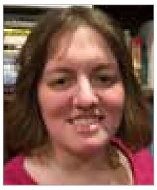
# Ten top tips: honing your pressure injury risk assessment

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The 2019 International Guideline on Pressure Injury/Ulcer Prevention and Treatment (European Pressure Ulcer Advisory Panel et al, 2019) recognises risk assessment as an important first step in identifying high-risk patients (Haesler, 2019). There are three commonly used pressure injury risk assessment tools: the Braden Scale, the Norton Scale and the Waterlow Scale. While these tools are evidence-based with significant scientific rigour and have become the standard in assessing for pressure injury risk, they do not capture risk in all patients. At times, the score on a risk assessment tool creates a picture of low risk when, in fact, the patient is at risk. This article will discuss 10 different populations in which the current formal risk assessment scales are often not sensitive enough to accurately determine the patient's risk for developing pressure injuries and what the additional risk factor(s) is/are. Clinical judgement is needed to clearly capture the risk factors.

Immobility is the highest risk factor for pressure injury development. This risk factor is easy to see, imagine that frail older woman in the hospital bed with a fractured hip. Her risk becomes easily obvious. Yesterday, she was puttering around her home, and regardless of all her comorbid conditions, she was at little to no risk for pressure injury … until she became immobile. Immobility can be temporary, prolonged, or permanent. Causes of immobility range from nerve blockade or anaesthesia, and chemically induced paralysis to spinal cord injury. These causes of immobility also reduce sensation and can lead to an overestimation of a patient's functional ability. For example, consider this scenario: During shift change report, or hand-off, the oncoming nurse receives report about a patient who had a right total knee arthroplasty this morning. The patient's femoral nerve block is still present and as expected, he has no sensation in the right leg. What may not be as obvious, is that his leg had not moved since arriving to the unit from the recovery room. Nevertheless, the Braden scale was scored as 23, or very low risk because it was based on his condition at the time of admission, when he had nothing by mouth since midnight.

If the risk assessment is scored based on retrospective (how the patient was at a prior time) or prospective data (how he/she will be on this shift, such as getting out of bed later), rather than current data, then risk cannot be appreciated. Consider risk assessments to be like vital signs; they need to be current because situations and patients are dynamic and can change quickly.

**1 The duration of anaesthesia is the major risk for pressure ulcer formation:** All forms of surgery require some type of anaesthesia both for patient comfort and haemodynamic stability during the operation. Risk factors associated with pressure ulcers that develop during surgery are poor pre-operative condition, such as older skin, malnutrition, diabetes, previous pressure ulcers or poor perfusion. The most significant risk factor is the duration of general anaesthesia, with cases over 3 hours being the highest risk. *Figure 1* shows a patient who was supine during a prolonged (<3 hour) surgery case. Other factors include being placed prone for the operation, being placed on an artificial heart machine, or being hypothermic. When the assessment of pressure ulcer risk is completed prior to surgery, it has low predictive value. A study of the Braden scale for predicting intraoperative pressure ulcer formation was shown to have a sensitivity of 42% and a specificity of 84% (He et al, 2012). Specific risk assessment tools for the surgical patient have been developed, the Scott Triggers (Scott, 2015) and the Munro Scale (Munro, 2010).

Nerve blocks are commonly used for postsurgical pain management. The patient cannot move or sense pain in the extremity and, therefore, will not move it. Unfortunately, the previous case study of the patient with a total knee replacement is all too commonplace. Pressure injuries can begin in a short time when the magnitude of pressure is high, such as lying on a gurney in recovery room. Therefore, pressure ulcer prevention is needed when nerve blocks are used, despite the nerve block being a foreseeable temporary condition.

**2 The completeness and level of spinal cord injury are important risk factors:** Spinal cord injury creates risk for pressure injury due to both a lack of sensation of the need to move and the lack of ability to move. Risk factors for pressure ulcers immediately following a spinal cord injury are the level and completeness of the spinal injury, spinal shock with hypotension, and the use of neck collars to stabilise the cervical spine (Wilczweski et al, 2012). Faecal management systems are commonly used for patients with liquid stool until a bowel

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*Figure 1. Pressure ulcers develop during surgery.*

*Figure 2. Critically ill patients on vasoconstrictors can develop peripheral ischaemia.*

*Figure 3. Children are at high risk for device pressure ulcers.*

programme can be developed. The use of steroids following spinal cord injury has been cited as a risk factor, but the use of steroids is not always clinically indicated. In patients with spinal injury higher than T-6, there is a risk of autonomic dysreflexia, and the usual treatment is to position the patient with the head of the bed elevated, which increases risk for shearing the sacrum.

During initial rehabilitation from spinal cord injury, the patient is often transferred to a semi-recliner chair position. These chairs offer the patient an opportunity to be mobile, but when the patient is restrained in the chair, shear forces on the sacrum and/or ischial tuberosities are very high and time in the chair must be limited to reduce risk. Once in a wheelchair, the risk stems from being chair bound. These patients are anxious to return to some kind of 'new normal' life and often struggle to recognise and appreciate their ongoing risk for pressure ulcers to the ischial tuberosities from being seated. Daily assessment of the chair cushion is crucial (Paralyzed Veterans of America, 2012).

**3 The critically ill patient's risk for pressure injury stems from severity of illness, especially the need for vasopressors:** Critically ill patients have the highest reported rates of pressure ulcers. Many studies have been done to try to discern what creates such a high risk (Benoit and Mion, 2012; Richardson and Barrow, 2015; Richardson and Straughan, 2015; Kayser et al, 2019). The 2019 international guideline reported that 49 prognostic studies reported perfusion, circulation, and oxygenation as a significant risk factors for pressure ulceration. Common reasons for admission to critical care units are sepsis, severe cardiac disease, need for mechanical ventilation, major traumatic injury, or complex and long surgical cases. These scenarios present with some or all of the high-risk factors. All the classic risk factors, lack of sensation, exposure to moisture (especially faecal incontinence), immobility and inactivity due to chemical sedation, malnutrition and exposure to shear with the head of the bed elevated often occur, sometimes simultaneously, in one critically ill patient. What makes the critically ill at an increased risk is that the risk quickly compounds and is not captured by the formal risk assessment tools.

One common circumstance in critical care that is not captured in formal risk assessment is the use of vasopressors. Patients in critical care also often receive vasopressors to stabilise blood pressure and may at times be determined by the staff to be too haemodynamically unstable to be turned in bed. Haemodynamic instability can be defined as a drop in blood pressure, leading to falling blood oxygen levels or the development of dysrhythmias. This can drive pressure ulcer risk because the patient is not turned out of fear that these events recur (Black et al, 2011). Vasopressor-induced peripheral ischaemia *[Figure 2]* must be considered as an independent risk factor. Further, when multiple vasopressors are used, ischaemia of organs worsens.

**4 Any medical device creates risk for pressure ulcers:** The simple presence of the medical device creates risk. Medical devices create a unique risk factor in that they may not be easily moved or removed. In addition, when devices are inserted or applied at the time of admission, and in patients who will undergo fluid resuscitation or develop oedema, the device and its securement quickly become too tight. Moreover, the securement device is sticky and damages skin when removed and reapplied multiple times, which reduces the staff's willingness to move the device as often as it needs to be.

Medical devices are the leading cause of pressure ulcers in children (Razmus and Bergquist-Beringer, 2017), often due to not having exact sizes for the child and the application of tight securements *[Figure 3]*. Due to the high incidence in children, the risk assessment tool for children has been revised to include medical devices as a risk factor (Curley, 2018). Respiratory devices include Bilevel or two-level Positive Airway Pressure (Bi-PAP) and Continuous Positive Airway Pressure (CPAP) and Endotracheal (ET) tubes, and tracheostomy flanges and straps are the most common device leading to pressure ulcer formation (Black and Kalowes, 2016). Even personal protective equipment, such as N-95 face masks, can lead to ulceration when worn for too long. This finding has become unfortunately prevalent in staff working in COVID-19 wards and wearing N-95 masks for hours without reprieve.

Other occasionally overlooked medical devices are prosthetics. Often made of plastic and other hard materials, these devices can ulcerate the skin if proper prevention garments and/or dressings are either not applied, applied correctly, or not fitted correctly to the patient. If the patient has a significant weight fluctuation, the garments will need to be refitted to accommodate the new body habitus. Ill-fitting prevention devices can be harmful to the skin, similar to any other ill-fitting attire.

**5 Bariatric patients pressure ulcer risk stems from tissue-on-tissue pressure and moisture:** Bariatric patients may appear to be at low risk for pressure ulcers due to ample padding on bony prominences. While to some degree this is true, the weight of the skin folds creates a unique risk by placing pressure on the inferior tissues, such

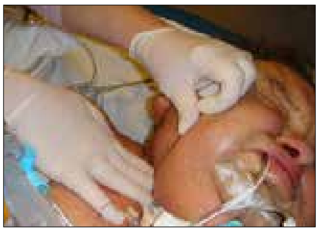

*Figure 4. Skin folds need to be carefully examined for moisture damage and medical devices.*

*Figure 5. Pressure on the heel can create pressure ulcers in a short period of time.*

*Figure 6. When the head of the bed is elevate over 60 degrees pressure and shear injure the lower buttock.*

as the abdominal pannus placing pressure on the thighs and pubis. In addition, bariatric patients require equipment (e.g. lifts) or extra personnel to be turned in bed. These extra resources can be time-consuming or not available, which leads to turning not being done as often and/or may be done inadequately due to bed or patient size.

Skin folds are often moist in bariatric patients because they perspire more to control body temperature. Moist skin can become macerated and does not tolerate pressure or shear. In extreme obesity, items can get trapped in the skin folds and create additional pressure. A thorough skin assessment, including under folds of skin, is critical to the prevention of a device-related pressure injury (Black and Hotaling, 2015; *see Figure 4*).

**6 Several unique risk factors contribute to pressure ulcers on the heel:** Pressure ulcers on the heels is the second most common location for wound development *[Figure 5]*. They are difficult to heal, often developing osteomyelitis and requiring amputation. Therefore, clarifying the risk factors is important. Like most bony prominences, the heel has little padding. Combined with little padding, is a prominent calcaneus protruding beyond the calf muscle and, therefore, prone to exposure to pressure on any mattress. Blood flow to the heel is from the posterior tibial and peroneal arteries, however, neither of these vessels flow directly to the heel, rather they branch across the heel.

Many diseases impact the risk for heel ulcers. Neuropathic disease, especially diabetes, creates a unique risk for patients. The patient may move the leg, but cannot feel pressure on the heel or foot. Diabetes also creates additional problems, as the atherosclerosis occurs faster in these patients than patients without diabetes, as well as altered anatomy due to chronic diabetes, i.e Charcot's foot. Atherosclerosis begins in the extremities and can quickly occlude small arterioles. A classic sign on impaired perfusion is toes and the leg lacking hair. Patients with arthritis often prefer to flex the knee and may have contracture of the knee; in these patients the heel is firmly on the bed bearing the weight of the lower leg. Finally, patients who are confused, spastic, or in pain often rub the heel on the linen, creating friction injuries on the heel. The Waterlow scale does measure several variables uniquely occurring on the heel.

Owing to the frequent occurrence of heel pressure injury and rapid deterioration, some simple additions to any risk assessment programme should include: determining if the patient can and does move the leg independently, is capillary refill normal or delayed, is sensation normal or diminished and the presence of elastic stockings.

**7 Dyspneic and head injured patients experience shear on the sacrum:** The severely dyspneic patient may not be able to tolerate side lying. The patient may become severely breathless with any activity and, therefore, makes few movements in bed. Tri-pod position (sitting erect in bed or in a chair with elbows resting on the table and the chest leaning forward) places excessive pressure on the elbows and ischial tuberosities if in a chair and on the lower sacrum if in bed, because the head of the bed often cannot be elevated to a 90-degree elevation. The tripod position leads to high shear forces on the sacrum because the patient slides down in bed. Due to the increased energy expenditure to maintain oxygenation, patients with severe dyspnea may not be willing to 'waste' energy to shift in the bed or chair, while sitting in high-Fowler's position or on the edge of the bed.

Patients with increased intracranial pressure are positioned with the head elevated at 60 degrees. This position creates high shear forces on the sacrum, which often cannot be removed because the patient cannot be repositioned because the intracranial pressure rises with movement. *Figure 6* is an example of this. In this circumstance, additional padding, such as a five-layer foam prophylactic dressing, or an alternate surface may be appropriate to consider.

**8 Prone patients ulcerate quickly because there is little soft tissue padding:** Prone position is being utilised more and more with COVID-19, as well as being indicated for Acute Respiratory Distress Syndrome or posterior spine and cranial surgery. This position is inherently riskier for pressure ulcer development than supine or lateral positioning because the body does not have the adipose tissue on the face or upper chest. Pressure ulcers can occur within hours while prone, the risk also stems from the padding used on the face while prone *[Figure 7]*. Proning for respiratory distress leaves the patient in prone position for over 12 hours, at times reaching 18 hours (Guérin, 2013). When a patient is prone for non-surgical care, the interdisciplinary team needs to work together to pad high-risk areas and reposition the face, head, and arms every 2 hours.

**9 Scar tissue does not tolerate shear:** Scar tissue, in and of itself, has significantly different characteristics than non-scar tissue. For example,

*Figure 7. The anterior surfaces of the body are at very high risk when the patient is prone.*

*Figure 8. Scar tissue following secondary healing of full thickness pressure ulcer does not have the resiliency of native tissues.*

scar tissue has 80% the tensile strength of native tissue and does not stretch. In addition, scar tissue lacks sweat and oil glands, so skin will be dry, which reduces tolerance of external forces. Furthermore, rete pegs are lost in scar tissues and the lack of rete pegs makes scar prone to shear forces. Finally, scar tissue also may have less superficial nerve density, which may alter the ability to sense tissue ischaemia, which may previously have triggered the patient to move or adjust (Bijlard et al, 2017). Due to the natural changes to the skin from scarring, scar tissue located in a high-risk location, such as a previous full-thickness pressure injury, is a risk factor for a new ulceration *[Figure 8]*.

**10 Pressure ulcers create risk because the patient has fewer body areas to rest upon:** It may seem intuitive that once a patient develops a pressure ulcer, he/she is more likely to develop another one. This logic is based upon the idea that the intrinsic factors leading to ulceration are still present. Some pressure ulcers occurred during a time of extrinsic high risk, such as a long surgical procedure, and the intrinsic factors played only a small role in ulcer development.

However, what is true in all cases of pressure ulcers, is that the patient cannot lie or sit on the ulcer. Therefore, the patient has fewer turning surfaces. For example, if the patient has a sacral pressure ulcer, he/she can only be positioned side to side. Those body parts now bear more pressure over time than before the sacral ulcer developed and are at higher risk of ulceration.

## Conclusion

The use of current evidence-based practice tools to determine risk should remain in daily practice as the standard of care. Unfortunately, none of the current risk assessment tools predict pressure ulcers in all patients. As with all areas of care, clinical judgement is needed to refine and create an accurate risk assessment considering the patient's unique and dynamic situation. WINT

## References


Benoit R, Mion L (2012) Risk factors for pressure ulcer development in critically ill patients: A conceptual model to guide research. *Res Nurs Health* 35(4): 1–23

Bijlard E, Uiterwall L, Kouwenberg CAE et al (2017) A systematic review of the prevalence, etiology, and pathophysiology of intrinsic pain in dermal scar tissue. *Pain Physician* 20(2): 1–13

Black J, Edsberg L, Baharestani M et al (2011) Pressure ulcers: avoidable or unavoidable? Results of the National Pressure Ulcer Advisory Panel Consensus Conference. *Ostomy Wound Manage* 57(2): 24–37

Black J, Kalowes P (2016) Medical device-related pressure ulcers. *Chronic Wound Manage Res* 3: 91–9

Black J, Hotaling P (2015) Ten top tips: bariatric skin care. *Wounds International* 5(3): 13–7

Curley MAQ, Hasbani NR, Quigley SM et al (2018) Predicting pressure injury risk in pediatric patients: The Braden QD Scale. *J Pediatr* 192: 189–95

European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance (2019) *Prevention and Treatment of Pressure Ulcers/Injuries*. EPUAP/NPIAP/PPPIA

Guérin C, Reignier J, Richard JC et al (2013) Prone positioning in severe acute respiratory distress syndrome. *N Engl J Med* 368(23): 2159–68

He W Liu P, Chen HL (2012) The Braden Scale cannot be used alone for assessing pressure ulcer risk in surgical patients: a meta-analysis. *Ostomy Wound Manage* 58(2): 34–40

Kayser A, VanGilder CA, Lachenbruch C (2019) Predictors of superficial and severe hospital acquired pressure injuries. *Int J Nurs Stud* 89: 46–52

Munro C (2010) The development of a pressure ulcer risk assessment scale for perioperative patients. *AORN J* 92(3): 272–87

Razmus I, Bergquist-Beringer S (2017) Pressure Ulcer Risk and Prevention Practices in Pediatric Patients: A Secondary Analysis of Data from the National Database of Nursing Quality Indicators®. *Ostomy Wound Manage* 63(2): 28–32

Richardson A, Barrow (2015) Part 1: pressure ulcer assessment: the development of a Critical Care Pressure Ulcer Assessment Tool made Easy (CALCULATE). *Nurs Crit Care* 20(6): 308–14

Richardson A, Straughan C (2015) Part 2: pressure ulcer assessment: implementation and revision of CALCULATE. *Nurs Crit Care* 20(6): 315–21

Paralyzed Veterans of America (2012) Pressure Ulcer Prevention and Treatment Following Spinal Cord Injury. Washington DC: Paralyzed Veterans of America

Scott SM (2015) Progress and challenges in perioperative pressure ulcer prevention. *J Wound Ostomy Continence Nurs* 42(5): 480–5

Wilczweski P, Grimm D, Gianakis A et al (2012) Risk factors associated with pressure ulcer development in critically ill traumatic spinal cord injury patients. *J Trauma Nurs* 19(1): 5–12