

Case-Based Learning Module: PRESSURE INJURIES

INTRODUCTION

Pressure injuries, also called pressure ulcers*, are a common and serious complication of spinal cord injury (SCI). The majority of people with a spinal cord injury will have at least one pressure injury at some point post SCI. Pressure injuries can limit an individual's ability to participate in meaningful activities and substantially impact quality of life.¹ Pressure injuries are a common reason for hospitalization, and seven to eight percent of individuals who develop pressure injuries will die from related complications.² Pressure injuries are largely preventable complications of SCI and can be managed more effectively when identified early.

Management of pressure injuries can be quite specialized and often be considered daunting and beyond the scope of primary care, but there is a key role for primary care providers.

This module aims to help primary care providers:

- Identify patients with SCI at risk for pressure injury and provide education and apply preventive measures for those patients
- Assess and stage pressure injuries to guide a rational treatment plan
- Optimize treatment through a multidisciplinary team approach

*In April 2016, the National Pressure Ulcer Advisory Panel (NPUAP) proposed a change in terminology from pressure ulcer to pressure injury to better reflect the full spectrum of damaged skin.³ Since the term pressure ulcer is still commonly used in literature, both terms are used interchangeably in this document.

CASE

Sandra, age 76

You are seeing Sandra who is accompanied by her husband and primary caregiver, Bill, with whom she lives at home. Sandra sustained a T2 SCI as a result of a fall a few years ago. Because of limited mobility, she spends the majority of her time in her wheelchair. She has urinary incontinence, for which she wears incontinence undergarments. Bill reports that he has recently noticed red areas on the skin of her buttocks. Her vitals are normal, she appears thin and frailer since you last saw her.

What risks for pressure ulcers can you identify and what might you take in terms of prevention?

- *In addition to her SCI, Sandra's risk factors include: advanced age, decreased activity and mobility, incontinence, and low weight.*

- *In order to help mitigate these risk factors, home care with a physical and/or occupational therapist should be recommended to help reduce pressure on Sandra's skin. The therapist could also assess and recommend appropriate seating, and/or other support surfaces/pressure-reducing devices, with a social worker and/or OT helping to identify potential sources of financial assistance (e.g., Assisted Devices Program, etc.).*
- *The importance of daily skin inspection and proper skin care should be emphasized and a personal support worker could be enlisted to help with personal care, especially with regards to Sandra's incontinence. Red areas of the skin suggest that Sandra already has a Stage 1 pressure ulcer. As such other areas need to be monitored thoroughly.*
- *A nutritional assessment could be helpful in uncovering potentially correctable deficiencies. Educating Sandra and Bill about preventative strategies would be important.*

INFORMATION SECTION

Definition/Staging

A pressure injury is localized damage to the skin and/or underlying tissue caused by unrelieved pressure, or pressure in combination with shear and/or friction, usually occurring over bony prominences or related to a medical or other device. Pressure injuries range from non-blanchable erythema of intact skin to deep ulcers extending to the bone.^{4,5}

Pressure injuries are classified by stages according to the severity of tissue damage. Accurate staging is essential in order to determine appropriate services, supplies/equipment, and treatment options. (See **Appendix 1** for more information on pressure injury staging.)

It is important to distinguish pressure injuries from other types of ulcers including venous ulcers, arterial ulcers, mixed (arterial and venous) ulcers, and diabetic foot ulcers, as management varies.⁶

Epidemiology:

Up to 95 percent of people with spinal cord injury will experience a pressure injury at some point during their lifetime.⁷ The annual incidence rate of pressure ulcers ranges from 23 to 37%.

The most common sites for pressure ulcers in SCI patients are:⁸

- Ischium (31 percent)
- Trochanter (26 percent)
- Sacrum (18 percent)
- Heel (5 percent)
- Malleolus (4 percent), and
- Feet (2 percent)

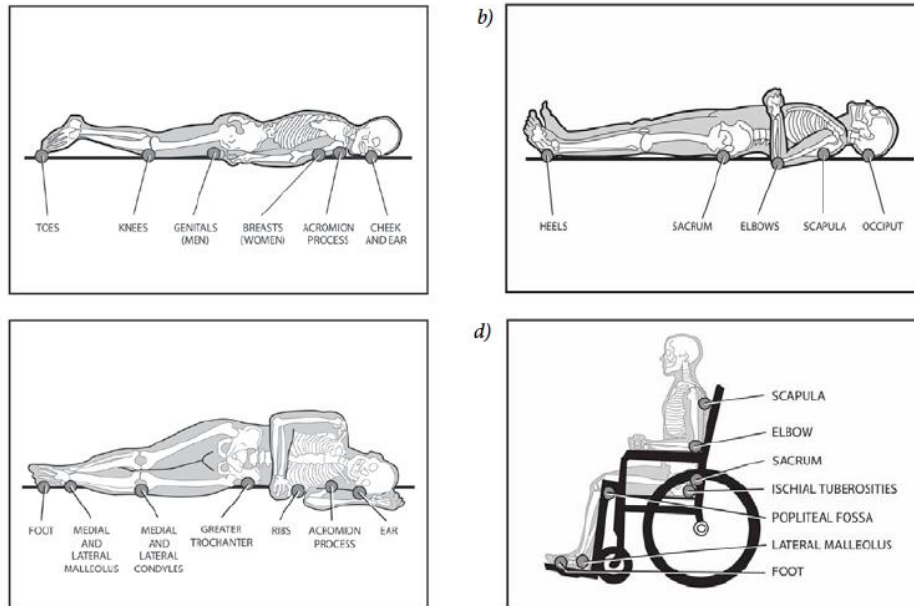


FIGURE 1. Common sites for pressure injuries¹

Approximately one third of patients have multiple pressure-induced injuries.

Seven to eight percent of those who develop pressure ulcers will die from related complications (such as sepsis or osteomyelitis).^{9,2}

Pathophysiology:

The development of a pressure injury is a multifactorial process that is not fully understood. It is believed that external forces such as pressure, shear, and/or friction cause blood vessels to collapse. Host-specific factors, such as nutritional deficiencies, altered skin properties resulting from spinal cord injury, and moisture increase susceptibility to ischemia. Collectively, these mechanical and ischemic factors can lead to inflammation and necrosis, and ultimately, pressure injuries. Bacterial colonization of an ulcer further contributes to necrosis and may also lead to infection.¹¹

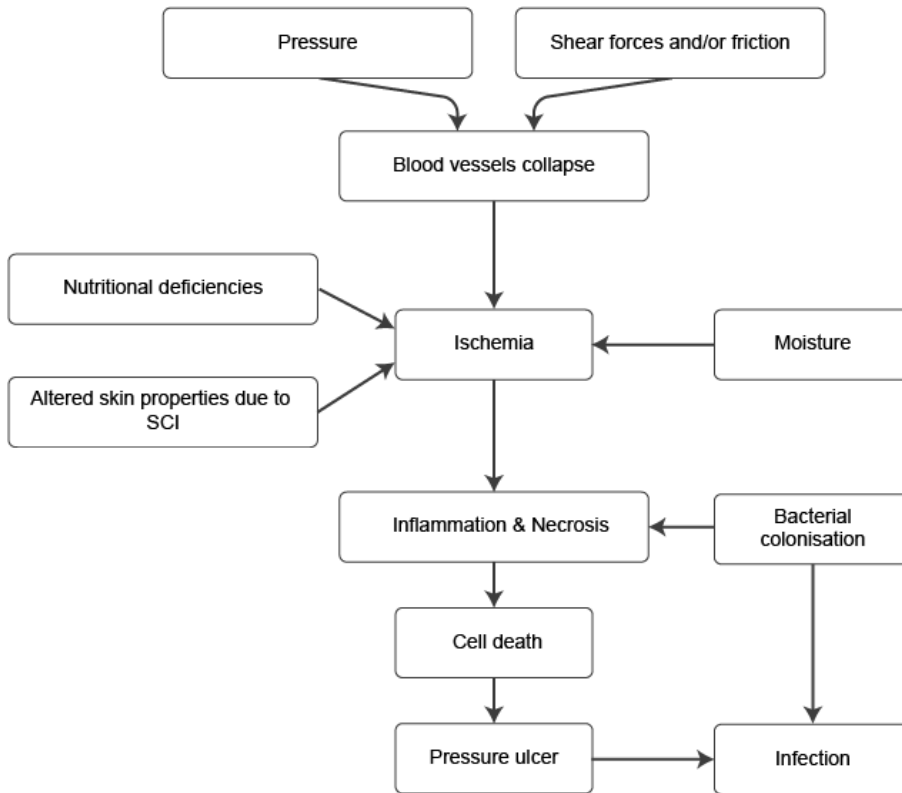


FIGURE 2. Pathophysiology of pressure ulcers

Clinical Pearl: As muscle cells require more oxygen, cell death happens quicker in muscle tissue and the extent of injury to deep tissues is often much greater than perceived from the visible ulcer on the skin surface (the skin changes are just the “tip of the iceberg”).

Prevention:

RISK FACTOR ASSESSMENT:

All individuals with SCI are at risk for developing a pressure injury. In order to help prevent pressure injuries, regular, comprehensive and systematic assessments of additional risk factors – demographic, physical/medical, and psychosocial – should be incorporated into the overall care of all individuals with SCI. Ideally, clinical judgment should be used alongside a standardized risk assessment tool such as the Waterlow Scale (highest sensitivity – 86%), the Braden Scale¹⁰ (see **Appendix**), or the Spinal Cord Injury Pressure Ulcer Scale (SCIPUS)¹.

Risk factors include but are not limited to:

Pressure ulcer risk factors during acute and rehabilitation stages ¹¹		
Risk Factors		Level of Evidence
Demographic, Neurological factors (such as level of lesion, transversal or vertical extension)	<ul style="list-style-type: none"> • Not considered risk factors during acute stages of rehabilitation 	Variable
Functional factors	<ul style="list-style-type: none"> • Activity level • Mobility level 	Insufficient Insufficient
Medical factors and comorbidities	<ul style="list-style-type: none"> • Lung disease • Low blood pressure • Moisture • Mental status • Nutrition marker 	Insufficient Moderate Insufficient Insufficient Insufficient
Care management	Pre-hospital stage <ul style="list-style-type: none"> • Transport time • Distance • Length of time on long spine board Hospital stage <ul style="list-style-type: none"> • Length of stay • Tracheotomy • Vertebral osteosynthesis 	Moderate Insufficient Moderate Insufficient Insufficient Insufficient
Demographic, Neurological factors (such as level of lesion, transversal or vertical extension)	<ul style="list-style-type: none"> • Not considered risk factors during acute stages of PU 	Variable

TABLE 1. Risk factors for pressure injuries during acute and rehabilitation stages

Pressure ulcer risk factors during chronic stages ¹²		
Risk factors		Level of Evidence
Demographic	<ul style="list-style-type: none"> • Advanced age • Male gender • Lower education level • Marital status • Professional status 	Strong Strong Moderate Moderate Moderate
Neurological factors	<ul style="list-style-type: none"> • Time since injury • Transversal extension • Age at time of injury (young) • Vertical extension 	Strong Strong Moderate Moderate

Medical comorbidities	<ul style="list-style-type: none"> • Lower limb fracture • Deep vein thrombosis (DVT) • Autonomic dysreflexia • Pneumonia 	Moderate Strong Moderate Strong
Physical/medical	<ul style="list-style-type: none"> • Previous pressure ulcer • Disability (FIM) • Handicap • Level of activity • Bladder incontinence • Daily skin monitoring • Smoking • Alcohol • Sleeping pills 	Strong Moderate Insufficient Moderate Insufficient Moderate Moderate Moderate Potential
Psychological factors	<ul style="list-style-type: none"> • Depression • Anxiety personality 	Insufficient Insufficient
General protective risk factors	<ul style="list-style-type: none"> • Regular physical activity • Healthy diet • Healthy lifestyle 	Potential Potential Potential

TABLE 2. Risk factors for pressure injuries during the chronic stages

As risk factors are identified, targeted preventative strategies should be implemented as appropriate.¹³

PREVENTATIVE STRATEGIES:

Preventative strategies include:

- Pressure redistribution
- Daily skin inspection
- Proper skin care
- Nutrition and weight optimization
- Patient education and caregiver engagement
- Optimizing overall mobility

PRESSURE REDISTRIBUTION:

Pressure redistribution is the most important factor in preventing pressure ulcers and is accomplished primarily with the appropriate use of pressure-reducing devices and surfaces (e.g., overlays, mattresses, beds, wheelchair cushions, etc.), and proper patient positioning. The selection of pressure reducing support products should take into account the risk of ulcer development, the ease of use,

other patient characteristics and costs.^{14,15,16} Occupational and/or physical therapists are invaluable in helping determine and optimize the use of a pressure-reducing system. Both the patient and the therapist should perform regular assessments of equipment and support surfaces. Therapists are also important in educating the patient and caregivers on the influence of posture and positioning on pressure ulcer development. They can help establish and initiate a specific pressure relief regimen (e.g., weight shifts) within the individual's capability.¹⁷

Skin Inspection:

Clinical Pearl: Generally, it is recommended that patients reposition themselves or be repositioned at least every two hours when supine, every 15 to thirty minutes when sitting, and pressure relief should last 1-2 minutes (see patient resources – spinalcordessentials.ca).¹⁸

Individuals with SCI and their caregivers should be encouraged to conduct comprehensive daily (preferably twice daily) visual and tactile skin inspections, with particular attention to the areas most vulnerable to pressure ulcer developments (*see Epidemiology*). Frequent inspection promotes familiarity with normal skin appearance and allows early detection of impending skin damage.¹ (See *Appendix B* for a patient handout on skin inspection.)

Clinical Pearl: Ideally, the skin inspection of the individual with SCI is consistently inspected by the same person as their familiarity with the individual's skin may enable them to detect early changes.

SKIN CARE:

With regards to skin care for pressure ulcer prevention, guidelines from the Registered Nurses' Association of Ontario (RNAO) and the National Pressure Ulcer Advisory (NPUAP) European Pressure Ulcer Advisory Panel recommend the following:^{18,5}

NUTRITION:

Malnutrition is a major risk factor related to the development of pressure injuries in individuals with SCI and people with a pressure ulcer have a much greater risk of further skin breakdown and delayed ulcer healing if nutritional deficiencies are not addressed promptly and adequately. It is recommended that for patients with SCI at risk of developing a pressure injury, a registered dietician, ideally one skilled in the care of individuals with SCI, be involved to perform a nutritional assessment, determine and recommend the appropriate intervention, and assess the outcome.¹⁷ For individuals in Ontario,

registered dieticians can be accessed via phone or e mail with eatrightOntario.ca.

Both being overweight and underweight have been implicated as risk factors for pressure injuries; helping a patient with SCI attain and maintain a healthy weight is another important preventative measure.

EDUCATION AND SELF-MANAGEMENT:

Ongoing, structured, individualized education about effective strategies for the prevention and treatment of pressure ulcers (such as those described above) should be provided to patients with SCI, their families, significant others, and healthcare professionals. It is important to promote self-management, helping the patient learn, consistently apply, and incorporate effective and appropriate strategies into their daily lives (see *Patient Resources*).

OPTIMIZING MOBILITY:

Advocating mobility should go a step beyond the conventional positioning, repositioning and moving between different surfaces. Strengthening, stretching and wheelchair training can help improve participation in leisure activities and exercise. This should include encouraging as much independence as possible. Many patients can become deconditioned after an acute illness and seldom get a chance to rehabilitate to improve strength and mobility. In addition to improving the overall quality of life, skin breakdown can be a secondary complication that can be delayed.

Assessment following the onset of a pressure ulcer:

Assessment following the onset of a pressure ulcer should include an assessment of the individual including a complete history and physical aimed at determining the etiology and mechanism of the injury.

Taking pictures can help especially when transferring difficult and to determine progression of the injury site as well as any factors that may impede healing.

In addition to an assessment of the pressure injury itself, other important information may include:

- **Anatomic location and stage** (see *Appendix A*).
- **Size:** Length, width, depth in cms? Increasing or decreasing?
- **Undermining or tunnelling/sinus tracts:** Absent or present? (check size with probe)

- **Wound edges:** Attached or not attached? Maceration?
- **Peripheral tissue:** Colour changes? Edema or induration? Cellulitis?
- **Odour:** Absent or present?
- **Exudate:** Colour, consistency, and amount?
- **Wound bed:** Granulation, hypergranulation, friable, necrotic tissue, avascular?
- **Pain:** Type, location, quantity (use a scale)?

An objective and thorough description of a pressure ulcer enables the development of an appropriate treatment plan, forms the basis for serial assessment to determine response to treatment, and provides a reliable means of communicating wound status among health-care professionals.⁵ Once this information has been obtained, it is important to ensure that occupational therapy and/or physiotherapy, wound care and nutritional consult are in place.

Investigations:

When a pressure ulcer is identified, it can be helpful to order laboratory and other diagnostic tests to evaluate the extent of the pressure ulcer and any other medical problems that may have contributed to the development of the injury. Suggested investigations may include:

- **If impaired healing capacity suspected:** Consider screening for anemia, inflammation, diabetes, and hypothyroidism, which are known to delay healing.
- **If infection suspected:** CBC, ESR, C-reactive protein, culture and sensitivity of wound (ensure wound is well irrigated and culture sample is from deeper tissue).
- **If nutrition impairment suspected:** Body weight, albumin, transferrin, and pre-albumin in 1-2 weeks.
- **If osteomyelitis suspected:** Prompt referral to infectious disease specialist or physicians with expertise in chronic wounds (X-ray, bone scan, or MRI of adjacent bone are not universally accepted and can be performed by specialists).
- **If chronic wound is not healing despite best practices:** Consider referral for a tissue biopsy to rule out the presence of an underlying malignancy (e.g., Marjolin ulcer).

Treatment:

There is no “one-size fits all” treatment for pressure ulcers. The elements of a standard treatment plan should include:¹

- Attention to underlying causes and implementation of measures to prevent worsening
- Local wound care
- Nutritional assessment

- Pain management
- Regular reassessments (at least weekly) (35 in PBSG)
- Monitoring for infection
- Special measures for non-healing lesions
- Referral to wound care experts as needed
- Psychosocial support

*Management of pressure injuries is best accomplished with the help and expertise of a multidisciplinary team ideally including a homecare physical and/or occupational therapist, wound care nurse and/or clinician, dietician, psychologist, and social worker as available and appropriate.

Underlying Causes:

The development of a pressure ulcer should underscore the need to review and optimize preventative measures. (See *Preventative Strategies* for more details). This is especially important as a key factor for subsequent skin breakdown is the presence of an existing wound.

Clinical Pearl: Because the extent of injury to deep tissues is often much greater than perceived from the visible ulcer on the skin surface, even stage 1 pressure ulcers should be covered with a dressing, usually a transparent film, and managed with intensive preventive measures.

Nutritional Assessment:

The development of a pressure ulcer should prompt for a comprehensive nutritional assessment. Pre-albumin levels are usually low and indicate deficiencies. Serial weight assessments also reflect insufficient intake of proper nutrition. Both blood work and/or serial low weight assessments should result in referral to a registered dietician for assessment of nutritional status and management of deficiencies. Enhanced foods (for additional calories or protein), vitamin and mineral supplements (e.g., multivitamin, vitamin C, zinc) and adequate hydration are often recommended.

Clinical Pearl: *Do not underestimate the importance of nutrition!* On top of malnutrition being a risk factor for pressure injuries, the presence of pressure ulcers can result in losses in protein and fluid into the exudate, further aggravating the conditions of malnutrition and hypoalbuminemia. Pressure ulcers can also induce chronic inflammatory processes, which increase systemic hypermetabolism and possibly result in loss of weight

Pain Management:

Adequate pain control should be provided for patients with pressure ulcers. Particular attention should be paid to pain management during wound dressing and debridement. Oral non-opioid pain medications can be used for mild pain; opioid analgesics may be needed for moderate to severe pain. Topical local anesthetics (e.g., lidocaine, lidocaine-releasing dressings) can be a useful adjunct for a specific procedure, but should not be used as the only method of pain relief. Remember that individuals may lack sensation/pain but may experience other symptoms such as spasticity, autonomic dysreflexia (see individual CBLMs), worsening of those conditions may actually be the first indication of pressure injury.

Reassessment:

Monitor and document the pressure ulcer's progress on a consistent and ongoing basis to determine the adequacy of the plan of care, and follow up with respect to change/progress after you have referred the patient on to specialist care. There is little data about expected healing times for pressure ulcers. Recommendations such as a 30 per cent reduction in wound measurement (length x width x depth) at three to four weeks which indicates wound healing are based on other types of wounds (diabetic foot ulcers and venous leg ulcers).²⁰ Clinical studies with people at Stage III or IV pressure ulcers AND spinal cord injury show that less than 50% reduction after 3 months is predictive of non-healing.³²¹⁹

Modify the treatment plan if the ulcer shows no evidence of healing within two to four weeks.

- Ask patient to bring photographs of the wound, documentation from the wound care nurse, and dressings to appointments.
- Whenever possible, coordinate services and plan appointments on days dressings need changing.

Clinical Pearl: Studies of pressure ulcer patients have found:

Stage 2: >70% healed at 6 months

Stage 3: 50% healed at 6 months

Stage 4: 30% healed at 6 months, 77% healed at 2 years and lean body mass.

Monitoring For Infection:

All pressure ulcers are colonized with bacteria, but **only** clinically evident infections should be addressed with culture and antibiotic treatment. The clinical signs of infection include: warmth, spreading erythema, local tenderness, purulent discharge, and foul odour. However, the manifestations of infection in pressure injuries can be variable with delayed wound healing being the only sign of infection.

*Microbial analysis is not routinely recommended as part of wound care as swabs are likely to identify contaminants rather than infecting organisms.^{20,21} Indications for swabbing include:²²

- Signs of spreading or systemic infection
- Lack of response to appropriate antibiotic treatment
- Protocol requirements for antibiotic-resistant organisms

Clinical Pearl: When taking a swab, clean the ulcer with saline and remove unhealthy tissue, then place the swab onto “clean” viable tissue, rotate and press firmly to obtain fluid from beneath the surface of the wound. Pressure ulcers can serve as a reservoir for resistant organisms such as methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci, and multiply-resistant gram-negative bacilli; precautions should be used when examining and treating ulcers.

Patients with deep ulcers, delayed wound healing, and recurrence of pressure ulcers should be evaluated for the presence of osteomyelitis.

Special measures for non-healing lesions:

Advanced therapies should be entertained within 6 months of onset of PU or if the likelihood of stimulating closure is significantly less. These therapies include but are not limited to: electrical stimulation, therapeutic ultrasound, hyperbaric oxygen, topical oxygen, and application of growth

factors. Referral to a local wound care expert* for consideration of these modalities is warranted in complex or non-healing ulcers.

Also, although most patients are successfully managed without surgery, procedures such as direct closure, skin grafts, musculocutaneous flaps, and free flaps may be appropriate in certain cases; refer individuals with complex, deep stage III pressure ulcers (i.e., undermining, tracts), or stage IV pressure ulcers for surgical consideration.

* Local wound experts can also involve nurses who have completed enterstomal therapy course and designed as nurses specialising in wound, ostomy, and continence Canada' (NSWOCC), MCISc-WH (Masters of Clinical Science Wound Healing) and IIWCC (International Interdisciplinary Wound Care Course)

Psychosocial support:

The psychosocial impact of pressure injuries and immobility is often overlooked. Pressure ulcers have been reported to lower self-esteem and diminish already achieved level of functional independence. It is crucial to include psychosocial support as a part of the management strategy of pressure ulcers. Referral to appropriate resources such as vocational rehabilitation services, peer counselling and support groups, formal psychotherapy and/or family therapy should be initiated as appropriate.

Sandra. Age 76

PART 2 – THREE MONTHS LATER

Unfortunately, Bill has experienced a decline in his own health and has been unable to implement most of the strategies that had been recommended to him by the allied health professionals. Sandra returns to your office today after having developed an ulcer on her buttocks.

How would you approach treatment?

- *After a thorough assessment of the wound, a multi-pronged management plan should be implemented using the resources of a multidisciplinary team. If not already in place, a homecare physical and/or occupational therapist should be involved for assessment and instructions on pressure redistribution techniques and support surfaces, and a dietician elicited for nutritional optimization.*
- *Incontinence briefs should be avoided as they have been known to cause pressure ulcers.*
- *Referral should be made to local community care agency for appropriate wound care including dressings and dressing changes, debridement, and controlling risk factors for infection.*
- *Short-term insertion of a urinary catheter may be necessary to prevent urine from soaking the ulcerated area. Barrier cream should be suggested along with good pericare.*
- *Pain management should also be addressed and regular reassessments of the wound for signs of non-healing and/or infection performed.*

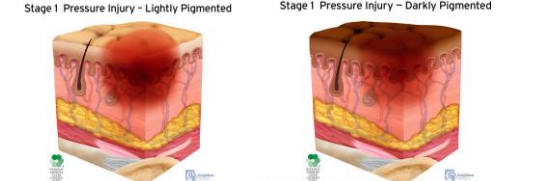
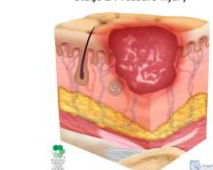


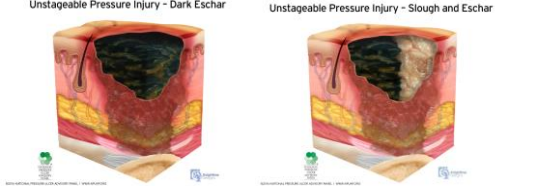

What further treatment options would you consider if the ulcer was not healing well with your initial management plan?

- *If the wound fails to heal, consultation with a local wound expert would be useful and consideration of other interventions. If a specialist is not available locally this can sometimes be arranged via telemedicine surfaces.*
- *The psychosocial impact of the wound on both the patient and caregiver(s) should also be assessed and addressed appropriately. Personal support workers can relieve some of the work burden, while family, friends, and volunteers can assist with other caregiving tasks.*

SUMMARY

- Pressure injuries are a frequent, costly, and potentially life-threatening complication of spinal cord injury.
- Pressure injuries can have a major impact on quality of life.
- Prevention, and early detection and treatment are key. Family physicians play a critical role, especially in helping to coordinate management, order necessary tests and refer to appropriate services.
- Wounds in the gluteal region of people with SCI need to be monitored closely. They have resulted in serious systemic infections such as septic shock, osteomyelitis, and even death.
- Deep wound infections have huge impact on the person's quality of life, are a leading cause of hospitalization and surgery, and are not always treatable.
- Pressure redistribution, daily skin inspection, proper skin care and nutrition and weight optimization play an important role in the prevention of pressure injuries.
- Treatment of pressure injuries is best done through a multidisciplinary team approach that includes a physician, wound care nurse, physical and/or occupational therapist, and other specialists as required.
- Patient and caregiver education is essential.

APPENDIX A. THE NATIONAL PRESSURE ULCER ADVISORY PANEL STAGING SYSTEM

Stage	Illustration	Description
1		Skin intact but with non-blanchable redness for > 1 hour after relief of pressure.
2		Blister or other break in the dermis with partial thickness of dermis, with or without infection.
3		Full thickness tissue loss. Subcutaneous fat may be visible; destruction extends into muscle with or without infection. Undermining and tunneling may be present.
4		Full thickness skin loss with involvement of bone, tendon, or joint, with or without infection. Often includes undermining and tunneling.
Unstageable		Full thickness tissue loss in which the base of the ulcer is covered by slough and/or eschar in the wound bed.
Deep Tissue Pressure Injury		Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister.

From: National Pressure Ulcer Advisory Panel²³

NPUAP* stage	Defining characteristics
Suspected deep tissue injury	<ul style="list-style-type: none"> • Purplish discoloured skin or blood-filled blister • May be painful, boggy or firm, warm or cool • Even with treatment, may evolve rapidly with exposure of additional tissue layers • Difficult to detect if skin tone dark
Stage 1	<ul style="list-style-type: none"> • Intact skin with non-blanchable redness • May be painful, firm or soft, warmer or cooler than adjacent tissue • Localized, usually over bony prominence • Darkly pigmented skin may not have visible blanching, though its colour may differ from the surrounding area
Stage 2	<ul style="list-style-type: none"> • Partial-thickness loss of dermis • Shallow and open • Red or pink wound bed without slough or bruising • May be shiny or dry, intact or with an open serum-filled blister
Stage 3	<ul style="list-style-type: none"> • Full-thickness tissue loss • Subcutaneous fat may be visible, but no tendons, muscles or bones • May be undermined or tunnelled • Depth varies with anatomical location: areas without adipose tissue may be shallow, while areas of significant adiposity may develop very deep Stage 3 ulcers
Stage 4	<ul style="list-style-type: none"> • Full-thickness tissue loss • Bone exposed, tendon or muscle visible or palpable • Slough or eschar may be present on parts of ulcer • Often includes tunnelling or undermining • Depth varies with anatomical location (as with Stage 3 ulcers) • May extend to muscle and/or supporting structures, making osteomyelitis or osteoitis likely
Unstageable	<ul style="list-style-type: none"> • Full-thickness tissue loss • Base of ulcer bed covered by slough or eschar • Cannot determine stage until enough slough or eschar is removed • Note: stable dry black heel eschar should not be removed

*NPUAP = National Pressure Ulcer Advisory Committee




Sources:

1) Pressure Ulcer Prevention. National Pressure Ulcer Prevention Advisory Panel (NPUAP) 2009. Available at: http://www.npuap.org/Final_Quick_Prevention_for_web_2010.pdf (Accessed April 2012)

2) Berlowitz D. Et al. Pressure ulcers: epidemiology, pathogenesis, clinical manifestations, and staging. *UptoDate.com*, 2011

Note: Full colour illustrations of the various stages of ulcers are available in both the online version of this appendix, which can be found through Members Online at <https://members.fmpe.org/>, and the National Pressure Ulcer Advisory Panel website at <http://www.npuap.org/resources/educational-and-clinical-resources/pressure-ulcer-categorystaging-illustrations/>

APPENDIX B. SKIN INSPECTION PATIENT/CAREGIVER HANDOUT

HOW TO CHECK YOUR SKIN	
LOOK FOR:	<ul style="list-style-type: none"> • redness, bruising, or any change of colour • changes in texture, such as rashes, dryness, or swelling • cracks, scabs, and blisters 
FEEL FOR:	<ul style="list-style-type: none"> • a difference in skin temperature from surrounding areas • hardness or softness different from the surrounding skin. 
USE A MIRROR OR PHONE	<ul style="list-style-type: none"> • use long-handled mirror to check parts of your skin you can't see • ask someone else to hold the mirror • Some people use their phones to check places on their skin they cannot see, by having someone take photos. 

Do skin checks even more often:

- any time you are not moving as much as usual (e.g. if you are in bed during the day)
- if you have already identified a skin problem
- when you are trying out new equipment
- when your lifestyle changes and you are sitting more often, or for longer stretches of time
- if your medical condition is getting worse.

APPENDIX C. BRADEN SCALE ¹¹

BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK

Patient's Name _____		Evaluator's Name _____		Date of Assessment					
SENSORY PERCEPTION ability to respond meaningfully to pressure-related discomfort	1. Completely Limited Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation. OR limited ability to feel pain over most of body	2. Very Limited Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/2 of body.	3. Slightly Limited Responds to verbal commands, but cannot always communicate discomfort or the need to be turned. OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	4. No Impairment Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort..					
MOISTURE degree to which skin is exposed to moisture	1. Constantly Moist Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. Very Moist Skin is often, but not always moist. Linen must be changed at least once a shift.	3. Occasionally Moist: Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. Rarely Moist Skin is usually dry, linen only requires changing at routine intervals.					
ACTIVITY degree of physical activity	1. Bedfast Confined to bed.	2. Chairfast Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. Walks Occasionally Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair	4. Walks Frequently Walks outside room at least twice a day and inside room at least once every two hours during waking hours					
MOBILITY ability to change and control body position	1. Completely Immobile Does not make even slight changes in body or extremity position without assistance	2. Very Limited Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. Slightly Limited Makes frequent though slight changes in body or extremity position independently.	4. No Limitation Makes major and frequent changes in position without assistance.					
NUTRITION <u>usual</u> food intake pattern	1. Very Poor Never eats a complete meal. Rarely eats more than 1/2 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement OR is NPO and/or maintained on clear liquids or IV's for more than 5 days.	2. Probably Inadequate Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement. OR receives less than optimum amount of liquid diet or tube feeding	3. Adequate Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) per day. Usually will refuse a meal, but will usually take a supplement when offered OR is on a tube feeding or TPN regimen which probably meets most of nutritional needs	4. Excellent Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.					
FRICION & SHEAR	1. Problem Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction	2. Potential Problem Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. No Apparent Problem Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair.						
					Total Score				

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PATIENT RESOURCES

There are many helpful educational materials available for patients and caregivers including but not limited to:

- Ontario Neurotrauma Foundation:
 - Preventing and Treating Pressure Sores – A Guide for People with Spinal Cord Injuries (http://onf.org/system/attachments/312/original/Pressure_Ulcer_Guide_medium-res_single_pages.pdf)
- Spinal Cord Essentials (an education initiative from the Toronto Rehabilitation Institute’s Brain and Spinal Cord Injury Rehabilitation Program):
 - Pressure Sore Prevention (<http://www.spinalcordessentials.ca/handouts/pressure-ulcer-prevention/>)
 - Pressure Relief Techniques (<http://www.spinalcordessentials.ca/Handouts/Pressure-Relief-Techniques/>)
- Paralyzed Veterans of America:
 - Pressures Ulcers: What You Should Know (<http://www.pva.org/CMSPages/GetFile.aspx?guid=dbc55cfa-463a-453d-8586-2eeb28706b4c>)

INFORMATION FOR PATIENTS

Cleansing	<ul style="list-style-type: none"> • Use a pH-balanced, non-sensitizing skin cleanser and warm (not hot) water. • Avoid perfumes or other ingredients that may irritate skin, bar soap. • Handle skin gently (e.g. soft wash cloth) during cleansing to minimize force and friction.
Hydration	<ul style="list-style-type: none"> • Use a non-sensitizing, pH-balanced, fragrance-free, alcohol-free emollient moisturizer. • Monitor fluid intake to ensure adequate hydration. • Whenever possible, control environmental factors, such a low humidity, exposure to cold, that can lead to dry skin.
Protection	<ul style="list-style-type: none"> • Protect skin from excessive moisture, including incontinence. • Use a topical barrier to protect skin from moisture; do not use products that compromise the absorptive capacity of incontinent briefs. • Use protective barriers, such as liquid barrier films, hydrocolloids, or protective

	padding to reduce friction.
Prevention of skin damage	<ul style="list-style-type: none"> • Avoid rubbing skin vigorously. • Massage is contraindicated if the skin is fragile or inflammation is present. Always avoid vigorous massage over bony prominences. • Do not turn the individual onto a body surface that is still red from previous weight bearing. • Wear proper fitting clothing made of non-irritating, lightweight materials such as cotton. • Whenever possible, avoid sources of external heat, such as over-exposure to the sun, hot showers, cigarettes, exposed pipes and heaters, heating pads or electric blankets, ovens, or hot liquids that can cause burns and lead to ulcer formation. • If skin irritation due to moisture develops or persists, pursue a consultation with a nurse with continence training for evaluation, topical treatment, and review of the bowel and bladder programs.
Other	<ul style="list-style-type: none"> • Implement an ongoing exercise regimen to promote maintenance of skin integrity, increase strength, and improve mobility.

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