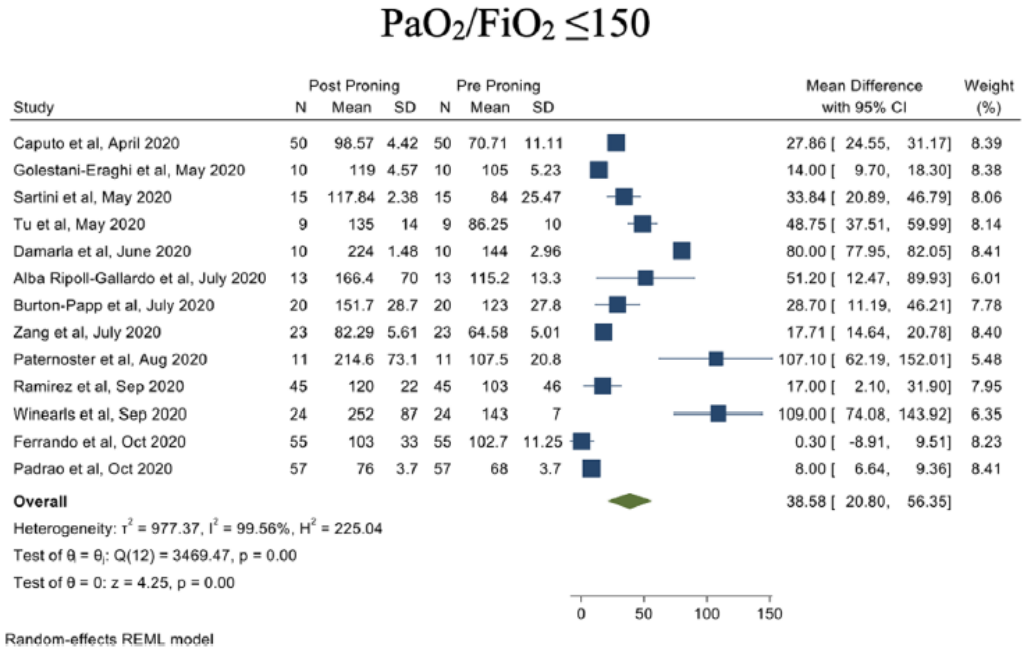


Reddy MP, et al Crit Care Med, 2021; 49(10): e1001-e1014

Does Awake Proning Impact Patient Outcomes? Systematic Review and Meta-Analysis

- Results
  - Improvement in P/F ratio 20mmHg, and RR ↓ 3.2 breaths per minute
  - Intubation rate 24%, mortality 13%
  - No life threatening or major adverse events
  - Minor: pain in the back, sternum & scrotum, general discomfort, dyspnea & coughing





Reddy MP, et al Crit Care Med, 2021; 49(10): e1001-e1014

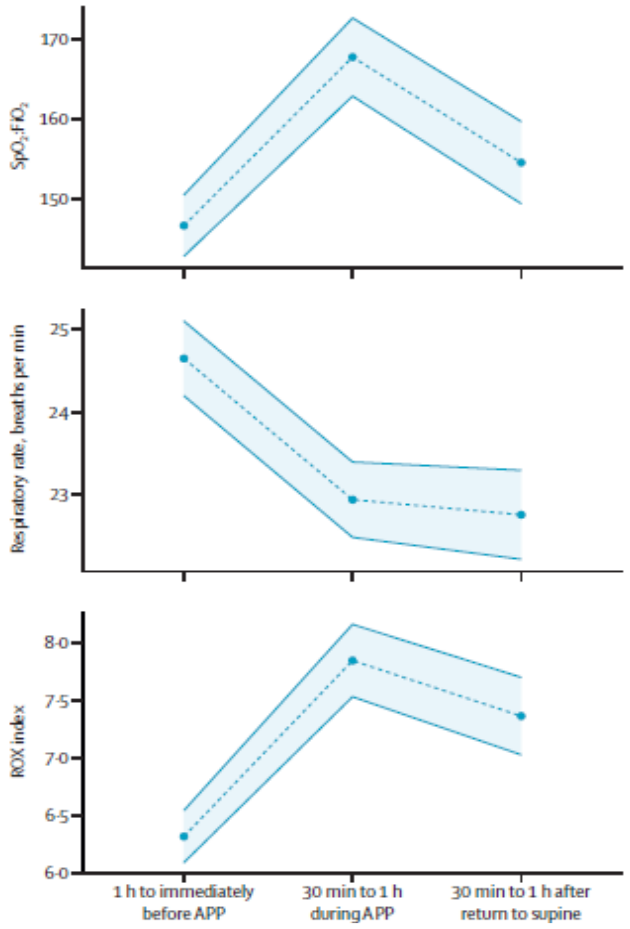
Awake Prone Positioning with COVID: Open Label RCT

- 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 $\leq$ 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

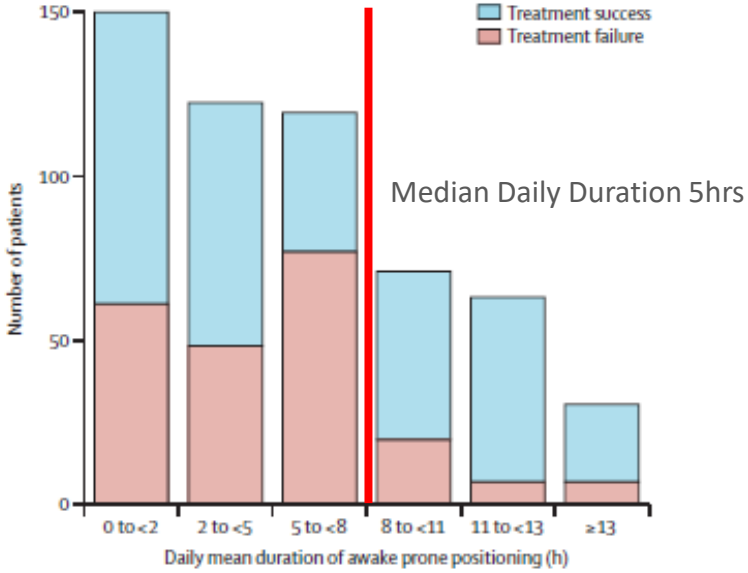
Ehrmann S, et al. Lancet Respiratory, 2021; online ahead of print

Awake Prone Positioning with COVID: Open Label RCT

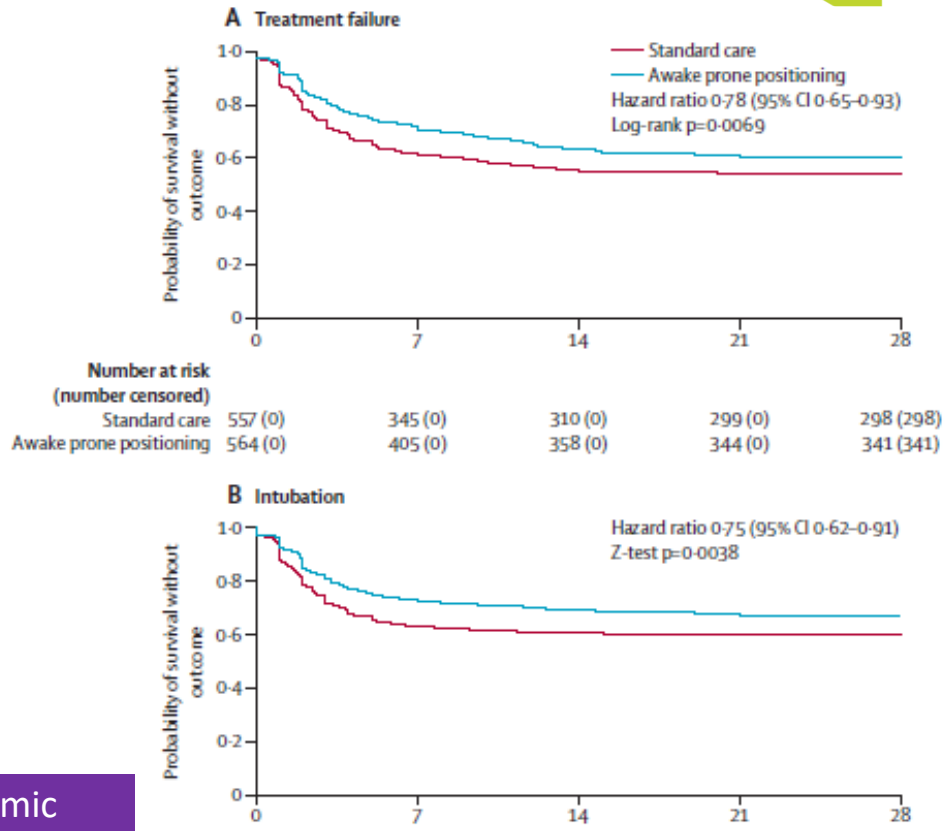
Physiologic Impact of Awake Prone Positioning



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

Ehrmann S, et al. Lancet Respiratory, 2021; online ahead of print

Practical Application of Awake Proning

	Domain	Recommendation	Grading	Considerations for use in LMICs*
1	Indications	Suggest: Consider awake proning in patients with acute respiratory failure requiring supplemental oxygen to maintain saturation > 93%.[11,15,22]	Low-quality evidence	Where pulse oximetry is not available, it would be reasonable to trial awake proning for COVID-19 patients with cyanosis, marked tachypnea, or other evidence of respiratory distress.
2	Indications	Suggest: Consider awake proning in patients able to follow instructions.	Expert opinion	No additional considerations.
3	Indications	Recommend: Use awake proning during the 1st and 2nd trimesters in pregnant women with additional monitoring of the position and the fetus.	Expert opinion	In settings without tocography and Doppler, fetal monitoring using clinical auscultation of the fetal heart rate should be performed.
4	Contra-indications	Suggest: Use awake proning in the 3rd trimester of pregnancy with additional monitoring with caution and on an individual risk–benefit basis.	Expert opinion	In settings without tocography and Doppler, fetal monitoring using clinical auscultation of the fetal heart rate should be performed.
5	Contra-indications	Recommend against: Awake proning in patients with extreme respiratory distress requiring immediate intubation.[15,20,22,28,29]	Low-quality evidence	Where mechanical ventilation is not available or affordable, a trial of awake proning may be performed as a rescue maneuver.
6	Contra-indications	Suggest against: Awake proning in patients with impaired consciousness.	Low-quality evidence	No additional considerations.

- Preparation of the Patient & Environment:
  - Strongly recommend preparing the patient and family for what it is like to be in the prone position what can be expected in how to maintain the position (expert opinion)
  - Recommend preparation for complications (safe airway, suctioning in pressure injuries) (expert opinion)

Stilma W, et al. Am J Trop Med. Hyg. 2021;104(5):1676-1686

Practical Application of Awake Proning

- Monitoring: Expert Opinion
  - Recommend monitoring respiratory rate, work of breathing and dyspnea
  - Suggest possibility of monitoring respiratory status by using the ROX index (Ratio of SPO2/FIO2 to RR)
  - Recommend monitoring MAP & SBP
  - Suggest visual care monitoring by open wards in the event of huge surge capacity
  - suggest against awake proning in conventional hospital wards for patients with severe respiratory failure
- Oxygen supply:
  - Recommend use of any available method of oxygen delivery during awake proning (expert opinion)
  - Suggest use of high frequency nasal oxygen or CPAP for delivery of higher oxygen depending on available expertise (low quality evidence)

Stilma W, et al. Am J Trop Med. Hyg. 2021;104(5):1676-1686

Practical Application of Awake Proning

- Position (Expert Opinion)
  - Train the team
  - Slightly lateral position to turn the face
  - Avoid a closed pack shoulder by keeping the shoulder of the raised arm around 80 degrees abduction
  - Full flexion of the knees if possible and maximum range ankle motion
  - Use analgesia when low back pain becomes a problem
  - Supportive padding above and below the gravid uterus with pregnant women
  - Semi lateral prone position in pregnant women in the second/ third trimester is an alternative

Stilma W, et al. Am J Trop Med. Hyg. 2021;104(5):1676-1686

Safe Awake Proning Checklist

Preparation	Proning	After turning/during proning
Patient	Patient	Patient
Identity	Self-proning	Comfort
Explanation procedure	Assisted proning	Document chosen position (prone and lateral)
Document duration of procedure		Document position of arms
Consent		
Materials	Materials	Materials
Pillows and slide sheet	Sufficient room between the head and shoulders for oxygen supply	Provide emergency buzzer, mobile phone, and improvised rattle
Crash cart	In pregnant women, special attention to alleviate pressure on the gravid uterus	
Oxygen available		
Suction equipment available		
Monitoring: pulse oximetry if available		
Check		Check
Vital signs: SpO_2, RR, HR, and BP	Oxygen supply continued	Vital signs: SpO_2, RR, HR, and BP
IV access		IV access
Nurse call system		Nurse call system
Baby monitor in case of pregnancy		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	Emergencies	Emergencies
Emergency team for the supine position	Emergency team for the supine position	Emergency team for the supine position
Crash cart (intubation equipment) available	Crash cart (intubation equipment) available	Crash cart (intubation equipment) available and know where to find

BP = blood pressure; HR = heart rate; IV = intravenous; RR = respiratory rate; SpO_2 = peripheral oxygen saturation. Based on the WHO surgical checklist and Safe prone checklist.[66]

Stilma W, et al. Am J Trop Med. Hyg. 2021;104(5):1676-1686

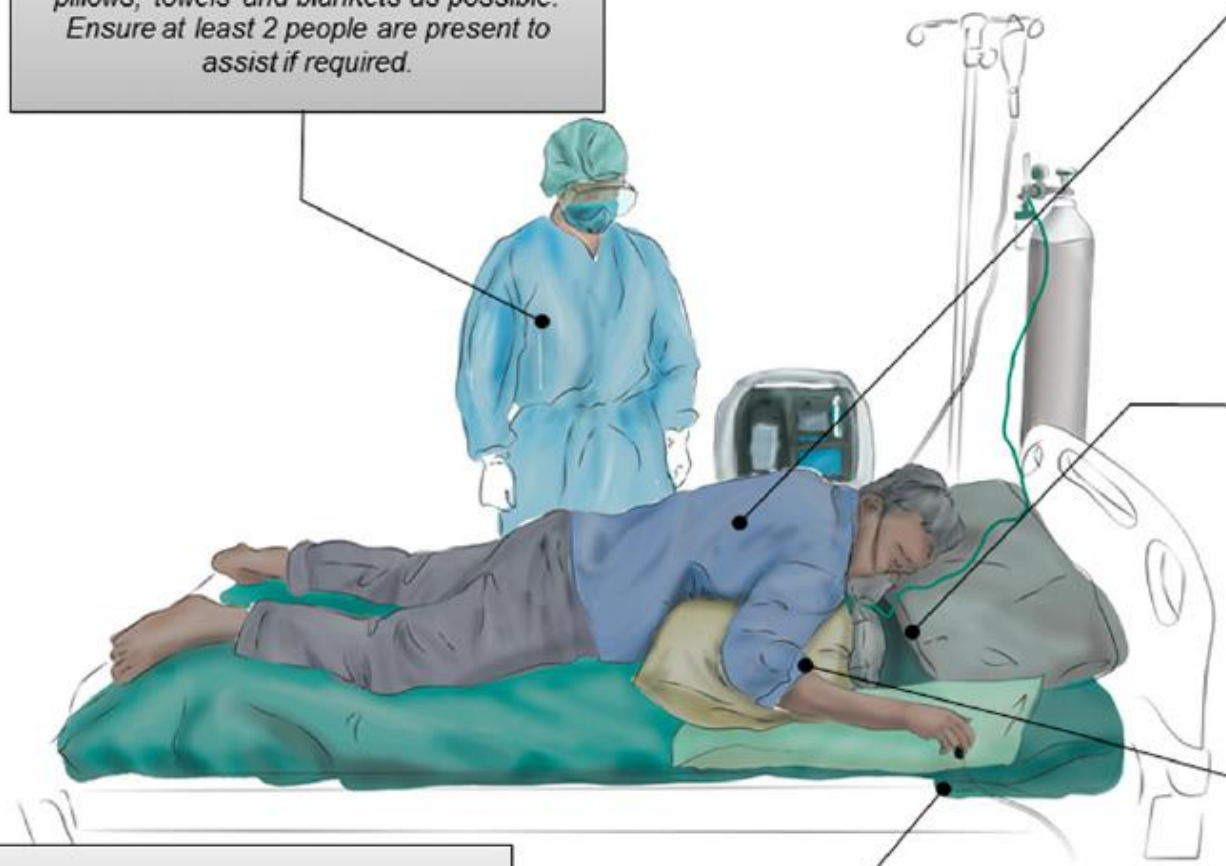
Awake proning in 5 steps

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).*

Stilma W, et al. Am J Trop Med. Hyg. 2021;104(5):1676-1686

Reducing Patient Injury in the Awake Prone Position

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
    - A study reported 34.6% PI in peri-oral area related to medical devices

Bloomfield R, et al. Cochrane Database Sys Rev, 2015, 11 CD08095.
Mora-Arteaga JA at al.. Med Intensiva, 2015, 39 (6), 359-372.
Munshi L, et al. Ann Am Thorac Soc, 2017, 14 S4, S280-S288.
Fourie A, et al. J Tissue Viability. 2021 Sep 23: in press
Challoner T, et al. Surgeon 2021; August 6th in press

Adverse Events	No. of Trials Reporting the Outcome	Events/Prone	Events/Supine	Treatment Effect (Random-Effect Model) OR (95% CI)	p	Number Needed to Treat/Number Needed to Harm	Heterogeneity I² (%)	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

Lee JM, et al. Crit Care Med, 2014;42(5):1252-1262

Safety & Outcomes of Prolonged Prone Positioning for MV COVID 19 Patients

- Single center retrospective study MICU
- Mechanically ventilated patients with COVID 19
- Lung protective ventilation & prolonged prone positioning without daily supine unless FiO2 < 60% & PEEP < 10cm for ≥ 4 hrs
- 61 of 87 of MV COVID pts received prone ventilation
- Intubation to initial PPV was .28 days
- Total duration of PPV averaged 4.87 days before return to supine
- Measurement
  - Primary Safety Outcomes: Pressure injuries
  - Secondary Outcomes: hospital survival, ICU LOS, rates of facial & limb edema, HAI's, device displacement, lung mechanics and oxygenation

Douglas IS, et al. Critical Care Medicine, 2021 online

Safety & Outcomes of Prolonged Prone Positioning for MV COVID 19 Patients

Primary Outcome

- 71.7% developed ventral pressure injuries/22.6% on dorsal surface
  - Associated with duration and day 3 SOFA score/Median Braden score 11

Wound location	N (%)
Any Wounds	43 (70.49%)
Scattered	4 (6.56%)
Ventral wounds from PPV	40 (65.6)%
Chest	3 (4.92%)
Abdomen	9 (14.75%)
Perineum, groin and scrotum	15 (24.59%)
Dorsal Wounds	12 (19.67%)
Back	4 (6.56%)
Sacrum/buttocks	9 (14.75%)
Posterior neck	2 (3.28%)
Head and Neck	
Ears	17 (27.87%)
Face, Chin, Nose and Neck	27 (44.26%)
Axilla	2 (3.28%)
Extremities	
Lower extremities	12 (19.67%)
Upper extremities	16 (26.23%)

Secondary Outcomes

- 68.9% survived
- Prone duration 4.87 days
- PP applied for 30% of first 28 days
- 95.1% limb weakness
- 8.2% brachial plexus palsies
- Low HAI's

Douglas IS, et al. Critical Care Medicine, 2021 online

Overall Pressure Injury Prevention: Prone Positioning

- Pressure redistribution surface
- Skin assessment before, during and after positioning prone
- 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.
- Placement of prophylactic dressings over all potential pressure injury risk areas

Green areas represent pressure sources while lying prone

https://cdn.ymaws.com/npiap.com/resource/resmgr/online_store/posters/npiap_pip_tips_-_proning_202.pdf NPIAP 2020
Peko L, et al. *Int Wound J*. 2020;17(6):1595-1606. doi:10.1111/iwj.13435
Moore Z, et al. J of Wound Care, 2020;29(6):312-320

Facial Pressure Injuries

Areas of Risk

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

https://cdn.ymaws.com/npiap.com/resource/resmgr/online_store/posters/npiap_pip_tips_-_proning_202.pdf NPIAP 2020
Peko L, et al. *Int Wound J*. 2020;17(6):1595-1606. doi:10.1111/iwj.13435
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Head Specific Interventions to Reduce PI while Proning

- Nose/NGT
  - Change to oral gastric if possible
  - Secure using hammocking technique
  - Check skin around nostrils with head position change
- Offload head
  - Consider density of foam, height of cushion, angle of face and positioning of ETT when selection device
- Eye care
  - No direct pressure on the eyes
  - Lubricate
  - Closed with tape –horizontal, ensure eyelashes are facing outward
- Tongue inside the mouth
- Shift patients head q 2 hrs, reposition every 4
- Reverse Trendelenburg 10 to 25°

https://cdn.ymaws.com/npiap.com/resource/resmgr/online_store/posters/npiap_pip_tips_-_proning_202.pdf NPIAP 2020
Peko L, et al. Int Wound J. 2020;17(6):1595-1606. doi:10.1111/iwj.13435
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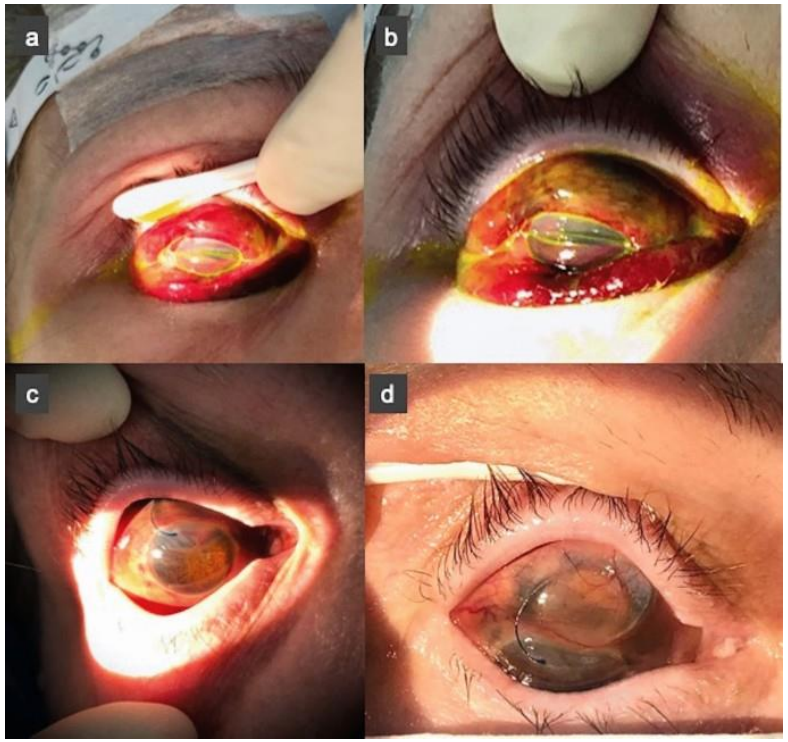
Ocular Injury

- 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)

Patterson TJ, at al. Am J Ophthalmol. 2021 Mar 3:S0002-9394
Sansome SG, et al. British Journal of Hospital Medicine. 2020;81(6):1-10.

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

Sansome SG, et al. British Journal of Hospital Medicine. 2020;81(6):1-10.
Gardner LA. Patient Safety, 2020 2(4), 11–2344.
Sanghi P. et al., J Intensive Care Med. 2021 Mar;36(3):361-372.

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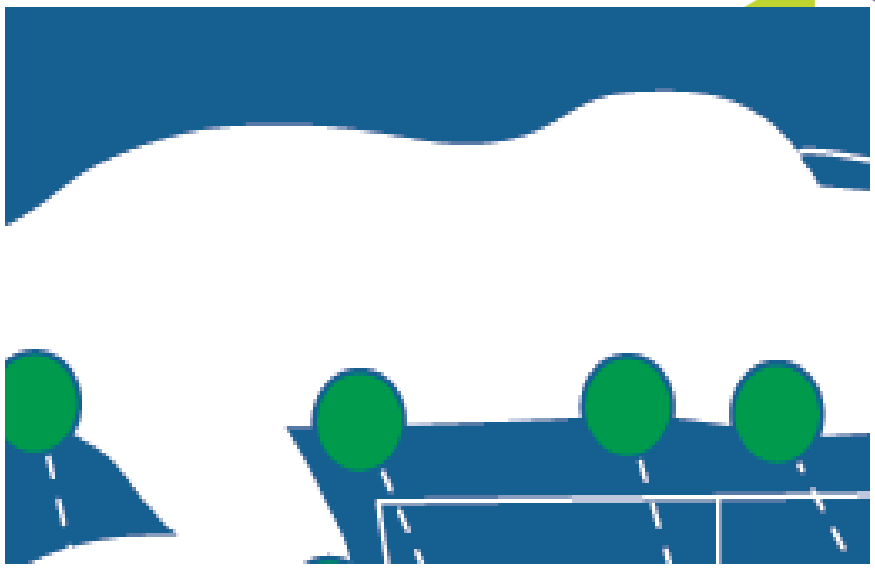
Moore Z, et al. J of Wound Care, 2020;29(6):312-320

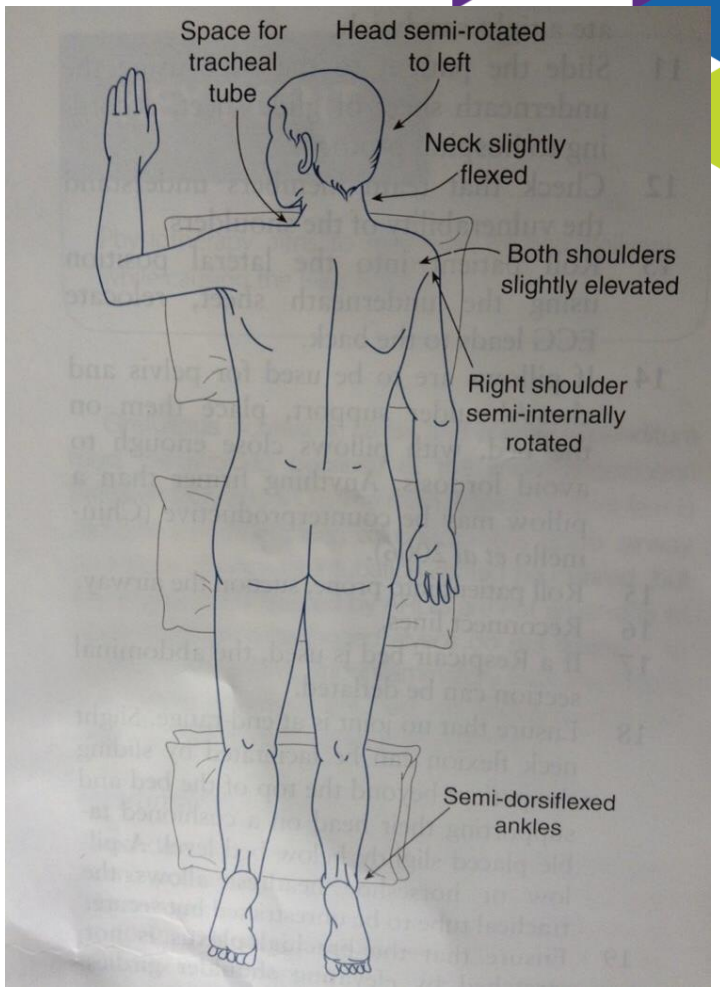
Torso

- 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

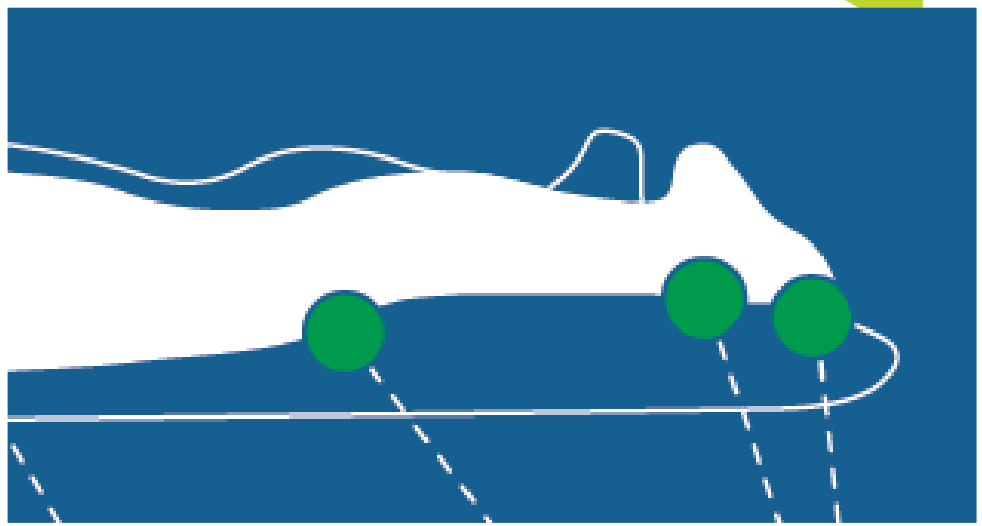


Physio-pedia.com

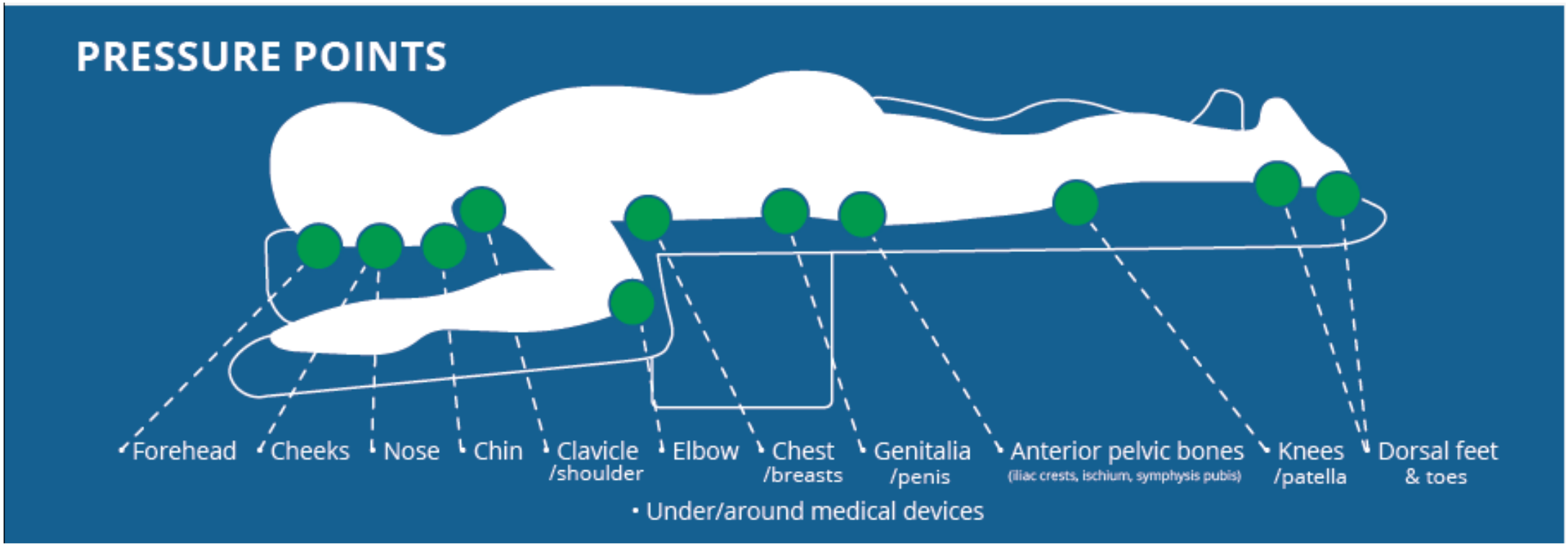
Brugliera L, et al. Arch Phys Med Rehabil. 2021 Mar;102(3):359-362.
Miller C, et al. *Phys Ther*. 2021 Jan 4;101(1)
Bamford P, et al. Available from https://www.ficm.ac.uk/sites/default/files/prone_position_in_adult_critical_care_2019.pdf.
Simpson AI, et al. J Intensive Care Med. 2020;35(12):1576-1582

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



Prophylactic Dressings for Prone Position PI Prevention



Upon returning to supine position, assess skin including under the dressings

https://cdn.ymaws.com/npiap.com/resource/resmgr/online_store/posters/npiap_pip_tips_-_proning_202.pdf NPIAP 2020

Medical Device Related Injury

- Check under and around all devices including tubes, ostomies appliances, EKG leads, feeding tubes, urinary catheters
- Consider removing commercial ETT holder for prone positioning
- Utilize tape after prepping & protecting the skin to secure the ETT

European Pressure Ulcer Advisory Panel/ National Pressure Injury Advisory Panel, and Pan Pacific Pressure Injury Alliance. Prevention & treatment of pressure ulcers/injuries :Clinical Practice Guideline. Emily Haesler (Ed).EPUAP/NPIAP/PPPIA. 2019
https://cdn.ymaws.com/npiap.com/resource/resmgr/online_store/posters/npiap_pip_tips_-_proning_202.pdf NPIAP 2020
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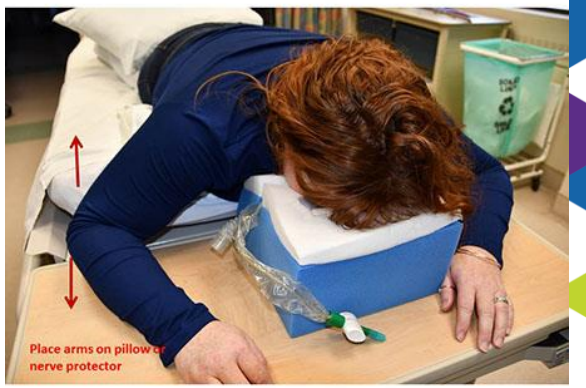

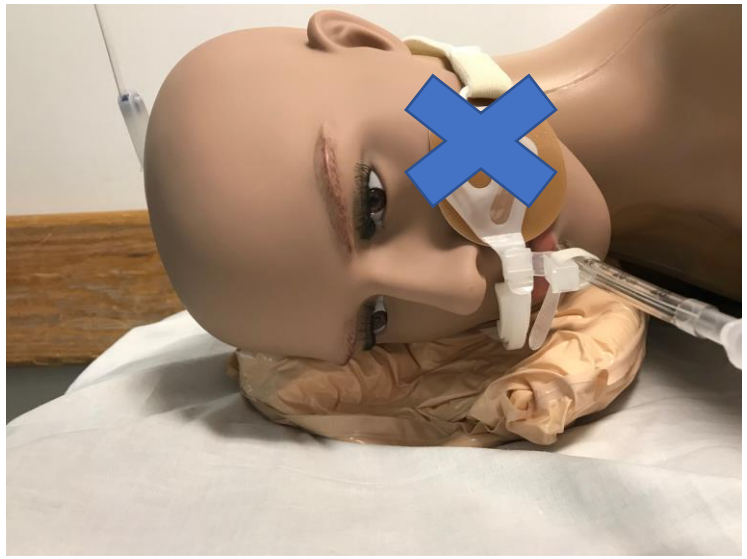

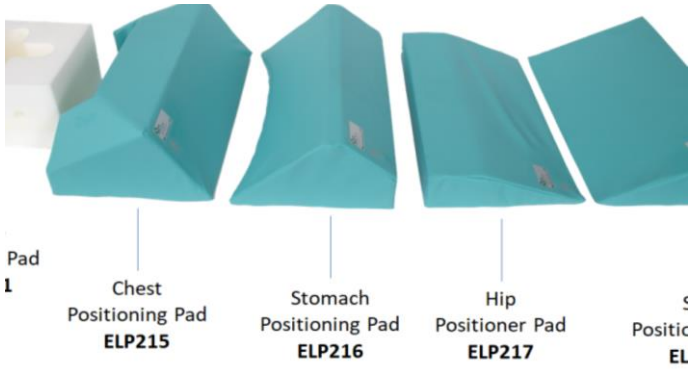

List various equipment available for prone (Fourie A, et al. J Tissue Viability. 2021 Sep 23: in press)

Summary

- Awake proning reduces the risk of intubation in COVID 19 patients requiring HFNC
- 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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