Best Practice Recommendations For Skin Health and Wound Management 2025

CHAPTER 7

Prevention and Management of Pressure Injuries

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INTRODUCTION

The prevention of pressure injuries (PI) continues to be a concern in Canadian health-care systems. In a 2004 study funded by the then Canadian Association of Wound Care (now Wounds Canada), the overall prevalence of pressure ulcers (PU) across all health-care settings was 26%, with approximately 70% of these wounds considered preventable.[1] According to published literature, clinical practice and expert opinion, nearly all pressure injuries can be prevented.[2] Prevention, based on best practices and use of appropriate equipment and education for interprofessional health-care teams, is of paramount importance and must be the focus of care for all patients, families, care partners and relevant departments across all care settings. RNAO emphasizes "It is good practice for organizations to implement an interprofessional approach for the assessment, prevention and treatment of pressure injuries. This approach includes shared decision making with persons at risk of or living with pressureinjuries and their essential caregivers."[16]

Despite the focus on prevention to date, pressure injury incidence rates have not significantly decreased in Canada[3] when compared with other countries around the world, including the U.S.[4] An integrated approach focused on prevention is required to make a significant difference in incidence rates. For optimal effectiveness, teams need to be interprofessional and integrated to include the person at risk of, or with a, pressure injury (as the first team member), along with their families, care partners and relevant and relevant departments such as purchasing and housekeeping (in the institutional setting).

Pressure injuries affect quality of life, increase mortality and death, are expensive, can take months to heal and not all PIs close.[5] The equipment and interventions required to prevent pressure injuries are less expensive than the cost of treatment.[6,7] The number of pressure injuries in a setting can be multiplied by the appropriate monthly cost per stage to determine the total cost of treatment per month in a setting. Explicitly identifying this cost may help with the advocacy for pressure injury prevention programs and equipment.

In one study in Ontario, the cost of treatment for individuals over 65 who were admitted to hospital with a pressure injury was compared with individuals over 65 who acquired a pressure injury while in the hospital.[8]

- Costs to treat pressure injuries that were present prior to admission ranged from CA $11,000 for a Category/Stage 3 pressure injury to CA $18,500 for a Category/Stage 4 pressure injury.[8]
- Hospital-acquired pressure injury treatment costs ranged from CA $44,000 for Category/Stage 2 to $90,000 for Category/Stage 4.

Researchers studied, "1351 cases of hospital-acquired PUs, and 2523 cases of pre-admission PUs over five years.

- Net cost of hospital-acquired PU ranged between CA$44,000 for a category 2 PU to CA$90,000 for a category 4 PU.
- For pre-admission PU net cost was between CA$11,000 to CA$18,500 for category II and category IV PU, respectively. The net cost of treating hospital-acquired PU is higher than pre-admission PU. Costs increase with increasing PU severity.

In conclusion, the total net adjusted hospitalization cost of a hospital-acquired PU in Ontario was CA$44,000–90,000, compared with CA$11,000–18,500 for a pre-admission PU. Future studies should determine the attributable cost of PU using patient-level data to verify the accuracy of the study results."[8]

Although pressure injury prevention has received increased attention in recent years, Vanderwee et al. found that, "Only 10.8% of the patients at risk received fully adequate prevention in bed and while sitting."[9] At the same time, "More than 70% of the patients not at risk received (some) pressure ulcer prevention while lying or sitting."[9] Overall, the authors suggest, "The biggest improvement can be gained in prevention interventions while sitting (chairs and in bed) and the prevention specific for heels."[9] This study points to the importance of assessing individual patients to ensure pressure management resources are used appropriately to prevent pressure injuries.

"Pressure Ulcer" or "Pressure Injury"?
In May 2016, the National Pressure Ulcer Advisory Panel updated the term pressure ulcer to pressure injury. This update was done to clarify that both Category/Stage 1 and Deep Pressure Injuries refer to intact skin.[10,11] The definitions of the categories of pressure injuries were changed slightly by the revision.[11] In this chapter, the term pressure injury is considered synonymous with pressure ulcer and is used throughout except when directly quoting previously published literature.[12]

This document is written with the intent to encompass the quintuple aim for health-care improvement. This is to enhance the patient experience, reduce costs, improve population health, improve the clinician experience and enhance equity (See Table 1). This equity piece is particularly important for patients living with skin issues, wounds and, specifically, at risk or having developed a pressure injury. Ensuring all patients receive care, supplies and ongoing preventative strategies needs to be recognized and communicated to policy makers.[13]

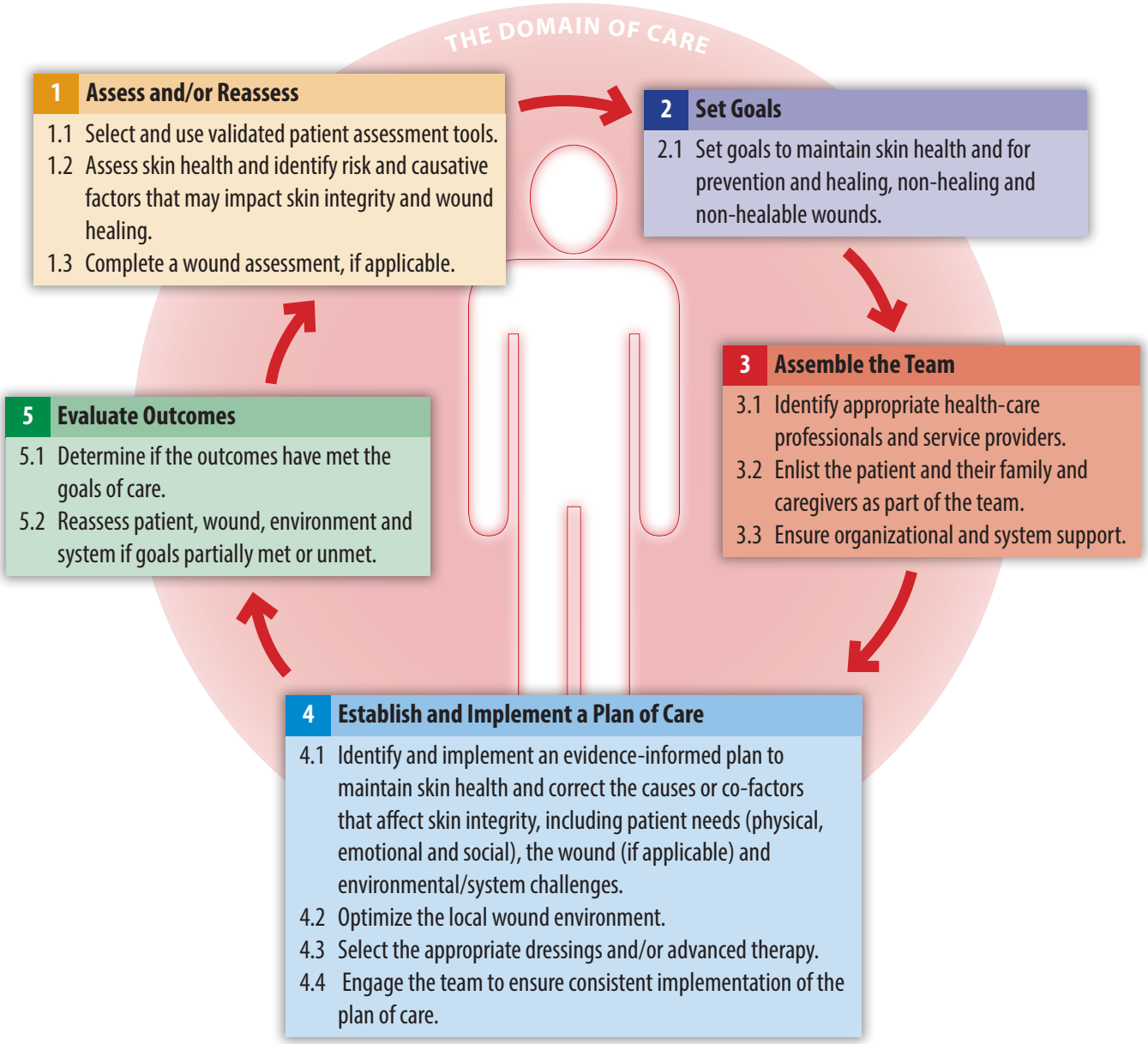
Table 1: Quintuple Aim and Management of Pressure Injury

5 components	Applied to Pressure Injury
Improving population health	Through prevention, education and self-management strategies
Reducing costs	Application of best practices to ensure most effective treatment. Appropriate use of resources-examples: products, dressings, pressure redistribution surfaces, devices
Advancing health equity	Application of principles to all those at risk (those with darker skin tones) or affected by pressure injuries
Care team wellbeing	Providing clinically usable information for front line clinicians
Enhancing the patient experience	Providing a supportive process of care for all those with pressure injury issues

THE WOUND PREVENTION AND MANAGEMENT CYCLE

This chapter offers a practical, easy-to-follow guide, called the Wound Prevention and Management Cycle (See Figure 1) as outlined in Chapter 3,[14] that guides the clinician through a logical and systematic method for developing a customized plan for the prevention and management of wounds from the initial assessment to a sustainable plan targeting self-management for the patient.

Figure 1: The Wound Prevention and Management Cycle



The recommendations in this chapter are based on the best available evidence and are intended to support the clinician, the patient, care partners, their family, the health-care team and decision makers in planning and delivering the best clinical practice. Two foundational chapters supplement this chapter with additional evidence-informed information and recommendations that are general to all wound types: Chapter 3: Skin: Anatomy, Physiology and Wound Healing[14] and Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15]
There are three guiding principles within all the Best Practice Recommendation (BPR) chapters that support effective prevention and management of skin breakdown:

1. the use of the Wound Prevention and Management Cycle regardless of the specifics to prevent and manage skin breakdown,
2. the constant, accurate and multidirectional flow of information within the team and across care settings, and
3. the patient as the core of all decision making.

Key reference documents include:

- Registered Nurses' Association of Ontario. Pressure Injury Management: Risk Assessment, Prevention and Treatment. Fourth edition. 2024.
- National Pressure Ulcer Advisory Panel/European Association of Pressure Ulcer Panel Pressure Ulcer Prevention Guidelines, 2019.
- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Quick Reference Guide. Emily Haesler (Ed.). Cambridge Media: Osborne Park, Australia; 2019.
- Wound Ostomy and Continence Nurses Society Guidelines for the Prevention and Management of Pressure Ulcers; 2017. Association for the Advancement of Wound Care Pressure Ulcer Guideline; 2017.
- AORN (Association of Peri-operative Registered Nurses Association). Guideline for positioning the patient. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:705-780.

Step 1: Assess and/or Reassess

Recommendations
1.1 Select and use validated patient screening and assessment tools (Special populations are discussed below)

Discussion: Expert opinion clearly supports the use of validated pressure injury risk assessment tools (e.g., Norton, Braden, Braden Q for pediatric assessment, Waterlow, Gosnell), but controversy exists over which tool is best suited to a particular care setting. In any case, expert opinion recommends the systematic use of a specific validated tool and the development of care plans based on the subscale scores that identify factors that put the person risk for PU development.[16] Wounds Canada has additional best practice resources that provide links to tools that can be used to assess the risk of skin breakdown: https://www.woundscanada.ca/health-care-professional/resources-health-care-pros/28-publications/wound-care-canada/200-library-2.

To support Indigenous communities, Wounds Canada has developed Pressure Injuries: A guide for Alberta with a focus on Indigenous health. Available at: https://www.woundscanada.ca/doclink/bpr-brief-pressure-injuries/eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJicHltYnJpZWYtcHJlc3N1cmUtaW5qdXJpZXMiLCJpYXQiOjE2ODcyMDM4NzEsImV4cCI6MTY4NzI5MDI3MX0.mI_GfJt8uVhZl0b7HhjOHaS91fCQ4tDzuppbltBypSs

As well as the extrinsic risk factors that are addressed by the risk assessment tools, clinical judgment is required to assess for intrinsic risk factors that include the physical, psychosocial and medical conditions.[2] Factors such as neurological disease, advanced age, hydration status, lifestyle, peripheral vascular disease and level of consciousness must also be taken into account.[17] It is important to note that screening tools and visual inspection are critical to prevention due to the under identification of pressure injuries in people with darkly pigmented skin. See the Support surface selection tool for a list of these tools: https://www.woundscanada.ca/dhfy-doc-man/public/2950-wc-product-picker-surfaces-fillable/file.

Assessment Tools: The use of a comprehensive, structured and validated wound assessment tool assists the health-care professional (HCP) to identify the potential etiology of areas of impaired skin integrity, including the ability to determine the depth of trauma by staging pressure injuries.[16,18,79,80] In addition, RNAO states that skin assessment, a visual assessment, looking for redness or skin changes is not sufficient. Using other tools as an adjunct is recommended. This will mean an additional cost for health care systems/facilities, so clinicians need to be equipment to advocate for these devices with a clear rationale). For example, RNAO recommends "...nurses and health providers use thermography as an adjunct to skin assessment for early detection of pressure injuries. Furthermore, RNAO has a conditional recommendation that "...nurses and health providers use subepidermalmoisture detection as an adjunct to skin assessment for early detection of pressure injuries."[16]

Caution should be utilized when selecting a wound assessment tool to ensure that the tool has been validated to be responsive and show changes in the wound status over time. Although there are several wound assessment tools available, none of the tools reviewed by Pillen et al. (2009) were found to be valid in all required criteria (validity, reliability and sensitivity).[19] The Pressure Ulcer Scale for Healing (PUSH) and the revised Photographic Wound Assessment Tool (PWAT) showed strong scores for responsiveness. The revised PWAT is a valid and reliable tool to assess chronic wounds of various etiologies using digital images.[20]

Wounds Canada, Additional Best Practice Resources provides links to Wound Assessment Tools.

Wounds Canada. Wound Healing Phases. Available at:
https://www.woundscanada.ca/health-care-professional/indigenous-health/alberta

Wounds Canada. Wound Types Poster. Available at:
https://www.woundscanada.ca/health-care-professional/indigenous-health/alberta

Although the Pressure Sore Status Tool (PSST) and the BWAT both provide a comprehensive description of wound parameters with good reliability they have not been shown to be sensitive to change. The BWAT demonstrated excellent reliability when used by nurses with special training in wound assessment and has undergone some testing that demonstrated the total BWAT score may be useful in predicting outcomes, although more research is required to determine its predictive validity.[21] If available, serial photography using a standardized technique and/or reliable validated electronic data collection devices can also provide valuable information to assist with wound assessment, although more research is needed.[22]

Stage or Category?
Europeon Pressure Ulcer Advisory Panel (EPUAP) classifies pressure injuries in categories, while the National Pressure Injury Panel (NPIAP) classifies pressure injuries in stages. **It is important to note that whether it be stage or category this classification indicates depth of initial trauma not progression of healing.** It is important that clinicians are not using a system that back stages. The RNAO states "It is good practice for health providers to classify a pressure injury using a validated classification system. This classification system should not be used for monitoring pressure injury healing."[16]

Other validated assessment tools may be required based on patient need. No matter what assessment tool or scale is chosen, the same measurement should be used for subsequent assessments for ongoing comparison. See Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15]

Nutritional screening tools such as the Mini-Nutritional Assessment – Short Form and the Malnutrition Universal Screening Tool or the Malnutrition Screening Tool can be used to assess compromised patients.[23,24] See Appendix 1: Nutrition for Skin Health, Wound Prevention and Wound Healing in Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15]

- Pain scales provide a systematic approach to assess and address the factors that are causing or exacerbating pain.[25] There is no one pain scale deemed universal and useful for all individuals; the selection of a specific pain scale must take into account the person's age, language, educational level, sensory impairment, developmental stage and cognitive status.[16] It also must take into account clinician education.[26]
- Quality-of-life assessment: Maintaining a patient's quality of life is important as it can affect skin health and wound

healing. Use of a validated quality of life (QoL) assessment tool may be beneficial to direct appropriate interventions, monitor effectiveness and to identify barriers to healing and potential options for improvement.[15] For more information on quality-of-life assessment tools please see Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.

1.2 Identify risk and causative factors that may impact skin integrity and wound healing

Discussion: Assessment is the foundation for providing the most appropriate and timely interventions to prevent wounds and improve the healing potential of existing wounds. Early screening and assessment and collaborating with the patient and family are necessary to identify the risk for pressure injury development and factors that may affect wound healing, enabling the prompt development and implementation of a care plan with appropriate resources and interventions according to the risk factors identified.

The International Pressure Injury Guideline[2] recommends that screening for the risk of pressure injury development occur when a person first enters into any health-care setting and that assessment be repeated according to the level of risks identified, the person's level of acuity and with any changes in their condition (medication use, pain, altered awareness and sensation).[27, 28] For example, in Long Term Care it has been recommended that risk assessment occur whe the client is admitted, weekly for the first 4 weeks and then quarterly. This schedule is recommended as the client's condition often changes within the first 4 weeks of admission to a LTC home, necessitating the increased fequency of assessment.

Reassessment of both risk screening and wound assessment is recommended to evaluate the effectiveness of interventions and identify alterations to the treatment plan that may be beneficial.[2]

1.2.1 Patient: Physical, emotional and lifestyle

Discussion: Clinicians must complete a comprehensive patient history to determine general health status, comorbidities and risk factors that may lead to pressure injury formation or that may affect the healing of existing wounds.[2] To facilitate consistent implementation of strategies for pressure injuries, patient levels of risk and additional risk factors must be communicated with all team members. Strategies to communicate risk include but are not limited to unit huddles/rounds, patient safety boards, identifying patients with an armband, email alerts and having regular check-ins with the patient and family. In community this may include client communication journals. It is important to remember that communication needs to needs to occur in a culturally safe and inclusive manner. RNAO states "It is good practice for organizations and health providers to communicate and collaborate in a culturally safe and inclusive manner with persons and their essential caregivers in the assessment, prevention and treatment of pressure injuries." This is particularly important given the higher rates of severe PI in people with darkly pigmented skin-- and that we are unable to detect pressure injuries through "skin redness" as we have traditionally recommended."[16]

Pressure, Shear and Friction[29, 30]

- **Pressure** is defined as, the force per unit area exerted perpendicular to the plane of interest.
- **Shear** is a general term that encompasses both shear strain and shear stress.
- **Shear strain** is the distortion or deformation of tissue as a result of shear stress.
- **Shear stress** is the force per unit area exerted parallel to the perpendicular plane of interest.
- **Friction:** From a clinical perspective, friction tends to hold the skin in place, enabling the shearing of the bony prominence against the inside of the skin. Although friction doesn't cause pressure injuries, it is clinically important because the friction holds the skin in place, allowing shear to occur.[31,32]

Physical Assessment

Pressure and shear: Clinicians must assess potential sources of pressure and shear by evaluating the patient's posture, activities, mobility, lifestyle, current pressure redistribution surfaces such as sleeping and sitting surfaces and underlying medical conditions (e.g., spinal cord injury).[29,30,33]

Pressure or pressure in combination with shear are recognized as the main factors in the development of PI, with pressure three to five times higher internally near a bony prominence. Although at one time it was thought that individuals could tolerate higher pressure for short periods of time, this curve has been blunted, and the goal now is to redistribute pressure to reduce peak areas of pressure.[2]

Figure 2 demonstrates how pressure alone also contributes to shear strain in the tissue as the tissue deforms around the shape of the bony prominence. Also ideally the blood vessels should curve and move around the bone, be thinner as they reach the bottom of the bony prominence and thicker further away from the bony prominence. For shear see Figure 3: Shear.

Figure 2: Tissue Distortion Due to Pressure

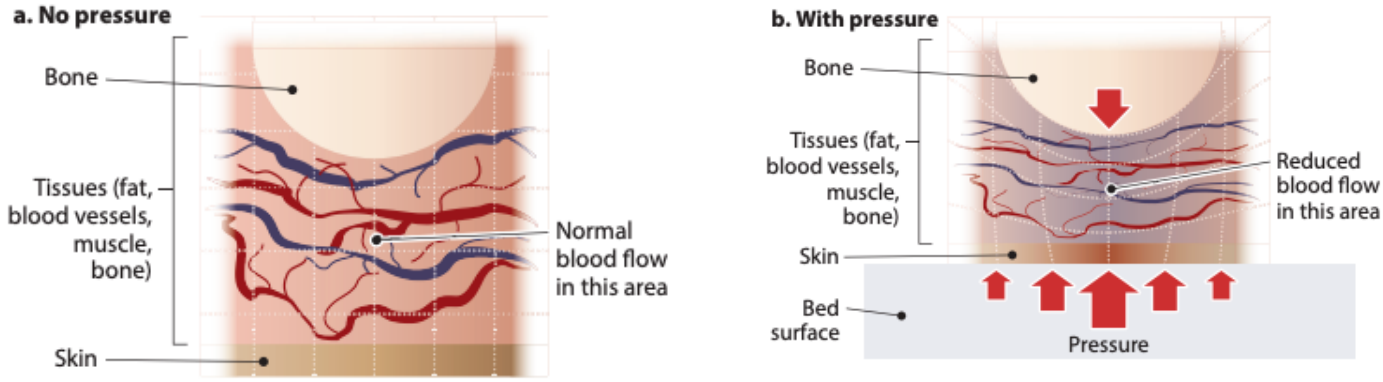
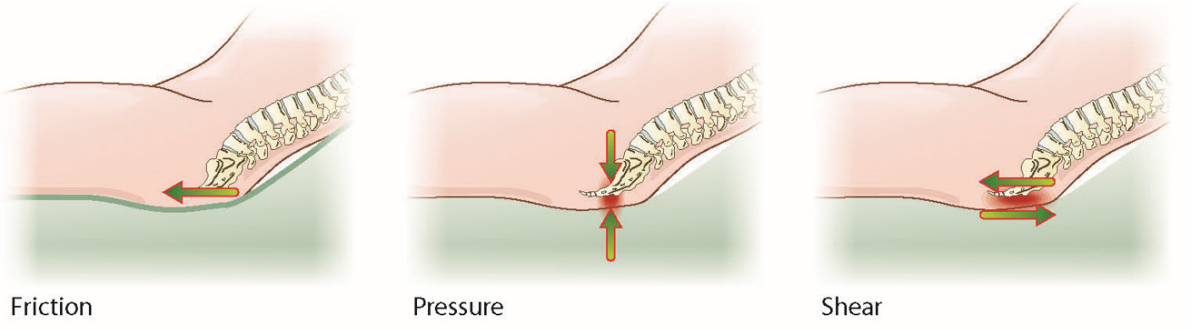


Figure 3: Shear



The role of shear force is equally as important to understand. Shear can be described as the deformation of tissue by two oppositely directed parallel forces, such as what happens with patients slipping down in bed.[31] "The addition of shear forces doubles the impact of pressure."[29] Asymmetrical wound undermining is an indication that shear forces are occuring. The direction of this undermining occurs along the track of movement of the bony prominence during the activity where the shearing is occuring. For example, if there is asymmetrical undermining of a wound over the ischial tuberosity, and the undermining is in a head-to-toe direction, this is likely caused by rocking (the ischial tuberosity moves back and forth) or the patient sliding down in bed or forward in the wheelchair. Knowing the direction of the undermining and the relationship to shear can help the clinician identify the movements and activities where the shear is occurring and develop strategies to minimize shear during these activities.

An assessment to determine the forces occurring on all sleeping and sitting surfaces and during all transitions (e.g., transfers, sitting up in bed), as well as the condition of the surfaces will help identify the priority areas for intervention.[2]

Friction injuries are often misdiagnosed as pressure injuries. An analysis of the literature by Brienza identified that friction contributes to shear strain in deeper tissues, which is identified as a factor in the development of a pressure injury.[32] Clinically this is important because reducing friction may help to reduce shear, as friction holds the skin against the surface allowing the bony structures to slide against the inside of the skin. Tissue damage from friction is related to excessive cell deformation and not ischemic pressure injury in the superficial layers of the skin. Therefore, friction alone is not a direct cause of a pressure injury. Friction is identified as a "risk factor that may contribute to, or exacerbate,

pressure injury development due to the shear it creates."[32] Thus shear has been identified as a "primary causative factor" contributing to pressure injury development, and friction has been eliminated from the current NPIAP definition of pressure injury.[2]

Nutrition screening

Lack of optimal nutrition and hydration may interfere with skin integrity for individuals with elevated pressure injury risk and treatment effectiveness for individuals with pressure injuries (See Table 2).[34,35] For example, placing a patient on a low air-loss mattress may lead to an increase in fluid loss. In addition to using validated nutritional screening tools it is important to review blood work for signs of compromised nutritional status. See Appendix 1: Nutrition for Skin Health, Wound Prevention and Wound Healing in Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15] A comprehensive assessment utilized to screen participants with Category/Stage 2, 3 and 4 pressure ulcers in a randomized controlled trial by Houghton et al. identified a decreased healing potential when the number of abnormal blood values increased and a higher rate of non-healing over a six-month period for those with two or more abnormal blood values (even mildly abnormal).[34,36] This study highlighted the value of blood analysis as an effective tool to assist in the identification of nutrition-related barriers that negatively impact pressure injury healing.[36]

Recent research focuses on identification of biomarkers such as hemablogin, albumin, C-reactive protein, pressure injury risk score, age and gender as factors to consider when predicting pressure injury formation.[37] Determining the level of hemoglobin and conducting vascular studies in relevant cases can be beneficial. The presence of low hemoglobin and the presence of more than one wound can be risk factors for delayed wound healing.[38] Having two or more low hematological values is also thought to be indicative of delayed wound healing.[36]

Table 2: Blood Screening Tests to Consider for Nutritional Barriers to Wound Healing

Suggested blood screen to identify nutrition-related barriers to pressure injury healing	Screening for	Normal Values
Complete blood count (CBC)	Hemoglobin (g/L)	123 – 174
Iron status screening: ferritin, serum iron, % saturation, TIBC (total iron building capacity): assess for iron deficiency anemia	Ferritin (ug/L) Serum iron:Fe (µmol) Sat % TIBC (µmol)	41 – 300 11 – 32 0.20 – 0.65 45 – 82
CRP, ESR: (inflammation/ infection – anemia of chronic disease)	CRP (mg/L) ESR (mm/hour)	< 0.8 < 6 ≤ 10
Prealbumin/albumin: severity of illness/injury and risk malnutrition	Prealbumin (mg/L)	180 – 450
BUN, creatinine: assess for dehydration and kidney function	BUN (mmol/L) Creatinine (µmol)	2.5 – 8.0 mmol/L 50 – 100 micromoles/L
Fasting blood glucose (FBG) and glycosylated hemoglobin (HgbA1c): assess for hyperglycemia/ diabetes	FGB (mmol/L) HgbA1C	3.3 – 5.8 4 – 6 %
Thyroid function: assess for hypothyroidism	TSH (mU/L)	0.4 – 5.00

Moisture-Associated Skin Damage (MASD) is a broad term that encompasses several types of skin damage. For more on MASD, please see Chapter 5: Prevention and Management of Moisture-associated Skin Damage.[39] MASD and pressure injuries may co-exist, so a thorough assessment is essential to differentiate the etiology of a pressure injury, MASD lesions, incontinence-associated dermatitis (IAD) and other skin conditions. It is important to know the link between MASD (compromised skin) and risk of developing a pressure injury.[40]

In 2015 the Global Expert IAD Panel used the following descriptor to differentiate IAD from pressure injuries: "IAD is a 'top down' injury, i.e., damage is initiated on the surface of the skin, while pressure ulcers are believed to be 'bottom up' injuries, where damage is initiated by changes within soft tissue."[40,42] It is important that clinicians recognize that incontinence is likely a confounding factor in populations characterized by immobility and poor skin status. It is also likely that, as well as moisture, there is a skin irritant component to many of the factors where moisture is present and the presence of moisture may impact both the mechanical boundary condition (type of load) and the susceptibility and tolerance of the skin (mechanical properties of the tissues). The coefficient of friction is shown to be greater over moist skin.[43]

Skin assessment relies on clinical observation and visual inspection as described in the Table 3.

Table 3: Differential Diagnosis of Pressure Injury and IAD[41]

	Pressure Injuries (Category /Stage1)	Pressure Injuries (Category /Stage 2)	Incontinence-Associated Dermatitis
Location	Over bony prominence or sites exposed to external pressure and shear, or associated with a medical device	Over bony prominence or sites exposed to external pressure and shear, or associated with a medical device	May be localized to the perineum, perigenital areas or generalized to include buttocks; gluteal fold; medial and posterior aspects of upper thighs; lower back; may extend over bony prominence
History	Exposure to pressure, shear, immobility	Exposure to pressure, shear, immobility	Urinary and/or fecal incontinence
Pain (for those with intact sensation)	Burning, itching, warmth	Burning, pain	Burning, itching, tingling, pain
Odour	None	Unlikely	Fecal and/or urine
Characteristics	Localized heat, edema and change in tissue consistency in relation to surrounding tissue (e.g., induration/ hardness) have all been identified as warning signs for pressure injury development.	Shallow open area with distinct edges or margins	Area is diffuse with poorly defined edges with superficial, partial-thickness skin loss or may be intact skin with blanchable or non-blanchable, blotchy erythema Note: This may not be visible in people with darkly pigmented skin.
Periwound skin	Intact	Intact	Irritated, red

	Pressure Injuries (Category /Stage1)	Pressure Injuries (Category /Stage 2)	Incontinence-Associated Dermatitis
Infection	Rare	Rare, although secondary soft tissue infection may be present	Secondary superficial skin infection such as candidiasis may be present
Improvement	Pressure redistribution	Pressure redistribution	Control/containment of incontinence, effective skin protection

Surgical considerations: If surgery is being considered for closure of a pressure injury, a pre-operative interprofessional/multidisciplinary assessment should be conducted, including management of underlying medical conditions, optimizing nutritional and hydration status, smoking cessation, bowel regulation, management of spasticity/contractures and presence of and/or management of infection.[44] The patient's ability and readiness to participate and/or ability to adhere to the post-operative medical requirements and rehabilitation processes must be assessed before surgery is offered. These include, but are not limited to, post-operative protocols for pressure redistribution and progressive seating, as well as readiness for tertiary prevention of pressure injuries. It is important to recognize that any surgical intervention or lengthy procedure increase the risk for PI development in persons at risk for PI.

Emotional Assessment

Prevention assessment needs to identify if the patient has multiple complicating factor such as achieving a balance between the need for pressure redistribution, social-mental wellbeing, physical and psychological needs (e.g., sleep, travel, participating in activities of daily living or meaningful activity such as employment, caregiving or childcare responsibilities).

Pressure injuries negatively affect quality of life (QOL).[45] Effects on QOL differ between partial-thickness and full-thickness tissue injuries.[46] A psychological and QOL assessment should be conducted to assess the impact of the pressure injury on the QOL for the patient and their family/care partners. This assessment will assist in determining their goals, along with their ability and determination to participate in the plan of care.[47] If a pressure injury is deemed healable, commitment of the person with a pressure injury and care partners is crucial in achieving successful outcomes in a timely, resource-efficient manner. As with all parameters of a complete assessment it will ultimately guide the plan of care.

Lifestyle: The importance of the lifestyle choices the person with a pressure injury makes regarding pressure injury prevention and management practices cannot be overstated. Clark et al. summarized the impact of lifestyle choices on pressure ulcer risk: "Every person sculpts a unique existence that reflects an interconnected network of psychological traits, goals, values, preferred activities, environmental opportunities and challenges, habits, routines and personal health practices. Embedded in the context of his or her daily activities and concerns, each individual has a distinctive pattern of pressure ulcer risk."[48]

Lifestyle factors, beyond just smoking history and alcohol or drug use, should be considered when identifying risk for the development of pressure injuries, and when assessing an individual with a pressure injury. An assessment of daily activities, life goals, habits and routines, in addition to the devices and care available, is required to identify the person's pattern of pressure injury risk. This assessment must be done in partnership with the patient and be redone regularly and include decision support systems, where available.[49] A thorough assessment enables the health-care provider to work with the person at risk for or with the pressure injury to identify realistic ways to reduce their risks and implement an achievable and relevant care plan.

General risk factors for the development of a pressure injury may include:[16]

Extrinsic (External) Risk Factors
- Poor hygiene
- Unhealthy living conditions
- Medications (polypharmacy, sedatives)
- Pressure, inability to modify risk factors
- Friction
- Shear
- Use of devices or equipment that press on the body such as some sporting equipment (e.g., sledge hockey and skiing equipment etc)
- Clothing/garments (including footwear) or the ability to acquire
- Presence of moisture
- Transfer type/quality
- Restraint use
- Pressure redistribution surfaces

Intrinsic (Internal) Risk Factors
- Nutritional status (malnutrition and dehydration) anaemia
- Reduced mobility/immobility
- Muscle spasms
- Posture, contractures
- Sensorimotor impairment
- Incontinence (urinary and or fecal)
- Extremes of age
- Level of consciousness
- History of previous pressure damage
- Vascular disease
- Severe, chronic or end-of-life illness
- Pain
- Hypoxia

Risk Assessment for Special Populations

Assessment of individuals with specific risks requires that the clinician be aware of and assess for specific factors that may increase risk for skin breakdown or affect healing of pressure injuries.[2] Screening for risk and assessment of a pressure injury should occur across all care settings. This includes wound care clinics, urgent care, emergency departments, geriatric and rehabilitation units, home-based and community care, convalescence and rehabilitation settings.[2]

The negative impact of not screening for risk can be significant. For example, in emergency care settings, a lack of screening of patients for PI is attributed to increased length of stay and cost of treatment.[50] More research is needed to understand PI prevention in this setting.

Risk for the individual with a spinal cord injury: Due to the lifelong risk of developing a pressure injury, individuals with a spinal cord injury require frequent expert assessment and intervention from an interdisciplinary and integrated team to prevent and manage pressure injuries. This includes providing education on, and engaging the patient in, self-monitoring activities to support prevention of pressure injuries.[51, 52]

Jackson et al. have identified multiple factors that influence the development of pressure injuries in people with spinal cord injuries.[53] These factors include:

- Perpetual danger: the risk of a pressure injury is always present, and a single incident of inattention can cause a pressure injury
- Change/disruption of routine: when a well-established routine is disrupted, such as a change in care partners
- Decay of prevention behaviours: over time, prevention behaviours tend to deteriorate and, for example, the individual may not shift their weight as often
- Lifestyle risk ratio: the unique set of risks and mediating factors for the individual, such as frailty, poor nutrition, inadequate finances, versus lack of a stable support system
- Individualization: the pressure management plan needs to be tailored to the individual's lifestyle and context
- Simultaneous presence of awareness and motivation: the individual must be aware of how to prevent the pressure injury and have the motivation to implement the prevention strategies
- Lifestyle trade-off: individuals may have a desire to participate in meaningful activities and choose these activities over pressure injury prevention
- Access to needed care, services and supports: the equipment, services and resources required for pressure injury prevention may not be available or available in time.

Risk for the elderly and vulnerable: Advanced age has been identified as a predictor of pressure-related injuries due to the gradual decline of general nutritional and mental status, decreased mobility, sensory perception deficits, incontinence and the changing characteristics of the skin, such as decreased elasticity.[54]
In persons living in long-term care homes with non-blanchable erythema, darker skin tones, pressure injury risk is increased for those with hypotension, contractures or a history of cerebral vascular accident; while those with urinary incontinence have a decreased risk of developing a pressure injury, perhaps in relation to the increased movement and positioning while care is being provided.[55] Being aware of the increased risks can assist clinicians in encouraging high-risk individuals and their families to engage in prevention programs.[2]

Risk for the patient in critical care: Pressure injury incidence and prevalence rates remain higher in critical care areas due to the numbers of severely compromised patients and potentially competing short-term goals.[56] The use of risk assessment tools that are specifically designed to assess risk factors related to critical care areas is highly recommended.[2]

Severely compromised patients include those with severe symptoms such as coronavirus disease (COVID-19). Risk factors that potentially increase the risk for pressure ulcer development in critically ill patients are described as:[57-59]
- Length of time in critical care
- Use of mechanical ventilation, intubation, tracheostomy (which may result in medical device-related pressure injuries, or MDRPIs*)
- Prone positioning (which, compared with supine positioning, makes it increasingly difficult to reposition and offload at-risk areas)
- Use of vasopressors (shown to be a significant risk factor in some studies),
- High Acute Physiology Chronic Health Evaluation 11 (APACHE 11) score 60

*In acute care, it has been shown that medical device-related pressure injuries (MDRPIs) account for more than 30% of all hospital-acquired pressure injuries due to long-term prone positioning with mechanical ventilation devices in the mouth and nose, which resulted in compression, shear forces and tissue ischemia to the surrounding tissues. Sedation, edema and increased skin moisture have also been identified as risk factors that contribute to MDRPI development.[57,58,59]

Risk for pediatric populations: Various pediatric risk assessments tools exist, such as the Braden Q. However, due to the variation of pressure injury risk factors within the wide range of the pediatric population—from neonates to infants and children—a valid PI risk assessment tool with validated cut-off points is still not available.[61, 62, 63]

Pediatric populations are at increased risk of developing PIs as their skin is not yet fully developed. Further adding to this risk assessment complexity is the child's communication level, developmental status and ability to properly differentiate pressure from other sensory perceptions of medical devices. According to Schluer et al., "in line with clinical expertise in the field of PU development in children, it is more reliable to focus on different risk populations,

such as children hospitalized in a PICU, and also to assess equipment-related factors contributing to the development of PUs."[61]

While the presence of medical devices is a specific risk factor in all age groups, limited activity, mobility and skin sensitivity are additional risk factors for this patient population. A comprehensive assessment should therefore include a pressure injury risk assessment and a head-to-toe skin assessment, including areas under splints, braces, traction boots, tracheostomy plates and arm boards.[64, 65]

Risk for bariatric populations: Although the precise relationship between obesity and pressure injury development is unclear, maceration, inflammation and tissue/skin necrosis are reported in large and deep skin folds in severely obese patients. Studies show that both increased tissue weight and fragile vascular and lymphatic frameworks subject the skin and tissues to ensuing complications.[28]

It can be challenging to assess skin and visualize all bony prominences. Skin areas under the pannus such as the hips, pubis, trunk and thighs require assessment, as the weight of the pannus can precipitate pressure injuries. Pressure injuries need to be differentiated from intertriginous dermatitis.[50]

Risk for surgical patients: Patients undergoing prolonged surgery have an especially high risk of developing pressure injuries due to the prolonged pressure from immobility during the pre-operative, intra-operative and immediate post-operative periods. Additional risk factors may include: duration of time the patient was immobilized before surgery, length of surgery, hypotensive episodes during surgery, low core temperature during surgery and reduced mobility post-operatively.[2]

Risk for patients at end of life: In many terminally ill patients, multiple factors and comorbid conditions increase their risk for the development of pressure injuries and need to be identified.[2, 66] Ferris et al. state that the prevalence of pressure injuries in patients receiving end of life or palliative care is higher than the general population. Skin failure occurs alongside failure of other systematic organ changes. This should be discussed with the family and care partners so they understand this is evidence of poor care.[67]

Risk for individuals living in community, at home:[2] Pressure injuries can occur in individuals living in the community, and many individuals return to the community from a care setting with a pressure injury. Quality of life must regularly be reassessed during these transitions of care. Regardless of the PI origin, it is essential that care planners and providers assess the risks posed by each individual's environment before developing and implementing a pressure injury prevention and management plan. Some of the challenges individuals face that may pose increased risk include:

- knowledge of available care options: types, location, local referral requirements, caseloads;
- access to health services - these may be difficult to access (including appropriate transportation to a service) and vary widely across geographic regions and access to equipment;
- limitations due to financial cost or availability.

Risk for individuals in the emergency department:[2] Many patients are admitted through the emergency department. Given that pressure injuries can occur quickly, within as little as two hours, the sooner pressure injury prevention strategies can be implemented, the more likely hospital-acquired pressure injuries can be avoided. Unfortunately, PI screening may not routinely happen in this setting, and risk assessment tools for staff in the ER are lacking. Screening for PI in the ER has been associated with decreased length of stay and decreased cost of PI treatment.

1.2.2 Environment: Socio-economic, care setting, potential for self-management

Discussion: Individuals who are at risk for or who have, a pressure injury often have other comorbidities, including disabilities such as mobility impairments. People with disabilities are often underemployed in Canada when compared with Canadians without a disability. Approximately 65% of persons with disabilities (ages 16–64) are employed.[68]

Furthermore, over 12% of people with disabilities have been refused a job because of their disability, with that figure rising to 33% for those with a severe or very severe disability.[69] People with disabilities who are employed tend to earn less than their non-disabled co-workers. The underemployment of people with disabilities has a direct impact on prevention and treatment plans, as they may not have the resources to pay for additional equipment or care.

Care is shifting away from institutions to the community, with over two million Canadians with disabilities receiving care at home. Most people (88%) receive at least some care from care partners, family and friends, while only 12% rely on professional services alone. For those receiving some care from family and friends, 70% have more than one care partner helping them.[70] Given these statistics, assessing the risk for pressure injuries and implementing appropriate care plans present unique challenges. Self-management, sometimes through the ability to direct others, becomes critically important. People at risk for pressure injuries or who have pressure injuries need to be able to identify and manage their own risks related to pressure injuries, as well as implement treatment plans. This works best when trained clinicians 'come alongside' and work collaboratively with care partners to listen, coach and provide education about risk and appropriate prevention and management activities.[71]

1.2.3 Systems: Health-care support and communication

Discussion: Pressure injuries are associated with a longer hospital length of stay,[72] especially for children[73], and those with darkly pigmented skin. Effectively addressing the issues surrounding pressure injury prevention and management at the systemic level (such as offload delays, increased time spent on ambulance or emergency room stretchers waiting for beds, hallway medicine, health-care provider shortages)[74] requires identifying the true scope of the problem and addressing deficits. In addition, a review of the literature by the Registered Nurses' Association of Ontario (RNAO) identified that patient records did not provide valid and reliable data about pressure injuries and often under-predicted prevalence rates. It recommended that more attention be focused on the quality of documentation of the data to enable the reliable use of the electronic patient record for data collection in the future.[6]

To address the issues, a systematic review by Sullivan identified key recommendations for in-facility health-care delivery to prevent hospital-acquired pressure injuries.[75] Findings suggested the following resulted in reduced pressure injury rates in acute and long-term care:

- Multiple components (bundles)
- A focus on accountability with continual performance measurement
- Simplification and standardization of pressure ulcer-specific interventions
- Consistency in staff training related to documentation
- Involvement of multidisciplinary teams and leadership
- Designated skin champions
- Ongoing staff education
- Ongoing audits that provide feedback and recognition of front line staff successes.[75]

The Canadian Patient Safety Institute (2021) recommends measurement of PI occurrences, exploration of contributing factors, and to identify solutions to mitigate risk. This includes solutions and interventions from leaders, clinicians, patient and care partners.[76]

Using these principles, Wounds Canada's Pressure Ulcer Awareness and Prevention Program (PUAP), a continuous quality improvement (CQI) program implemented in Canadian institutions, demonstrated a reduction rate up to 57% (prevalence) and 71% (incidence).[77]

Additional quality indicators such as the 'Required Organizational Practices' identified by national accreditation organizations were also recommended as a method to monitor outcomes.[6] For more information https://accreditation.ca/.

According to Bales et al., sustainability of any program requires assessment to determine if there is support through strong leadership, involvement of staff in decision-making and a desire to foster interdisciplinary relationships.[78]

1.3 Complete a skin and wound assessment, if applicable

Discussion: The early phases of PI development can sometimes be missed if the clinician waits for overt signs, such as complete skin breakdown. The RNAO recommends, "A comprehensive head-to-toe skin assessment be carried out with all clients at admission, and daily thereafter for those identified at risk for skin breakdown. Particular attention should be paid to vulnerable areas, especially over bony prominences and skin adjacent to external devices.[16]

Skin Assessment: A comprehensive skin assessment includes palpation to identify localized areas of edema, changes in tissue consistency and areas of warmth or coolness, which could be indicative of underlying pressure injury development. This is especially important when conducting a skin assessment in persons with darker skin tones where signs of pressure injury may not be easily identified.[2] It is important to document the patient's skin tone as part of the initial assessment. (See discussion of tools below).

Validated and reliable assessment tools that can detect progress toward healing and provide valuable information to direct treatment decisions should be used.[2]

Wound Assessment: In the presence of a wound, the use of a comprehensive, structured and validated wound assessment tool assists the health-care professional in identifying the potential etiology of areas of impaired skin integrity and helps in staging existing pressure injuries.[2] To enable consistent assessment of wound parameters it is recommended that all assessors use the same assessment tool. The frequency of a comprehensive wound assessment after initial assessment depends on the policies of the care setting.

Assessment tools specific to special populations, such as those with spinal cord injuries, have been developed to ensure population-specific information is considered. Thomason et al. introduced the Spinal Cord Impairment Pressure Ulcer Monitoring Tool (SCI-PUMT) which has now been revised to the Spinal Cord Injury Pressure Ulcer Scale (SCIPUS). This tool has been shown to improve outcomes for the assessment and treatment of pressure injuries in patients with spinal cord injuries or similar disorders.[80, 81] One validated tool currently used to measure healing with spinal-cord-injured patients is the Photographic Wound Assessment Tool (PWAT), which shows reliability and validity with other measures of healing.[80,81]

Physical Examination: Visual inspection to identify/classify pressure injuries in darkly pigmented skin is a challenge and is often inaccurate, requiring assessment for differences in skin temperature, colour, consistency and pain.[2] Wounds that are not pressure injuries should not be classified using NPIAP criteria. It is essential to differentiate pressure injuries from various other wound etiologies such as arterial ulcers, neuropathic ulcers, skin tears and moisture-associated skin damage, since management may differ based on cause.[2] Pressure injuries need to be assessed on admission to the care setting and at regular intervals.[2]

Wound Measurement: A wound should be at least 20% to 40% smaller at week four to heal at week 12.[16, 82] Wounds that fail to progress benefit from reassessment by an interprofessional team to ensure accurate diagnosis, to support patients' ability to heal and to optimize patient factors and treatment options. Reclassification of a wound to non-healing or non-healable may be necessary if conditions cannot be optimized.[16,84]

The MEASURE (Measure, Exudate, Appearance, Suffering, Undermining, Re-evaluate, Edge) mnemonic[82] is a communication device that captures many of the key parameters essential for pressure injury assessment.[28, 82] Other parameters that should be assessed include shape, base (tissue type), bacterial balance, wound edge attachment and progression, and periwound skin integrity.

Khoo and Jansen performed a literature search on types of wound measurement techniques.[85] A comparison of measurement techniques (ruler, digital planimetry, acetate tracings/contact planimetry, as well as laser and structured light devices) revealed digital planimetry provided the best precision and reliability over ruler and acetate tracings. The use of laser and structured light requires more study. Institutional resources must be considered when introducing an organizational standard for practice.

A thorough examination of bony prominences, folds, perineal and perigenital area and under medical devices is recommended. Evaluation tools and approaches for skin damage such as high-resolution ultrasound [86] and measuring subepidermal moisture[87] have been developed—and there are studies in progress regarding implementation into clinical practice.[88]

Recent studies now reveal that ultrasound may be useful in detecting deep tissue injury and soft tissue deformation but recommend that further investigations be conducted.

The use of photoplethsmogram (PPQ), Doppler flow meter (LDF) and measures of transcutaneous oxygen levels have also been identified as requiring further study prior to being recommended for practice.[2]

Changes in soft tissue skin temperature can be detected using a handheld infrared thermography device, which has proved valuable in identifying deep tissue injury, especially in persons with darker skin tones.[2] The subepidermal moisture/edema measurement device (SEM) has demonstrated the ability to identify inflammation and tissue damage predictive of stage 1 and greater pressure injuries, especially in the sacral area. NPIAP guidelines recommend that the use of skin temperature and subepidermal moisture measurement (SEM) be included in skin assessments, particularly for persons with darker skin tones.[89]

Staging and Grading Pressure Injuries: Health-care providers should assess and determine the category/stage of the pressure injury according to the NPIAP revised staging definitions.[12] The categories Unclassified/ Unstageable and Deep Tissue Injury should continue to be used. Categorizing pressure injuries from 2 to 4 is preferred to the use of the terms staging or grading, which tend to indicate a hierarchical progression which is not always the case. Accurate categorization of pressure injuries is essential for treatment planning, data collection and financial reimbursement. The NPIAP recommends that pressure injuries be categorized/staged according to the depth of original injury and not be categorized/staged in reverse as healing occurs. For example: A pressure injury that was originally identified as a Category/Stage 4 needs to continue to be classified as a Category/Stage 4 pressure injury as healing progresses.[2] In some provinces of Canada health care providers may be required to complete a version of MDS/RAI that requires back staging. It is recommended that clinicians follow the MDS/RAI requirements, but that their wound documentation in the progress notes not include back staging.

Wound Infection: The clinician must be able to identify when bacterial damage is occurring and differentiate between superficial, spreading and deep infection or abnormal persistent inflammation in order to create a plan of care that will provide the appropriate treatment and prevention of recurrence. Accurate identification of the microbial load and causative organisms within the wound is best achieved by tissue biopsy or by the Levine quantitative swab technique. See International Wound Infection Institute.[90]

For more information visit Wounds Canada. Infection Prevention and Control (IPAC): Focus on Wounds Care. Available at: https://www.woundscanada.ca/health-care-professional/indigenous-health/alberta

A bone biopsy is recommended for diagnosing osteomyelitis if there is clinical suspicion of osteomyelitis. Wound swab is not recommended to diagnose osteomyelitis. Swabs are useful for identifying causative organisms but not for diagnosing infection. For more on swabs, please see Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15]

Step 2: Set Goals

Recommendations
2.1 Set goals for healthy skin, prevention of skin breakdown and management of healing, non-healing and non-healable wounds

Discussion: Pressure injury prevention should be considered a patient safety goal. Because of the increased acuity of illness of elderly patients admitted and decreased lengths of stay in the hospital, older adults are at greater risk of developing pressure injuries within the first week of hospitalization. For those admitted to long-term care, pressure injuries are most likely to develop within the first four weeks.[91] Older adults with physical-motor limitations, persons with diabetes and those undergoing orthopedic surgery are at increased risk of developing PIs.[92]

Set SMART goals with the patient, caregiver and/or family as appropriate that are specific, measureable, achievable, relevant and timely.[15] To have consistent and quantifiable goals and objectives, the goals should be measurable, repeatable and specific, with interrater reliability.[93] This includes mutually agreed-upon goals that include patient-centered concerns.[94]

2.1.1 Identify goals based on prevention or healability of wounds

Discussion: Once a person has been identified as at risk for a pressure injury or has developed a pressure injury, goals will depend on the client's goals not just related to their PI, but their quality-of-life and the client and team's ability to modify both the intrinsic and extrinsic factors that support prevention or healing. To assist clinicians in setting realistic goals, in collaboration with the patient, family and care partners, risks need to be addressed for prevention goals and wounds need to be classified as healing, non-healing or non-healable.

Clinical judgment is an essential component of risk assessment to facilitate identification of risk factors that are modifiable and those that are not, including physical, psychosocial and medical conditions that may impact the person's level of risk and create potential barriers to healing.[6]

A goal of wound closure may not be realistic when factors that impair wound healing are present and cannot be controlled, such as poor blood flow or perfusion, malnutrition, malignancies, and unmanageable co-morbidities. Client choices around the PI prevention and management plan may cause the wound to be classified as non-healing. It is important to regularly check in with the client to see if their goals and choices have changed, such that the classification of the would would change to healable.[2] When preventing or healing a pressure injury is not possible, these wounds may be classified as non-healable and the goals of care should be centred on supporting optimum quality of life.[84]

Wound closure may also be an unrealistic goal for patients who are terminally ill. Therefore, setting goals that focus on quality-of-life, pain management, managing dressing changes, reducing odour and managing exudate may be most appropriate. It is essential that the care provider explain this approach to the care partners and family members so they are aware that wound closure is not a realistic option due to skin failure, and or systematic organ changes.[95] The use of the Skin Changes at Life's End (SCALE) may assist in care plan development in such circumstances.[96]

Goal Examples:
- For prevention: Daily skin assessment starting now!
- For all wounds: Adequate positioning and pressure redistribution surfaces within two days
- For a healable pressure injury: Wound closure within three weeks
- For a non-healing pressure injury: Wound infection controlled within two weeks
- For a non-healable pressure injury: Alleviation of smell and pain within four days.

Table 4: Team Members and their Roles[2,16]

Team Members	Roles
Patient, family and care partners	Communicate patient abilities, history and needs (goals) to rest of team, advocate for patient and identify any changes and progress they notice
Clinician with intermediate and advanced wound care training	Develop and implement optimized care planning for prevention and management of pressure injuries
Chiropodist/podiatrist	For pressure injuries on the foot: deliver specialized care, pressure offloading, some surgical procedures to eliminate or minimize pressure points on the foot
Diabetes educator	Provide ongoing education for the management of diabetes to optimize glucose control and enhance healing potential
Wound care educator	Deliver advanced education regarding risk assessment and management of pressure injuries
Infectious disease specialist	Address unresponsive, recalcitrant or recurrent infection such as osteomyelitis
Primary care provider (e.g., nurse practitioner, family physician, hospitalist)	Assessment and referral Prescribe medications, order tests/laboratory
Occupational therapist	Provide pressure redistribution; activities of daily living assessments; cognitive assessments and interventions; psychosocial and quality-of-life assessment; support; support/counseling; expertise in assessment of pressure redistribution surfaces, including wheelchair seating prescription, shear prevention and management
Pedorthist/orthotist	Provide pressure offloading for foot and lower extremity pressure injuries as well as bracing for other areas of the body
Personal support worker/ attendant/ care worker/ continuing care assistant	Deliver day-to-day personal care; provide early recognition of Category/ Stage 1 pressure injury, including changes in activity level, nutrition and hydration, bladder/bowel changes and/or mental wellness
Pharmacist	Assess and optimize medication(s) for management of comorbidities, pain, infection; provide information, education, monitoring for interactions, especially with polypharmacy
Physiatrist	Deliver care to persons with SCI and with other musculoskeletal injuries or other conditions; work with rehabilitation personnel
Physical therapist	Provide pressure redistribution, mobility, safe exercise and reconditioning, adjunctive therapies, wheelchair seating and positioning, shear prevention and management
Psychologist	Assess and treat mental health issues; provide coping strategies; address quality-of-life issues impacting adherence to the plan of care
Registered dietitian	Assess and manage nutritional status to ensure optimal nutrition to maintain skin integrity and facilitate healing
RN/RPN	Assess, manage and monitor patient and wound, perform dressing changes, administer medication, provide health-related education
Social worker	Provide psychosocial assessment and support/social supports (e.g., housing, devices, financial resources, food security) and transition in care planning

Team Members	Roles
Speech and language pathologist	Assess swallowing and communication ability and make recommendations to optimize nutritional intake and quality of life
Spiritual care	Provide support and counseling and connect patient/family to spiritual care communities
Surgeon	Perform surgical intervention, debridement, flap closure for deep or slow-healing pressure injuries; vascular interventions to improve perfusion to lower limb pressure injuries

2.1.2 Identify quality of life and symptom-control goals

Discussion: Goals need to be established to enhance the patient's quality of life regardless of the healability of pressure injuries.[84] Comfort is the principal consideration in supportive care and, therefore, may supersede prevention protocols and wound treatments for actively dying patients and for those who have conditions that cause them to have a single position of comfort.

Goal setting should centre on ways to prevent or minimize tissue trauma while engaging in meaningful activity, minimize dressing changes as able, prevent complications, such as infection and minimize pain. The importance of these types of goals in a patient's life cannot be overstated.

Step 3: Assemble the Team

Recommendations
3.1 Identify appropriate health-care professionals and service providers

Discussion: The etiology of pressure injuries is complex and multifactorial, and as a result requires an integrated, interprofessional team to address the many underlying impairments and contributing factors. Each team member brings a unique body of knowledge, but also needs to have a foundational understanding of pressure injuries, as well as the patient and their family. Team member knowledge can be assessed through tools such as the Pieper-Zulkowski Pressure Ulcer Knowledge Test (PZ-PUKT).[97]

The team process requires that all team members work together, not independently of one another, to create a customized plan of care to prevent or manage pressure injuries. The comprehensive patient assessment and goal-setting stages will help identify who should be part of the team. Table 4 lists some of the potential members and what they bring to the team.

3.2 Enlist the patient and their family and care partners as part of the team

Discussion: The success of a plan of care for the prevention and treatment of pressure injuries hinges on the collaboration of the person with a pressure injury, their care partners, family and their support system along with communication among the team of professionals involved in the development of the plan of care.[98] Consider engaging families virtually when they are not available in person. To be effective, all team members must have the motivation, capacity, ability and commitment to act on behalf of the patient, who may be unable to act for themselves.[2, 16]

3.3 Ensure organizational and system support

Discussion: Health-care organizations need to be accountable for any pressure injury development under their purview. To ensure prevention is a focus and is adequately supported, they need to:

- Set appropriate policies and procedures and ensure they are being followed; this must include policies and procedures related to:
    - o screening/assessment
    - o communication
    - o education*
    - o interventions
    - o documentation
    - o analysis of data
    - o continuous quality improvement**
- Make available relevant and adequate financial, human and material resources
- Create a culture of prevention that involves all staff (clinical and non-clinical), patients, family members and caregivers.[99]
- Ensure there is appropriate and equitable access to supplies and medical equipment such as moisturizers, skin barriers, therapeutic pressure redistribution surfaces and other devices.[6]

**It is essential that organizations support appropriate staffing and education so team members obtain adequate skills and knowledge to effectively manage the multiple complex issues related to pressure injuries. A needs assessment should be undertaken to identify knowledge gaps and ensure that educational sessions are tailored to meet those needs. Educational sessions need to utilize principles of adult learning, relate to clinical practice and reinforce strategies to sustain knowledge.[99] Patients and their families can also benefit from education about pressure injury prevention.*

*** Organizations should engage in assessment of Required Organizational Practices focused on prevention of pressure injuries as this process engages the team and provides opportunity for improvement.[100]*

The Patient Safety Institute states organizations are responsible for utilizing an interdisciplinary approach to support all levels of the organization in the prevention of pressure injuries. A standardized approach to prevention should be established across all units and care sectors, including patient transitions in care from one unit/setting to another (urgent care, emergency, medicine, surgery, rehabilitation, long-term care and home settings), where pressure injury prevention may be inconsistent and/or not a priority.[99]

Step 4: Establish and Implement a Plan of Care

Recommendations
4.1 Identify and implement an evidence-informed plan to support healthy skin, correct the causes or co-factors that affect skin integrity, including patient needs (physical, emotional and social), the wound (if applicable) and environmental/system challenges

Discussion: It is important to establish an establish an integrated, interprofessional, collaborative, patient-centred plan utilizing an evidence-informed approach that is aligned with with the patient care goals have been set during Step 2.

Pressure injury prevention interventions that are based on a comprehensive patient assessment and the risks identified by sub-scale scores of a structured and validated risk assessment tool have demonstrated effectiveness in reducing the incidence of pressure injuries.[101]

A systematic review by Reddy et al. on pressure injury prevention identified that the priority in the prevention of pressure injuries was to identify and address underlying causative and contributing factors rather than focus on local wound care. They found that the differences between specific treatment strategies were minimal.[102] Focus should be on forces associated with immobility such as shear, friction, temperature and moisture management to effectively reduce the risks of pressure injury development.[103]

Managing Pressure, Friction and Shear

Managing pressure, friction and shear forces is important in any pressure injury prevention and management plan.[2,16]

The optimal management of these forces requires an integrated team skilled in the management of pressure, friction and shear within the context of the person's goals and lifestyle. When considering interventions, the focus should be on maintaining mobility while reducing these forces. Interventions may need to be adjusted in the presence of presence of complicating factors and should achieve a balance among social, physical and psychology needs (for example, the use of a pressure redistribution surface on a bed shared with a partner).[2, 16]

Given the lifestyle factors that influence pressure injury development, the individual or POA and care partners should receive collaborative education regarding pressure, friction and shear, including the importance of reducing these forces, as well as specific information about reducing these forces based on their unique abilities and context. Individuals should be encouraged to apply this knowledge in their daily lives, particularly when their routine changes. Health-care providers may think they are addressing lifestyle factors by simply telling the patient they need to stop activities or stay in bed.[104] However the best approach is to work with the individual to assist them in finding ways to continue to participate in their life while managing pressure, friction and shear.[104, 105]

For Patients

The SSKIN bundle (skin assessment, surface, keep moving, incontinence, nutrition) is a group of interventions implemented by the team to support improved patient outcomes.[106] The RNAO "suggests that nurses and health providers implement preventative care bundles for persons at risk of pressure injuries."[16] The SSKIN bundle is a useful tool to open up communication between the team members, particularly with patients and their care partners. The + (plus) refers to additional interventions such as patient education, empowerment through self management and engagement and use of prophylactic dressings.

Utilization of the five As of self-management—(1) assess, (2) advise, (3) agree, (4) assist and (5) arrange—may be a useful technique to assist in the facilitation of, "effective collaboration between health-care professionals and persons and their primary caregiver(s) self-management education."[16] Growing patients' self-management skills helps establish a healthy pattern early in life and when living with chronic conditions.[105] Socio-economic challenges must be acknowledged and can be a barrier to patients adopting self-management skills.[107] Consider referral to a social worker to assist with finding resources.

Equipment and Supplies

All patient care across the continuum of care must be able to access the appropriate equipment and supplies to meet specific patient needs for managing pressure, friction and shear. Helpful equipment may include repositioning sheets, a trapeze bar, pressure redistribution surface in bed, a fitted wheelchair with a pressure management cushion and other equipment. Regardless of the pressure redistribution surface used,, it is important that care providers are knowledgeable regarding the use, maintenance and operation of these devices.[6] Refer the patient to a clinician skilled in wheelchair and seating assessment. Annual assessment by an expert clinician has been shown to reduce the incidence of pressure injuries.[108]

Sitting

All patients who have a pressure injury, or are at risk of developing pressure injuries should be positioned on a skin protection cushion when sitting, as skin protection cushions reduce the incidence of pressure injuries.[108-110]

Cushions with contours should be positioned so the contours are on the top of the cushion, and the rise in contour on the middle of one side (pummel) should be at the front of the wheelchair. Cushions with air should have their inflation checked regularly as per the manufacturer's instructions.[2,16]

OT/PT and rehabilitation assistant involvement is beneficial to ensure that the individual is positioned properly on a pressure-redistributing cushion when sitting in a chair.[2]

Cushions that are worn should be evaluated by an expert clinician; however, age of the cushion is not necessarily an accurate predictor of the need to replace a cushion; in some cases replacing the patient's skin protection cushion with a new version of the same cushion may actually produce increased pressure.[109]

Tilt (where the orientation of the seat and back of the wheelchair change in relationship to gravity) and recline (where the hip to back angle increases) used in combination have been shown to have a greatert reduction in pressure over the buttocks than tilt used in isolation.[111] Note: Recline alone should not be used as this increases the pressure and shearing forces over the sacrum and ischial tuberosities.

Patients may spend time sitting in other locations, such as on a power-lift recliner, in a car, on a commode or on sporting equipment. Limited research exists about best approaches to reducing pressure, friction and shear in these circumstances. Use of a skin protection cushion has been recommended when sitting on a power-lift recliner.[110,112] Skin protection cushions may also be used in the car (or other vehicles) but should be used with caution, with attention paid to the potential reduction in head clearance between the individual's head and ceiling of the vehicle (potentially dangerous when going over bumps in the road).

For patients with a pressure injury on the buttocks and/or trochanter, mobilization should be a priority. At a minimum, sitting should be encouraged where pressure on the ulcer can be managed to promote mobility and the minimization of bed rest.[16] Bed rest has known complications such as anorexia, decreased executive functioning, de-conditioning and potential pulmonary embolism. There are no randomized controlled trials (RCTs) that indicate that bed rest is effective in the treatment of pressure injuries.[113,114] Confining patients to bed often results in the person positioning the head of the bed at greater than 30 degrees for important activities such as eating, sponge bathing and visiting with family. Raising the head of the bed over 30 degrees increases the pressure and shear over the client's bony prominences and increases the risk of tissue damage. This increase may be beyond that of the same forces when sitting in the wheelchair. Managing pressure, friction and shear throughout activities of daily life likely results in an improved quality of life for the person with a pressure injury and decreases the risk that a pressure injury could develop in fragile tissues. Factors influencing shear force in bed include body type (slender individuals tend to have the highest shear force at the coccyx and sacrum), whether or not the knee is raised (raising the knees tends to decrease shear) and whether or not the position of the person with a pressure injury (bending points) in a supine position matches those of the bed.[2,115]

Patients and Family as Partners in Care

There has been an important shift toward developing self-care skills in persons with pressure injuries.[2] Engaging individuals in prevention of complications and in treatment and interventions is recommended. Incorporate evidence-based resources relevant to the individual and care partners focused education and self-care on relevant learning. Utilizing multi-facited approaches including verbal, web based tools, communication journals, phone and written materials is important with the patient and care partners.[2,16]

In Bed

When patients are in bed, the head of the bed is often set with an angle greater than 30 degrees for important activities such as eating, sponge bathing and visiting with family. Rebumbent pressure redistribution surfaces may not adequately manage pressure, friction and shear when the head of the bed is elevated to greater than 30 degrees. The patient may have better pressure management sitting up on a skin protection cushion for these activities. Managing pressure, friction and shear throughout activities of daily life likely results in an improved quality of life for the person with a pressure injury and decreases the risk that a pressure injury will develop in at-risk tissue.

It is also important to pay attention to the risk of "Patient Entrapment Hazards, Side Rail Latching Reliability, and Other Hazards" guideline by the Government of Canada. Entrapment is a critical issue that health care providers should be

aware. For example: "If a powered air mattress is replacing a mattress on a bed system that meets the recommendations in the guidance with the original mattress, the resulting bed system with the new air mattress may now pose a risk of entrapment. When these products are used, Health Canada recommends that steps be taken to ensure that the therapeutic benefit outweighs the risk of entrapment." As well, "suppliers of such mattress products should both warn and help facilities assess the potential impact these products may have on patient entrapment risks or patient falls." For more information on Patient Entrapment Hazards, Side Rail Latching Reliability, and Other Hazards visit: https://www.canada.ca/en/health-canada/services/drugs-health-products/medical-devices/application-information/guidance-documents/guidance-document-adult-hospital-beds-patient-hazards-side-rail-other-hazards.html.[2,26,191]

For more information on pressure redistribution surfaces, please see Product Picker: Integrated Therapeutic Support Surface Selection for Pressure Injury Prevention and Management, available at: https://www.woundscanada.ca/docman/public/2882-wc-product-picker-surfaces-for-review/file.

Repositioning

Repositioning should be considered for all those at risk of pressure injury development.[104] Personalized repositioning protocols should be based on the patient's tissue tolerance, level of mobility, medical condition, treatment objectives and the existing pressure redistribution surfaces.[2] The RNAO states: "that repositioning every two to four hours is recommended depending on the client situation, and for those at risk of pressure injuries"[16]

The use of a pressure-redistributing surface does not eliminate the need for repositioning, but it may extend the length of time before repositioning is required.[2,12,62] An individual assessment evaluating the skin's response to extending the time between turns (e.g., development of redness/or other skin changes) will help to determine the optimum turning schedule. Patient positioning and repositioning should be carefully assessed by a PT/OT. Several positions, such as semi-Fowler's with the head of the bed at greater than 30 degrees, and sitting in recline significantly increase the forces of friction and shear experienced by the patient. Elevating the patient's knees in bed prior to bringing the head of the bed up, utilizing tilt rather than recline and ensuring that the patient's feet are supported while sitting can help to decrease these forces.[2,115] Frequent repositioning is important to redistribute pressure on bony prominences but must be done in a manner that minimizes friction and shear by utilizing lifting sheets and positioning wedges. It is also very important that everyone involved in the patient's care is made aware of the patient's risk of tissue injury in order to ensure that safe transfers and adequate safe positioning and repositioning occur.[2]

Heels: The management of heels needs to be considered independently of the pressure redistribution surface.[6] A systematic review by Junkin and Gray found that pressure redistribution surfaces vary in their ability to prevent heel pressure injuries, but there was insufficient evidence to determine which surfaces were optimal.[116] A pressure redistribution surface tool has been developed based on the available evidence to assist clinicians in selecting the most appropriate support surface based on the risk level for developing pressure injuries of the person with a pressure injury and their level of mobility.[6,30] Evidence suggests that the use of a wedge-shaped cushion to suspend the heels off the bed is more effective in reducing the incidence of pressure ulcers than the use of a standard pillow.[117]

For more information on pressure redistribution surfaces, please see Product Picker: Integrated Therapeutic Support Surface Selection for Pressure Injury Prevention and Management, available at: https://www.woundscanada.ca/docman/public/2882-wc-product-picker-surfaces-for-review/file.

Positioning patients for the prevention and management of pressure injuries can be very challenging. The following positioning tips will assist the clinician in preventing or managing pressure injuries.[16]

- Follow a positioning schedule. Position every two to four hours while in bed; weight shift every 15 minutes when sitting. For clients who are able, self repositioning and weight shifting should be encouraged
- Avoid positioning the person with a pressure injury on bony prominences or on existing pressure injuries
- Limit head of bed elevation to less than 30-35 degrees if not contraindicated by medical condition
- Use pillows or wedges to assist with proper positioning and body alignment. Do not use donut-type devices. Utilize assistive devices (such as bed rails, transfer boards, trapeze bars) to increase the patient's independence and

safety with repositioning and transfers
- Develop a modified sitting schedule based on equipment availability (e.g. use of a pressure redistribution surface in sitting as approiprate), quality-of-life goals and evidence of wound healing. Ask an occupational therapist or physical therapist for a patient-specific transfer technique to minimize shearing effects and maintain the patient's independence
- Inform the patient, family and care partners about the positioning schedule and proper transferring and weight-shifting techniques
- Ask an occupational therapist to assess the wheelchair and cushion for at-risk patients and for patients with known pressure injuries on the ischial tuberosities, coccyx or sacral area. Ensure feet are supported
- Check your sling! Some types of slings are designed to be left under patients, while others are to be removed after transfer. When using slings, there needs to be a balance between the impact to transfers and repositioning and pressure management with the removal of the sling. Evaluate each situation individually considering these factors.

Safe Patient Handling

Reviewing the safety of patient handling procedures is essential and should be ongoing.[118,119] Transfers in particular should be assessed both at the beginning and end of the day when patient/clinician/care partner fatigue may impact the quality of the transfer. There are several devices available to aid in transfers and positioning, including transfer boards, trapezes and slider sheets, all of which help to reduce the forces of pressure, friction and shear. These devices, however, need to be used properly and by trained staff. Improved functional status translates into improved transfers, positioning and bed mobility. It is essential that patients, where possible, care partners and care providers have the necessary knowledge and skills because poorly executed positioning, transfers or shifts in bed can result in increased tissue injury due to friction and shear.[6] Transfer techniques should therefore be assessed by physical and/or an occupational therapists for all people with pressure injuries and those at risk for developing pressure injuries.[2,6,102]

Other Considerations

Because the effects of friction and shear are increased in the presence of moisture, and moisture from incontinence can be a risk factor for pressure injury development[114], an individualized bowel and bladder program for patients with incontinence should be established[16] including offering a bedpan or urinal in conjunction with turning and oral hydration schedules. See Table 6: Managing Moisture of Intact Skin for more on moisture and skin breakdown. As with all wound types, the clinician must establish effective pain management strategies to optimize comfort, especially prior to movement and positioning.

Managing Moisture of Intact Skin

The management of moisture of intact skin can be applied to all patient populations. In addition extra care is needed for patients utilizing dressings and or experiencing urinary and/or fecal incontinence (e.g., liquid stool) especially coccyx or sacral dressings, due to the risk of maceration.[16] Chapter 5: Best Practice Recommendations for the Prevention and Management of Moisture-Associated Skin Damage.[39]

Specific Information for Care of Specific Populations

Care for the older adults and vulnerable populations: Pressure injury prevention and treatment plans should be developed with consideration of the person's values and goals as well as their cognitive status to promote adherence.[2,16]

Care should include promotion of skin health and the use of barrier products to protect skin from excessive moisture. As well, strategies need to include protection from medical devices, use of atraumatic wound dressings, and the establishment of an individualized continence (bladder and bowel) program.[120] Repositioning (manual handling as well as equipment) and pressure redistribution surfaces should address pressure redistribution and reduction of shearing forces.

Care for the patient with a spinal cord injury: Because of the patient's immobility, muscle atrophy, weight changes, decreased sensation and changes in skin perfusion, the use of seating surfaces, transfer devices and mattress pressure redistribution surfaces are essential.[51,81] Providing education, training and assistance to the individual so they can apply the concepts of reducing pressure, friction and shear into their daily activities will help them prevent pressure injuries in a way that is relevant to their unique situation.[2,16]

Care for the patient in critical care: Pressure redistribution surfaces and repositioning are crucial for this vulnerable—and largely immobile—patient population. According to the European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance, redistribution surfaces should be, " chosen based on the patient's needs including, but not limited to, their need for pressure redistribution, shear reduction, reducing moisture at the client-surface interface, postural drainage and percussion". [2,16]

Patients who cannot be turned for medical reasons should also be evaluated for a therapeutic redistribution surface. The European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance also state, "In some instances individuals cannot be safely repositioned due to temporary oral-pharyngeal airway, spinal instability or the risk of fatality due to hemodynamic status. Indications of an individual being too hemodynamically unstable for repositioning include being actively fluid resuscitated to maintain systemic blood pressure, active hemorrhaging, life-threatening arrhythmia or changes in hemodynamic parameters that do not stabilize with 10 minutes of repositioning. Regular repositioning should be implemented as the patient stabilizes and reassessed ongoing."[2,16]

Repositioning schedules that employ slow, gradual turns should be initiated for each patient with consideration of their current oxygenation and hemodynamic tolerance to position change. For patients who cannot tolerate major changes in body position, small, frequent shifts in body position are beneficial to promote reperfusion.[2,16] Patients should be positioned off pressure injuries as much as possible. The lateral rotation surface function is not recommended for patients with existing pressure injuries. If the lateral rotation feature of the pressure redistribution surfaces (beds) needs to be used, the patient should be secured with bolster pads to prevent sacral shear.[50]

Heels should be floated off the bed surface to reduce pressure injury development. Knees should be slightly flexed to prevent popliteal vein obstruction and avoid pressure over the Achilles tendon.[50]

Care for pediatric populations: Teach children (and their care partner, family member) the importance of checking their skin for redness or other changes and how to redistribute pressure. For pediatric populations the presence of medical devices requires interventions to prevent and address pressure under intravenous infusion equipment (e.g., ventilation tubes, intravenous tubing, tapes), splints, braces, traction boots, tracheostomy equipment and arm boards/ splints.[51] Schluer et al. found increased pressure injuries under blood pressure cuffs, transcutaneous oxygen pressure probes, nasal prongs, CPAP masks and plaster casts.[61]

Pediatric pressure injury interventions should be based on their needs. Other medical devices such as orthotics, wheelchairs and wheelchair cushions should be frequently reassessed in growing children.

Providers should not treat children simply as scaled down adults, as the development of the integumentary system means that the development of pressure injuries in this population could be inherently different in etiology. Remember that because of integumentary system development, signs of tissue damage can be difficult to visualize in neonates. The Dubowitz Neonatal Maturity Assessment Scale provides a measure of skin texture/maturity in neonates.[2,121]

There appears to be a natural division for care pathways and overall approach to care when guided by a framework based on selection of some defined age range according to characteristics such as integumentary development and ability to participate in care. Care pathways must be multifactorial, ensuring that moisture, mobility, nutrition and medical device-related pressure are addressed. Neonates and children are at higher risk of nutritional deficiencies due to having an increased nutritional requirement per unit weight to meet normal growth needs, as well as having smaller appetites and dietary intake (see See Appendix 1: Nutrition for Skin Health, Wound Prevention and Wound Healing in

Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15]) Immature skin is at increased risk of damage due to epidermal stripping from wound dressings or toxicity from exposure to topical agents.

Medical devices are a leading cause of PIs in the younger pediatric population (neonates and children) and need to have very special consideration. Children often end up using devices that are meant for adults, resulting in devices that are ill-fitting, thereby becoming sources of pressure.

Care for bariatric populations: Due to the increased difficulty obese patients may have with moving, it is important to have bariatric management strategies to safely optimize manual handling techniques. Friction and shear injuries are increased, as patients often drag their heels and sacrum during transfers. Patients and all other team members should have access to equipment (such as beds, chairs and commodes) with the appropriate size and weight specifications to accommodate the patient's body stature.[2] All skin folds and surfaces should be assessed and addressed regularly, as pressure injuries may also develop over areas of high adipose tissue concentration such as across the buttocks and between skin folds.[2]

Care for patients during peri-operative stage: While specific patient positioning is crucial for access and exposure to the surgical site, special attention is required when positioning the patient on the operating table to protect pressure points during surgery[2], redistribute pressure and minimize the effects of shearing as much as possible.[122,123] Reactive redistribution surfaces are recommended for patients identified as being at risk. Protection of accessible bony prominences and heel elevation with protection of the Achilles tendon are also recommended.[2]

Care for patients at end of life: While palliative care focuses on symptom management and comfort measures, the prevention of pressure injuries is an important aspect of care. However, during the time of active dying, the patient's wishes for pain control and comfort may outweigh the desire for pressure injury prevention.[2]

Completion of the Skin Changes at Life's End (SCALE) holistically contributes to development of effective treatments and comfort measures.[124] Comfort measures may include skin emollients to maintain adequate skin moisture and prevent dryness. Pre-medicating the person with a pressure injury prior to repositioning, respecting the patient's choices in turning schedules and utilizing a pressure redistribution surface may be beneficial. Hydration goals should be compatible with the patient's condition and wishes.[125]

Wound care for existing pressure injuries should focus on reduction of pain, minimizing odour, managing exudate and addressing other symptoms that may impact quality of life.[2]

The patient's choices and involvement in co-creating the plan of care, as able, regarding turning should be respected and include whether they have a 'position of comfort' after an explanation of the rationale for turning. The family and care partners should be an integral part of setting the goals and plan of care. Social work and spiritual care are important resources to consider for this population in order to provide holistic care.[2,16]

Management options for wounds that are non-healable because of factors such as an inability to effectively offload sitting pressures for a person with a Category/Stage 4 ischial pressure injury due to restricted finances should focus on the promotion of quality-of-life improvements such as comfort and management of wound symptoms as identified by the patient.

Additional Considerations

Medical device-related pressure injuries: The NPIAP states, "Medical device-related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device".[2,16]

Routine skin inspection should include areas beneath medical devices for edema and potential skin breakdown if not medically contraindicated. Medical device-related injuries should be categorized/staged according to the degree of

tissue injury. All staff members should be educated on the correct size of device to be used and proper positioning and placement of the device based on location, presence of existing pressure injuries and the patient's mobility status. High-risk areas, such as the nasal bridge, should be cushioned with protective dressings.[2,16]

Mucosal membrane pressure injuries: The NPIAP states, "Mucosal membrane pressure injuries are located on mucous membranes with a history of a medical device in use at the location of the injury. Due to the anatomy of the tissue these injuries cannot be staged."[2] Mucosa inspection should occur in conjunction with skin assessment and areas of compromised mucosa documented for health-care team awareness and continued monitoring. All health-care providers should be educated about appropriate anchoring techniques, according to anatomical location, to prevent friction from movement, shearing and pressure.

Pain: Pain is often considered one of the most problematic aspects of wound management, and pharmacotherapy continues to be the mainstay of pain management.[126] Pain medication may mask the body's normal cues that signal the need for repositioning making the need for a specific, individualized turning schedule even more important. There is also a need to balance repositioning with the position of comfort. Turning schedules should be based on the tolerance for pressure, the available positions of comfort, effectiveness of the pain management techniques. Appropriate agents should be selected based on severity and specific types of pain according to the World Health Organization's Analgesic Ladder[127,128] and the modified WHO Analgesic ladder for chronic non-cancer pain.[129] Some evidence suggests that topical agents such as ibuprofen[130] and morphine and dressings[131] play a role in alleviating wound-related pain.

Support pain management with non-pharmacological pain management strategies, including adjunctive therapies (e.g., music, distraction, activity, massage, journaling, art).[2,16]

Use repositioning techniques and equipment with consideration to preventing and managing pressure injury pain. Please see Chapter 4 for more on pain management.[15]

Surgical management of pressure injuries: Surgical intervention may be an option for Stage 3 and 4 pressure injuries provided it is consistent with the patient goals of care.[2,16] This will require multidisciplinary team discussions if pressure injuries are reoccurring, as it may indicate the risk factors have not yet been addressed or resolved. The decision-making process should be done in collaboration with the individual with the pressure injury and the interdisciplinary wound care team. Potential risks and benefits must be discussed with the patient, care partners and team to ensure to ensure that the patient's expectations and condition are understood and optimized prior to surgery.[132]

Psychosocial and socioeconomic factors that may impact surgical wound healing and the patient's willingness/ability to participate in all post-operative activities must also be considered and addressed prior to surgery.[2,16]

Some persons may have a pressure injury caused by a one-time only incident and they are at low risk of recurrence, so early surgical management may be appropriate, especially if it helps them to reintegrate to their community or return to work earlier.

The focus of post-operative flap care should be protecting the blood supply to the incisions from pressure and tension through the use of pressure redistribution techniques. These techniques might include the use of a pressure redistribution surface capable of reducing shear and pressure.

The recurrence rates for pressure injuries treated with plastic surgery have been reported to be high (13 – 31%).[132-134] Risk factors contributing to recurrence should be assessed and reassessed at regular intervals.[135] For persons with a spinal cord injury and risk of pelvic recurrence, Morel el al. reported approximately half (n=85) has a recurrence and in one-third the recurrence was at the surgical site.[136] To prevent recurrence it is crucial to engage the patient in per-operative care planning and to involve the rehabilitation team early after surgery.

4.2 Optimize the local wound environment

4.2.1 Cleansing: Wound cleansing and irrigation promote the removal of exudate, slough, debris (dressing) and bacterial contaminants from pressure injuries, as well as the periwound skin. Use room temperature fluids at a pressure between 8-15 psi to cleanse a wound using up to 100-150 mls of solution. Larger PIs may require more cleansing fluids.[137,138]

Discussion: Optimizing local wound healing is multifaceted. Expert opinion recommends that:

- Pressure injuries and surrounding skin can be cleansed using solutions with low toxicity such as saline, water[84] or acetic acid (0.5%–1.0%)
- Tap water should not be used for wound cleansing for persons who are immuoe-compromised[2]
- Aseptic technique using sterile products should be applied for persons who are immuno-compromised[2]
- Irrigation of wounds should be avoided when you cannot see where the solution is going or cannot retrieve/ aspirate the irrigation solution[84]
- Cleansing solutions containing surfactants and/or antimicrobials can be effective in critically colonized or infected wounds.[2] Clinicians should be aware of the cytotoxicity of each solution, appropriate concentrations and the individual wound requirements when choosing the most appropriate solution[86]
- Ensure skin cleaners are not used as wound cleansers[139]
- Cleansing the periwound skin is associated with reduction of skin microbials for up to 24 hours[2]
- Wound cleansing solutions vary and should be used at body temperature. Cleansing solutions should be nontoxic, hypoallergenic, readily available, cost-effective and easy to use
- Wound cleansing is likely to cause pain during dressing change. The routine practice of using abrasive materials and gauze to scrub the wound surface is discouraged. Use of analgesics prior to wound cleansing should be considered.

For more information on cleansing, see Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview - Section 4.2.1.[15]

Wounds Canada Product Picker: Skin and Wound Clean-up. Available at: https://www.woundscanada.ca/health-care-professional/resources-health-care-pros/library/183-resources-industry-partner/288-product-picker

4.2.2 Debriding

Discussion: Debridement of healable pressure injuries continues to be recommended when compatible with patient goals, the comprehensive wound assessment, underlying medical/ surgical issues, the environment, the scope of practice of the person conducting the debridement and the resources available for the various debridement methods.[84,140] As described in Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview[15] there are many methods of debridement to remove, "necrotic material, eschar, devitalized tissue, sero-crusts, infected tissue, biofilm, hyperkeratosis, slough, pus, hematomas, foreign bodies, debris, and bone fragments from a wound to promote wound healing".[15,141]

Surgical debridement of pressure injuries is recommended in the presence of advancing cellulitis, crepitus, fluctuance and/or sepsis from wound-related infection and considered with the presence of undermining, tunneling or extensive necrosis.[2] For non-healable wounds, only conservative debridement should be performed.

Assessing the underlying vascular supply is critical to pre-planning any surgical event.[15] It is recommended that dry, stable eschar on ischemic limbs not be debrided.[2,141] Debridement methods may be selective (removing only non-viable tissue).

For more information on debridement see Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.[15]

4.2.3 Managing bacterial balance

Discussion: Bacterial balance is essential for wound healing.[143,144] Management needs to address the interaction between the individual and the infecting pathogen by optimizing the host response, reducing the number or virulence of micro-organisms in the wound and optimizing the wound environment including removal of slough.[90] Wound deterioration or failure to progress toward healing is an indicator of potential wound infection when other potential causes have been managed. Therefore, the rate of healing in conjunction with subtle or overt signs of infection can help to guide intervention decisions.[90]

Standard medical practice for osteomyelitis also includes a prolonged course of antibiotics of at least a six-week duration. If surgical intervention is planned, the infected bone should be resected prior to surgical closure.[145]

For more information on managing bacterial balance see Chapter 4: Prevention and Management of Wounds: An Overview[15] and the International Wound Infection Institute's Slough: Composition, Analysis and Effect on Healing.[142]

4.2.4 Managing moisture balance

Discussion: Moisture balance within the wound base can be achieved through dressing selection. Dressings should be selected according to the amount of available moisture within the wound bed and the cause of any excess of wound drainage. An increase in wound exudate may be the result of recurrent trauma, unmanaged co-morbidities, such as congestive heart failure, or wound infection. These comorbidities should be addressed. For more information on managing moisture balance, see: Chapter 4: Prevention and Management of Wounds: An Overview.[15]

4.3 Select the appropriate dressing and/or advanced therapy

Discussion: Research indicates that application of a prophylactic dressing can influence the microclimate of the wound and periwound area. In some cases, the construction of prophylactic dressings significantly influences moisture trapping and humidity close to the skin. Accumulation of moisture at the skin surface decreases the ability of some dressings to work effectively.[2] For some care settings, use of a prophylactic dressing may not be appropriate due to toileting preferences, incontinence (fecal and/or urine).

Emerging evidence suggests that a dressing with a slippery backing placed over areas at risk for pressure injury development may help to reduce friction and shear and lower the incidence of pressure injuries.[147]

A systematic review by Clark et al. studied the evidence regarding the use of prophylactic dressings for the prevention of pressure injury.[146] They report that several cohort studies, weak RCTs and case series all suggested that the introduction of a dressing as part of pressure ulcer prevention may assist to reduce pressure ulcer incidence associated with medical devices, especially in immobile intensive care unit patients. Silicone dressings, film and foam dressings have been studied for their use as a preventative measure to protect bony prominences for those at risk of pressure injury. Clark et al. commented on dressings for wound healing by stating they did not identify clinical evidence that one dressing type was more effective than other dressings. One identified RCT suggested that dressings can be of use for preventing wounds. This study found that the, "placement of a soft silicone foam dressing over the sacrum significantly reduced the incidence of pressure ulcers compared to similar patients who received preventive care but no dressing". The RNAO (2024) state: "that nurses and health providers apply multilayer foam silicone dressings as a prophylactic measure for individuals at risk of pressure injuries, in addition to other preventative care strategies. These dressings should be applied to specific at-risk body locations, considering the potential for shearing,friction, and pressure."[16]

Table 5: Additonal Therapies

Electrical stimulation therapy (EST)	EST has been demonstrated to be effective in enhancing the healing of recalcitrant Category/Stage 2, 3 and 4 pressure injuries.[16] There are 12 randomized controlled studies involving the study of a total of 404 subjects. No new trials were identified for this update. Ten of the 12 studies report that EST accelerated wound healing compared with subjects in the control group. The results of these clinical trials are to be combined in a meta-analysis.[148] Preliminary findings demonstrated a significant increase in closure rates of pressure injuries of EST compared with controls.[149] Meta-analysis identified 17 studies with 768 randomized participants that showed that EST could both reduce pressure injury area and accelerate the healing of pressure ulcers.[150]
Platelet-derived growth factor (PDGF-BB)	The clinical evidence on platelet-derived growth factor (PDGF) suggests that PDGF-BB may improve healing of pressure injuries. However, the evidence is not sufficient to recommend this treatment for routine use (cost).[2] In the past, three trials (RCTs) examined the impact of using PDGF on pressure injuries. Only one reported a significant increase in wound healing rate for chronic pressure injuries treated with PDGF-BB.[151]
Electromagnetic therapy (EMT)[2]	EMT could be considered a treatment for recalcitrant Category/Stage 2, 3 and 4 pressure injuries. The literature reports two randomized controlled trials (RCTs), involving 60 participants. Both trials compared the use of EMT with sham EMT, although one of the trials included a third arm in which only standard wound care was applied. The results of this review provided no strong evidence of benefit in using EMT as an adjunctive modality to treat chronic pressure injuries.[148] In addition, the RNAO state: "nurses and health providers, in collaboration with the person and their essential caregivers, consider using electrical stimulation for treatment of pressure injuries if the person meets indications and there are no contraindications".[16]
Negative pressure wound therapy (NWPT)[2]	The evidence for the use of negative pressure wound therapy with pressure injuries is not sufficient to recommend its use; more research is needed. In three studies, the wound improvement was similar with NPWT when compared with standard care.[152] NPWT may be considered in the preparation of pressure injuries prior to surgical closure, with the aim of reducing the wound surface area and to stimulate wound bed vascularization, but no RCTs have been published to support this application. As found in the Cochrane Review published in 2008 and reviewed in 2011, there are now seven trials (RCTs) that report the effects of NPWT on chronic wounds but only one on patients with chronic pressure injuries.[153] At present, there is no meta-analysis published on the effects of NPWT on chronic pressure injuries specifically. Recently the RNAO stated: "that nurses and health providers, in collaboration with the person and their essential caregivers, consider using negative pressure wound therapy for treatment of pressure injuries if the person meets indications and there are no contraindications."[16]
Ultraviolet light C (UVC)	One small RCT (n = 16) demonstrated that UVC combined with standard wound care generated a greater effect on wound healing of chronic pressure injuries[154] than standard wound care alone; however, no evidence exists to clarify whether UVC or ultrasound, used alone, exerts any beneficial effect.[155] One study reported a significant reduction in semi-quantitative swab results following a single treatment with UVC.[156] If one of the goals of care is to reduce bacterial burden in clean but critically colonized Category/Stage 3 and 4 pressure injuries, UVC may be considered but should not be used instead of other products, dressings or therapies to reduce bacterial burden.[2]

Warming therapy	Two RCTs support the use of the warming therapy or noncontact normothermic wound therapy (NNWT) in the treatment of chronic pressure injuries. Subjects received three treatments daily during which the dressing was warmed for one hour. The results of the two trials are similar and report an increased healing rate for the warming therapy group.[157,158]
Laser	Two trials (RCTs) on the use of laser as an adjunctive therapy in the treatment of chronic pressure injuries reported no difference between laser therapy and standard wound care, which presents a contradiction to what may be believed in clinical practice.[154,158]
Topical oxygen therapy (TOT)	Only one research study has been completed on the subject and it included only three patients.[159] Results showed a positive effect on the healing rate, but more research is needed to confirm that TOT is a useful adjunctive modality in the treatment of chronic pressure injuries.
Ultrasound therapy[2]	Three RCTs involving[146] subjects have been published on the use of ultrasound therapy in the treatment of chronic pressure injuries. Results showed no significant difference in healing rates between the ultrasound treated and the control group.[152,160]
Hyperbaric oxygen therapy[2]	Hyperbaric oxygen therapy is considered useful for ischemic wounds, but there is a lack of data concerning the correlation of this modality and the treatment of chronic pressure injuries. No RCTs on the subject have been found.[161]
Skin equivalents	The literature review did not find a single published RCT exploring the effect or benefit of skin equivalents on chronic pressure injuries. There is insufficient scientific evidence to support their use at this time.
Proteases modulating[2]	The literature review did not find a single published RCT exploring the effect or benefit of protease modulating products on hard to heal pressure injuries. For example, use of protease modulating products may be of benefit for chronic pressure injuries only when all underlying factors have been optimized.

Dressings/devices should be selected to contain wound exudate and maintain exudate off periwound skin with slight moisture at wound base.[83] It is also important to choose products that will prevent trauma or injury to fragile/friable tissue—including the periwound area—such as those that are silicone based or non-adherent.[78]

Dressing considerations for non-healable wounds may include the use of products that reduce moisture, bacteria and odour and are atraumatic to reduce painful removal and contribute to conservative debridement. The use of advanced active therapies is often contraindicated when goals are not related to healing.[28,84]

There are various categories of antimicrobial dressings, including antiseptics and products containing silver, honey, slow-release iodine and polyhexamethylene biguanide (PHMB). Topical antimicrobial dressings are to be discontinued once critical colonization has been corrected or if a beneficial effect is not evident after two to four weeks of use.[28, 84] Topical dressings exist to reduce matrix metalloproteinases (MMPs) and can be used in combination with topical antimicrobials or systematic anti-inflammatories/antimicrobials.[28,84]

Additional Therapies and Devices

Additional therapies and device options are available to promote PI healing.[2,16] Determining when to introduce additional therapies is a discussion that should include the patient, care partners and team.[28] A person with a hard-to-heal pressure injury may be a candidate for these therapies when other aspects of the treatment plan have been optimized. These are therapies that support, enhance or replace traditional therapies (see Table 5: Additional Therapies).

4.4 Engage the team to ensure consistent implementation of the plan of care

Discussion: Clear instructions to all care providers, including the person at risk or with a pressure injury, care partners and family are essential. The team should have the confidence to implement and maintain the individualized pressure injury prevention and treatment plan because they have the appropriate knowledge and training. Education on the

prevention and management of pressure injuries should be designed to incorporate the principles of age-specific learning and the level of information required by all team members. The mode of delivery must be flexible to accommodate the needs of the learner. To maximize retention of information and to facilitate translation into practice,[16] information needs to be presented at a level that is appropriate for the target audience.

Health-care providers may think they are addressing lifestyle factors by simply telling the patient they need to stop activities or stay in bed; however the best approach is to work with the individual to assist them to find ways to continue to participate in their life while managing pressure and shear forces.

Patients should also be encouraged to reposition themselves when they have the ability to do so. Education should include information regarding appropriate use of therapeutic surfaces, the roles of various health professionals, strategies to manage pain and discomfort, expected outcomes and duration of treatment, if known.[2,16]

Individuals with spinal cord injuries who have a wound often depend on informal care partners for follow-up and prevention, and health-care professionals in non-SCI specialties often lack the knowledge needed to manage pressure injuries in this specific patient group. Tailored education and peer support help self-managing individuals set boundaries, be assertive and cultivate a positive attitude when dealing with pressure injuries.[81]

Patient and Care Partner Resources

Wounds Canada
Pressure Injuries: The problem and the solution: Action is needed to prevent pressure injuries. Available at: https://www.woundscanada.ca/docman/public/1842-pressure-injuries-action-sheet-a-1595e/file

Caring for Pressure Injuries at Home. Available at:
https://www.woundscanada.ca/docman/public/patient-or-caregiver/1691-home-pi-care-1940e/file

Do It Yourself Skin Health Series.
All Types of Wounds, Pressure Injury, Incontinence Associated Dermatitis
Available at: https://www.woundscanada.ca/patient-or-caregiver/resources/diy-series

Wounds International
Pressure Ulcers and Skin Tone. Available at: https://woundsinternational.com/made-easy/pressure-ulcers-and-skin-tone/

Health-care professionals: Engaging health-care professionals in comprehensive, evidence-based educational skin and wound care programs is an essential component of effective pressure injury prevention and management. Programs need to be readily available and funded for health-care professionals, with implementation across the continuum of care[6,2] to ensure accurate, consistent and uniform assessment, treatment and management of pressure injury prevention programming for the interdisciplinary team.[44] RNAO (2012) has available an implementation toolkit to support uptake of best practice.[162]

This is important, as Magnan and Maklebust identified a relationship between scores on Braden subscales and nurses' selection of commonly used best practice interventions for pressure injuries prevention.[163] Their data analysis provided evidence that accurate risk assessment promotes increased attention to preventative measures, thereby reinforcing the importance of staff education programs focused on both accuracy of pressure injury risk assessment and aggressive preventative interventions.[163]

Education programs should outline the roles of health-care professionals in the prevention of pressure injuries, including skin inspection for signs of pressure injuries, skin care regimens, pressure management, reduction of friction and shear injuries, positioning and transfer techniques [44] and monitoring for poor nutritional status.[2,16]

Critical analysis and auditing of current practice and outcomes, formation of an interdisciplinary team, development of simple prevention protocols, selection of therapeutic pressure redistribution surfaces and mandatory staff training[164] have all been identified as essential for program success.

Detailed components of education for health-care professionals should include instruction on how to achieve accurate and reliable risk assessments by incorporating clinical judgment of risk factors, and how to conduct comprehensive skin assessments, including special assessment techniques for unblanchable erythema, especially for those with darker skin tones.[89] Education should also include the development of the integumentary system and the differences across the age span. The importance of documentation of all risk and skin assessments and the necessity for ongoing assessment to detect early signs of pressure damage are described as essential in ensuring accurate communication within the integrated team, providing evidence that care planning is appropriate and is serving as a benchmark for monitoring progress.[2]

Educational programs also need to include strategies to differentiate pressure injuries from other types of wounds and the appropriate use of a classification system, including the appearance of different tissue types. Training regarding repositioning strategies and the use and maintenance of pressure management devices is essential for all those involved in the prevention and care of pressure injuries, including the person at risk of or with a pressure injury.[2,44] Prevention programs should be structured, organized, comprehensive, sustainable and be updated on a regular basis to incorporate new evidence and technologies.[6] Integrating a process for continuous program improvement (including understanding the root cause) and evaluation into the planning process is essential.[165]

The creation of pressure injury prevention teams, use of champions to assist with local implementation of pressure injury prevention programs, establishment of goals for pressure injury reduction and maintenance of data on identification, prevention and outcomes assists facilities with the evaluation of their nursing practice based on nurse-sensitive indicators.[166] Identification of facility-wide barriers, including failure to consistently differentiate community-acquired versus hospital-acquired pressure injuries, is also important for the creation of successful pressure injury prevention and management programs.[165]

Additional quality improvement strategies to facilitate culture change should include health-care professionals in partnership with patient and care partners. Activities include, but are not limited to, involvement in skin-care-unit-based council meetings and activities, lectures, newsletters, informal one-on-one bedside clinical instruction, networking opportunities, positive feedback and reinforcement of learning.[6,167]

Technology-assisted education, including web-based training modules and resources, has been identified as an effective method to improve knowledge and the abilities of health-care professionals in pressure injury risk assessment and pressure injury identification and staging.[168]

Step 5: Evaluate Outcomes

Recommendations
5.1 Determine if the outcomes have met the goals of care

Discussion: Through the use of validated tools, the clinician can determine if the goals of the prevention or treatment plan have been met.[169] Prevention of pressure injuries is the ultimate goal; however, if wounds occur, signs of progress toward healing should be evident for most wounds within two weeks of treatment.[170]

5.2 Reassess patient, wound, environment and system if goals are partially met or unmet

Discussion: Goals of care such as the maintenance of skin health, pressure injury prevention and wound closure, quality-of-life issues and symptom control may not occur until all the underlying causes have been optimized. It is important to return to the assessment and recommendations and re-evaluate and potentially revise the treatment plan to address gaps and areas for modification. As well, at all transitions of care between health-care settings, it is important to reassess goals of care.

Reassess the patient, wound and environment: Validated and reliable tools that have been tested for responsiveness are essential in assisting the wound team in evaluating wound healing and other wound-related goals.[11] If wound closure is expected, goals should be based on the patient's condition and ability to heal. If there is no evidence of progress toward the goals within two weeks, a return to Step 1 of the Wound Prevention and Management Cycle (WPMC) reassessment of the patient and wound is required. Goals and plan of care may need to be adjusted based on the new assessment. Although rare, chronic pressure injuries that are not healing as expected can become malignant and form a Marjolin's ulcer. A biopsy of the wound during reassessment may be considered.[171]

Reassess the system: A root cause analysis (RCA) process, as recommended by the NPIAP, provides a systematic process to assist a facility to, "gain insight into the development of a pressure injury through a review of the timeline of events. In this case, using the PCA process could be used for all facility acquired pressure injuries."[170] Such a review can help to identify why a PI developed and what strategies, including improvement to the facility's skin management program, can be implemented to prevent further pressure injuries. The NPIAP emphasizes that an RCA is to be an opportunity for the team to look at all levels of their organization for improvement and for ways to lower risk.[170] The NPIAP also recommends that quality councils track trends using event forms such as the RCA, to identify and investigate facility acquired pressure injuries.[2] These trends can then be compared with similar facilities to assist with benchmarking.

Soban et al. (2016) identified five essential components of pressure injury prevention toolkits,[169] such as he Veterans Health Administration (VHA) Handbook (2019)[172] and the Agency for Healthcare Research and Quality[173] toolkit for PI prevention. These components include policy, committee/team, wound specialist/team, monitoring performance and staff education. Evaluation of these components on a regular basis is crucial to ensure pressure injury prevention program success and show improvement over time.

Evidence suggests that a well-designed pressure injury prevention program can reduce the incidence of pressure injuries in an acute orthopedic environment.[174]

Evaluation of prevention equipment, devices and supplies: All equipment, such as pressure redistribution surfaces and medical devices used by patients, needs to be regularly maintained and re-evaluated. These activities must be documented. Most equipment manuals will provide information on preventative maintenance requirements as well as the life expectancy of the equipment. The appropriateness of a well-maintained piece of equipment for a specific patient also needs regular evaluation. Ideally, this evaluation should occur annually or with any change in equipment/device.
Evaluation of supplies should also occur regularly. Cost effectiveness, rather than straight cost, should be considered in conjunction with patient satisfaction and care provider satisfaction. This has been of increased concern during the coronavirus pandemic where patient,[175] care partner, health-care provider and systems were under increased pressure.[176,178] More research is needed to understand the Canadian context.[178]

Evaluation of policy/programs: The RNAO has made the following recommendation for the evaluation of policies and programs: "Organizations must lead and provide the resources to integrate pressure injury management best practices into standard and interprofessional clinical practice, with continuous evaluation of outcomes".[16] The provision of, "organizational support", including identification of barriers to implementation, decision support tools, a communication mechanism and standardized metrics were identified as key to the successful implementation of pressure injury best practices.[16] Collaboration with the integrated team to support best practices and identify resources was also highlighted as an important component of quality management of pressure injuries.

Staff-to-patient ratios: During the coronavirus pandemic the risk of pressure injuries increased related to staffing challenges[179] and increased use of medical devices. Researchers found that low saturation of oxygen and several non-modifiable variables increased the risk of developing dependency-related injury.[175] Specifically, anterior pressure ulcers were related to proning and mechanical ventilation, and the use of invasive medical devices such as urinary catheters, feeding tubes and central venous and arterial lines,[180] and with longer lengths of stay.[179]

It is well documented that the ratio of patients to staff has also been identified as having an impact on pressure injury occurrence. A systematic review by Backhaus et al. found that the availability of more staff resulted in a decrease in pressure injury development.[181]

Prevalence and incidence studies using validated collection tools and focused audits have been identified as useful methods to monitor performance, interventions and outcomes, as well as embedding prevalence of pressure injury studies into assessment of risk/quality and professional practice.[182] Quality indicators such as those identified by national accreditation organizations should also be used to monitor outcomes.[6]

Review of patient records, and the use of administrative health databases such as the Discharge Abstract Database has not presented valid and reliable data about pressure injuries and often under-predicts prevalence rates.[183] It is recommended that more attention be focused on the quality of documentation of the data to enable the reliable use of the electronic patient record for data collection in the future.[6]

Evaluation of committee and teams: Quality reviews assist with the assessment of teams and culture. Sullivan identified key recommendations to prevent hospital-acquired pressure injuries with a "focus on accountability, continued measurement of performance, staff autonomy with interventions, consistency in staff training relating to documentation and recognition of front-line staff success".[75]

According to Bales et al., sustainability requires an environmental assessment to determine the existence of strong leadership, involvement of staff in decision-making and a desire of the team to develop and foster relationships.[78] Hospitals with a wound care specialist staff resource had a high association of successful performance monitoring, staff education and lower pressure injury rates. Further studies are needed to investigate the relationship between key operational components to prevent pressure injuries and the influence of a wound-care specialist.[172] Staffing should also be considered when evaluating a pressure injury program. Trinkoff et al. noted that higher turnover of CNA staff was linked to higher rates of pressure injuries.[184]

Organizational Culture: Successful pressure injury prevention programs require assessments of communication and routines. Niederhauser et al. recommend evaluating routine care and communication strategies to improve programs.[185] Evaluating practices and bundling common care activities can successfully assist care partners with prevention activities when added to routine practices already built into their day.

The Attitude towards Pressure ulcer Prevention instrument (APuP) may help to illuminate some of the barriers to prevention. This instrument has been designed to measure five factors:[186,187]

1. Attitude toward personal competency to prevent pressure ulcers,
2. Attitude toward the priority of pressure ulcer prevention,
3. Attitude toward the impact of pressure ulcers,
4. Attitude toward responsibility in pressure ulcer prevention,
5. Attitude toward confidence in the effectiveness of prevention.

With appropriate, multifaceted education, adherence to guidelines increases.[188] Paquay et al. also found that while almost all recommended prevention strategies were implemented, repositioning in bed and in the armchair decreased significantly, likely because the nurses mistakenly believed the pressure management materials in place were sufficient and, therefore, repositioning was unnecessary. Knowledge of pressure injuries and pressure injury prevention is not enough—the attitudes of nurses toward pressure injuries are significantly correlated with the implementation of prevention activities.[188]

Evaluation of education programs and the health-care team: Interdisciplinary education should be standardized and reviewed for application of knowledge.[16] The RNAO recommends pre- and post-assessment of knowledge related to pressure injury prevention. Assessments of knowledge transfer to practice should be assessed through audits and case study exercises. Recommendations related to frequency or timing of post evaluations are lacking in the literature. The RNAO recommends post-test assessment of knowledge, attitudes and skill to reinforce previous learning.[16]

The Pieper Pressure Ulcer Knowledge Test (PPUKT) is a valid and reliable tool to assess knowledge of pressure injury prevention and management and has been in use since 1995.[189] In 2014, Pieper and Zulkowski added improvements to their test and renamed it the Pieper/Zulkowski Pressure Ulcer Knowledge Test (PZ-PUKT); however, this has not been tested for validity and reliability.[97]

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Discussion: Sustainability of an individualized pressure injury prevention protocol or maintenance of a healed pressure injury is dependent on access to appropriate equipment and services, collaboration among the person with or at risk for a pressure injury, their care partners, service providers and the interprofessional team of health-care professionals and other care and service providers. This is especially important with any transitions of care. During these times patients, care partners and health-care providers all benefit when clear communication is used to reiterate focus on pressure injury prevention and the current plan of care.[53,190] Ongoing evaluation, as well as clear, effective communication regarding the plan and follow-up, is required by all involved across the continuum of care.

At the system and institutional levels, successful sustainability of pressure injury prevention programs was described by Bales and Padwojski as dependent on strong leadership and management skills to identify prevention as a key priority within organizations and promote the involvement of staff in decision-making and interdisciplinary participation to ensure optimal outcomes.[78] In addition, a systematic review by Sullivan et al. identified that measures of performance, such as conducting quarterly prevalence studies and continually monitoring all hospital-acquired pressure injuries, were key components to sustaining improvements.[75] Prompt identification of pressure injuries that fail to progress to sustained closure is essential for reassessment and evaluation of the treatment plan. As well, a rapid response to Category/Stage 1 injuries, including pressure management strategies, will provide a sustainable, cost-effective model to support improved outcomes.

Conclusion

Prevention of pressure injuries is of paramount importance in any health-care setting.[2,16] Despite a focus on prevention to date, pressure injury incidence rates have not significantly decreased. An integrated approach focused on prevention is required across all areas of health-care systems to make a significant difference in incidence rates. For optimal acceptance and effectiveness, integrated teams need to include other departments, such as purchasing and housekeeping, and be driven by well-informed patients, care partners and their families. Collaboration and communication across all departments and sectors of care are vital to ensure that outcomes are optimal.

Immediate implementation of pressure management strategies has been shown to be effective when a Category/Stage 1 pressure injury is identified, yet our systems may not be set up to support this rapid response, even though it is important they be structured to facilitate it. It is also important to return to the basics of prevention: look at all surfaces upon which the person at risk for, or with, a pressure injury sits or lies, as well as at transfer techniques during all points of care, such as in acute care, operating and interventional room tables, emergency room stretchers, ambulatory departments, rehabilitation settings, community and long-term care. Focusing on treating the potential causes of pressure injuries is essential, while at the same time remembering that not all pressure injuries are preventable.[42]

In all cases of injury prevention or management, customized plans of care should be implemented. The use of metrics to monitor clinical outcomes is essential to drive culture and practice changes that may be necessary to prevent and manage pressure injuries. Identification of facility barriers and implementation of strategies to resolve these issues are imperative to support the changes required.

Pressure injury prevention and management have now been recognized as measures of quality by Accreditation Canada in both long-term care and hospitals, and national hospital pressure injury rates are being reported, with facilities being named.

It is time to ensure that pressure injury prevention becomes a critical component of all aspects of safe patient care. Prevention is key!

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