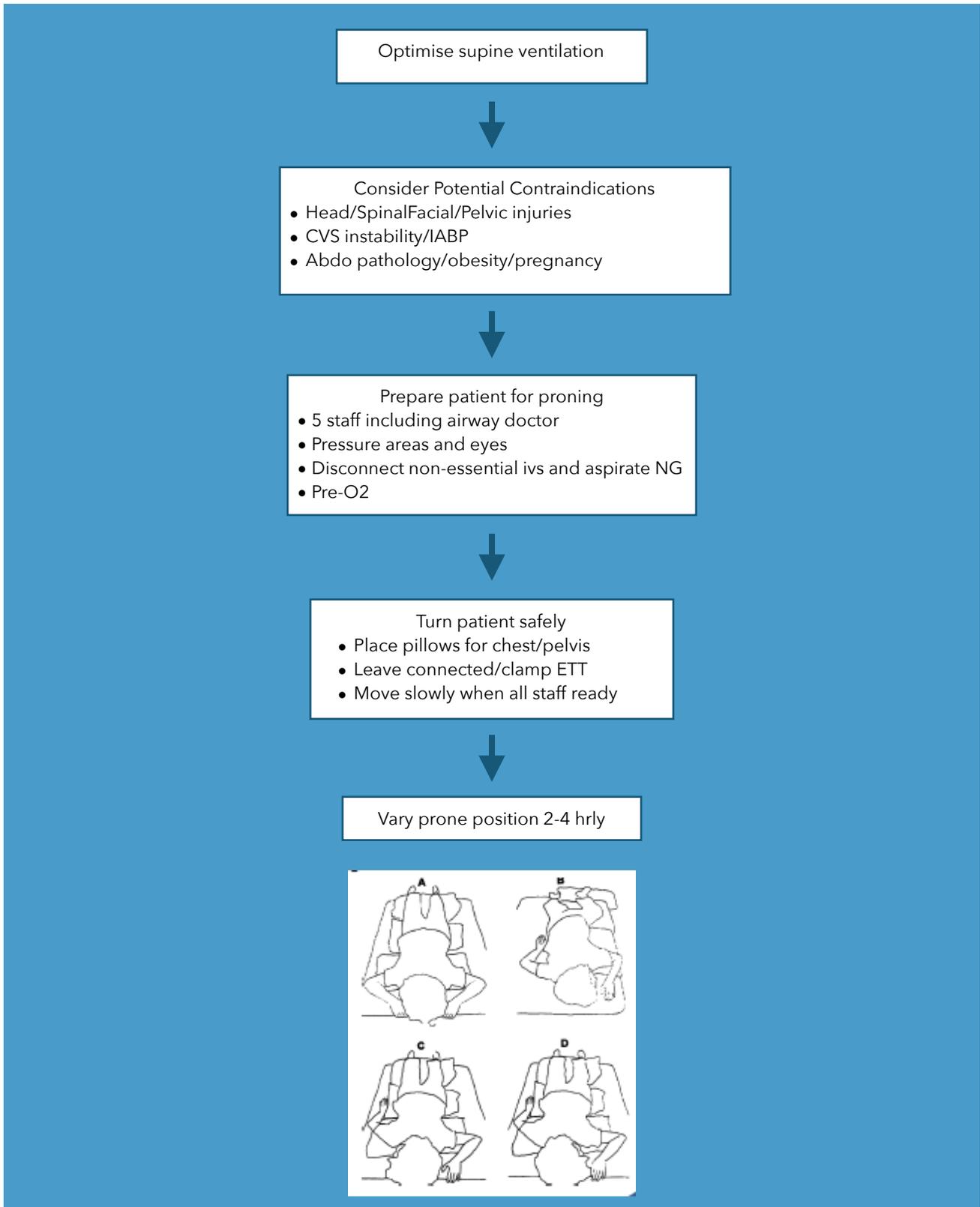


Guidelines for Care of the Patient in the Prone Position



1. INTRODUCTION

Background

The prone position was first described in Intensive Care unit (ICU) in 1974 for mechanically ventilated patients with Acute Respiratory Distress Syndrome (ARDS). There had been very little evidence to support the use of the prone position improving outcome or mortality in the ventilated patient with ARDS.

Evidence had shown an improvement in oxygenation in studies and therefore turning patients prone was often used as a rescue therapy.

The PROSEVA trial was the first study to show a significant improvement in mortality comparing patients in the supine position.

Some evidence suggests that there is reduced risk of Ventilator induced Lung Injury (VILI) in the prone position.

Prone Position reduces the areas of over inflated lung whilst promoting alveolar recruitment, in comparison to a patient nursed supine.

Theory

Positive pressure ventilation will force gas into the area of lung with the least resistance. In the supine position this is the upper lobes, often causing over distension and potential lung injury. In conjunction with this the upper lobes have the least blood flow causing a ventilation perfusion mismatch.

The prone position reduces the compression of to the dorsal aspects of the lungs due the weight of lung tissue and less compression of the left lower lobe cause by the heart. The decompression allows lower resistance meaning the positive pressure will expand the basal area of lung first, in keeping with how the lungs fill in 'normal' self-ventilating patient.

The dorsal area of lung has the greatest surface area allowing better ventilation. The perfusion throughout the lungs remains largely unchanged but does result in a more equal ventilation/perfusion distribution.

Peak airway pressures may increase immediately after a patient is placed in the prone position. Peak pressure typically declines with time. The initial increase is likely related to decreased chest wall compliance, while the subsequent decrease is probably due to progressive alveolar recruitment and/or improvement in ARDS .

Use of muscle relaxant drugs (Paralysis) is not necessarily required and potentially harmful, since it could exacerbate supra-diaphragmatic alveolar collapse. However it has a place with the more difficult to ventilate and ensuring protective ventilation.

Prone positioning improves postural drainage, so that more secretions can be suctioned from the patient, improving ventilation.

The prone position shows an increase in PaO₂. However, a trend towards Patients with an extra-pulmonary cause for their ARDS seem more likely to increase their PaO₂ during prone ventilation than patients with a pulmonary cause.

An increase in cardiac output has been observed in patients in the prone position. It is thought the mechanism Increases right ventricular preload and decreased right ventricular

afterload, attributed to lung recruitment and reduction in hypoxic pulmonary vasoconstriction may be responsible.

Indications

- Diagnosis ARDS
- P/F ratio < 200 mmHg,
- FiO₂ > 0.6

Contra-indications to Proning

Absolute	Relative
Cardiovascular instability	Recent laparotomy
Recent cardiac arrest	Obesity* Advice from MH team)
Unstable spinal fracture	Kyphosis/scoliosis
Acute Head Injury/ raised ICP	Raised intrabdominal pressure/ acute abdomen
Open abdomen	Facial surgery or fractures
Pregnancy	
IABP in situ	
Pelvic fracture	

*Manual Handling team (Sarah Bright Nicola Ludlow) ext. 67823 for advice on moving & handling.
Out of hours Moving and handling link nurse or discuss with the Nurse in Charge

2. PROCESS

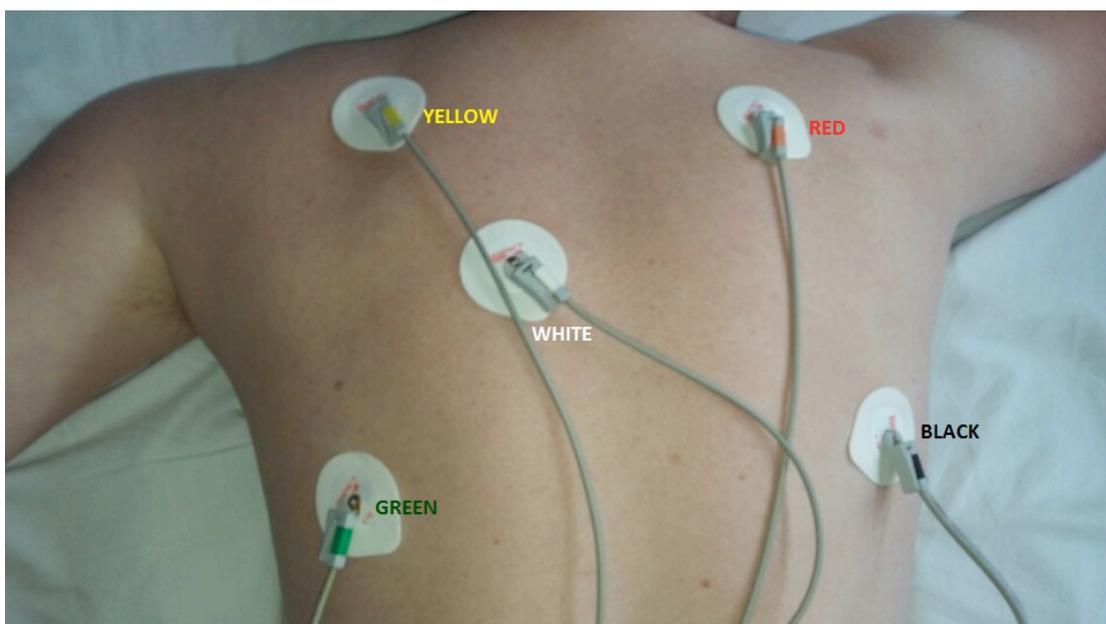
Before proning

Recommendation (Action)	Justification (Rationale)
Nursing a ventilated patient in the prone position is medical decision. Ensure this is documented in the medical notes before starting.	Duration of time in the prone position documented. Usually 12-24 hours but indication and duration must be prescribed.
Has the ventilation already been optimised?	High PEEP. Prolonged inspiratory time. Consider APRV

Prepare the patient

Recommendation (Action)	Justification (Rationale)
Leave the patient connected to the ventilator if possible. Otherwise clamp the ETT on disconnecting the patient to turn them.	This prevents derecruitment of the lungs as PEEP is maintained
ET tape rather than Anchorfast to secure ETT.	Less likely to cause pressure sore to the face in the prone position.
Duoderm to the corners of the mouth	To prevent breaking the skin in the corners of the mouth
Ensure IV lines which are going to be inaccessible are clean with a dressing intact.	To maintain sterility
Tape the eyes closed	To prevent corneal abrasion.
Put the patient on 100% FiO ₂ , if not already.	To reduce the chances of desaturation
Disconnect non essential IV infusions.	The less attached for the turn the better.
Pause NG feed, aspirating NG tube	To ensure the stomach is empty.
Remove ECG leads from chest.	Re-apply to the patients back once turned prone (see below)

Figure 1. Positioning of ECG dots on the back



Turning Safely

Recommendation (Action)	Justification (Rationale)
Minimum of five people are required and an Anaesthetic doctor must assist and take the hold of the ET tube whilst turning the patient prone.	There is a risk of loss of airway during proning
Two people either side	
The most experienced person leads and explains procedure in advance.	This is usually the nurse in charge
Otherwise, Silence throughout . Only speak up to raise a concern. Re airway/lines.	To facilitate communication
Turn using method detailed in Box 1 below	To allow consistency
Check for potential complications Box 2.	

Box 1 Standard Operating Procedure for Proning

1. Prepare the sheet; Roll the sheet with most hanging from the side of the bed.
2. Slide the patient to the edge of the bed, away from the way which the patient is to be rolled. (Usually easier to roll towards the ventilator)
3. Prepare Inco's to go underneath the patients head/Slide sheets. Put 5-6 Inco on top of each other. This allows for easy removal when doing head turns
4. Remove monitoring. Keep sats probe if possible.
5. Roll into the lateral position. Place pillows under hips & top of the chest
6. Tuck the old sheet underneath the patient, put in the new sheet with a slide sheet.
7. Slide the patient through so they are lying in the prone position.
8. In the event of patient deterioration assistance should be sought as soon as possible to ensure enough staff are available to turn supine if necessary.

In the event of cardiac arrest the patient should not be turned supine until there is enough staff available to do this safely.

Box 2. Potential Complications

- ETT/tracheostomy displacement.
- Airway obstruction
- CVS instability.
- Displaced IV lines
- Muscular skeletal injury (Brachial plexus)
- Facial/peri-orbital oedema
- Corneal abrasions
- Pressure damage

Nursing care once Prone

Recommendation (Action)	Justification (Rationale)
Once in the prone position recheck ET tube position, ET level & cuff pressure, leak volume & document	Continue to check cuff pressure 4 hourly. Ensure Balloon port is visible accessible. Ensure Suction catheter can be easily passed
Observe for immediate changes in tidal volume, rise in EtCO ₂ or changes in EtCO ₂ waveform	Consider increasing P _{Insp} to maintain TV 6 mls/kg/IBW. Aim Peak airway pressure < 30 ABG within 30mins of turning prone
Alternate swimmers position (arms and head turn) 2-4 hourly. Avoid pulling at patient's wrist and ensure the upper arm is supported	To extend wrist and allow flexion to the joint To avoid pressure damage to cheeks, neck and ears To minimise the risk of limb contractors. To avoid subluxation (incomplete or complete dislocation) of the glenohumeral joint. See Appendix 1
Nurse patient in the reverse Trendleberg 10-15 degrees foot down (lower extremities lower than the head).	This may facilitate gastric emptying, as well as minimising facial and ocular oedema To promote effective sputum drainage.
Place ECG leads on the patients back in a mirror image. See Picture.	
Ensure lines are accessible, not kinked and are not underneath the patient	Pressure damage Access in an emergency

Recommendation (Action)	Justification (Rationale)
It is likely sedation will have already been increased Maintain sedation score -4	Consider more and/or adding paralyzing agent if asynchronous with the ventilator. Consider BIS monitoring
Ensure catheter can drain freely & is between legs. Male genitalia between legs	Prevention of pressure damage/ ischemia
Targeted fluid Balance	Often these patients are run 'dry' Reduce fluid in the interstitial spaces and improve gaseous exchange at the alveolar membrane.
Restart Enteral nutrition	Consider pro-kinetics if failing to absorb. Gut motility often slowed by prone position/ increase in sedation/use of paralysis Consider concentrated NG feed to reduce the volume in the stomach and reduce cumulative volume input.
Place a pillow underneath the patients' shins to allow the feet to be free	Prevent foot drop & prevent damage to Achilles tendon
Support the patient's body under the chest and pelvis with pillows	Keep the Abdomen free & allow chest expansion to lower lobes
Eye care lubrication & Tape eyes closed.	To minimise risk of corneal drying/abrasion/ulceration
Mouth care & oropharyngeal suction.	To reduce the risk of VAP.Minimise complications such as Dry mouth, ulcers, cracked lips, thrush and bleeding.
Communicate to the family the rationale for this treatment before they see their relative	It is often quite distressing for the relatives and may be a shock. Explain in laymen's terms our rationale.

**This document is to aid the nursing care of the patient in the prone position and for guidance only. The procedure should be carried out by experienced staff in the presence of an anaesthetist.
Seek the support of the shift leader if unsure.**

3. GLOSSARY

ETT	Endotracheal tube
VAP	Ventilator-associated pneumonia
P Insp	Inspiratory Pressure
TV	Tidal volume

4. REFERENCES AND ONLINE RESOURCES

1. Gattinoni L, Tognoni G, Pesenti A, Taccone P. Effect of prone positioning on the survival of patients with acute respiratory failure. *N Engl J Med.* 2001;345(8):568–573.
2. Henderson AC, Sá RC, Theilmann RJ, et al. The gravitational distribution of ventilation-perfusion ratio is more uniform in prone than supine posture in the normal human lung. *J Applied Physiology* 2013; 115:313.
3. Mentzelopoulos SD, Roussos C, Zakynthinos SG. Prone position reduces lung stress and strain in severe acute respiratory distress syndrome. *Eur Respir J* 2005; 25:534-44.
4. Guerin , Prone Positioning in Severe Acute Respiratory Distress Syndrome. (2013) Guerin et al. *The New England Journal of Medicine.*
5. Jonson B, Richard JC, Straus C, et al. Pressure-volume curves and compliance in acute lung injury: evidence of recruitment above the lower inflection point. *Am J Respir Crit Care Med* 1999; 159:1172.
6. Galiatsou E, Kostanti E, Svarna E, et al. Prone position augments recruitment and prevents alveolar overinflation in acute lung injury. *Am J Respir Crit Care Med* 2006;174:187-97.
7. Gosheron, M, Leaver, G, Forester, A, and Hamsworth, A. (1998) Prone Lying – a nursing perspective. *Care of the Critically ill.* April. 14(3).
8. Jozwiak M, Teboul JL, Anguel N, et al. Beneficial hemodynamic effects of prone positioning in patients with acute respiratory distress syndrome. *Am J Respir Crit Care Med* 2013; 188:1428.
9. Lim CM, Kim EK, Lee JS, et al. Comparison of the response to the prone position between pulmonary and extrapulmonary acute respiratory distress syndrome. *Intensive Care Med* 2001; 27:477
10. Ball, C, J, Boyce, S, and Robinson, P. (2001) Clinical guidelines for the use of the prone position in acute respiratory distress syndrome. *Intensive and critical care Nursing.* 17. Pp. 94-104.
11. Reignier J, Thenoz-Jost N, Fiancette M, et al. Early enteral nutrition in mechanically ventilated patients in the prone position. *Crit Care Med.* 2004; 32:94-99.
12. Renton S (2007) Mouth care. In: Jamieson EM et al (eds) *Clinical Nursing Practices.* Edinburgh: Churchill Livingstone

Appendix 1. Performing a head turn.

The patients head and arms should be changed every 2 -4 hours. Document on the CIS Prone and comment when a head turn is done.

There are two methods of performing a head turn. Both take a minimum of three people. At least one should have experience.

When performing a head turn the first thing to consider is TILE. (Task, Individual capability, Load, Environment)

You should assess your patient to which method is most suitable. Take into consideration ability of individual capability nurses performing the task.

Option 1

- Move the patients arm down so both arms are by their sides.
- 1 nurse takes the ET tube (Head end of the bed) and will be responsible for keeping the airway secure and performing the turn of the head.
- The other 2 nurses will be either side of the bed and will raise the patients shoulders off the bed, approximately 6 inches.
- The nurse at the head end will then move the head to face the opposite direction. The patient is brought back down onto the bed.
- The arm in which the patients head is facing will be brought up into the swimmers position.

Option 2

- Ensure there is a slide sheet underneath your patient.
- Move the patients arm down so both arms are by their sides.
- 1 nurse takes the ET tube (Head end of the bed) and will be responsible for keeping the airway secure and performing the turn of the head.
- Tilt the bed head down.
- Slide the patient up so the head is over the end of the bed. Then turn the head to face the opposite direction.
- Tilt the bed feet down. Slide the patient back down the bed.
- The arm in which the patients head is facing will be brought up into the swimmers position.

The use of this guideline is subject to professional judgement and accountability. This guideline has been prepared carefully and in good faith for use within the Department of Critical Care at Brighton and Sussex University Hospitals. The decision to implement this guideline is at the discretion of the on-call critical care consultant in conjunction with appropriate critical care medical/ nursing staff.