

Prone Positioning Solutions





What is prone positioning?

Prone position is most commonly used today in intensive care units (ICU) for patients with moderate to severe acute respiratory distress syndrome (ARDS)¹⁻³, a life-threatening form of respiratory failure characterised by inflammatory pulmonary oedema resulting in severe hypoxemia.⁴

Improving oxygenation and reducing mortality are two of the key reasons to implement prone positioning in patients with ARDS.⁵

Prone positioning involves turning a patient onto their chest and managing their condition in the prone position. The latest guidelines⁶ suggest that prone sessions should last for more than 16 hours each day to take advantage of physiological changes that can result in improved oxygenation.

Turning a patient over so that they lie in a chest-down position may sound like a relatively straightforward task. However, clinicians appreciate that this can be a complex, labour-intensive manoeuvre that can put both patients and caregivers at risk.



Arjo – your prone positioning partner

At Arjo, we leverage decades of global expertise in patient handling, pressure injury prevention, and care of the critically ill to help you simplify aspects of the prone positioning process with intensive care patients. Through our range of clinical services and broad product portfolio, Arjo can help to reduce the risk of injury and improve care efficiency during this labour-intensive, demanding process.



Acute respiratory distress syndrome (ARDS)

ARDS is a life-threatening form of respiratory failure characterised by inflammatory pulmonary oedema resulting in severe hypoxemia.

ARDS is not a disease in itself, but a syndrome precipitated by a large variety of clinical conditions such as pneumonia, sepsis, trauma, aspiration and massive pulmonary embolism.

Stratified according to their level of hypoxemia, patients are classified as having mild, moderate or severe ARDS according to the Berlin Definition.⁷

ARDS is prevalent and often fatal

10%

of ICU patients met the criteria for ARDS in LUNG SAFE, an international, multicentre, prospective study conducted with over 29,000 patients in 50 countries⁸

23%

of ventilated patients had ARDS⁸

45%

hospital mortality in patients presenting with severe ARDS⁸

ARDS guideline recommendations:

- **2017:** American Thoracic Society/European Society of Intensive Care Medicine/Society of Critical Care Medicine clinical practice guideline of mechanical ventilation in adult patients with ARDS **strongly recommended that patients with severe ARDS receive prone positioning for more than 12 hours per day**⁹
- **2019:** Formal guidelines⁶: management of acute respiratory distress syndrome, published in the *Annals of Intensive Care* suggests Prone positioning should be used in ARDS patients with PaO₂/FIO₂ ratio < 150 mmHg to reduce mortality. Sessions of at least 16 consecutive hours should be performed. GRADE 1+

Prone positioning

Several studies and meta-analyses have found that prone positioning patients with ARDS improves both their oxygenation and clinical outcomes, including mortality and duration of mechanical ventilation.¹⁰

Decreased mortality

PROSEVA is a major multicentre prospective, randomised controlled trial¹ involving 466 patients. It concluded that prone positioning, used as an early intervention for patients with severe ARDS, decreased mortality by 50% after 28 days and 42% after 90 days (p<0.001).

Mortality was significantly lower in the group of ventilated severe ARDS patients who were placed in the prone position for at least 16 hours per day, compared to patients left in the supine position. A noticeable reduction in days on a ventilator was also observed over similar periods for patients in the prone group.

The prone position significantly reduces mortality in patients with moderate to severe ARDS when used early and for greater than 16 hours per day in patients receiving lung protective ventilation.²

Improved oxygenation

Oxygenation can be improved in patients with ARDS when ventilated in the prone position.^{1,11-14} Based on the results of many observational studies, as well as randomised controlled trials, there is wide agreement that prone positioning increases oxygenation in 70-80% of patients with ARDS.¹⁵ However, the degree of the response can vary, ranging from significant improvement to no change.

Among patients whose oxygenation improves, this improvement usually progresses while in the prone position, showing a time-dependent effect. In conclusion, the oxygenation response is highly varied, probably because the response is strictly dependent on the patients' underlying pathophysiological status.



50% decrease in mortality¹

Reduced ventilator days¹

Improved oxygenation¹¹

COVID-19 and prone position

Prone positioning is a mainstay of treatment in COVID-19-related ARDS and has been recommended in the Surviving Sepsis Campaign COVID-19 guidelines.¹⁶⁻¹⁸

Awake prone position

During the COVID-19 pandemic, reports emerged of the potential benefit of prone positioning of patients with COVID-19 who were hypoxic and not intubated. Adopting awake prone positioning in non-intubated patients with COVID-19 pneumonia is a low-risk, low-cost manoeuvre that may potentially delay or reduce the need for intensive care.¹⁹

Prone position and veno venous (VV) ECMO

This multicentre retrospective cohort study in six Italian ECMO centres included patients with ARDS managed with prone positioning during ECMO support (prone group, four centres) and patients managed in the supine position (control group, two centres).

The study assessed the feasibility, safety and effect on oxygenation and lung mechanics of prone positioning during ECMO. As a secondary exploratory aim, the association between prone positioning and hospital mortality was assessed. The study concluded that prone positioning during ECMO improved oxygenation and was associated with a reduction in hospital mortality.²⁰

When and how long to prone

Start proning early ⌚

Prone positioning may be most effective in improving oxygenation when initiated early during the exudative phase, when congestive and compressive atelectasis are predominant features.^{21,22}

By optimising patient selection and treatment protocols, the PROSEVA trial demonstrated a significant mortality benefit with prone ventilation. This trial and subsequent meta-analyses support the role of prone positioning as an effective therapy to reduce mortality in severe ARDS, **particularly when applied early with other lung-protective strategies.**¹⁵

Prone for longer duration ⌚

Prone ventilation for 16 or more hours per day should be actively considered in patients with severe hypoxaemia within 48 hours of mechanical ventilation.^{2,23}

The optimal daily duration of prone positioning is still unknown. However, more recent RCTs applied an extended time in prone positioning compared with early trials (e.g. 17-18 versus 7-9 hours/day), and the PROSEVA study¹, which used a prolonged prone position and clearly demonstrated a significant reduction in mortality.



Repositioning dependent patients within their bed is the single greatest risk factor for musculoskeletal injuries²⁸

The risks of prone positioning

Risk of patient injury

While the benefits of prone ventilation are significant, turning a patient with an endotracheal tube and other indwelling devices from the supine to prone position can be complex, and the process must be managed carefully as most patients are heavily sedated and usually medically paralysed to facilitate ventilation. Most patient-related complications are preventable but can include²⁴:

- Pressure injury
- Facial oedema/increased periorbital pressure
- IV line/ET Tube displacement
- CVS instability
- Ocular injury/corneal abrasions
- Brachial plexus injury
- CRRT line flow problems

To reduce risks during the prone manoeuvre, patients are typically prepared by pre-oxygenation, gastric emptying and the removal of secretions by suction of ETT and the oral cavity. ECG leads are relocated to the patient's back.²⁵ All intravenous lines and other tubing are secured, and naso or oro-gastric feedings stopped.²⁶

Clinicians should follow their ICU protocol for prone positioning. However, where none exists, published guidance²⁴ is available to reduce the risk of patient-related complications.

Guidance to reduce risk of patient-related complications is available²⁴

Frequent manual prone positioning places significant demands on critical care staff, increasing fatigue and risk of injury. As the obesity epidemic progresses, healthcare workers will be required to prone heavier patients more frequently, putting them at higher risk for musculoskeletal injury. The use of passive lifts with repositioning slings can help reduce the number of caregivers required and the effort needed.

Risk of caregiver injury

While the risks to patients during the prone positioning manoeuvre are well documented, the potential impact on caregivers receives much less attention.

Manually moving a patient into the prone position can be labour-intensive, requiring a coordinated effort among clinicians for each turn.

With up to one third of ICU patients suffering from obesity²⁷, and the high volume of equipment in use, this can be a complex manoeuvre requiring up to eight staff gathered at a bed space to help manually turn the patient to or from a prone position.

Confined, crowded bed spaces and the importance of protecting vital invasive lines and ventilation tubing further compound the risk of the caregiver adopting awkward postures (reaching, bending, twisting) and subsequently exposing themselves to the risk of injury.

With the current very high demand for prone positioning due to the COVID-19 pandemic, caregivers are at particular risk of musculoskeletal injury.

With the limited availability of personal protective equipment (PPE) in some centres, minimising the number of healthcare workers needed to prone the patient is beneficial not just for workflow and staffing, but also to limit the number of staff exposed to patients with COVID-19.



Pressure injury prevention

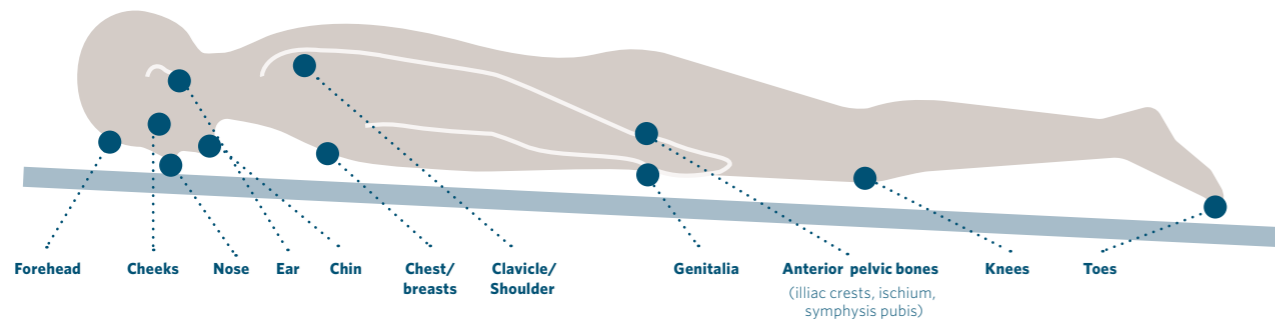
ICU patients are at very high risk of developing pressure injuries. The recent DecubICU study²⁹, a one-day international prevalence study carried out in 1117 ICUs across 90 countries, identified an ICU acquired prevalence rate of 16.2%.

Patients in ICU are at particular risk due to their inherent immobility, haemodynamic instability, poor tissue perfusion and oxygenation, and to a wide range of intrinsic and extrinsic risk factors. They are also highly exposed to medical devices.²⁹

When prone positioning is adopted, caregivers face further challenges to prevent pressure injuries due to:

- Lack of subcutaneous fat and protection over weight-bearing pressure points when in the prone position
- Prolonged tissue loading with prone sessions of 16 hrs per day or longer
- High levels of skin moisture
- Increased shear and friction during repositioning

PRESSURE POINTS



Lengthy prone positioning sessions in ICU, are associated with an increased frequency of pressure injury development.³⁰ This can lead to a protracted hospital stay, patient suffering, possible surgical intervention, and increased costs of care.³¹

Prior to placing the patient in the prone position and on returning to a supine position, skin assessment, cleaning and moisturisation are essential.³²

Protection of vulnerable areas is recommended through the use of pressure redistribution surfaces, positioning devices and regular repositioning to off load pressure points on the face and body.³²

Use of dressings to help protect 'at risk areas' may also be of benefit in decreasing skin breakdown.³³

THE FOLLOWING DOCUMENTS ARE LIKELY TO BE VERY HELPFUL REFERENCE MATERIAL:

- NPIAP PIP TIPS for Prone Positioning, Guidance For: Prone Positioning in Adult Critical Care³³



- 2019 Intensive Care Society and Faculty of Intensive Care Medicine²⁴



Support surface selection

Utilisation of a support surface to provide pressure redistribution, microclimate management, and other therapeutic functions is an important intervention to help reduce the risk of pressure injury development of patients being managed in the prone position.



NIMBUS PROFESSIONAL ALTERNATING PRESSURE MATTRESS REPLACEMENT SYSTEM

When patients are immobile in the prone position for prolonged periods, an active support surface such as the Nimbus Professional alternating pressure mattress ensures pressure under the patient is frequently redistributed through the periodic inflation and deflation of alternate mattress cells over a ten-minute cycle. Clinical studies on the Nimbus product range consistently demonstrates excellent outcomes for the most vulnerable patients or those with existing wounds.³⁴⁻⁴¹



ZONED WOUND VALVE TECHNOLOGY

In addition to pressure redistribution, Nimbus Professional wound valve technology allows caregivers to completely deflate individual cells under the patient's body, providing an adaptable support surface for the management of highly vulnerable areas when the patient is in the prone position. Cell deflation can be targeted at sensitive body areas at particular risk.



CITADEL® C200 PATIENT CARE SYSTEM

An integrated pressure redistribution surface is built upon a universal medical bed platform and offers a choice of active and reactive surface technologies for the prevention and management of pressure injuries. Each of the four zones in the surface can be manually adjusted to increase or decrease internal cushion pressures to suit each patient's individual requirements.

Temporary head section deflation can help provide more space when caregivers need to reposition the head, and the reverse trendelenburg feature raises the head of bed to help prevent facial oedema and gastric reflux.



SKIN IQ® MICROCLIMATE MANAGEMENT

There is a growing appreciation of the role of microclimate management in helping to improve tissue tolerance to aid pressure injury prevention and management, particularly in the presence of excessive moisture and elevated temperature at the skin/surface interface.

Skin IQ is an adjunctive therapeutic mattress cover, which adds microclimate control to a pressure redistribution surface used with patients presenting with complex skin care issues.

CITADEL PLUS AND AURALIS PLUS

With up to one third of ICU patients suffering from obesity²⁷, caregivers may at times need a width adjustable bed and support surface to provide more space when turning plus size patients to and from the prone position. The Citadel Plus bed frame and Auralis Plus Alternating Pressure Mattress will accommodate plus size patients weighing up to 454 kg (1000 lbs). The Skin IQ 1000 coverlet can be added to provide microclimate management.

Device-assisted prone positioning

With the increased demand for prone positioning, rising rates of patient obesity and caregivers under increasing time pressure, alternative approaches to manual prone positioning are available.

Using patient handling devices, such as ceiling and floor lift systems, reduces physical effort, the number of people required to carry out repositioning and allows caregivers to perform the positioning manoeuvre in a controlled manner.^{42, 43}

When there is no access to passive lifts, friction-reducing devices such as slide sheets offer an easy way to augment manual prone positioning practice.

Disposable repositioning slings and slide sheets are available to support compliance with infection control policies and reduce the risk of cross-contamination.

Lift-assisted prone positioning

Regarded as the 'gold standard' of safe patient handling and mobility technology, ceiling lifts are frequently advocated to mitigate the risk of injury to healthcare workers when lifting, transferring or repositioning patients.⁴²

Ceiling lifts such as the Maxi Sky 2 are ideal for use in the ICU because they do not add to the already crowded floor space and are readily accessible when prone positioning is required.

Floor lifts such as the Maxi Move can also be used, and even though a floor lift takes up bedside space, caregivers soon get used to working around it to gain sufficient access to the patient during prone positioning.

The Maxi Sky 2 and Maxi Move can both be fitted with Repositioning Slings or the Maxi Transfer Sheet, for carrying out prone positioning manoeuvres.

A friction reducing device such as the MaxiSlide can be positioned under the sling during the process to further aid patient positioning.



Maxi Sky 2



Maxi Move



Repositioning Slings
Maxi Transfer Sheet



MaxiSlides
MaxiSlide Flites

Reduced caregiver effort

Fewer caregivers required



Prone positioning with slide sheets

The risks of manually moving the full body weight of a dependent patient are well recognised. Where passive lifts are not available to aid in prone positioning, the provision of friction-reducing slide sheets such as MaxiSlides may reduce physical effort.

Using low friction textiles for patients at risk of pressure injury is recommended by International best practice guidelines.⁴⁴

Where manual prone positioning is the only option, slide sheets can help to reduce caregiver effort and lower the risk of shear and friction

Key steps in lift-assisted prone positioning

The use of a passive lift to aid patient movement into the prone position allows caregivers to conduct the transfer in a more controlled manner⁴³ to help reduce the risk of adverse events. It can also reduce the effort required and the number of caregivers needed to perform the manoeuvre.

Regardless of whether a ceiling or floor lift is used, the movement to prone position contains three common steps:

Reduced manual handling. Improved control⁴³



1. Lateral repositioning to the side of the bed

2. Turning from supine to side lying

3. Lowering from side lying to prone



1. Slide sheets can be inserted from either the head end (e.g. the unravelling method).

2. Or the side (e.g. the rolling method).

3. Two flat slide sheets should be used together. Whichever method is used, the slide sheets should be inserted and unravelled so they are under the patient while in the supine position.

4. Move the patient to the side of the bed (sending side) using the top slide sheet.

5. If pillows are being used to help keep the abdomen free when in prone position, these can be positioned now prior to the turn. Remember the use of pillows can interfere with the effectiveness of a pressure redistribution surface and individual risk assessment is always required.

6. Turn the patient toward the receiving side and into the prone position in the centre of the bed, using the top slide sheet.

7. Once in prone position the slide sheets should be removed.

8. Follow hospital prone positioning policy for guidance regarding management of the patient's head position, eye protection, placement of arm into the front crawl or swimmers position etc. If no policy exists, ICS guidance document or similar provides detailed advice.²⁴

Watch our guideline video

Summary

Over the last four decades, manual techniques have been used to achieve prone positioning for ICU patients. In more recent times, the increased adoption of prone positioning, heavier ICU patients, and the larger number of staff required to help with the manoeuvre, increases risk of injury to caregivers who are already in short supply.

Device assistive technologies such as ceiling lifts and slings, already used in many ICUs for in-bed repositioning or transferring patients out of bed, should be considered to help improve efficiency and reduce the risks to caregivers associated with prone positioning.

Visit [Arjo.com/Prone](https://www.arjo.com/Prone) for further information.



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March 2021. At Arjo, we believe that empowering movement within healthcare environments is essential to quality care. Our products and solutions are designed to promote a safe and dignified experience through patient handling, medical beds, personal hygiene, disinfection, diagnostics, and the prevention of pressure injuries and venous thromboembolism. With over 6000 people worldwide and 60 years caring for patients and healthcare professionals, we are committed to driving healthier outcomes for people facing mobility challenges.

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