CHAPTER 3 Skin: Anatomy, Physiology and Wound Healing

CHAPTER 4 Prevention and Management of Wounds

CHAPTER 5 Prevention and Management of Pressure Injuries

CHAPTER 6 Prevention and Management of Skin Tears

CHAPTER 7 Prevention and Management of Surgical Wound Complications

CHAPTER 8 Prevention and Management of Diabetic Foot Ulcers

CHAPTER 9 Prevention and Management of Burns

CHAPTER 10 Prevention and Management of Venous Leg Ulcers

CHAPTER 11 Prevention and Management of Peripheral Arterial Ulcers

CHAPTER 12 Prevention and Management of Moisture-associated Skin Damage

CHAPTER 13 Prevention and Management of Wounds Related to Lower Limb Lymphedema

BPR BRIEFS

A Digest Version of

Best Practice Recommendations for Skin Health and Wound Management 2025

Editors:
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WoundsCANADA.ca

BPR Briefs: A Digest Version of Best Practice Recommendations for Skin Health and Wound Management 2025

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Information presented herein is based on the best available evidence at the time of writing and review, but it is likely that best practice will change and develop as new findings become available. Readers are encouraged to use their best judgement when applying the information in their practices. Wounds Canada shall not be held liable for any damages arising out of the use of the information contained within this resource.

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Contents

Click to go to . . .

BPR BRIEFS

A Digest Version of

Best Practice Recommendations for Skin Health and Wound Management 2025

About This Resource

The Best Practice Recommendations (BPRs) are Wounds Canada's most popular resources, used by frontline clinicians, students and policy makers. Each BPR is a chapter in a comprehensive "super resource" called the Best Practice Recommendations For Skin Health And Wound Management 2025. The goal of the current Recommendations, which, in total, have been developed by over 50 well-known experts from multiple disciplines, is to provide information to support best-practice-based care of Canadian patients, regardless of geographic or clinical setting.

Due to the complex nature of wounds and the need to provide comprehensive information the chapters tend to be long. To ensure their widespread and sustained use, the Wounds Canada team has created abbreviated versions that can be used by clinicians who are already familiar with the full versions to quickly access the key information they need.

For clinicians, these resources are meant as cues for practice by providing the key points of each recommendation.

For policy makers, they highlight actions and policies that support best practice.

An important feature of the BPR Briefs is the number of hyperlinks they contain, making them function more like a web-based app, than a static resource. For example, a clinician using the documents online can easily click on a link and be taken to the relevant tool or resource—such as Inlow's 60-second Diabetic Foot Screen or a specific Product Picker—or to a specific page in the related BPR that provides a deeper explanation.

Key Points

The BPR Briefs

- are short documents that capture concisely the key components of the associated BPRs
- offer quick and efficient access to "cues for care" as well as actions and policies that support best practice
- contain live links to background documents and useful tools
- are most effectively used by readers who are familiar with the full Best Practice Recommendation documents

Suggestions for use:

Readers can access the full document or connect to the individual BPR Briefs within it. From there the documents can be:

- downloaded for use on a personal device, where it will still be interactive if the device is connected to the Internet
- printed (in clinical settings we suggest placing hard copies of the full documents and the Briefs in a binder for use by all staff)
- accessed as needed online for interactive use.

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Skin: Anatomy, Physiology and Wound Healing

Skin is the largest organ of the body. It consists of two layers—the epidermis and dermis—that are supported by a number of underlying structures. Skin has multiple functions. It is a barrier between the external environment and the internal organs, protecting against trauma from water, chemicals, micro-organisms, mechanical stress and radiation. It performs sensory functions related to touch, pressure, heat, cold and pain, and alerts for potential tissue damage. It has a role in exchanging fluids, salts, gases and heat.

Skin health is influenced by various internal and external factors that also influence wound healing. Therefore, to support skin health and wound management, clinicians need to recognize, understand and appreciate both the complex nature of skin itself and what lies beneath. Skin components and underlying structures, their functions and implications for wounds and wound healing are reviewed in Table 1.

Table 1: Anatomy and Physiology at a Glance

Skin Structure	Function	Implications for Wounds
Epidermis **Layers:** ▪ stratum corneum ▪ stratum lucidum ▪ granular cell layer ▪ squamous cell layer ▪ basal cell layer	▪ This outer layer has no blood vessels and gets its oxygen and nutrients from the deeper layers of the skin. It provides protection against trauma, a harmful environment and harmful organisms.	▪ Abrasion occurs if epidermis is damaged.
Dermis **Contains:** ▪ rete pegs ▪ extracellular matrix ▪ arterioles and venules ▪ lymph capillaries ▪ hair follicles, sweat glands and sebaceous glands	▪ This next layer is made up of a tough, supportive connective tissue matrix directly beneath and connected to the epidermis. It provides skin flexibility and strength.	▪ Bleeding occurs and the body's first line of defence is breeched. Healing is multifactorial.
Blood and Lymph Fluid		
Blood is mostly water containing dissolved proteins, glucose, mineral ions, hormones, carbon dioxide, platelets and blood cells. Blood cells make up 55% of blood plasma and include red blood cells (erythrocytes), white blood cells (leukocytes: neutrophils, eosinophils, basophils, lymphocytes and monocytes) and platelets.		
Fluid Type	**Function**	**Implications for Wounds**
Arterial blood ▪ rich in oxygen	▪ Supplies oxygen to the body	▪ Poor arterial flow leads to ischemia and impaired healing.
Venous blood ▪ carries carbon dioxide	▪ Removes metabolic waste products from the body	▪ Venous hypertension leads to edema and interferes with healing.
Lymph ▪ straw-coloured fluid that forms in interstitial spaces	▪ Transports excess tissue fluid; removes metabolic waste and supports immune response and fat absorption from the gut	▪ Often accompanies venous edema. **All chronic edema is lymphedema.** Lymphedema is rarely acknowledged and poorly understood.

cont'd. . . .

Disclaimer: *This document provides a brief clinical enabler for the content provided in the relevant chapter(s) of Best Practice Recommendations for Skin Health and Wound Management 2025. It is not intended to provide comprehensive information on the given topic(s). For more complete information on specific best practice recommendations, refer to the full publication at: https://www.woundscanada.ca/news/752-bpr-new*

Underlying Structures	Function	Implications for Wounds
Subcutaneous tissue ▪ composed of adipose cells ▪ contains connective tissue, larger blood vessels and nerves	▪ Located beneath the dermis; provides protection, cushioning, insulation and energy storage	▪ Poorly vascularized tissue leads to slow healing.
Fascia ▪ strong connective tissue primarily consisting of collagen ▪ extends throughout the body	▪ Gives structure, protection, support	▪ Entry of wound into fascial plane may lead to infection.
Muscles **Types of muscles:** ▪ smooth involuntary muscle (such as in the stomach) ▪ striated voluntary muscle (such as in the arms and legs) ▪ striated involuntary muscle (such as in the heart)	▪ Specialized tissue made up of cells that have the ability to contract and conduct electrical impulses, performing voluntary and involuntary movement	▪ Very vascular, tear easily
Tendons ▪ tough bands of fibrous connective tissue	▪ Attach muscles to bones	▪ Exposed tendons should be kept moist. Tendons are poorly vascularized, leading to slow healing. Loss of tendons means loss of function.
Ligaments ▪ short bands of fibrous connective tissue	▪ Attach bones to bones to form a joint	▪ Exposed ligaments should be kept moist. Ligaments are poorly vascularized, leading to slow healing. Loss of ligaments means loss of function.
Bones ▪ hard, white, dense connective tissue ▪ a periosteum covering that provides an external blood supply	▪ Provide protection, strength and support; continually remodel; produce new bone in marrow	▪ Exposure of bone can quickly result in infection, which can lead to osteomyelitis. Exposed bone (periosteum) should not be allowed to dry out.
Joints ▪ fibrous joints are joined by fibrous connective tissue ▪ cartilaginous joints are joined by cartilage ▪ synovial joints are not directly joined	▪ Facilitate movement and mechanical support where two or more bones make contact	▪ Joint involvement in wounds may lead to osteomyelitis.
Synovium ▪ thin layer of tissue that lines the joints and tendon sheaths ▪ produces a thick, viscous, sticky lubricant called synovial fluid	▪ Lubricates to reduce friction in the joint during movement	▪ Appearance of synovial fluid in wounds indicates exposure to joint cavity.
Cartilage ▪ dense connective tissue found in many areas in the body ▪ does not contain blood vessels	▪ Acts as an intermediate between bone and dense connective tissue	▪ Cartilage grows and repairs more slowly than other connective tissues. ▪ Exposed cartilage should be kept moist. Exposure may lead to osteomyelitis.

For the complete version of Skin: Anatomy, Physiology and Wound Healing, visit here.

Normal Changes and Differences in Skin

Infant Skin

Infant skin differs from adult skin in several ways that place an infant at greater risk for skin damage:

- Thickness of infant skin is 40% to 60% that of adult skin.
- Weak rete ridges provide limited surface attachment to an immature dermis.
- Infant's ratio of body surface area to weight ratio is up to 5 times that of an adult.
- Acid mantle changes from 6.5 at birth to about 5.5 within a few weeks, which isbeneficial for antimicrobial defence through the inhibition of the growth of pathogenic bacteria.

The optimal pH of skin is 5.5, which is referred to as the "acid mantle." The acid mantle provides the body with defence against invading micro-organisms.

Skin Changes in the Adolescent

Adolescence is associated with a surge in the sex hormones estrogen, androgen and progesterone, leading to:

- Stimulation of the sebaceous glands, resulting in increased production of oil, or sebum.
- Development of apocrine glands in the pubic region and armpits, resulting in thick sweat mixed with bacteria on the skin that can cause body odour. At the same time, hair growth occurs in these areas.
- An increase in the lipid content during this time enhances the heat-insulating properties of skin, improving temperature regulation.
- The higher fat content also helps to retain moisture, making teenage and young adult skin less susceptible to drying out.

Skin Changes in the Older Adult

As individuals age, skin goes through many changes based on genetics, environment, lifestyle factors and any existing chronic disease states. Despite individual variations, the normal aging process of all skin causes many predictable changes:

- With increasing age there is a 50% decrease in the turnover of the epidermal layer.
- Skin pH becomes less acidic and more susceptible to bacterial growth.
- Thinning of the outer epidermal layer can cause a 1% decrease in collagen per year. Since collagen gives skin tensibility, this loss leads to wrinkling.
- Langerhan's cells, which serve as macrophage and immune moderators, decrease.
- The dermis becomes increasingly avascular with age.
- Biochemical changes in collagen and elastin, which give the skin its firmness, occur.
- Elastin fibres significantly decrease in size and number, which leads to decreased elasticity and recoil, leading to wrinkling.
- The skin becomes less elastic and drier.
- Older skin has a reduced ability to perceive sensation to pressure and light touch, along with an increased threshold for pain.
- Underlying fatty tissue begins to disappear, and skin begins to sag and become supple. Wrinkles begin to form, leading to atrophy of subcutaneous fat in the hands, face, shins, waist (men) and thighs (women), resulting in sagging and folds. At this stage, skin is more easily injured, heals more slowly and tends to dry out more quickly.
- Melanocytes, the pigment-producing cells, decrease in number. Hair follicles also decrease in number and growth rate, with associated greying due to the decrease and loss of melanin.

For the complete version of Skin: Anatomy, Physiology and Wound Healing, visit here.

Differences between Male and Female Skin

Skin is affected by sex hormones: estrogen increases collagen and skin moisture and promotes wound healing, while testosterone stimulates oil production and the growth of facial hair. Men and women have *both* these sex hormones; skin is able to convert testosterone to estrogen, and ovaries produce a small amount of testosterone.

Women's skin is generally thinner and less oily than men's skin, and women are more likely to experience wrinkles because thinner, drier skin is more prone to damage from the sun and cigarette smoke. Women also sweat less than men do and thus are more likely to suffer heat stroke. During menopause the loss of sex hormones accentuates wrinkles, and estrogen-deprived skin thins, loses collagen and slows down its cell renewal.

The rate of the loss of skin firmness and elasticity differs from individual to individual, depending on genetic makeup, general health, amount of sun exposure, skin care regimen (or lack thereof) and other factors.

Wound Healing

Skin's Response to Damage

To heal, the wound environment must be optimized so the wound can fill in from the bottom up and then in from the sides. When skin is damaged (wounded) it attempts to regenerate itself to continue to protect the larger organism. Research on acute wounds in animal models shows that wounds heal in four phases. (Note: some authors combine the first two phases.)

1. Hemostasis
2. Inflammation
3. Proliferation (also known as Granulation and Contraction)
4. Remodeling (also known as Maturation)

Dean Kane created a wound repair analogy that compares wound healing to the repair of a damaged house. As with the rebuilding of a house, the process relies on the right materials (cells) being delivered to the site (wound) in the right order (see Table 2 on page 5) and at the correct time. A successful rebuild also depends on access to the damaged areas with the high-quality materials (adequate blood supply and an active immune system) necessary to get the job done well.

For the complete version of Skin: Anatomy, Physiology and Wound Healing, visit here.

Table 2: Phases of Wound Healing and the Kane Analogy

Phase of Healing	Time Post Injury	Cells Involved in Phase	Function or Activity	Analogy to House Repair
Hemostasis Blood vessels constrict in response to injury.	Immediate	▪ Platelets	▪ Clotting	▪ Cap off broken utilities
Inflammation Presents as erythema, swelling and warmth often associated with pain. Inflammation is a normal response to trauma.	Day 1 – 4	▪ Neutrophils ▪ Macrophages	▪ Phagocytosis	▪ Unskilled labourers clean up the site
Proliferation Observed by the presence of pebbled red tissue or collagen in the wound base as well as contraction of the wound.	Day 4 – 21	▪ Macrophages ▪ Lymphocytes ▪ Angiocytes ▪ Neurocytes ▪ Fibroblasts ▪ Keratinocytes	▪ Fill defect ▪ Re-establish skin function ▪ Closure	▪ Contractor/ supervisor ▪ Specific labourers ▪ Plumbers ▪ Electricians ▪ Framers ▪ Roofers and siders
Remodeling In **acute** epithelialization thin layers of scar tissue form and thicken over time: deep pink in colour, changes to bright pink. In **chronic** epithelialization scar tissue may be hypertrophic, keloid or hyperkeratotic.	Day 21 – 2 yrs	▪ Fibrocytes	▪ Develop tensile strength (will never be as strong as non-injured skin)	▪ Remodelers

Defining the Wound Repair Process

Not all wounds heal in the timeframe as indicated in Table 2, and when that is the case clinicians need to determine why healing times are slow or even stalled.

- Acute wounds heal in a normal, orderly sequence of repair as described above. This usually occurs because the cause of the wound has been removed and an optimum environment for healing has been created. Note: time to heal will also depend on the dimensions of the wound.
- Non-healing wounds are wounds that have failed to progress through a normal, orderly and timely sequence of repair due to unresolved factors that interfere with healing. These wounds may eventually pass through the repair process without restoring sustained anatomical and functional results. This usually occurs when the cause(s) or cofactors of the wound have not been corrected and an optimum environment for healing has not been established.

Summary

Knowledge of the anatomy and physiology of skin and the wound healing process is essential for healthcare professionals to effectively prevent, assess, treat and manage wounds of all types.

For the complete version of Skin: Anatomy, Physiology and Wound Healing, visit here.

BPR BRIEFS

Skin: Anatomy, Physiology and Wound Healing

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BPR BRIEFS

Prevention and Management of Wounds

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Wounds**. In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/165-wc-bpr-prevention-and-management-of-wounds/file.

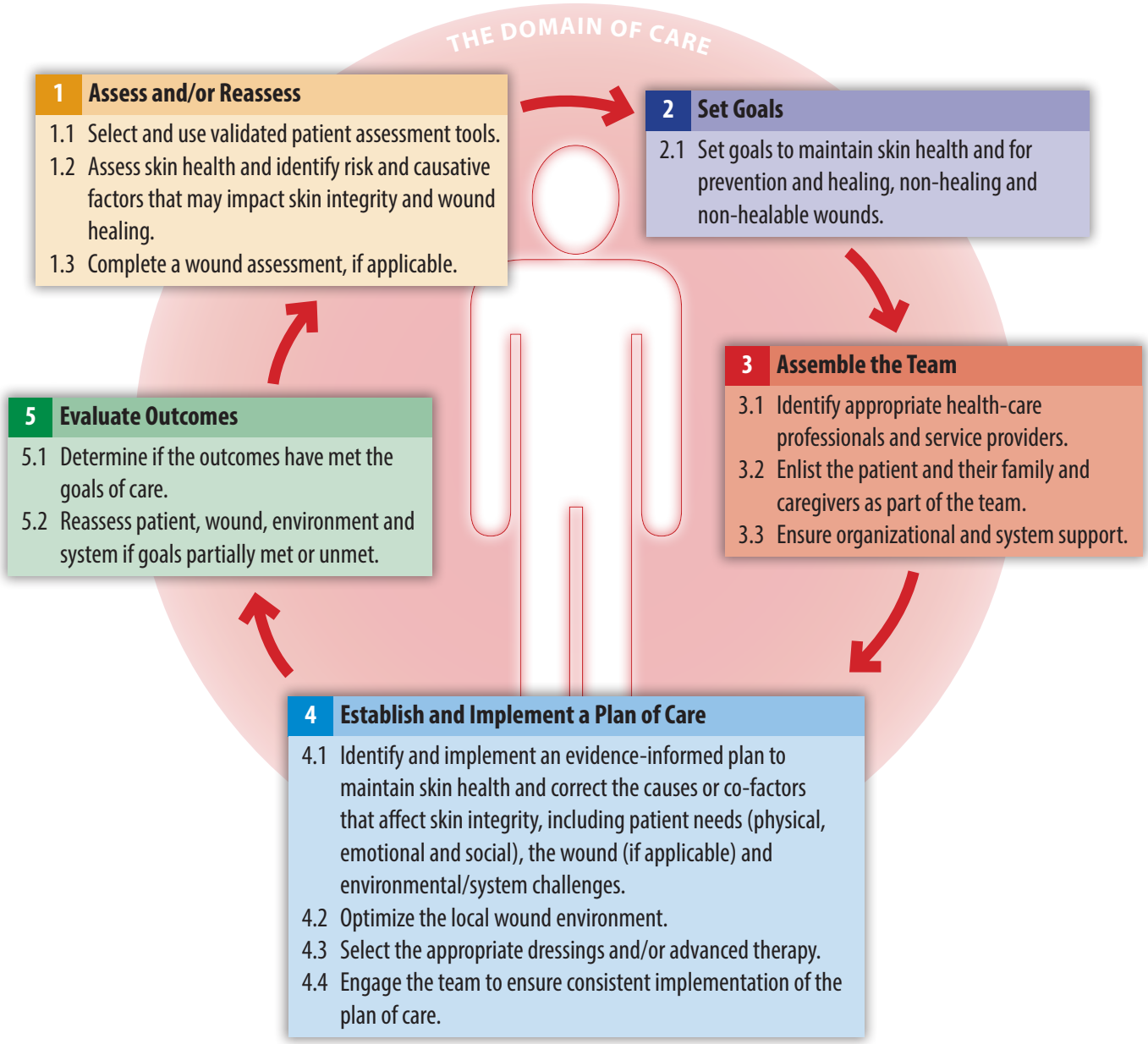
Introduction

Wound prevention and management can be challenging, particularly when the patient is living with complicating factors that may increase the risk of new wounds or prolong the healing of existing wounds. The following three guiding principles can support optimal prevention and management of skin breakdown:

- Use of a logical and systematic approach, regardless of the specifics, to prevent and manage skin breakdown
- Constant, accurate and multidirectional flow of meaningful information with the team and across care settings
- The patient as the core of all decision making

Disclaimer: *This document provides a brief clinical enabler for the content provided in the relevant chapter(s) of Best Practice Recommendations for Skin Health and Wound Management 2025. It is not intended to provide comprehensive information on the given topic(s). For more complete information on specific best practice recommendations, refer to the full publication at: https://www.woundscanada.ca/news/752-bpr-new*

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Wounds, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status; skin status (and wound status, if applicable); environmental factors and system factors. If, after the WPMC has been completed, goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools.

Tools need to be selected based on patient need—for example, the Braden Scale for Predicting Pressure Ulcer (Injury) Risk, Braden Q Scale for pediatric patients, International Skin Tear Advisory Panel (ISTAP) Risk Assessment Tool, Inlow's 60-Second Diabetic Foot Screen, Vancouver Burn Scar Assessment Scale, Wong-Baker FACES Pain Scale, Cardiff Wound Impact Schedule, Canadian Nutrition Screening Tool, Bates Jensen Wound Assessment Tool.

Let assessment guide intervention.

1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing

Key **risk factors** for skin breakdown, interfere with healing and/or impair immunity should be identified. These might include diabetes mellitus, advanced age, peripheral arterial disease, lymphedema, obesity, collagen vascular diseases, organ transplant, cancer, chemotherapy and/or therapeutic radiation. Any **causative factors**, such as trauma and thermal injury, that resulted in the injury must be removed from the wound environment.

1.2.1 Patient: Physical, emotional and lifestyle

It is essential to assess the patient's health history, general health and specific issues related to the skin condition (skin tone), including relevant surgical history, active infections, current medical conditions, current prescription and non-prescription medications, allergies, nutrition and hydration, cognitive/mental status, lifestyle, psychosocial and spiritual issues, pain, functional status and use of adaptive aides. This also includes a review of blood work and a focused physical exam (e.g., height, weight, blood pressure, pulse, temperature).

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

Assessment of socio-economic determinants includes income, employment and working conditions, food security, environment and housing, early childhood development, education and literacy, social supports and connectedness, health behaviours and access to health care and services. It is critical to provide a culturally sensitive environment for care.

1.2.3 System: Health-care support and communication

This involves assessment of access to funding, availability of services and wound-related products, diagnostic services, service delivery personnel and co-ordination of care.

1.3 Complete a wound assessment, if applicable

The wound needs to be examined using a standardized tool that identifies the anatomic location, shape, size, depth, edges, undermining, tissue type and amount, exudate type and amount, periwound tissue and degree of bacterial burden should be documented (Figure 2).

Figure 2: Wound showing progressive improvement over time, with decreased slough and redness (as well as edema management, as shown in the photos)

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

-Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patient's health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easureable, **A**ttainable, **R**elevant and **T**imely.

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds

Goals are not static and can often transition with various conditions over time. Goals must be adjusted accordingly. For example, a wound may start healing and then become non-healing.

2.1.1 Identify goals based on prevention or healability of wound

- For intact skin, goals should be developed based on risk to prevent skin breakdown.
  - E.g., putting pressure reduction surfaces in place within 3 days
- For healing wounds, goals should be developed to address wound closure.
  - E.g., achieving wound closure within 2 weeks by optimizing the wound environment
- For non-healing wounds, goals should be developed to enable any wound healing potential and to prevent further deterioration of the wound.
  - E.g., pain controlled within 1 day
- For non-healable wounds, goals should be developed to manage symptoms and prevent deterioration of the wound.
  - E.g., infection prevention plan in place within 1 day

2.1.2 Identify quality-of-life and symptom-control goals

Address goals that impact a patient's daily life, such as returning to normal routines, improving emotional well-being, controlling symptoms and decreasing the number of dressing changes.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

An integrated team is necessary to implement, adjust and sustain a plan to meet the patient-specific goals. The team should include the relevant health-care professionals and other service providers as required as well as the patient, care partners and their support system.

3.1 Identify appropriate health-care professionals and service providers

Selection of team members is based on the patient assessment and needs analysis. Health-care professionals on the team may include chiropodists/podiatrists, diabetes educators, dietitians, nurses, occupational therapists, orthotists/pedorthists, pharmacists, physicians (specialists and generalists), physiotherapists, psychologists, recreational therapists, social workers, spiritual care providers, surgeons. Service providers on the team may include garment fitters, homemakers, meal delivery services, shoe fitters, transportation providers, rehabilitation specialists, and others, depending on the needs of the patient.

3.2 Enlist the patient and their family and caregivers as part of the team

The patient and possibly family members and care partners support an integrated, patient-focused approach to care and essential in communication between patients and the health-care professionals and care delivery.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

A successful wound prevention and management program involves collaboration with practice leaders, researchers, educators, policy makers and administrators at a local, regional and national level. These relationships can support the education of staff, policy development, product availability, services and resource allocation. To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as patient education and clinical visits.***
- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a wound management program.***
- ***Establish a pathway for referral of people with or at risk for wounds to a interprofessional skin and wound care service.***
- ***Work with community and other partners to develop a process to facilitate patient referral and access to local resources and health professionals with specialized knowledge in wound management.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of preventative skin care.***
- ***Ensure care services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent wounds, and to support management in their health-care or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of wounds.***
- ***Establish and sustain a communication network between the person with wounds and the necessary healthcare and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

For the complete version of Best Practice Recommendations for the Prevention and Management of Wounds, visit here.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

Ensure that care addresses the goals and considers patient needs, factors relating to the skin and wound (if applicable), as well as the environment and the system in which the patient and team are situated.

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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

Address causes, co-factors and comorbid conditions, as well as identified risk factors, that affect the health of skin and/or its ability to heal. Consider interventions to address the patient's level of activity, nutrition, moisture control, mental health and lifestyle choices.

4.2 Optimize the local wound environment: Cleansing, debriding, managing bacterial balance and managing moisture balance

Local wound management interventions should be part of the plan of care and fit within the context of the overall goals of care. These include:

4.2.1 Wound cleansing: The wound should be cleansed with solutions that are nontoxic, hypoallergenic, readily available, cost-effective and easy to use. They should be used at body temperature. See Wounds Canada's Product Pickers, below, for more information.

4.2.2 Debridement: Debridement may be required to remove of devitalized tissue, infected tissue, hyperkeratosis, slough, pus, hematomas, foreign bodies, debris or bone fragments from a wound. Debridement may be selective (biological [biosurgical], hydrosurgical, autolytic, enzymatic, surgical and conservative sharp) or non-selective (mechanical and chemical). See Wounds Canada's Product Pickers, below, for more information.

4.2.3 Managing bacterial burden: Bacterial balance can be achieved by addressing the interaction between the individual and the infecting pathogen (local, spreading or systemic infection [IWII]) through the optimization of the host's response, reducing the number or virulence of micro-organisms in the wound and optimizing the wound environment. See Wounds Canada's Product Pickers, below, for more information.

4.2.4 Managing moisture balance: The wound should retain enough moisture to stimulate healing but not cause maceration or irritation to the surrounding tissues. Some advantages of moist wound healing include decreased dehydration and cell death, increased angiogenesis, enhanced autolytic debridement, increased re-epithelialization and decreased pain. See Wounds Canada's Product Pickers, below, for more information.

4.3 Select the appropriate dressings and/or advanced therapy

The selection of the appropriate dressing or advanced therapy needs to consider the goal of treatment, wound characteristics, phase of healing, product indications and contraindications, patient choice, risk factors, lifestyle and comfort, product availability and the availability and skill of the care partner, safety and effectiveness, ease of use and cost-effectiveness. See Wounds Canada's Product Pickers, below, for more information.

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

Ensure that all team members have well-defined roles, are making contributions and are actively connected to and communicating with the larger team. The team needs to show continuous progress toward the goal(s) of the plan of care and provide regular feedback to all team members.

5 Evaluate Outcomes

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

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

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goal(s). If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient in sustaining the achieved outcomes after discharge.***

Wounds Canada's Product Pickers

- Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations.
- Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals.
- Control of Venous Leg Edema: helps users choose the appropriate compression system for the reduction of venous leg edema.
- Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions.
- Offloading: helps users choose the most appropriate offloading device for patients with plantar diabetic foot ulcers based on the needs of the patient, their wound and environmental and system factors.

For the complete version of Best Practice Recommendations for the Prevention and Management of Wounds, visit here.

5.1 Determine if the outcomes have met the goals of care

The use of validated and responsive tools as well as patient feedback assist in determining if the goals of care have been met.

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

When goals of care are not met, the team should go back to Step 1 of the Wound Prevention and Management Cycle. Reassessment needs to consider gaps in care and the person's ability to adapt to their condition and engage in self-management.

If the plan of care is appropriate and the wound is not improving, consider a biopsy to rule out skin disorders or a malignancy.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Ensure appropriate discharge planning, including educational materials for patients and their care partners, is in place. The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.

For additional Wounds Canada resources including monofilaments and brochures, go to: www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique

Care at Home Series:

- Caring for Your Wound at Home: Changing a Dressing
- Caring for Your Swollen Legs at Home: Preventing and Managing Venous Leg Ulcers
- Caring for Pressure Injuries at Home: Preventing and Managing Pressure Injuries
- Caring for Your Feet: Safe Foot Care if You Have Diabetes
- Caring for Yourself After Surgery: Preventing Surgical Site Infections
- Diabetic Foot Complications: When is it an emergency?
- Caring for Easily Damaged Skin: Preventing and Managing Moisture-associated Skin Damage
- Preventing and Managing Skin Injuries: Minor Cuts (Cuts, Scrapes and Bruises)
- Burns: Preventing and Managing Skin Injuries
- Indigenous Health

Download the appropriate wound-specific BPR Brief based on wound type: www.woundscanada.ca/health-care-professional/publications/dfc-2.

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BPR BRIEFS

Prevention and Management of Wounds

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Wounds Canada is the leading wound-related knowledge mobilization organization in Canada.

WoundsCANADA.ca

Pressure Injuries

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Pressure Injuries.** In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/172-bpr-prevention-and-management-of-pressure-injuries-2/file.

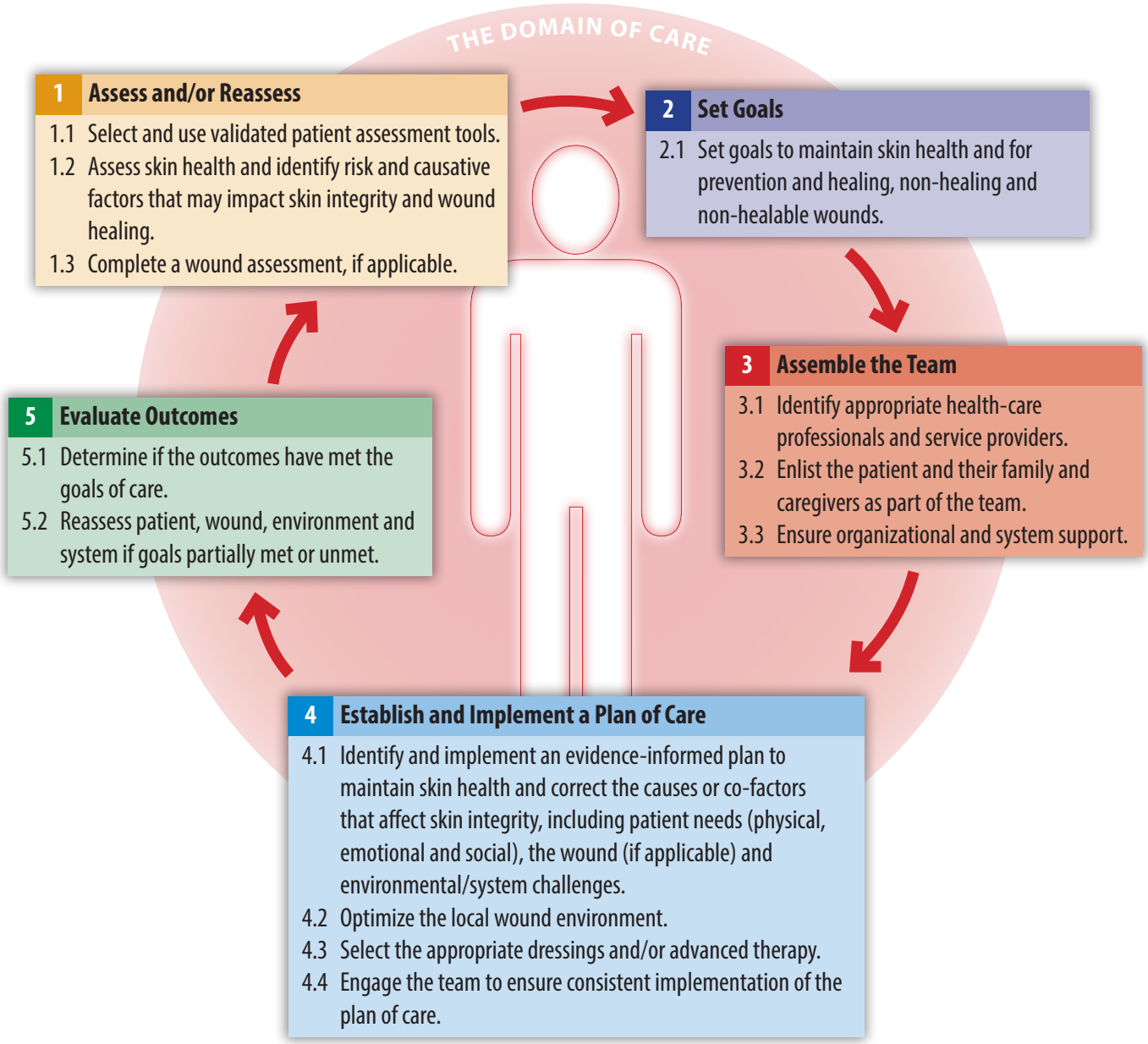
Introduction

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. According to published literature, clinical practice and expert opinion, nearly all pressure injuries can be prevented.

Despite the focus on prevention to date, pressure injury incidence rates have not significantly decreased in Canada when compared with other countries around the world, including the U.S. An integrated approach focused on prevention is required to make a significant difference in incidence rates. For optimal effectiveness, teams need to be inter-professional 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 theinstitutional setting).

Approximately 70% of pressure injuries are considered preventable.

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status, skin status, baseline skin tone (and wound, if applicable), environmental factors and system factors. If, after the WPMC has been completed, goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

Let assessment guide prevention, referrals and intervention.

1.1 Select and use validated patient assessment tools (Specific populations are discussed below)

Pressure-injury-specific risk assessment tools include: the Braden Scale for Predicting Pressure Ulcer Risk, Braden Q Scale, InterRAI Pressure Ulcer Risk Scale, Norton Pressure Sore Risk Assessment Scoring System, Waterlow Scale for Stratification of Pressure Sore Risk, Gosnell Scale, Spinal Cord Injury Pressure Ulcer Scale

To support Indigenous communities, Wounds Canada has developed Pressure Injuries: A guide for Alberta with a focus on Indigenous health. Available here.

1.2 Identify risk and causative factors that may impact skin integrity and wound healing (patient, wound, environment and system)

1.2.1 Patient: Physical, emotional and lifestyle

Admission tools standardized to identify risk and causative factors for all patients need to be available and supported by staff education and policy. Physical risk and causative factors include: sensory perception deficits, skin exposure to moisture, decreased physical activity and mobility, inadequate nutrition and hydration, presence or risk of friction and/or shearing forces (e.g., muscle spasms), hypotension, vascular disease, obesity, pain, extremes of age, institutionalization on a critical care unit, and acute, severe chronic or terminal illness.

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

Assessment of socio-economic determinants should include income, employment and working conditions, food security, environment and housing, early childhood development, education and literacy, social supports and connectedness, health behaviours, access to health care and services. It is critical to provide a culturally sensitive environment for care.

1.2.3 Systems: Health-care support and communication

Assessment of access to funding, availability of services and wound-related products, pressure redistribution surfaces, diagnostic services, service delivery personnel and co-ordination of care.

For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

1.3 Complete a wound assessment, if applicable

The choice of wound assessment tool should be consistent across all care settings and supported by education and policy.

- The National Pressure Injury Advisory Panel (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.
- Wounds should be assessed for healing or deterioration using tools such as the Bates-Jensen Wound Assessment Tool (BWAT), Pressure Ulcer Scale for Healing (PUSH), Sessing Scale, Spinal Cord Impairment Pressure Ulcer Monitoring Tool.
- The presence or absence of infection and osteomyelitis should be assessed. Assess for infection using the International Wound Infection Institute (IWII) continuum. Other tests may include swabs, bone biopsy, x-rays, blood tests for inflammatory markers, MRI.
- Some conditions may co-exist so it is important that the assessment is able to differentiate the etiology of the injury (Table 1)

Table 1: Differential Diagnosis of Pressure Injury and Incontinence-associated Dermatitis (IAD)

	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
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

For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patients' health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easurable, **A**ttainable, **R**elevant and **T**imely.

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

SMART goals needs to be part of care planning and be supported by a care planning policy. Goals need to be established to enhance the patient's quality of life regardless of the healability of pressure injuries. Pressure injury prevention should be considered a patient safety goal.

2.1.1 Identify goals based on prevention or healability of wounds

- 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.

2.1.2 Identify quality-of-life and symptom-control goals

QoL and symptom control goals might include:

- Return to social activities (modified if necessary) within one month.
- Participate in 2–3 sessions of strength training and 50 minutes or more of low-intensity, low-impact aerobic exercises per week within one month.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

An integrated team is necessary to implement, adjust and sustain a plan to meet the patient-specific goals. The team should include the relevant health-care professionals and other service providers as required as well as the patient, family and their support system.

For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

3.1 Identify appropriate health-care professionals and service providers

Team members may include: wound clinician, continence specialist, dietitian, family physician or primary care nurse practitioner, infectious disease specialist, mental health specialist, nurse, occupational therapist, orthopedic surgeon, orthotist, personal support worker, pharmacist, physiatrist, physical therapist, surgeon/plastic surgeon, social worker, speech-language pathologist, spiritual care practitioner.

3.2 Enlist the patient and their family and caregivers as part of the team

The team must include the patient and/or their family and care partners, with successful prevention and management of pressure injuries hinging on their collaboration and communication with other members of the team.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

It's not what you put on a pressure injury, it's what you take off a pressure injury.

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:***
  - ***screening/assessment***
  - ***communication***
  - ***education****
  - ***interventions***
  - ***documentation***
  - ***analysis of data***
  - ***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.***
- ***Ensure there is appropriate and equitable access to supplies and medical equipment such as moisturizers, skin barriers, therapeutic pressure redistribution surfaces and other devices.***

****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. Patients and their families can also benefit from education about pressure injury prevention.***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

Ensure that care addresses the goals and considers patient needs, factors relating to the skin and wound (if applicable) as well as the environment and the system in which the team is situated.

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

The plan of care must be patient-driven, based on assessment and risk, and supported by available resources and policy.

- Daily skin care and inspection for early identification of at-risk areas
- Pressure and shearing forces should be addressed, through techniques such as proper positioning and frequent and safe repositioning and transfers, mobilization and minimization of bed rest, initiation and proper use of pressure redistribution support surfces and transfer aides, and use of protective skin barriers.
- Proper positioning of tubing and devices must be ensured.
- Moisture can be addressed through techniques such as individualized bowel/bladder programs; use of bedpans/urinals, absorbent pads/dressings, commercial moisture barriers; temporary use of condom/indwelling catheters or fecal management systems and use of moisture wicking materials.
- Nutrition and hydration support must be in place to support healing and address blood pressure and body mass index.
- Physical exercise is recommended to optimize body mass index and muscle strength, and to improve activity and mobility.
- Surgical intervention is an option to close recurrent, multiple or non-healing Category/Stage 3 and 4 pressure injuries provided it is consistent with the goals of care.

For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

Patients and Family as Partners in Care

There has been an important shift toward developing self-care skills in persons with pressure injuries.

- 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.

4.2 Optimize the local wound environment: leansing, debriding, managing bacterial balance and managing moisture balance

4.2.1 Cleansing: Non-irritating wound cleansers such as potable water, normal saline or commercially prepared wound cleansers should be used, depending on patient needs (see Wounds Canada's Product Pickers, below).

4.2.2 Debriding: Non-viable tissue should be debrided to promote wound closure (**if appropriate**) (see Wounds Canada's Product Pickers, below).

4.2.3 Managing bacterial balance: Any local, spreading or systemic infection must be treated, including osteomyelitis if present (see Wounds Canada's Product Pickers, below).

4.2.4 Managing moisture balance: Moisture can be contained or provided through dressing selection (see Wounds Canada's Product Pickers, below).

4.3 Select the appropriate dressings and/or advanced therapy

Select products or advanced therapies that will address the local wound environment needs as well as prevent trauma to fragile/friable tissue—including periwound skin (see Wounds Canada's Product Pickers, below).

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

Education/instruction should be available to all levels of care providers, including the patient and care partners, on topics such as:

- Potential risks of pressure injuries
- Daily skin assessment and care
- Nutrition (food, fluids) and exercise
- Use of pressure redistribution devices
- Wound care
- Signs of infection
- Self-management

Wounds Canada's Product Pickers

- Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations
- Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals
- Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions
- Wounds Canada Nutrition and Wound Healing

For the complete version of Best Practice Recommendations for the Prevention and Management of Pressure Injuries, visit here.

5 Evaluate Outcomes

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

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

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goal(s). If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient in sustaining the achieved outcomes after discharge.***

5.1 Determine if the outcomes have met the goals of care

Outcomes need to reflect goals of care and sustainability needs to reflect continuity of care; both need to be included in the plan of care and supported by policy. Outcomes may include:

- Achievement of blood pressure, body mass index, nutrition and exercise targets
- Prevention of pressure injury
- Achievement of a daily skin assessment and care routine
- Success level of pressure, shear and moisture management
- Resolution and/or prevention of infection +/- osteomyelitis
- Wound closure and prevention of recurrence

Team members should refer back to original goals and, through the use of validated tools, determine if the goals of the prevention or treatment plan have been met.

If the plan of care is appropriate and the wound is not improving, consider a biopsy to rule out skin disorders or a malignancy.

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

When goals of care are partially met or unmet, go back to Step 1 of the Wound Prevention and Management Cycle. Reassessment needs to consider gaps in care or the person's ability to adapt to their condition and engage in self-management.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Sustainability may depend on access to appropriate equipment and services and 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.

Additional Wounds Canada resources, including a variety of Product Pickers and brochures, are available online at: www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

Care at Home Series:

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Pressure Injuries

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BPR BRIEFS

Skin Tears

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Skin Tears.** In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

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- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
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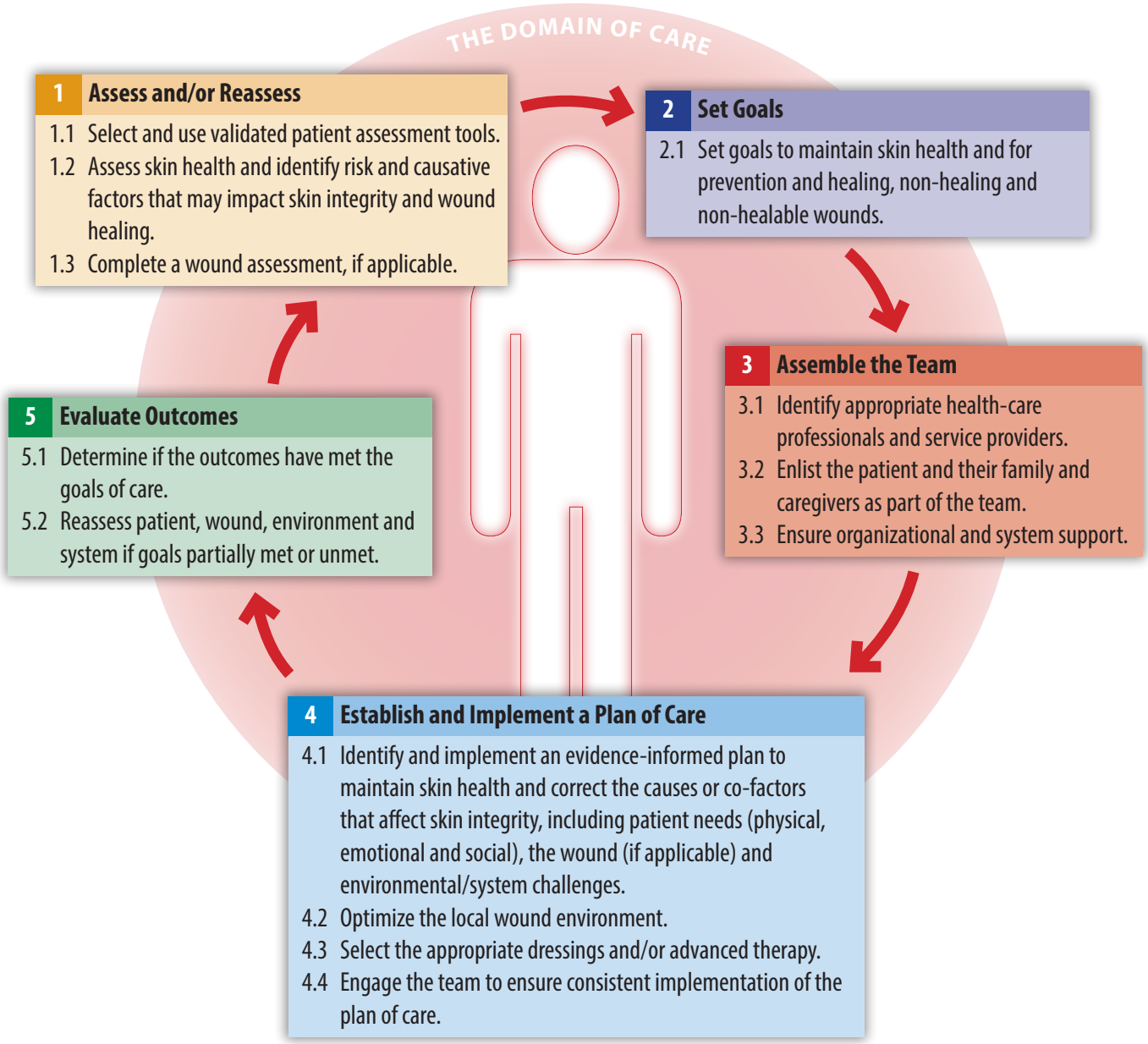
Introduction

Skin tears are found in various settings and yet are highly preventable wounds. Skin tears are frequently compared to pressure injuries in the literature because they are both found in the frail elderly, the very young and those who are critically or chronically ill, and because pressure injury burdens have long been used to benchmark quality of care, a function that could be applied to skin tears as well.

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status, skin status (skin tone) and wound if applicable, environmental factors and system factors. If, after the WPMC has been completed, goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools.

The use of the ISTAP (International Skin Tear Advisory Panel) risk assessment pathway allows the clinician to assess risk in three areas: general health, mobility and skin.

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

1.2.1 Patient: Physical, emotional and lifestyle

The International Skin Tear Advisory Panel (ISTAP) conducted a review of skin tear risk factors and expanded on search criteria. Using a Delphi process, the panel subsequently developed a risk assessment pathway.

The ISTAP risk assessment pathway is composed of three categories:

- 1. General health (chronic and critical disease, polypharmacy, cognitive, sensory, visual and auditory impairment and nutritional status),
- 2. Mobility (history of falls, impaired mobility, dependence for activities of daily living [ADLs] and mechanical trauma), and
- 3. Skin (extremes of age-neonates, children, older adults- fragile skin and previous skin tears).

Considerations specific to the pediatric population

In Canada, pediatrics includes neonates, infants, children, adolescents and young adults. Skin tears occur in greatest numbers in the pediatric population. Unfortunately, limited literature addresses skin tear risk factors in these populations. Premature neonates are known to have minimal stratum corneum and attenuated rete ridges, giving their skin a red, wrinkled, translucent and gelatinous appearance. They also have less subcutaneous tissue than other populations, meaning that the dermis lies directly over muscle. With less subcutaneous tissue, pediatric patients are at a much higher risk of skin tears caused by medical adhesive removal.

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

Discussion: Health-care professionals must have knowledge about the environmental factors that can impact apersons' skin integrity. These factors include socio-economic status, health-care setting and ability to self-manage skin care. Socio-economic and environmental factors not only affect patients' access to prevention, wound-healing products and technology, but also their ability to adhere to a recommended prevention or wound management protocol. Regional differences in access to supplies, equipment and care may also affect the individual's self-management potential. Even within similar regions, access to supplies, equipment and care may fluctuate depending on the type of environment in which the care is being delivered.

1.2.3 Systems: Health-care support and communication

Organizations and health-care professionals are concerned with the prevalence of skin tears and theirultimate burden on the health-care system. To improve care, screening and assessment are required to understand current skin tear prevention practices at a population, health-care professional and organizational level. This assessment is challenging due to the absence of existing skin tear evidence that might inform quality indicators. Health-care professionals require regular and consistent education about skin tear risk assessment, prevention and treatment. A skin tear knowledge assessment instrument is supported by acceptable psychometric properties and can be applied in nursing education, research and practice to assess knowledge of health-care professionals about skin tears.

1.3 Complete a wound assessment, if applicable.

Health-care professionals can more effectively communicate with other health-care professionals, policy makers, researchers, educators and patients/care partners by using common and appropriate descriptors for various types of wounds, including skin tears (see Table 1).

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

"A flap in skin tears is defined as a portion of the skin (epidermis/dermis) that is unintentionally separated (partially or fully) from its original place due to shear, friction, and/or blunt force. This concept is not to be confused with tissue that is intentionally detached from its place of origin for therapeutic use, e.g., surgical skin grafting."[21]

Table 1: Examples of intact aging skin and skin tears

Descriptor	Examples of skin changes	
Aging skin – intact Note: thinning of skin, sun damage	 	  
	Aging skin, early senile purpura	Aging skin, thinning with sun damage
	Permission: Wounds Canada	

cont'd. . . .

Type 1 No skin loss. This may be linear or there may be a flap that the clinician can reposition over the wound bed	 Left forearm, linear type *Permission: Wounds Canada*
Type 1: Flap not approximated: not yet categorized	
Same wound as above, now categorized as Type 1 Skin Tear Sutured (not recommended)	 Type 1: Sutured *Permission: Marlene Varga*

cont'd. . . .

Type 2 Partial skin loss, the flap is partially missing and when repositioned does not cover the wound bed		
	Multiple skin tears on lower leg Top: Type 3 as no flap present Bottom: Partial flap present and wound bed exposed	Bruising, skin flap does not cover wound bed
	Permission: Rose Raizman NP (Scarborough Health Network)	*Permission: Mölnlycke*
		
	Top: Wound bed dry, with a devitalized flap Bottom: No flap present	Ecchymosis with skin flap irregular and bruising
	Permission: Rose Raizman NP (Scarborough Health Network)	*Permission: Mölnlycke*
Type 2 Skin Tear with Ecchymosis		
	Permission: Marlene Varga	

cont'd. . . .

Type 3 Full skin loss when the flap is missing and the wound bed is exposed	Skin Tear with clear dressing applied – demonstrates progressive healing  *Permission: Wounds Canada*

Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patients' health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easurable, **A**ttainable, **R**elevant and **T**imely.

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

Even in the presence of skin tears, a primary goal is the promotion of healthy skin and prevention of future-skin tears. Goals should be developed using the SMART principle. An example of a multi-part SMART goal may be: within two days the patient and family member will receive educational materials on skin tears, be able to discuss the importance of intact skin and begin to apply lotion to skin twice daily.

2.1.1 Identify goals based on skin health and prevention or healability of wounds

It is a priority to promote skin health and prevent skin tears. Protecting intact skin should inform the setting of all goals. Preventative goals could include the implementation of a skin hygiene regimen, hydration of skin with appropriate lotion and promoting oral hydration. Wearing protective clothing, keeping mobile and identifying risk are essential.

Healing: The skin tear has sufficient vascular supply, underlying causes can be corrected and health can be optimized.

Non-healing: The skin tear has healing potential, but various factors are compromising wound healing at this time (e.g., skin tear on a lower limb with uncontrolled edema).

Non-healable: The skin tear has no ability to heal due to untreatable causes such as terminal disease or end-of-life status. If the wound is deemed to be non-healable, goals should be set that reflect management strategies for activities that prevent infection and protect the fragile periwound and other skin to prevent further skin tears from occurring.

2.1.2 Identify quality-of-life and symptom-control goals

An important aspect of goal setting includes the customization for each individual. Any plan of care should include the patient's goals of care and cultural considerations, e.g., promotion of healthy skin (nutrition, hydration, lotion use) prevention of future skin tears, pain management and wound healing. Goals should be congruent with the individual's needs, preferences and abilities, risk factors, co-morbidities, pain, quality-of-life issues, support systems and access to care.

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

Wounds Canada's Product Pickers

- Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations.
- Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals.
- Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

An integrated team is necessary to implement, adjust and sustain a plan to meet the patient-specific goals. The team should include the relevant health-care professionals and other service providers as required as well as the patient, family and their support system.

3.1 Identify appropriate health-care professionals and service providers

Key team members should be identified and included in any promotion of skin health, skin tear prevention and management program. These team members should include (but are not limited to): individuals at risk and their families and interdisciplinary team members such as: nurses, physicians, pharmacists, registered dietitians, paramedics, physiotherapists, occupational therapists, personal support workers, social workers, psychologists, spiritual care providers, policy makers and other allied health professionals as appropriate.

3.2 Enlist the patient and their family and caregivers as part of the team

Patients, care partners and health professionals should be provided with health information regarding the promotion of skin health, risks, prevention and treatment of skin tears. In addition, they must be aware of the proper techniques for providing care without causing skin tears.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources, patient education and clinical visits***

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

- ***Develop and implement policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a wound management program.***
- ***Establish a pathway for referral of people at risk for skin tears.***
- ***Work with community and other partners to develop a process to facilitate patient referral and access to local health professionals with specialized knowledge in wound management.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of preventative skin care.***
- ***Ensure services exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent skin tears, and to support management in their health-care or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of skin breakdown.***
- ***Establish and sustain a communication network between the person at risk and the necessary health-care and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

Ensure that care addresses the goals and considers patient needs, factors relating to the skin and wound (if applicable) as well as the environment and the system in which the team is situated.

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

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

Address the following:

- Promote skin health, nutrition and hydration
- Assess for risk factors and prevention strategies following a systematic approach such as:
  - Nutritional status (fluid and nutritional intake, swallowing)
    - Continence status – bladder, bowel status
    - Use of urinary devices (ostomy pouches, urinary catheters, briefs etc)
  - Skin conditions (history of issues e.g., eczema, psoriasis, sunburn, pignementation)
    - Location of skin tear
  - Cognitive status (e.g., delirium, dementia, depression, anzxiety)
    - Vision, hearing, speech changes and adaptative devices)
  - Neurological status (e.g., diseases)
    - Mobility and devices uses
    - Footwear (seasonal)
- History or risk of falls (e.g., initiate a falls prevention program)
- Mechanical trauma (not related to mobility aids) (e.g., implement safe activities for those who are at risk for skin tears)
- Skin changes related to extremes of age and critical illness (e.g., hydrate skin with hypoallergenic moisturizer after bathing, with the skin still damp, not wet; use warm, not hot, water for bathing)

4.2 Optimize the local wound environment: Cleansing, debriding, managing bacterial balance and managing moisture balance

4.2.1 Cleansing: Non-irritating wound cleansers such as potable water, normal saline or commercially prepared wound cleansers should be used, depending on patient needs (see Wounds Canada's Product Pickers, below). Control bleeding with gentle pressure. Control bleeding with gentle pressure.

4.2.2 Debriding: Gently roll back the skin tear flap into place utilizing a dampened sterile cotton tip applicator, gloved finger or tweezers (if able). Non-viable tissue should be debrided to promote wound closure (if appropriate) (see Wounds Canada's Product Pickers, below). Debride nonviable tissue to promote wound closure.

4.2.3 Managing bacterial balance: Any local, spreading or systemic infection must be treated (see Product Pickers, below).

4.2.4 Managing moisture balance: Moisture can be contained or provided through dressing selection (see Wounds Canada's Product Pickers, below).

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

4.3 Select the appropriate dressings and/or advanced therapy

Select products that promote moist wound healing while protecting the fragile skin of those at risk (see Wounds Canada's Product Picker for Dressing Selection). ISTAP does NOT recommend dressings be used as preventative measures. Adhesives should be avoided on the skin whenever possible. Select products that will prevent trauma to fragile/friable tissue—including periwound skin.

Figure 2: This demonstrates the correct way to label a dressing and remove the dressing

Dressings should always be removed in the direction of the skin flap (the pedicle) and not against it, thus maintaining flap viability. Indicate on the dressing the classification, size and shape of the skin tear, as well as the direction for dressing removal. Follow the product monogram instructions for proper dressing removal.

Permission: Mölnlycke

Special Considerations for Skin Tears in the Pediatric Populations

- Ensure that all products used have been verified for use in the pediatric populations
- Ensure that products do not pose a risk of causing systematic or tissue toxicity when used on immature skin
- Ensure that all products are atraumatic on removal

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

Skin tear prevention programs across all age groups and levels of care must include a plan for engaging individuals, families, care partners, health-care professionals and organizations to ensure that best practices are implemented. All stakeholders must collaborate to ensure that programs are successful and sustainable.

5 Evaluate Outcomes

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

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

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goal(s). If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient in sustaining the achieved outcomes after discharge.***

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

5.1 Determine if the outcomes have met the goals of care

Outcomes need to reflect goals of care and sustainability needs to reflect continuity of care; both need to be included in the plan of care and supported by policy. Use validated tools and patient interaction to determine if the goals of the promotion of skin health, prevention or treatment plans have been met.

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

If skin tears do not close in a timely fashion, return to step 1 of the WPMC to re-assess barriers to wound healing (e.g., repeated trauma to the area and/or comorbidities that might be delaying healing). Reassessment needs to consider gaps in care or the person's ability to adapt to their condition and engage in self-management.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Sustainability of a successful skin tear program requires support at both the organizational and clinical level. The association between skin tear prevalence and rising wound care costs, coupled with governments' political agendas emphasizing primary prevention, provides governments with the incentive to promote population-based skin health. Skin tear prevalence and incidence should be monitored and tracked to allow for benchmarking and program evaluation.

Additional Wounds Canada resources, including a variety of Product Pickers and brochures, are available online at: www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

Care at Home Series:

- Caring for Your Wound at Home: Changing a Dressing
- Preventing and Managing Skin Injuries: Minor Cuts (Cuts, Scrapes and Bruises)

For the complete version of Best Practice Recommendations for the Prevention and Management of Skin Tears, visit here.

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BPR BRIEFS

Skin Tears

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Surgical Wounds

This BPR Brief is an abridged version of **Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications.** In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

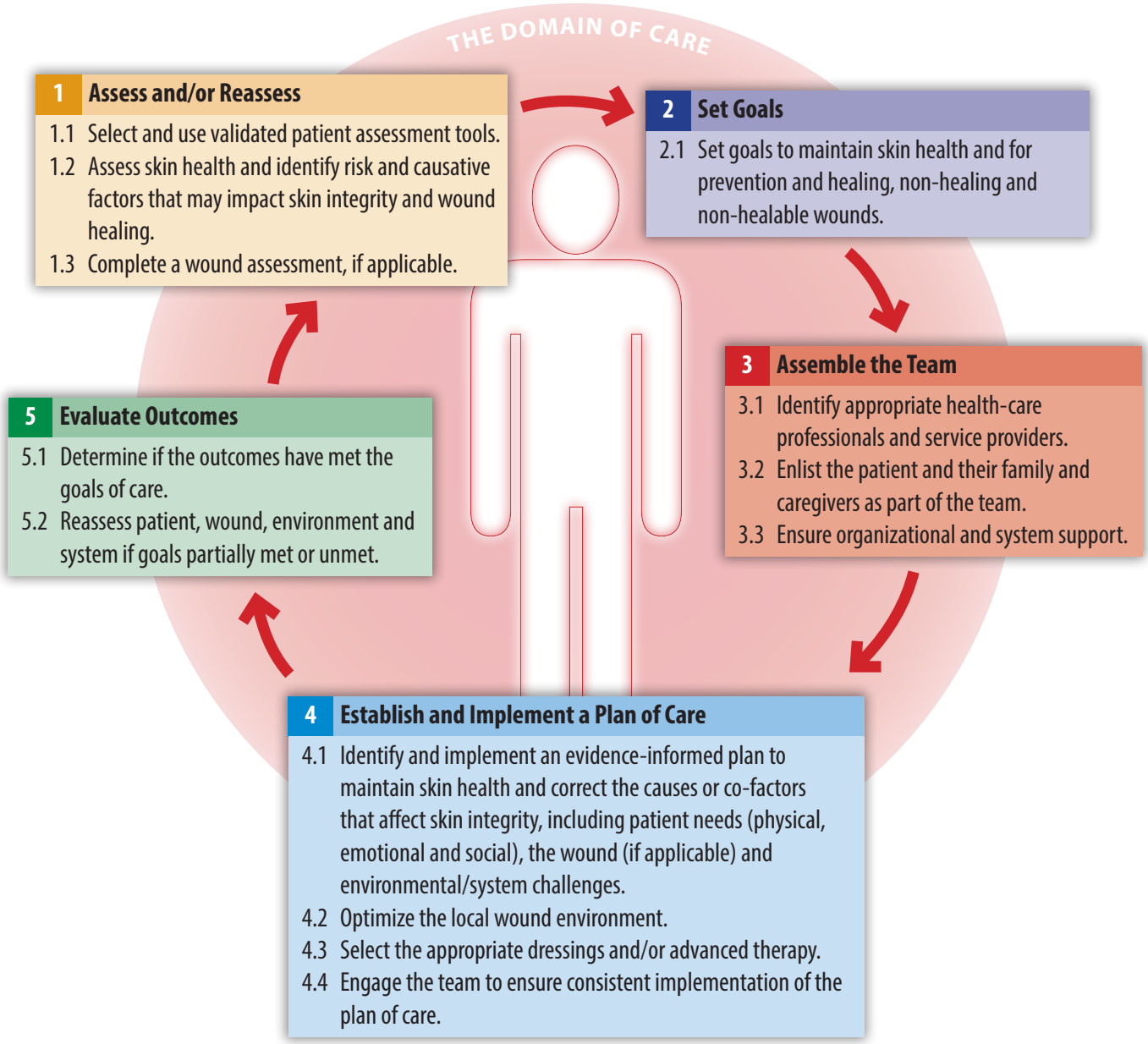
For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/552-bpr-prevention-and-management-of-surgical-wound-complications.

Introduction

The Canadian Patient Safety Institute has identified the safety of surgical care as one of its four priority areas. Surgical procedures can be performed either as inpatient, day surgery with admission of at least one night, or, depending on the procedure, in outpatient ambulatory care settings. Many surgical procedures are complex and may carry significant risks for patients regardless of the health-care setting. The patient facing surgery brings their own unique individual health history: while some bring excellent health with the expectation of rapid healing, others have surgery when their complex health history/issues seriously impair their general recovery and wound healing abilities. Surgical site infection (SSI) is the most common health-care-associated infection and, with up to three-quarters of all surgical procedures performed in the hospital outpatient setting, most SSIs will now be recognized in the community. Approximately 77% of surgical-patient deaths are reported to be related to infection.

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Complete a holistic patient assessment to identify factors that may affect surgical wound healing in the pre-, intra- and post-operative phases. The preoperative phase is a critical time, offering the opportunity to create an environment that prevents surgical wound complications. Surgical wounds should be assessed and reassessed during the entire post-operative phase, and the findings documented using a standardized and comprehensive wound assessment tool to provide a baseline that can help with the identification of wound changes. This information assists with identifying either wound healing or deterioration and should guide ongoing treatment decisions.

1.1 Select and use validated patient assessment tools

Some of the tools available for use in the assessment of persons with or at risk for surgical site complications are:

- Barber Measurement Tool (BMT): uses the percentage reduction in wound size over time as an indicator of healing
- ASEPSIS tool: developed to evaluate the effectiveness of antibiotic treatment on surgical site infections by examining wound characteristics
- Granulometer: assesses the status of skin grafts
- Outcome and Assessment Information Set-C (OASIS-C): contains a section for surgical wounds

1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing

Complete a holistic patient assessment to identify factors that may affect surgical wound healing in the pre-, intra- and postoperative phases. It is crucial to provide a culturally sensitive environment for care.

Pre-operative Risks

Key risk factors for surgical complications should be identified and addressed wherever possible. These factors include obesity, malnutrition, smoking, hypertension and coronary artery disease, pre-existing body site infection, diabetes mellitus (poor glycemic control), size and virulence of the microbial inoculums, general health and comorbid disease processes, including medications that affect integrity of the individual's host defences, alcohol or substance use, physical activity and mobility limitations, previous complications with anesthetic and surgeries, advanced age and patient emotional health and readiness for surgical intervention.

Surgical Risk Calculator

The American College of Surgeons Surgical Risk Calculator is an invaluable tool designed to provide evidence-based insights into assessing the risk of SSI. With the ever-evolving landscape of health care, precise risk evaluation is crucial for timely and effective decision-making. This user-friendly online platform offers health-care professionals a systematic approach to estimate the risk of SSI events in individual patients.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

The American Society of Anesthesiologists (ASA) has established categories to classify the patient's physical status to identify patient-related risk factors for developing SSI.

- Class I: A normally healthy patient with no functional limitations, non-smoking and minimal alcohol use
- Class 2: A patient with mild systemic disease without substantive functional limitations, current smoker, social alcohol use
- Class 3: A patient with severe systemic disease that limits activity, with substantive functional limitations
- Class 4: A patient with severe systemic disease that is a constant threat to life
- Class 5: A moribund patient who is not expected to survive without the operation
- Class 6: A patient who is declared brain-dead and whose organs are being harvested for donation

Intra-operative Risks

The intra-operative risk of developing an SSI can be affected by the nature of the intended surgical procedure; whether or not an SSI develops can depend upon how these factors interact.

There are a number of potential risks.

- Patients with high ASA index
- Hypothermia
- Advanced age
- Length of procedure
- Status of surgery
- Type of surgery
- Method of surgery
- Level of oxygenation of the tissues
- Emergent (vs. elective) surgery
- Implants (vs. no implants)
- Use of internal mammary artery grafts (for CABG)
- Prolonged ventilation
- Use of blood products

Post-operative Risks

While many of the SSI risks following surgery are the same as the pre-operative ones, there are some additional risk factors:

- Post-operative dressing selection and integrity
- Wound care
- Wound dehiscence
- Patient condition and interventions
- In addition, hematomas or seromas may develop and require intervention.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

1.3 Complete a wound assessment, if applicable

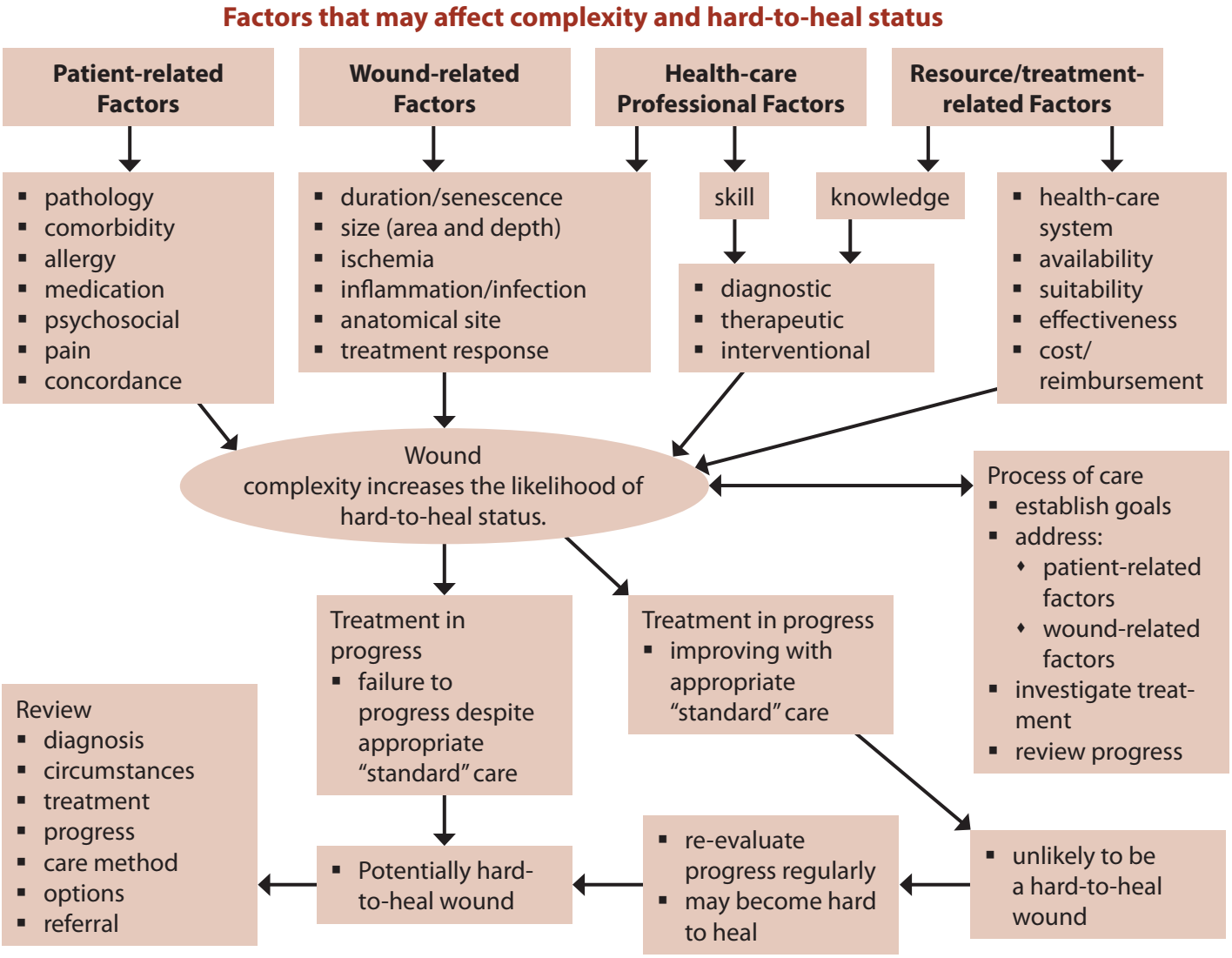
Table 2: Surgical Wound Descriptions

0 Newly epithelialized: ▪ wound bed completely covered with new epithelium ▪ no exudate ▪ no avascular tissue (eschar and/or slough) ▪ no signs or symptoms of infection
1 Fully granulating: ▪ wound bed filled with granulation tissue to the level of the surrounding skin ▪ no dead space ▪ no avascular tissue (eschar and/or slough) ▪ no signs or symptoms of infection ▪ wound edges open
2 Early/partial granulation: ▪ ≥ 25% of wound bed covered with granulation tissue ▪ < 25% of wound bed covered with avascular tissue (eschar and/or slough) ▪ no signs or symptoms of infection ▪ wound edges open
3 Not healing: ▪ wound with ≥ 25% avascular tissue (eschar and/or slough) OR ▪ signs/symptoms of infection OR ▪ clean but non-granulating wound bed OR ▪ closed/hyperkeratotic wound edges OR ▪ persistent failure to improve despite appropriate comprehensive wound management

Source: Wound, Ostomy and Continence Nurses Society (WOCN). WOCN's Nurses Society's guidance on OASIS-D integumentary items: best practice for clinicians. 2019. Available from: https://cdn.ymaws.com/member.wocn.org/resource/resmgr/docs/OASIS-D_Best_Practice_Docume.pdf

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

Figure 2: Predictors for Wound Healing



Source: Moffat C, Vowden P. Hard-to heal wounds: a holistic approach. London: MEP Ltd; 2008. Reprinted with permission.

For wounds healing by primary closure with well-approximated incisions, the close proximity of the incisional edges leaves no areas for granulation to occur. Only the "newly epithelialized" and "not healing" choices apply. For wounds healing by secondary intention, all four choices would apply.

CDC Surgical Wounds Classification identifies the degree of contamination:

- Clean: an uninfected operative wound in which no inflammation is encountered, and the respiratory, alimentary, genital or uninfected urinary tracts are not entered.
- Clean-Contaminated: operative wounds in which the respiratory, alimentary, genital or urinary tracts are entered under controlled conditions and without unusual contamination.
- Contaminated: open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract, and incisions in which acute, non-purulent inflammation is encountered.
- Dirty or Infected: includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

CDC Classification of a Surgical Site Infection stratifies the infection as superficial, deep or organ/space:

- Superficial incisional: involves only skin and subcutaneous tissue of the incision
- Deep incisional: involves deep soft tissues of the incision (e.g., fascial and muscle layers)
- Organ/Space: infection involves any part of the body deeper than the facial/muscle layers that is opened or manipulated during the operative procedure

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Based on identified risk factors and a complete patient, wound and environmental assessment, goals need to be set in collaboration with the patient, family and/or care partner. Patient priorities and goals for health care in regard to the surgical wound must be identified along with the available options so that informed decisions can be made.

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds

Prevention of surgical wound complications should always be considered a patient safety goal. Goals need to be determined from a patient's perspective and be created using the SMART priniciple: **S**pecific, **M**easureable, **A**chievable, **R**elevant and **T**imely.

- Pre-operative goals should revolve around maximizing patient health through goals such as nutritional support and smoking cessation.
- When the person with a surgical wound is initially recovering, they are also coping with the effects of anesthesia, analgesia, disrupted sleep patterns and impaired nutrition, and they may have weakness, nausea and pain. The initial short-term goals should address these issues and promote healing and restoration of health.
- Identify goals based on prevention or healability of wounds. The three surgical wound closure goals are as follows:
  - Primary intention is healing of a closed surgical wound. Re-epithelialization of the uppermost approximated skin edges normally occurs within 24 to 48 hours, with wound closure within two to three days. Sutures or staples are usually kept intact for seven to 10 days, at the surgeon's discretion. Acute surgical wounds heal within an expected timeframe and without complications.
  - Delayed primary closure of a surgical wound may be used to prevent infection in contaminated surgical wounds. The wound is allowed to remain open for several days before final closure to ensure all sources of contamination have been removed and/or infection is resolved. Another term for this method is healing by tertiary intention.
  - Secondary intention is healing of surgical wounds that may be dirty or infected, where the wound is left open and heals when granulation tissue fills the wound from the base up. Failed primary closure incisions that dehisce or separate are often best left to heal by secondary intention.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

2.1.1 Identify goals based on prevention and healability of wounds

Goals need to be set to support the patient through the physical and psychosocial challenges that arise from having a surgical wound; especially one that leads to complications. Not all patients look to healing as a goal of care. Pain or tenderness alone can be a symptom of a SSI, and pain levels need to be consistently addressed to determine if pain reduction goals are being met. Getting back to work or caring for family are common patient-driven goals.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

Health-care professionals, patients, their care partners and family must take responsibility for doing all they can to support a holistic, integrated approach to care and work together to ensure the best possible outcomes.

As surgery-related procedures, including preparation, intervention, discharge and follow-up, involve shorter hospital stays, a trusting, culturally sensitive, positive relationship must be developed among the patient, care partners, surgical team and follow-up clinicians.

3.1 Identify appropriate health-care professionals and service providers

Surgical-wound healing requires a collaborative and integrated team approach that allows for the safe and efficient treatment of patients undergoing surgery. This includes numerous interactions, including the physician consult to the laboratory and diagnostic department, the surgeon and in-house surgical team, community pharmacists, the pre-admission care team, community nurses, dietitians, spiritual care providers, physiotherapists and the in-house surgical team—in pre-, intra- and postoperative phases.

3.2 Enlist the patient and their family and caregivers as part of the team

Patient involvement starts in the doctor's office or emergency room, as soon as patients are made aware of the need for a surgical intervention. When possible, patients and care partners can work with their family doctor, the surgeon and the pre-operative team for optimal surgical preparation to reduce post-surgical complications.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

To support this model and secure successful outcomes, decision makers:

- ***Use globally recognized risk classificationsto identify risk, support prevention and develop management strategies by allocating appropriate resources such as patient education and clinical visits.***
- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a SSI program.***
- ***Establish a pathway for referral of people with surgical site complications to a multidisciplinary wound care service.***
- ***Work with the community and other partners to develop a process to facilitate patient referral and access to local resources and health professionals with specialized knowledge in wounds.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of complex surgical site care.***
- ***Ensure services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk for surgical site complications, and to support management in their healthcare or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of surgical site complications.***
- ***Establish and sustain a communication network between the person with the surgical site complication and the necessary healthcare and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.

4.2 Optimize the local wound environment.

4.3 Select the appropriate dressings and/or advanced therapy.

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

The integrated team needs to create a treatment plan to eliminate or reduce factors that may negatively affect surgical-wound healing in the pre-operative, intraoperative and post-operative phases of care. Strategies that promote timely healing of surgical wounds are essential in all phases of care.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

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

Pre-operative strategies

- Treatment plans may include smoking cessation, review of physical activity levels, obesity assessment and education about glycemic control, nutritional screening and counselling to correct any deficiencies that may cause delayed healing or immunosuppression.
- Pre-operative education/instruction for patients needs to reflect the needs of the individual and should include hand hygiene, SSI risks, team members' contact information, and post-operative instructions that includes information on wound care, dressing use and how to recognize wound problems.

Safer Healthcare Now recommends four key strategies in the peri-operative phase to reduce SSIs:

1. Perioperative antimicrobial coverage
   a. appropriate use of prophylactic antibiotics
   b. antiseptic use – bathing, showering
   c. decolonization
   d. antiseptic-coated suture
2. Appropriate hair removal as directed by surgeon
3. Maintenance of perioperative glucose control
4. Perioperative normothermia
5. Pressure injury prevention begins pre-operatively by completing a pressure injury risk screening and intervening.
   - Medications for diabetes and autoimmune issues should be reviewed with specific instructions for use before surgery.
   - The Canadian Malnutrition Task Force has guidelines and a screening tool, found at http://nutritioncareincanada.ca
   - Healthcare Excellence Canada supports the understanding of the pre-operative mental health status (dementia, depression) of the person by establishing a baseline status; delirium increases the patient's length of hospital stay, increases mortality and reduces physical and mental functioning.

Wounds Canada's Product Pickers

- Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations.
- Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals.
- Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions.

Intra-operative strategies

- Surgical patients are cared for by an operating team that minimizes the transfer of micro-organisms during the procedure by following best practice in hand hygiene and theatre wear, and by not moving in and out of the operating area unnecessarily.
- Staff protocols should include the removal of all hand jewelry, artificial nails and nail polish before operations.
- The skin should be prepared at the surgical site immediately before incision, using an antiseptic (aqueous or alcohol-based) preparation. Povidone-iodine or chlorhexidine are most suitable. Caution should be exercised regarding the use of skin antiseptics in babies (chlorhexidine, both alcohol-based and aqueous solutions).
- The recent NICE guidance does not recommend the use of diathermy for surgical incisions to reduce the risk of infection.
- When using sutures, clinicians should consider using antimicrobial triclosan-coated suture, especially for pediatric surgery, to reduce SSI risk.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

Post-operative Strategies

- Pain control: post-operative pain can be either nociceptive or neuropathic, or a combination.
  - Prescribed opiates remain key to post-operative pain management.
  - Non-steroidal anti-inflammatory agents (NSAIDS) can help to reduce the amount of opiates required in the acute phase.
  - Music therapy may reduce the patient's anxiety, pain and morphine consumption.
  - Reassess patient response to the pain management using the same re-evaluation tool.
  - Allow the patient an opportunity to discuss their knowledge and beliefs about pain management strategies. Provide information to patients as needed.
- Comfort measures such as non-stick dressings, warmed solutions and sitz baths for perineal wounds can be tailored to the patient's needs and situation and evaluated for effectiveness.
- Provide nutritional support to prevent wound dehiscence caused by malnutrition.
- Manage SSIs while the patient is still in hospital or after discharge.

4.2 Optimize the local wound environment: Cleansing, debriding, managing bacterial balance and managing moisture balance

4.2.1 Cleansing: Non-irritating wound cleansers such as potable water, normal saline or commercially prepared wound (see Wounds Canada's Product Pickers, below).

4.2.2 Debridement: Non-viable tissue should be debrided to promote wound closure (if appropriate) (see Wounds Canada's Product Pickers, below).

4.2.3 Managing bacterial balance: Any local, spreading or systemic infection must be treated, including osteomyelitis if present (see Wounds Canada's Product Pickers, below).

4.2.4 Managing moisture balance: Moisture can be contained or provided through dressing selection (see Wounds Canada's Product Pickers, below).

4.3 Select the appropriate dressing and/or advanced therapy.

Surgical wounds should be covered with an appropriate interactive dressing at the end of surgery. If the wound is healing by secondary intention the patient should be referred to a nurse specialized in wound, ostomy or continence care (NSWOC) or wound clinician for advice on appropriate dressings or advanced therapies (see Wounds Canada's Product Pickers, below).

Primary intention

Incisions closed by primary intention generally require:

- Application of a dry, sterile semipermeable cover dressing for 24 to 48 hours
- Negative pressure wound therapy (NPWT) to the primary incision; effective in sternotomy, orthopedic and vascular surgeries; NPWT can reduce SSI rates following invasive treatment of lower limb trauma

Secondary intention

Acute surgical wounds that are left open to heal by secondary intention require:

- A moist wound environment to support healing
- A dressing that prevents bacteria from entering and critically colonizing wound tissue

Pouching may be another option for the management of heavily exudating wounds. Negative pressure wound therapy (NPWT) can be used for types of open wounds as well as a method of bolstering flaps and skin grafts.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

Dry wounds

For some wounds, too little moisture causes the wound bed to desiccate, preventing growth of granulation tissue and re-epithelialization. Dry surgical wounds with healing as a goal may benefit from the addition of a hydrogel, hydrocolloid, non-adherent mesh dressing or transparent film to hold moisture in and protect the wound bed.

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

Individuals within the circle of care must understand their roles and responsibilities in relation to the formal care team for each specific element of care. Providing the following information to patients, families and their care partners should lead to early intervention, prompt treatment and reduce infection-related morbidity:

- The risks of an SSI and what is being done to reduce it, including any antibiotics given in hospital
- The signs and symptoms of SSI, how they are managed and who to contact if they are concerned
- The signs and symptoms of other surgical site complications such as a hernia or a wound dehiscence
- Who is responsible for what portion of their care and when should follow-ups be booked?
- How to care for the wound after discharge, including hand hygiene

5 Evaluate Outcomes

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

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

The overall goal is to assist patients and their care partners in maximizing their rehabilitation potential. Progress toward achieving established goals must be monitored with the patient, documented and communicated to the appropriate team members.

5.1 Determine if the outcomes have met the goals of care

The effectiveness of the interventions must be determined by a clinician who has the knowledge and skills to assess using standardized tools and methods as well as feedback from the patient and/or care partners.

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

When goals of care are not met, the team should go back to Step 1 of the Wound Prevention and Management Cycle. Reassessment needs to consider gaps in care and the person's ability to adapt to their condition and engage in self-management. A healing wound that is not responding to the treatment plan needs to be reassessed to determine:

- What host factors are contributing to delayed healing?
- Is the treatment optimal for the situation?
- When wound healing is not feasible, whether the treatment is preventing infection and deterioration, decreasing dressing frequency, managing pain and improving the patient's quality of life, where possible.

For the complete version of Best Practice Recommendations for the Prevention and Management of Surgical Wound Complications, visit here.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Primary care/family doctors, nurse practitioners and visiting health-care professionals should recognize wound complications and immediately communicate and/or refer the patient back to the surgeon. However, it is patients and their care partners who are the first line of defence in preventing and identifying complications. Teaching materials should be available for the patient and care partners both before and following surgery so patients can prepare appropriately, making adjustments to their environment, activities, nutrition, working lives, support system and more. Outpatient clinics and surgeon's time should be optimized so that follow-ups for patients whose situation warrants it can be done in a timely manner avoiding trips to hospital emergency departments.

For additional Wounds Canada resources including monofilaments and brochures, go to:
www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique

Care at Home Series:

- Caring for Yourself After Surgery: Preventing Surgical Site Infections
- Caring for Your Wound at Home: Changing a Dressing

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BPR BRIEFS

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BPR BRIEFS

Diabetic Foot Ulcers

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Diabetic Foot Ulcers.** In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized.

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/895-wc-bpr-prevention-and-management-of-diabetic-foot-ulcers-1573r1e-final/file.

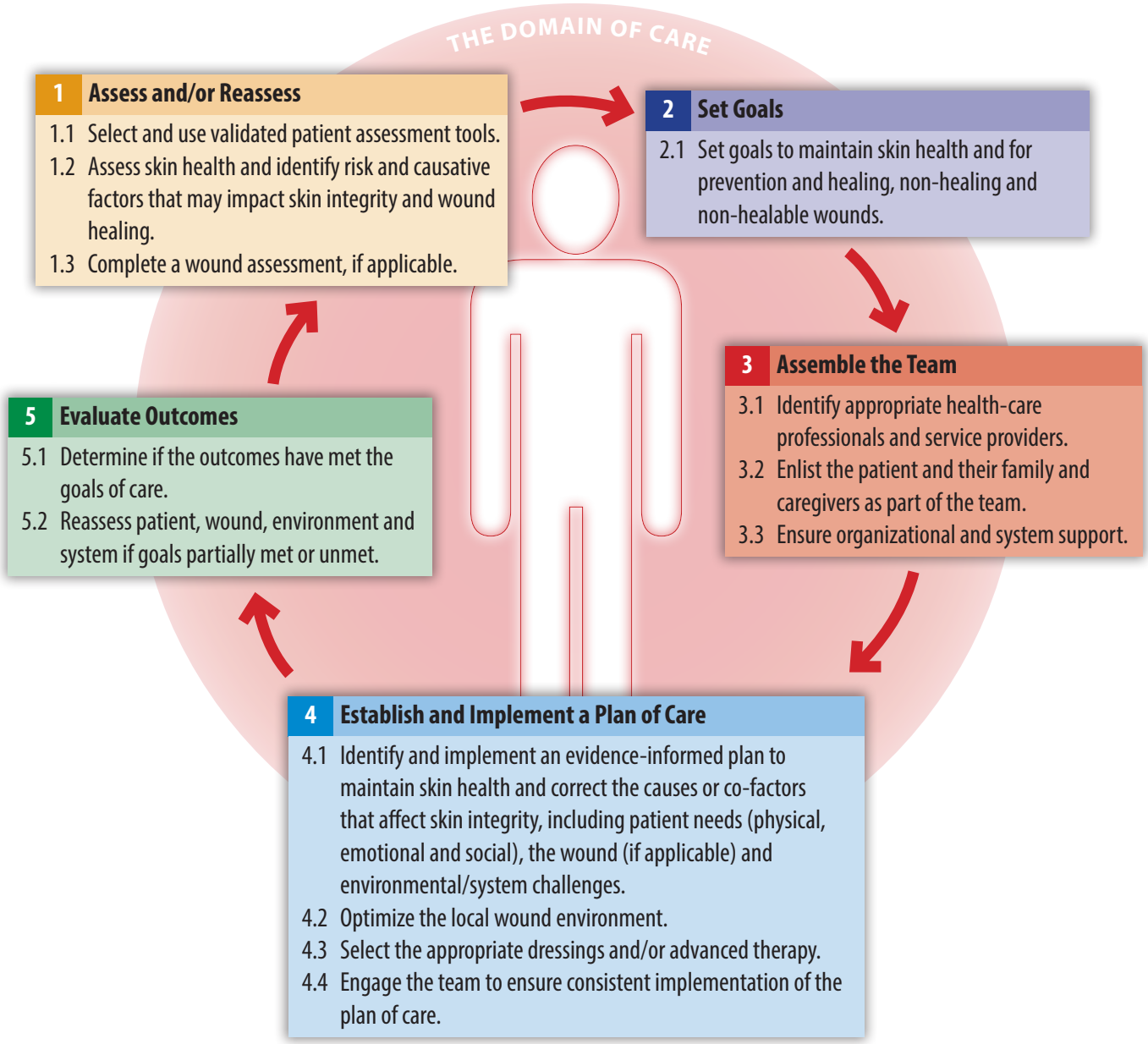
Introduction

Foot health should be a major consideration for people with diabetes and for those who care for them. Foot complications in this high-risk population can lead to a cascade of complications, potentially resulting in loss of limb and life. The lifetime risk for foot ulceration in people with diabetes is higher, at 19–35%, compared with the general population, with a yearly incidence in higher income countries of 2.4%.

The CIHI states "diabetes accounts for about two-thirds of lower limb amputations in Canada" CIHI data from 2020 to 2023 indicates that there are approximately 7,720 hospitalizations each year related to diabetes-associated lower limb amputations, with 3,080 involving major leg amputations. These cases often result in extended hospital stays, averaging days per admission, with each hospitalization costing around $47,000. Collectively, the healthcare costs associated with diabetic foot ulcers and amputations amount to $750 million annually.

Disclaimer: *This document provides a brief clinical enabler for the content provided in the relevant chapter(s) of Best Practice Recommendations for Skin Health and Wound Management 2025. It is not intended to provide comprehensive information on the given topic(s). For more complete information on specific best practice recommendations, refer to the full publication at: https://www.woundscanada.ca/news/752-bpr-new*

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Diabetic Foot Ulcers, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status; skin status (and wound status, if applicable); environmental factors and system factors. If, after the WPMC has been completed, goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC steps. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools

There are multiple tools to consider, such as Inlow's 60-Second Diabetic Foot Screen, which addresses four key areas: 1. assess skin health and nail changes, 2. peripheral neuropathy (Figure 2), 3. peripheral arterial disease (Table 1), 4. bony deformity and footwear. By using this tool clinicians are able to provide risk assessment, risk stratification and care recommendations. The Diabetes Distress Scale and the World Health Organization's WHO-5 Well-being Index are also available.

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

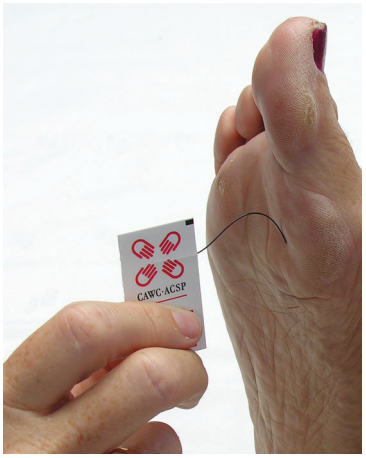
1.2.1 Physical

Admission tools standardized for all patients need to be available to identify risk and causative factors, supported by staff education and policy. Assessment must address the following:

- First, it is essential to identify individuals with an 'at-risk foot' before complications arise. This involves assessing risk factors such as neuropathy, PAD and foot deformities and the patient's ability to engage in self care activities.
- Second, regular examination of the feet in at-risk individuals is key for early detection of potential issues that could lead to ulceration.
- Third, structured, repeated education is emphasized, targeting patients, their care partners, family members and health-care professionals. Education focuses on raising awareness about diabetic foot risks, self-management, mental health, preventative care and the importance of early intervention.
- Fourth is the critical element of providing recommendations to patients about accessing and wearing appropriate footwear (seasonal). They should also be dissuaded from soaking their feet, as it causes maceration. Footwear protects feet (skin/nails), reduces pressure points and prevents injuries that could lead to pre-ulceration/ulceration.
- Finally, addressing risk factors for ulceration, such as blood glucose levels, skin and nail care, biomechanical abnormalities and footwear issues, forms a critical part of the prevention strategy. These combined efforts aim to significantly reduce the risk of foot ulceration in individuals with diabetes, thereby improving their overall health outcomes.

For the complete version of Best Practice Recommendations for the Prevention and Management of Diabetic Foot Ulcers, visit here.

Figure 2: Monofilament Testing Sites
See Appendix D for additional information on conduction sensation tests (SWMT), the 128 mHz Tuning Fork Vibration Testing, and the Ipswich Touch Test (IpTT) (Light Touch Test).



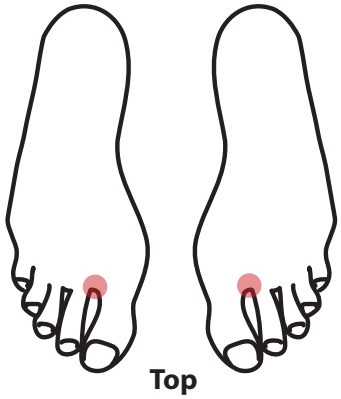


Table 1: Assessing Arterial Flow and Perfusion

Grade	Ankle-Brachial Pressure Index	Toe Brachial Index	Toe Pressure	Waveforms	Transcutaneous Oxygen Pressure (indicating perfusion)
Non-compressible	> 1.40 Be aware of possible **falsely** elevated measures	Preferred when vessels are non-compressible	Preferred when vessels are non-compressible		Preferred when vessels are non-compressible
Normal Range	1.0–1.40	> 0.7	> 70 mmHg	Triphasic	> 40 mmHg
Borderline	0.91–0.99	> 0.6	> 70 mmHg	Biphasic/ monophasic	> 40 mmHg
Abnormal	< 0.90	< 0.6	< 70 mmHg	Biphasic/ monophasic	< 40 mmHg
Mild	0.7–0.9	> 0.4	> 50 mmHg	Biphasic/ monophasic	30–39 mmHg
Moderate	0.41–0.69	> 0.2	> 30 mmHg	Biphasic/ monophasic	20–29 mmHg
Severe	< 0.4 critical limb-threatening ischemia (CLTI)	< 0.2	< 30 mmHg	Monophasic	< 20 mmHg

For the complete version of Best Practice Recommendations for the Prevention and Diabetic Foot Ulcers, visit here.

Assessing the Pathophysiology of the Diabetic Foot

Understanding the pathophysiology of diabetes is very important as it represents an awareness of the physiology of altered health. Pathophysiology deals with the structural and functional changes in the patient's cells, tissues and organs caused by diabetes.

The pathophysiology of diabetic foot complications is directly linked to amputation risk.

Key factors contribute to this risk:

- Peripheral neuropathy (sensory, autonomic, motor) reduces protective foot sensation
- PAD and vascular problems hinder wound healing
- Foot and bony changes affect footwear fit and, along with neuropathy, lead to trauma. Unnoticed, untreated wounds may become infected, further weakened by impaired blood flow, ultimately causing tissue damage,infection, gangrene and, in severe cases, a necessity to amputate to prevent infection spread, other complications and death.

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

A significant risk factor for the development of diabetic foot complications may be the financial cost of managing diabetes. Purchasing protective footwear, prescribed offloading such as pressure redistributing devices (e.g., boots, footwear) for employment, seasonal and leisure activities is unachievable for some patients without financial support. It is therefore essential that an environmental assessment be completed and communicated to the team to determine if the patient has the support in place to engage in a sustainable plan of care and self-management. Other determinants may include language, culture, education level, adequate housing, access to nutritious food and fluids, social networks and access to services or equipment, as well as family knowledge, comfort or capacity in providing support or care. ***It is critical to provide a culturally sensitive environment for care.***

See appendices in DFU BPR for additional screening tools:

- Appendix A: Patient Quality-of-Life Screening Tools
- Appendix B: Care Partner Stress Screening Tools.
- Appendix C: Quality-of-Life Tools and Scales for Persons Experiencing an Amputation and/or Prosthesis

1.2.3 Systems: Health-care support and communication

Determine if an organized, interprofessional, and collaborative approach to care is in place, as it is critical to improve diabetes-associated outcomes. Assess access to funding, availability of services and wound-related products, pressure redistribution (footwear) surfaces, diagnostic services, service delivery personnel and co-ordination of care.

1.3 Complete a wound assessment, if applicable

The choice of wound assessment tool should be consistent across all care settings and supported by education and policy (Table 2). Assess wound and periwound (if present), including callus, size, indications of infection.

The presence or absence of infection and osteomyelitis should be assessed. Assess for infection using the IWII (2022) continuum. Other tests may include swabs, bone biopsy, x-rays, blood tests for inflammatory markers, MRI.

Table 2: Common Classification Systems for Diabetic Foot Ulcers

System	Description	Comments
SINBAD	Site, Ischemia, Neuropathy, Bacterial infection, Area Ulcer, Depth	▪ Simple and quick to use ▪ Requires only clinical examination ▪ Contains necessary information to communicate for triaging purposes
WIfI	Wound Ischemia and Foot Infection Ischemia: based on ABPI or $TcPO_2$, Infection: based on the IWGDF criteria	▪ Estimates the risk of amputation and potential benefit of revascularization ▪ Co-morbidities are not included ▪ With confirmed infection and diagnosed peripheral artery disease, with vascular surgical expertise available this system should be considered
IWGDF/ IDSA	Classification system for the extent of infection and guide for management	▪ Assesses the severity of infection based on levels (1–4) ▪ Diagnosis is based on local or systemic signs and symptoms of inflammation ▪ Adds the presence of bone infection to the level (e.g., 3 [O-osteomyelitis])

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patients' health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easurable, **A**ttainable, **R**elevant and **T**imely.

2.1 Set goals for prevention, healing, non-healing and non-healable wounds

2.1.1 Identify goals based on prevention or healability of wounds

Goals should be relevant to skin and foot health, mental health and well-being and, especially, urgency and timelinessto wound assessment and healing, pain reduction, odour, controlled infection, frequency of dressing changes and need for offloading. Measuring patient outcomes using validated tools is important for research, education and to understand the need for system changes. This includes identifying patient-reported outcome measures (PROMS) that capture the experiences of patients while living with wounds.

2.1.2 Identify quality-of-life and symptom-control goals

Goals may include:

- Awareness of plan of care and the importance of appropriate footwear for prevention
- Lifestyle and environment changed (e.g., smoking cessation, increased physical activity) to reduce risk of re-ulceration within 1 month

For the complete version of Best Practice Recommendations for the Prevention and Diabetic Foot Ulcers, visit here.

A special note on pain: Reducing painful diabetic neuropathy can be a key goal for patients living with diabetic foot complications. According to the Diabetes Canada guidelines, few patients have complete relief of painful symptoms with any treatment, and reduction of 30 to 50% in pain levels is clinically meaningful. For example, a goal might be that neuropathic pain is controlled in 3–7 days with regular reassessments of progress.

Many clinicians struggle with the decisions surrounding limb preservation and need support when exploring all goals of care with the team. It is important to note that some patients may elect to undergo amputation, as the wound may be interfering with their occupation, mental health, social and family support systems, access to care and financial resources.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

An integrated team is necessary to implement, adjust and sustain a plan to meet the patient-specific goals. The team should include the relevant health-care professionals and other service providers as required as well as the patient, family and their support system.

3.1 Identify appropriate health-care professionals and service providers

Team members may include a primary care physician, nurse specialized in wound, ostomy and continence care (NSWOC), wound care clinician, chiropodist/podiatrist, orthotist and/or cast technician, vascular specialist, infectious disease physician, orthopedic surgeon, pedorthist or shoe fitter, diabetes educator, dietitian, social worker or spiritual advisor.

3.2 Enlist the patient and their family and caregivers as part of the team

The team must include the patient and/or their family and care partners, with successful prevention and management of diabetic foot ulcers hinging on their collaboration and communication with other members of the team.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as therapeutic shoes, patient education and clinical visits.***

For the complete version of Best Practice Recommendations for the Prevention and Management of Diabetic Foot Ulcers, visit here.

- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a diabetic foot management program.***
- ***Establish a pathway for referral of people with diabetes with an active foot problem to a multidisciplinary foot care service or foot care service within one working day and triaged within one additional working day.***
- ***Work with community and other partners to develop a process to facilitate patient referral and access to local diabetes resources and health professionals with specialized knowledge in diabetic foot management.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of preventative foot care, including preventative and treatment footwear.***
- ***Ensure foot care services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent diabetic foot ulcers, and to support management in their health-care or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of diabetic foot complications.***
- ***Establish and sustain a communication network between the person with diabetes and the necessary health-care and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

Ensure that the plan addresses the goals of care and considers patient needs, factors relating to the skin and wound (if applicable), as well as the environment and the system in which the team is situated.

For the complete version of Best Practice Recommendations for the Prevention and Diabetic Foot Ulcers, visit here.

4.1 Identify and implement an evidence-informed plan to 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

Identify recommended treatment strategies based on risk. Interventions may include:

- Patient/care partners taught to assess and provide foot care to both feet daily
- Management of blood glucose levels
- Plantar pressure reduced or eliminated through offloading
- Emotional and/or spiritual support
- Professional shoe fitting for BOTH feet
- Education and support around skin care, diabetes management, lifestyle, environment and activities of daily living (ADL) to reduce risk
- Surgical intervention

4.2 Optimize the local wound environment: Cleansing, debriding, managing bacterial balance and managing moisture balance

4.2.1 Cleansing: Cleanse the wound using non-irritating wound cleansers such as potable water, normal saline or commercially prepared wound cleansers, depending on patient needs (see Wounds Canada's Product Pickers, below).

4.2.2 Debriding: Debridement of non-viable tissue, including peri-ulcer callus, to promote wound closure (if appropriate) (see Wounds Canada's Product Pickers, below).

It's not what you put on the foot, it's what you take off the foot.

4.2.3 Managing bacterial balance: Local, spreading or systemic infection must be treated, including osteomyelitis if present (see Wounds Canada's Product Pickers, below).

- In general, mild soft tissue infections require two weeks of oral treatment.
- For more severe soft-tissue infection or for larger necrotic wounds a longer course may be required.
- For osteomyelitis, four to six weeks of antibiotic therapy (IV and/or oral) is recommended, although the duration varies based on severity, chronicity of infection, need for surgical intervention and clinical response.

4.2.4 Managing moisture balance: Moisture can be contained or provided through appropriate dressing selection and is based on wound exudates, reducing periwound skin excoriation, maceration or desiccation (see Wounds Canada's Product Pickers, below).

Wounds Canada's Product Pickers

Offloading Plantar Pressure in Diabetes: helps users choose the most appropriate offloading device for patients with plantar diabetic foot ulcers based on the needs of the patient, their wound and environmental and system factors

Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions

Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations

Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals

For the complete version of Best Practice Recommendations for the Prevention and Management of Diabetic Foot Ulcers, visit here.

4.3 Select the appropriate dressings and/or advanced therapy

- Select products and therapies that will address the local wound environment needs as well as prevent trauma to fragile/friable tissue—including periwound skin (see Wounds Canada's Product Pickers, below).
- Products should support slight moisture at wound base in healable wounds and should not contribute to increased pressure.

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

Education/instruction should be available to all levels of care providers including the patient and care partners on topics such as:

- Potential risks for diabetic foot ulcers
- Daily foot assessment and care
- Diet and exercise
- Use of offloading devices
- Wound care
- Signs of infection
- Self-management

5 Evaluate Outcomes

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

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

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goal(s). If, after the cycle has been completed, the goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.***

5.1 Determine if the outcomes have met the goals of care

Determine if the goals of care have been met use of validated and responsive tools as well as patient feedback. Outcomes may include:

- Blood glucose, blood pressure and weight normalized
- Skin and nail hygiene and care routine in place
- Plantar pressures managed with offloading and appropriate footwear
- Skin remains intact and/or wound closes
- Lifestyle and environmental changes established to decrease risk of skin trauma
- Further skin breakdown prevented, wound stable and not infected

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

When goals of care are not met, go back to Step 1 of the Wound Prevention and Management Cycle. Reassessment needs to consider gaps in care or the patient's ability to adapt to their condition and engage in self-management.

For the complete version of Best Practice Recommendations for the Prevention and Diabetic Foot Ulcers, visit here.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Ensure appropriate discharge planning, including educational materials for patients and their care partners. The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.

If the plan of care is appropriate and the wound is not improving, consider a biopsy to rule out skin disorders or a malignancy.

For additional Wounds Canada resources including monofilaments and brochures, go to:
www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique

Care at Home Series:

- Caring for Your Feet: Safe Foot Care if You Have Diabetes
- Diabetic Foot Complications: When is it an emergency?
- Caring for Your Wound at Home: Changing a Dressing

Diabetes, Healthy Feet and You:

- https://www.woundscanada.ca/for-patients-public/240-diabetic-healthy-feet-and-you/for-patients-and-public/267-information-about-diabetes-and-healthy-feet

BPR BRIEFS

Diabetic Foot Ulcers

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BPR BRIEFS

Burns

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Burns**. In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

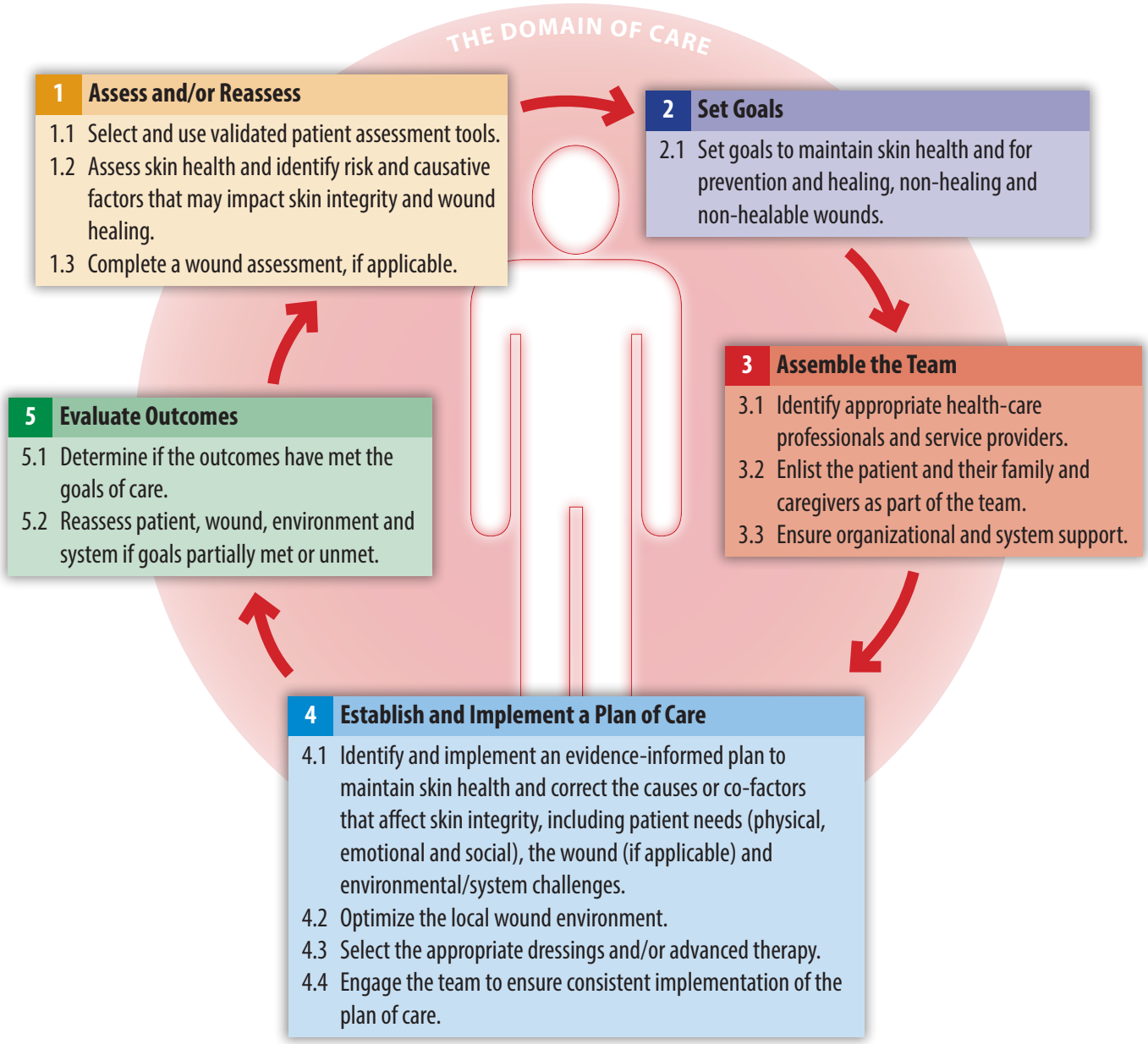
We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1308-bpr-for-the-prevention-and-management-of-burns/file.

Introduction

Burns are injuries to the skin that occur when the skin or other tissues are damaged by contact with heat (scalds from liquids, grease or steam; contact burns; fire, flash or flame), electricity, radiation or chemicals. Burn injuries can be devastating and, without appropriate treatment, can result in slow healing, infection, scar formation and disfigurement, contractures, joint dysfunction, pain, as well as poorer mental health, well being and quality of life (QoL).

Burn victims may have to have multiple surgeries, undergo grafting, wear compression garments for several years and live with physical disability, body image disturbance, disfigurement and emotional and employment (schooling, training) challenges. Infants and children are increasingly vulnerable as they are growing, and the burn scarring and skin contracture lead to long-term care needs.

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must take place to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status, skin status, baseline skin tone (and wound status), if applicable, environmental factors and system factors. If, after the WPMC has been completed, the goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC steps. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools

The use of validated and standardized patient and risk assessment tools is essential for identifying factors that may impede healing and quality of life and for providing direction for preventative care or management.

- **Burn size:** The Lund and Browder chart, and Wallace's 'rule of nines' both estimate the total body surface area (TBSA) of a burn injury.
- **Burn severity:** The Hand Burn Severity (HABS) score was devised and validatded to assess burn severity.
- **Wound assessment tools:** Currently there are no burn-specific wound assessment tools.
- **Mortality risk assessment:** The FLAMES score is a validated tool that can predict burn injury related mortality. Frailty is also a predictor of adverse outcomes for patients with burns.
- **Scar assessment:** Examples of validated scar assessment scales include the Matching Assessment of Scars and Photographs, Patient and Observer Scar Assessment Scale, Satisfaction with Appearance Scale and Vancouver Burn Scar Assessment Scale.
- **Pain assessment:** Currently there are no burn-injury-specific pain assessment tools. Examples of validated pain assessment tools that could be used to assess for burn injury pain include the visual analogue scale, numeric rating scale, verbal rating scale, the Brief Pain Inventory and the McGill pain questionnaire, among others.
- **Anxiety assessment:** The Burn Specific Pain Anxiety Scale is a valid and reliable tool that provides a standardized approach for identifying burn patients with feelings of anxiety and worry who require further assessment and intervention. Researchers also discuss the role of massage therapy in pain and anxiety reduction.
- **Nutrition screening:** Examples of validated nutritional screening tools that could be considered for use with burn injury patients include the Subjective Global Assessment, the Malnutrition Screening Tool, the Nutrition Risk Screening-2002, the Malnutrition Universal Screening Tool, the Subjective Nutrition Assessment Questionnaire and the Canadian Nutrition Screening Tool.
- **Quality-of-life (QoL) assessment:** Examples of validated tools to assess burn-injury-related QoL include the Burn Specific Health Scale-Abbreviated, Burn Specific Health Scale-Revised, and Burn Specific Health Scale-Brief.
- **Coping assessment:** The Coping with Burns Questionnaire was developed to measure coping after discharge and is based on the theory of coping as a process.

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

- **Empowerment:** Empowerment is an important aspect of emotional care. Patients may benefit from activities that support skill building in stress management, adaptability to coping, social reintegration, emotion regulation, and problem-solving.

1.2 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds

According to the Canadian Hospitals Injury Reporting and Prevention Program (CHIRRP) database, in 2013 the five most common causes of burn injuries are:

Table 1: Highest Risk for Burn Type by Age and Sex

Burns Cause	Most at Risk (by Age and Sex)
Scalds: Includes contact with hot water, steam, food, oil, grease, liquid glue or liquid wax	Children under 1 year
Fire, flame, smoke (highest proportion)	Males aged 50–64 Females aged 20–29
Fire, flame, smoke (highest count)	Males aged 15–19
Sunburns (highest proportions)	Males/females aged 20–29
Electrical (highest proportion)	Males under 1 year Males 20–29 years
Electrical (highest count)	Males aged 2–4 years

Athough children and the elderly are most vulnerable to burn injury, those who cannot recognize or react to a dangerous burn-risk situation are at increased risk for burn injury, including persons with cognitive or mental impairment, impaired mobility and/or sensation, musculoskeletal or nervous system disorders, and/or mental illness. Recent rises in substance use have increased risks of burn complications, length of hospital stay and use of critical care services.

1.2.1 Physical

Primary Survey: evaluate all people with burn injuries requiring or receiving assessment by a health-care professional first using the ABCDEF mnemonic, listed in the order of priority, to identify any life-threatening injuries:

- **Airway:** Assess for airway obstruction and for injuries that are physically restricting breathing.
- **Breathing:** Evaluate breathing and ventilation. Watch for chest movement, auscultate and percuss to detect any conditions impeding ventilation.
- **Circulation:** Assess for signs of bleeding, hypovolemia and burn shock.
- **Disability:** Complete a neurological assessment to establish the patient's level of consciousness, pupil size/symmetry/reaction and evidence of spinal cord injury or compartment syndrome.
- **Exposure:** Expose the patient's skin to more accurately determine the area of burn injury.
- **Fluid resuscitation:** Assess the need for fluid resuscitation to combat the profound loss of intravascular fluid into the interstitial space.
- **Upper Gastrointestinal Burns:** Ingestion of caustic materials may cause chemical burns to the oropharynx, tongue, esophagus, stomach and duodenum. Laryngeal edema may occur, producing upper airway obstructions.

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

Secondary survey begins once the primary survey has been completed and resuscitation is successfully underway. It includes:

- A head-to-toe examination to rule out secondary injuries
- Completion of a systematic and detailed history of the patient's general health
- The identification of specific issues related to the burn injury
- A wound (burn injury) assessment
- Quality-of-life (QoL) assessment: Burn injuries may have profound physical/aesthetic, psychological, social and vocational consequences. Individuals with burn injuries may have to cope with itching, tightness to skin and changes to functional ability. To optimize the rehabilitation of a patient with a burn, it is important to assess the predictors of health-related quality of life (HRQL).

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

Assess income, employment and working conditions, food security, environment and housing, early childhood development, education and literacy, social support and connectedness, health behaviours and access to health care. It is critical to provide a culturally sensitive environment for care.

1.2.3 Systems: Health-care support and communication

A systems assessment takes into consideration the patient's access to emergency services, funding, availability of support services and wound-related products, devices, diagnostic services, service delivery personnel and co-ordination of care, all of which vary widely from province/ territory and from one interprovincial/ interterritorial region to another.

Health-care support and communication can even vary from one service delivery site to another. When setting patient goals and developing a plan of care, early communication with the care partner and/or family, clinicians must take into consideration the patient's access to health-care supports, as an organized, interprofessional and collaborative approach to care is critical to improving burn-injury-related outcomes.

1.3 Complete a wound assessment, if applicable

Burn injury assessment: When assessing a burn injury, it is important to determine the underlying cause or mechanism of the injury—this is key as the cause influences the pathophysiology of the injury and its management—burn depth and size, and severity of the burn injury. Assessment of the burn can help the team to determine the ability of the person to heal their burn injury, plan treatment, facilitate communication, monitor treatment and predict and verify outcomes.

Locally, a burn may be divided into three zones:

1. Zone of Coagulation

- Centre of the wound – the area that had the most contact with the burn source
- Irreversible full-thickness tissue damage with no tissue perfusion
- Tissue appears white or charred and will not recover.

2. Zone of Stasis

- Surrounds the zone of coagulation
- Deep partial-thickness injury with decreased tissue perfusion
- Tissue appears red initially and later turns white and may blanche with pressure. Petechial hemorrhages may be present
- With good management, tissue will likely recover.

3. Zone of Hyperemia

- At the periphery of the wound
- Superficial partial-thickness injury with good tissue perfusion
- Tissue appears red, blanches with pressure and will likely recover.

Note: SUPERFICIAL (FIRST DEGREE) BURNS ARE NOT INCLUDED IN THE CALCULATION OF BURN SIZE (SURFACE AREA).

Mechanism of Injury

- Heat-related burn injuries vary in depth and size and are caused by scalds from liquids spilled or liquid immersion, grease or steam; contact burns and fire, flash or flame. The severity of the injury is related to the rate at which the heat is transferred from the heating agent to the skin, which depends on the heat capacity and temperature of the agent, duration of contact with the agent, transfer coefficient, and heat and conductivity of the local tissue.
- Scalds tend to be superficial partial-thickness tissue damage and may involve a large area of skin.
- Immersion scalds can result in more severe burn injuries because of the increased duration of contact between the heat agent and the skin. Such burns can cover a large skin area.
- Contact burns tend to cause deep partial-thickness or full-thickness tissue damage and involve less skin area than other types of burns.
- Flame injuries are of various depths (superficial partial-thickness to full-thickness) and cover varied amounts of skin.
- Cold-related burns may occur through exposure to extreme cold. Across the spectrum of tissue damage patients may experience a freezing injury (FI) from frostnip, to superficial injury, to deep tissue freezing caused by crystallization of water in the cells, which may cause ischemia, leading to skin necrosis and damage to the deeper tissues. The Hennepin Score may be used to quantify injury and tissue loss of frost-bite injury, similar to TBSA calculators in burn patients.
- Electrical burns outwardly may not reflect the true extent of the injury, as internal tissue and organ damage may have ensued. The extent of electrical burns is related to the voltage of the current. With low-voltage electrical burns, small, deep burns are seen at the contact points. Assessing the contact points help to determine the probable path of the electrical current and thus the potential areas of injury is required. High-voltage burns (> 1,000 volts) may cause extensive deep tissue damage, limb loss and death.
- Radiation burns are injuries to the skin or tissue caused by exposure to ultraviolet rays (sunburn), radiation therapy for cancer treatment and, in rarer instances, nuclear emissions or explosions
- The extent and depth of a chemical burn is directly proportional to the amount, type and strength of the agent, its concentration, extent of penetration, mechanism of action and length of contact time with the skin/tissue. Chemicals will continue to destroy tissue until inactivated by reaction with tissues, neutralized, brushed off (powders), or diluted with the appropriate neutralizing agent (it is important to note that, in some cases, water may favour skin disruption*)
- At the periphery of the wound
- Superficial partial-thickness injury with good tissue perfusion
- Tissue appears red, blanches with pressure and will likely recover

Burns can also be characterized by depth of injury (see Table 2).

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

Table 2: Characteristics of Burn Types According to Depth

Classification	Depth of Injury	Appearance	Sensation	Most Common Cause of Injury
Superficial (first degree)	▪ Epidermis	▪ Intact skin (red, shiny) ▪ Blanchable erythema and mild edema ▪ Brisk capillary refill ▪ No blisters ▪ May scar	▪ Tactile and pain sensation intact ▪ Pain ranging from itching to sharp	▪ Scalds from spilled liquids (low viscosity) ▪ Electrical flash ▪ Sunburn
Superficial partial thickness (second degree)	▪ Epidermis with partial-thickness loss of dermis ▪ Dermal appendages intact	▪ Blanchable erythema ▪ Brisk capillary refill ▪ Intact or ruptured thin-walled serum-filled blisters (blisters may increase in size) ▪ If blisters ruptured, tissue is pink or red and moist ▪ Mild to moderate edema	▪ Sharp pain. Potential residual sensitivity to sun, cold, friction, months after healing. Possible residual pruritus[67]	▪ Scalds from spilled liquids (low viscosity) or steam ▪ Electrical flash ▪ Brief exposure to flame ▪ Brief contact with hot object ▪ Sunburn
Deep partial thickness (deep second degree)	▪ Epidermis with deep partial-thickness, loss of dermis ▪ Underlying structures are not exposed. ▪ Some dermal appendages intact	▪ Non-blanchable erythema ▪ Sluggish capillary refill ▪ Intact or ruptured thick-walled serum-filled blisters (blisters may increase in size) ▪ If blisters ruptured, tissue is blotchy/mottled, cherry red/blanched white and dry (plaque like) ▪ Will scar and may require surgery	▪ Deep pressure ▪ sensation intact ▪ Pinprick sensation ▪ absent ▪ Variable pain sensation	▪ Scalds from spilled liquids (low and high viscosity) or steam ▪ Exposure to flame ▪ Contact with hot object
Full-thickness (fourth degree)	▪ Full- thickness skin/tissue loss ▪ Exposed or directly palpable underlying structures (muscles, fat, bones, tendons) ▪ Dermal appendages destroyed	▪ Non-blanchable ▪ Tissue leathery, pale, mottled, red/ brown/ white in colour and dry ▪ Eschar may be present ▪ Thrombosed vessels visible (dry, carbonization, no blisters) ▪ Involves deeper tissues, and frequently leads to loss of the burned part	▪ Insensitive to pain and pressure; pain may be present at the periphery, and absent at the level of the burn	▪ Prolonged liquid immersion scald ▪ Prolonged contact with hot flame, hot objects, or chemicals ▪ Electricity

Adapted from the Ross Tilley Burn Centre

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patients' health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easureable, **A**ttainable, **R**elevant and **T**imely.

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds

Burn injury prevention should be considered a primary safety goal for all people and in all employment, home and social settings.

2.1.1 Identify goals based on prevention or healability of wounds

Where burn injury already exists, the most common goals must relate to the overall healing ability. Timeframes to accomplish goals are dependent on the depth and severity of the burn and may include:

- Prevent further progression of burn depth using cool water for for 20 minutes, once the causal agent has been identified,
- Wound closure, stabilization or prevention of deterioration,
- Reduction in the amount of necrotic tissue,
- Reduced bacterial burden or prevention of increased bacterial burden,
- Establishment or maintenance of an appropriate amount of wound moisture,
- Decreased number of dressing changes,
- Prevention of scarring or improved scar quality,
- Limb preservation,
- Improved nutrition and hydration and
- Mental health and well-being, and spiritual care

2.1.2 Identify quality-of-life and symptom-control goals

A comprehensive patient, wound, environment and systems assessment will also allow for the development of goals related to the impact of the burn injury on the patient's daily life. Such goals may include:

- Pain reduction and management,
- Reduction and management of wound-related itch,
- Maintaining or improving joint range of motion and function of the burn-injured area,
- Contracture reduction,
- Restoration of independence,
- Return to work, home, school or leisure activities,
- Reduced anxiety and/or psychological stress and
- Improved coping mechanisms and supported spirituality

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

Prevention, assessment and management of burn injuries require the collaboration of an integrated team to optimize the patient's overall health and well-being. The team must work closely and collaboratively to address the complex physical, emotional and social impacts of surviving a burn injury, and create and implement a sustainable plan of care based on the identified goals.

3.1 Identify appropriate health-care professionals and service providers

Team members may include first responders, anesthesiologists, nurse practitioners, burn nurse, burn surgeons, critical care specialists and post-critical care physicians, physiatrists, physician assistants, emergency room clinician, occupational therapist and assistant, pharmacist, physiotherapist and assistant, respiratory therapist, counsellor, social worker, psychologist, psychiatrist, speech language pathologist, spiritual care, and vocational/educational specialists.

3.2 Enlist the patient and their family and caregivers as part of the team

The success of a plan of care for the prevention and management of burn injuries hinges on the collaboration of the person with the burn injury (or at risk), their support system and communication among the integrated, collaborative team involved in the development of the plan of care.

For pediatric patients, parents or legal guardians need to be part of the care-planning team and for those with cognitive impairment, the assignee of their Power of Attorney for Personal Care.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

Successful burn injury programs are designed and evaluated in collaboration with clinical practice leaders, educators, policy makers and administrators at a local, regional, provincial/territorial and national level. To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as resources, patient education and clinical visits.***
- ***Develop and implement policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a burn prevention and management program.***
- ***Work with community and other partners to develop a process to facilitate patient referral and access to local health professionals with specialized knowledge in burn management.***

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

- ***Work with community and other partners to advocate for strategies and funding for all aspects of burn prevention.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

The development and implementation of a sustainable plan of care must be based on the identified goals and be collaboratively created with the patient, their family and care partners, and relevant health-care team members.

4.1 Identify and implement an evidence-informed plan to support healthy skin, to 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

Burn Prevention
Identify risk factors, provide education and heighten awareness of individual risk. Encourage people to practice strategies to decrease their level of burn injury risk at home, employment, social, educational or play.

Management – Primary Survey
After ensuring personal safety, the top priority of care for patients who have experienced a burn injury is to stop the burning process by:

- removing the heat source for patients who have experienced a thermal injury
- turning off the electricity supply for those with electrical burns
- brushing off dry chemicals or diluting liquid chemicals with water for those who have experienced chemical burns
- removing the patient from the source of radiation for those with radiation burns

In conjunction with the treatment of life-threatening injuries, most burn injuries need to be cooled. Thermal burns should be cooled with clean, tepid running water or wet towels and compresses to stop the burning process, limit tissue damage, minimize swelling, cleanse the wound and aid in pain control. Very cold water

and ice should not be used to cool burn injuries, as these can cause local vasoconstriction, which can increase tissue damage and may contribute to hypothermia.

For freezing injuries, moist rewarming, possible thrombolysis and watchful waiting are recommended. Organizations should have frostbite protocols in place for providers and regular education should be available.

- Once the initial treatment phase has passed in severely affected or symptomatic individuals or those at risk for re-injury, consider an assessment of quantitative peripheral sensory testing, using a tool such as Semmes-Weinstein monofilament.
- Freezing injuries, like other cold injuries, should be treated as an acute traumatic injury.
- Rewarm actively and rapidly in a water bath (40–42°C).
- Passive rewarming is only acceptable when the first option is unavailable.
- Have the patient avoid nicotine or other vasoconstrictors during the period of rewarming.
- Provide thrombolytic therapy to identified candidate patients but only in an appropriate medical setting.
- Debride necrotic tissue, if necessary, at a later stage and only after completion of the rewarming cycle.
- Provide supportive care of post-injury nerve and skin damage.
- Educate patients to prevent repeat injury.

Chemical burns require copious irrigation with tepid water or an appropriate antidote to remove the corrosive agent and stop the burning process. This irrigation process may be lengthy, e.g., 15–120 minutes, and should continue until the patient stops complaining of discomfort and the tissue pH normalizes. Electrical burns should not be irrigated.

All people with burn injuries who require care by a health professional, should then be provided care using the **ABCDEF mnemonic,** listed in the order of priority, to treat any life-threatening injuries:

- **Airway:** If the patient has an airway obstruction or an injury that is physically restricting breathing, attain and maintain an airway.
- **Breathing:** If the patient is not breathing, immediately initiate cardiopulmonary resuscitation (CPR). In addition, treat any conditions impeding ventilation.
- **Circulation:** If the patient is bleeding or has hypovolemia or burn shock, treat accordingly.
- **Disability:** If the patient presents with an altered level of consciousness, it is imperative to treat the underlying cause, e.g., hypoxia secondary to carboxyhaemoglobin level or hypovolemia. In addition, a fasciotomy may be required to treat compartment syndrome affecting a limb.
- **Fluid resuscitation:** For patients with major (complex) burns, e.g., TBSA > 10–15%, fluid resuscitation is key to combating the profound loss of intravascular fluid into the interstitial space, which can lead to organ dysfunction and death, and should be initiated as soon as possible after injury (ideally pre-hospitalization).

To access the updated American Burn Association (2022) Burn Patient Referral criteria for transfer of a patient to a burn unit, visit https://ameriburn.org/aba-releases-new-guidelines-for-burn-patient-referral/.

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

Management – Secondary Survey

The secondary survey should commence to diagnose any other injuries from head to toe, including the depth and extent of burn injuries. Once this thorough survey has been performed, appropriate and targeted treatment and management can begin. This includes correcting any modifiable comorbidities assessed during the detailed patient history that may negatively impact wound healing and general burn injury recovery.

Management – Burn Pain

The type and intensity of pain must be taken into consideration.

Table 3: Criteria for Transfer to a Burn Unit

	Immediate Consultation with Consideration for Transfer	Consultation Recommendation
Thermal burns	▪ Full-thickness burns ▪ Partial thickness ≥ 10% TBSA ▪ Any deep partial- or full-thickness burns involving the face, hands, genitalia, feet, perineum or over any joints ▪ Patients with burns and other comorbidities ▪ Patients with concomitant traumatic injuries ▪ Poorly controlled pain	▪ Partial-thickness burns < 10% TBSA ▪ All potentially deep burns of any size
Inhalation injury	▪ All patient with suspected inhalation injury	▪ Patient with signs of potential inhalation such as facial flash burns, singed facial hairs or smoke exposure
Pediatrics (less than or equal to 14 years or < 30 kg)	▪ All pediatric burns may benefit from burn centre referral due to pain, dressing change needs, rehabilitation, patient/caregiver needs or non-accidental trauma	
Chemical injuries	▪ All chemical injuries	
Electrical injuries	▪ All high-voltage (≥ 1,000 volts) electrical injuries ▪ Lightning injury	▪ Low-voltage (< 1,000 volts) electrical injuries should receive consultation and consideration for follow-up in a burn centre to screen for delayed symptom onset and vision problems

Consider non-pharmalogical interventions that may also be of assistance with pain management.

Quality-of-life (QoL): Once psychosocial issues such as anxiety, depression and post-traumatic stress disorder are identified, appropriate interventions, referrals and education need to occur. Treatment and intervention options may include coping self-efficacy, cognitive behavioural therapy, medications to treat anxiety and depression, and peer support groups.

Nutrition: Metabolic and nutritional management plays a vital role in the management of burn injuries. Proportionate to the severity of the injury, patients with major burn injuries often experience oxidative stress, intense inflammatory response and a long hypermetabolic and catabolic response. Such patients require the initiation of nutritional therapy, preferably by the enteral route, within 12 hours of the burn injury.

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

Physical therapy: Therapeutic exercise with the burn survivor should be goal oriented and directed at reducing the effects of immobilization, maintaining or improving function and strength and elongating scar tissue. Then, rehabilitative exercise should include stretching, strengthening, cardiovascular training and functional activities. Positioning and splinting of the burn patient become increasingly important as the TBSA increases. Larger TBSA burns will require specialized sleep surfaces along with positioning devices within the patient's bed environment. Minor burn injuries may simply require a supportive splint for the affected area. Rehabilitation may include:

- Strengthening exercises, resistance training
- Cardiopulmonary rehabilitation
- Return to work activities
- Positioning and splinting
- Orthoses
- Scar prevention and management (e.g., laser therapy, compression therapy, scar managment, pressure garment therapy, injection of fat).

4.2 Optimize the local wound environment: Cleansing, debriding, managing bacterial balance and managing moisture balance.

Local wound management strategies should be part of the plan of care and fit within the context of the overall healability of the burn injury. To optimize the local wound environment, clinicians must consider wound cleansing and debridement, management of bacterial burden and moisture control.

4.2.1 Cleansing

Cleansing solutions commonly used in wound management include sterile normal saline, sterile water, potable tap water, commercial wound cleansers and liquid antiseptics. Such cleansing solutions may be appropriate in the management of burn injuries depending on the goals of care.

Expert opinion recommends that sterile solutions be used for acute burn injury management and in situations where underlying structures are exposed, to cleanse tunnels or sinuses, where the patient is immune-compromised or is suffering from a current wound infection (or has a history of recurrent wound infections), or in situations where potable tap water is inaccessible or the environment in which the wound is being cleansed is less than hygienic. (See Wounds Canada's Product Pickers, below.)

4.2.2 Debriding

Debridement serves to remove microbes, foreign bodies, debris and non-viable tissue from a wound to promote wound closure. Like with wound cleansing, the appropriate method of debridement needs to be determined based on the needs of the patient and the wound, the environment, available resources and the scope of practice of the person completing the debridement.

Biological, mechanical, hydrosurgical, chemical, autolytic and enzymatic debridement methods have all been reported in the literature as effective debridement options for burn injuries to various degrees, although most research focuses on surgical debridement of major burn injuries to facilitate wound coverage (either using xenografts, allografts, autografts or skin substitutes) and reconstruction. (See Wounds Canada's Product Pickers, below.)

Debriding Blisters: If blisters are greater than 1 cm2, are filled with cloudy serous fluid or blood, are in an area where they are prone to break with routine activities or are impeding joint function they should be deroofed. All blisters secondary to chemical burns should be deroofed. Areas that are difficult to debride include the interweb spaces of the feet and hands, thin areas on the face and dorsum of the hands and areas that are edematous secondary to fluid resuscitation.

4.2.3 Managing Bacterial Balance

Acute burn injury infections are one of the most serious complications. Infections contribute significantly to burn morbidity and mortality. Infections are the result of the interruption in the skin's barrier, immune dysfunction and from invasive procedures. Management must focus on optimizing the host response, reducing the number or virulence of microorganisms in the wound and optimizing the wound environment. Jeschke et al. discuss the importance of topical antimicrobials as the mainstay of non-surgical burn treatment; no one dressing or agent is superior, and antimicrobial choice is often determined by the burn unit product/dressing availability, the preference of the staff and historical experience. Strategies to manage bacterial burden at the surface of the burn wound include prophylactic and therapeutic use of topical antiseptics and antimicrobials. (Table 4).

Table 4: Common Topical Antimicrobials Used in Burn Management

Agent	Description
Silver dressings*	▪ Silver-containing calcium alginates, foams, gels, gelling fibres and non-adherent synthetic contact layers ▪ Some formulations kill bacteria within the dressing, others release silver into the wound bed itself ▪ Broad-spectrum coverage ▪ May be toxic in high concentrations to fibroblasts and keratinocytes or if not delivered in a sustained release manner ▪ Most require less frequent dressing changes (except for the silver gel)
Honey (medical grade)	▪ Leptospermum honey-containing calcium alginates, gels and pastes ▪ Biocidal effect is multifactorial ▪ Broad-spectrum coverage ▪ Low toxicity ▪ Most require less frequent applications (except for the gel and paste) ▪ Promotes autolytic debridement
PMHB (Polyhexamethylene biguanide)	▪ Polyhexamethylene biguanide (PHMB)-containing ribbon gauze, gauze squares, transfer foam, foam, gel and non-adherent synthetic contact layer ▪ Bacteria kill occurs largely in/on the dressing ▪ Broad-spectrum coverage ▪ Low toxicity ▪ Most require less frequent dressing changes (except for the PMHB gel)
Gentian Violet/ Methylene Blue	▪ Gentian violet- and methylene blue-containing polyvinyl alcohol or polyurethane foam ▪ Biocidal effect is multifactorial ▪ Broad spectrum coverage ▪ Non-cytotoxic ▪ Require less frequent dressing changes
Hypochlorous acid (NaOCL/ HOCL)[170]	▪ Broad spectrum coverage ▪ Used for multi-drug resistant organisms (MDRO) ▪ Penetrates biofilm rapidly, killing formations from within; does not promote resistant bacteria strains

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OCT (Octenidine Dihydro-chloride)[165]	▪ Broad spectrum coverage ▪ Eradicates bacterial biofilm for up to 72 hours ▪ Gel, irrigation and surfactant preparations ▪ Does not promote bacterial resistance ▪ Good tissue tolerability, not shown to disrupt healing ▪ Anaphylaxis and allergic response rarely observed
PVP-I (Iodophors (Poly-vinyl alcohol)	▪ Knitted viscose fabric impregnated with polyethylene glycol containing 1% povidone iodine ▪ Biocidal ▪ Broad spectrum coverage ▪ Require less frequent dressing changes ▪ Used specifically for prevention of infection in minor burns
Silver sulfadiazine (SSD) cream	▪ Topical, water-soluble cream containing 1% silver sulfadiazine ▪ Bacteriostatic ▪ Broad-spectrum, but lacks fungal and vancomycin-resistant enterococci activity ▪ Has cytotoxic effects on fibroblasts and keratinocytes and may delay healing of superficial burns71 ▪ May create a pseudo eschar ▪ Once-daily dressing change versus twice daily171 ▪ Avoid in patients with sulfonamide allergies (sulfa) ▪ Avoid applying to the face as in rare cases localized argyria may develop172-174
***A Note on Silver Dressings** The 2018 International Society for Burn Injuries (ISBI) Practice Guidelines for Burn Care made the following recommendations for the use of silver as a topical agent: "Silver-containing compounds and dressings are effective topical antimicrobial agents. However, silver also has cytotoxic effects which may delay wound healing. Silver-based topical agents are appropriate for deeper burns (essentially those awaiting surgery)". (ISBI 2018).	

Adapted from: International Wounds Infection Institute, 2022.

Common organisms in critically ill burn-injured patients with bacteremia include *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella*, *Escherichia coli*, *Enterococcus* and *Acinetobacter* species. Such infections typically require surgical debridement of the involved tissue in conjunction with systemic broad-spectrum antimicrobials. The International Wound Infection Institute has created several enablers for optimal infection management that can be useful tools for clinicians. Resources can be found at https://woundinfection-institute.com/wp-content/uploads/IWII-CD-2022-web-1.pdf.

4.2.4 Managing Moisture Balance

Moisture balance within the wound base can be achieved through appropriate dressing selection and dressing change frequency (see Wounds Canada's Product Pickers, below). Increased wound exudate can also be a sign of increased trauma or infection, so assess the wound closely prior to dressing selection.

Wounds Canada's Product Pickers

Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions

Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations

Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

4.3 Select the appropriate dressings and/or advanced therapy

A good burn-injury dressing has the following characteristics (where indicated):

- Promotes autolytic debridement of non-viable tissue
- Protects against infection and environmental contamination/trauma
- Maintains a moist wound environment while containing or wicking away excess moisture
- Reduces evaporative losses
- Is non-adherent to protect delicate skin
- Contours easily and conforms to the wound bed
- Aids with splinting or immobilization
- Is esthetically pleasing
- Is easy to apply and remove
- Is painless on application and with wear and removal
- Is cost-effective (inclusive of the cost of the product, frequency of dressing change and the cost of health-care professional time)

Common dressings used in burn management can be found here. For more information, see Wounds Canada's Product Picker for Dressing Selection.

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

To ensure the best experiences and outcomes for patients with burn injuries, it is imperative that health-care professionals involved in the care of people with burns keep abreast of current research and innovations in burn wound management.

5 Evaluate Outcomes

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

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

5.1 Determine if the outcomes have met the goals of care

Routine reassessment using validated tools helps clinicians determine if the goals of the prevention and/or the treatment plan have been met. In addition, at discharge, the plan of care needs to be revisited and revised as needed to ensure that appropriate self-management strategies are in place to support the patient to sustain outcomes.

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

When the goals of care have not been met in a timely manner it is imperative to go back to Step 1 of the Wound Prevention and Management Cycle: Assess and/or Reassess. Careful re-assessment of the patient, their wound and environment and systems factors will most often reveal modifiable factors that can be addressed. Reassessment needs to consider gaps in care or the person's ability to adapt to their condition and engage in self-management.

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

At discharge, people with or at risk for burn injuries and their care partners require information regarding the cause and risk factors for burn injuries as well as their risk for re-injury. Both formal and information educational methods are beneficial, including the use of standardized patient-education materials as well as individualized demonstration and review of prevention and management techniques.

Specific teaching relevant to a newly closed burn injury includes:

- **Skin care:** For at least 12 months post closure, burn-injured skin requires daily (or more frequent) cleansing and moisturization (using an emollient). Products that are pH balanced, non-scented and non-sensitizing are preferred. Fragile tissue should be protected from the sun during this period as it is more prone to sunburn, and sun exposure may cause further pigmentation changes.
- **Burn itch:** Itchiness at the site of the burn injury is common post wound closure and can be worsened by heat, stress and physical activity. Keeping the tissue moisturized and the area cool, relaxation, distraction, and use of pressure garments are some non-pharmacological techniques for reducing itch. Topical and oral antihistamines may be required to manage itch.
- **Hypertrophic scarring:** Burn wounds heal with the formation of scar tissue. The amount of scar produced generally relates to the depth of the injury sustained. If not managed appropriately, the injured area may become hypertrophic. Scarring that crosses a joint can cause contracture and, as a result, decreased function of the area. The average length of time for a burn scar to mature can be two years or more. Treatment of hypertrophic burn scars involves a number of different modalities, including the application of pressure and silicone therapy and burn scar massage.

For more information on common expected burn outcomes by burn depth, see **(Hyperlink back to burns BPR table 14)**

Burn prevention is key to both people with burn injuries and those at risk for such injuries, and simple safety measures can reduce the risk of burn injury.

For additional Wounds Canada resources go to: www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

Care at Home Series:

- Burns: Preventing and Managing Skin Injuries
- Caring for Your Wound at Home: Changing a Dressing

For the complete version of Best Practice Recommendations for the Prevention and Management of Burns, visit here.

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BPR BRIEFS

Venous Leg Ulcers

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers.** In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1521-wc-bpr-prevention-and-management-of-venous-leg-ulcers-1874e-final/file.

Introduction

A venous leg ulcer (VLU) is an opening in the skin of the leg or foot in an area affected by sustained venous hypertension. ***VLUs lead to approximately 60 to 80% of lower leg ulcers,*** with the challenge that only 60% heal on average by 12 weeks, and once healed, 75% will recur within three weeks.

The pathophysiology of lower leg ulcers is associated with sustained venous hypertension due to CVI, including failure of the calf-muscle pump (CMP), incompetent valves and reflux in the venous leg system.

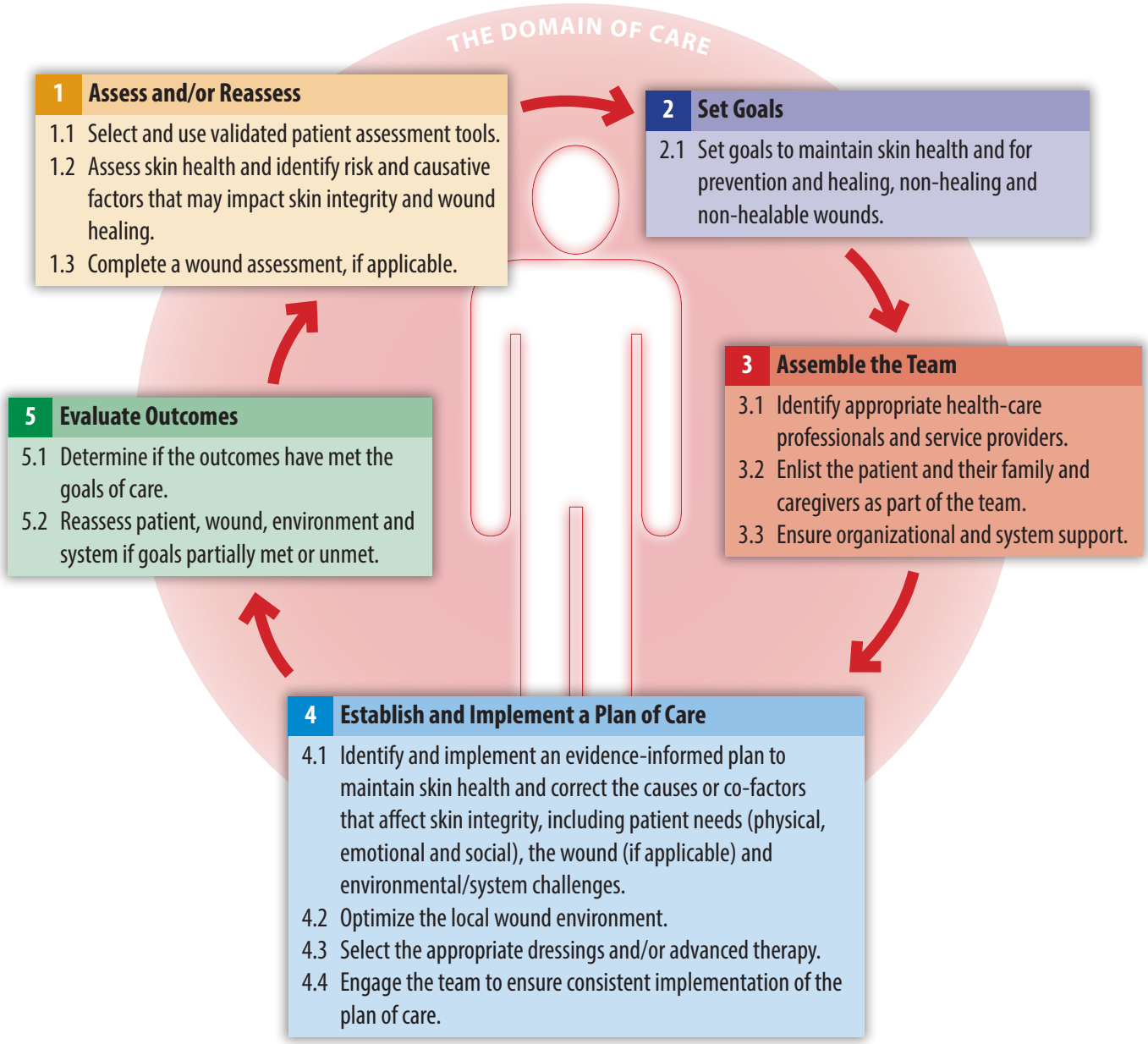
Each of these underlying issues together or singularly could contribute to reduced healing. Leg changes associated with venous disease are present in 10 to 35% of adults in the United States. This can lead to venous leg ulcers, which affect approximately 1% of the population (prevalence 0.12 to 1.69%); with age this prevalence increases to 4% in people older than 65 years.

VLUs are common and often recurrent and may result in significant economic and social burden to the patient, care partners, family and health-care system. Patient QOL is usually negatively affected. The role of compression has become well-established as a first-line therapy.

Edema which persists for more than three months and is minimally responsive to limb elevation and/or diuretics is defined as chronic edema. All chronic edema involves some lymphatic dysfunction and is appropriately classified as lymphedema (LE). For more information specific to lymphedema, see Chapter 13: Prevention and Management of Wounds Related to Lower Limb Lymphedema. As well consult the Canadian Lymphedema Framework (CLF) at https://www.canadalymph.ca/.

Disclaimer: *This document provides a brief clinical enabler for the content provided in the relevant chapter(s) of Best Practice Recommendations for Skin Health and Wound Management 2025. It is not intended to provide comprehensive information on the given topic(s). For more complete information on specific best practice recommendations, refer to the full publication at: https://www.woundscanada.ca/news/752-bpr-new*

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status; skin status (and wound status, if applicable); environmental factors and system factors. If, after the WPMC has been completed, goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC steps. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools

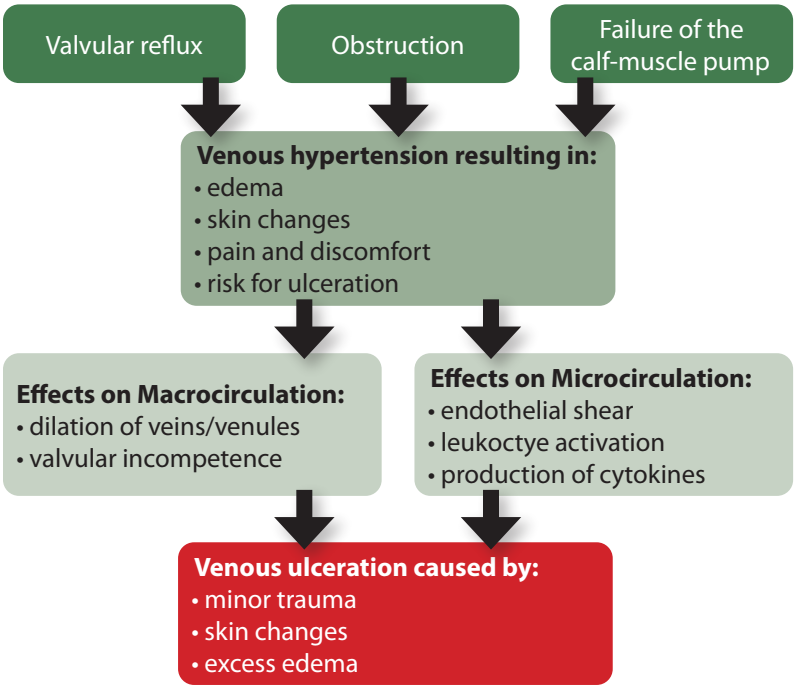
- Clinical-Etiology-Anatomy-Pathophysiology (CEAP) classification system is an international consensus method used to categorize chronic venous disorders and provide the clinician with a structured framework.
- Leg Ulcer Measurement Tool (LUMT) consists of domains and parameters to systematically assess leg ulcers and aid in assessing changes in wound healing.

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

Table 1: Risk Factors Associated with Venous-related Complications

Causes	Reflux	Obstruction	Failure of the Calf-muscle Pump	Other
Risks	▪ High body mass index (obesity) ▪ Multiple pregnancies ▪ Prolonged sitting or standing ▪ History of varicose vein stripping	▪ History of deep vein thrombosis (DVT) ▪ May-Thurner syndrome (anatomic variant at the left iliac vein)	▪ Joint issues in the lower extremity (ankle and leg) ▪ Surgery trauma ▪ Shuffling gait ▪ Medical conditions such as Parkinson's Disease and others	▪ Medications (e.g., hydroxyurea methotrexate) ▪ Family history ▪ Female > Male ▪ Genetic conditions: Ehler-Danlos syndrome, Klippel-Trenaunay syndrome

Figure 2: Pathophysiology for the Development of a Venous Leg Ulcer



1.2.1 Patient: Physical, emotional and lifestyle

Table 2: Components of the History and Physical Examination to Detect Chronic Vein Insufficiency (CVI)

History	▪ Risk factors for venous or arterial disease ▪ Co-occuring conditions (diabetes mellitus, connective tissue diseases, inflammatory conditions), arterial risk factors ▪ History of the ulcer(s) and recurrence and treatments used, tests conducted and effectiveness
Bedside examination	▪ Blood pressure (BP) ▪ Lower leg examination and ulcer characteristics ▪ Pulses: femoral, popliteal, dorsal pedis and posterior tibial ▪ Ankle-Brachial Pressure Index (ABPI) (see table below) ▪ Gait assessment, including walking aids/footwear/physical activity and ankle joint range of motion
Laboratory	▪ Blood glucose level ▪ Creatinine, CBC, AST, others depending on comorbid issues, diagnostic considerations (thrombophilia screen if DVT or history)
Vascular laboratory	▪ Venous duplex Doppler ▪ ABPI and more extensive arterial studies if indicated
Allergies/ Sensitivities	▪ Medication(s) ▪ Topical agents ▪ Environmental
Self-care/ treatment abilities and psychosocial issues	▪ Ability to actively participate in skin health and wound care treatments/interventions43 ▪ Quality of life assessment ▪ Continence status (urine, fecal or both, and associated devices) ▪ Patient support systems (care partner, family)

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Nutrition	▪ Weight ▪ Use of tools to evaluate
Medications	▪ Immunosuppressants ▪ Possible drug interactions if adding antibiotics or other agents
Pain	▪ Procedural ▪ Related to disease ▪ Related to compression or dressings ▪ Use of validated tools to evaluate

Table 3: Assessing Arterial Flow and Perfusion

Grade	Ankle-Brachial Pressure Index	Toe Brachial Index	Toe Pressure	Waveforms	Transcutaneous Oxygen Pressure (indicating perfusion)
Non-compressible	> 1.40 Be aware of possible **falsely** elevated measures	Preferred when vessels are non-compressible	Preferred when vessels are non-compressible		Preferred when vessels are non-compressible
Normal Range	1.0–1.40	> 0.7	> 70 mmHg	Triphasic	> 40 mmHg
Borderline	0.91–0.99	> 0.6	> 70 mmHg	Biphasic/monophasic	> 40 mmHg
Abnormal	< 0.90	< 0.6	< 70 mmHg	Biphasic/monophasic	< 40 mmHg
Mild	0.7–0.9	> 0.4	> 50 mmHg	Biphasic/monophasic	30–39 mmHg
Moderate	0.41–0.69	> 0.2	> 30 mmHg	Biphasic/monophasic	20–29 mmHg
Severe	< 0.4 critical limb-threatening ischemia (CLTI)	< 0.2	< 30 mmHg	Monophasic	< 20 mmHg

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

Assess the patient's ability and motivation to participate and engage in establishing the treatment goal and care plan.

Determine the patient's ability to conduct preventive self-care measures, including consistent management of leg edema. Ulcer formation and changes to mobility may contribute to employment changes, job loss or changes in one's level of social interaction. It is critical to provide a culturally sensitive environment for care.

1.3 Complete a wound assessment, if applicable

In the leg with CVI, wound and periwound area should be evaluated in terms of many parameters, including location (gaiter area, malleolar area), ulcer size (shallow), amount and type of exudate (mild to severe), appearance of the ulcer bed (irregular in shape), condition of the wound edge (attached, rolled), signs of clinical infection (see bacterial burden) and changes to the periwound skin.

The presence or absence of infection and osteomyelitis should be assessed. Assess for infection using the International Wound Infection Institute (IWII, 2022) continuum: https://woundsinternational.com/consensus-documents/wound-infection-in-clinical-practice-principles-of-best-practice/. Other tests may include swabs, bone biopsy, x-rays, blood tests for inflammatory markers, MRI.

Table 4: Physical Findings Associated with Venous Disease

Physical Changes and Presentation	Comments
	**Edema:** Edema is the perceptible increase in volume of fluid in skin and subcutaneous tissue, characteristically indented with pressure. Venous edema usually occurs in the ankle region but may extend to the leg and foot. Edema worsens with dependency and improves with leg elevation.
	**Stasis changes:** Eczematous changes make skin vulnerable, with redness and scaling often associated with pruritus. Management involves the use of emollients or topical corticosteroids. Contact dermatitis and allergies and or sensitivities may occur from the use of some topical agents.
	**Hemosiderin staining (hemosiderosis), hyperpigmentation:** When vein valves fail and red blood cells are forced out of capillaries, they break down and release the pigment hemosiderin. This results in grey-brown pigmentation of the skin in the gaiter area.
	**Corona phlebectatica:** This fan-shaped pattern of numerous small interdermal veins on medial or lateral aspects of the ankle or foot is commonly thought to be an early sign of advanced venous disease. Synonyms include *malleolar flare* or *ankle flare*. "The corona phlebectatica (CP) is classically described as the presence of abnormally visible cutaneous blood vessels at the ankle with four components: venous cups, blue and red telangiectases, and capillary stasis spots."
	**Retention Hyperkeratosis:** Common, benign skin condition related to reduction of edema and routing desquamation. Managed with skin hygiene protocols.
	**Varicosities:** Usually tortuous, but tubular, saphenous veins with demonstrated reflux may be classified as varicose veins. Synonyms include *varix* (plural varices) and *varicosities.* Varicose veins are blue, swollen, twisted veins that may be superficial or deep. Common locations include the ankle, back of the calf or medial aspect of the leg

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	**Acute lipodermatosclerosis (LDS):** Acute lipodermatosclerosis presents with an extremely painful red to purple indurated warm area on the lower leg. It is often misdiagnosed as cellulitis, phlebitis or panniculitis. These changes progress over months to years to the chronic form.
	**Chronic lipodermatosclerosis (LDS):** Localized chronic inflammation and fibrosis of skin and subcutaneous tissues of lower leg, sometimes associated with scarring or contracture of Achilles tendon. LDS may be proceeded by a diffuse inflammatory edema of the skin, which may be painful, referred to as hypodermatitis LDS, or acute LDS. The chronic form is recognized as a sign of severe venous disease or C4 in the CEAP classification.
	**Inverted champagne bottle deformity:** This is a form of lipodermatosclerosis with subcutaneous fibrosis, which leads to proximal leg swelling with skin tightening and a narrowing band at the distal leg or ankle.
	**Atrophie blanche:** Characterized by localized, often circular, whitish and atrophic areas surrounded by dilated capillaries and sometimes hyperpigmentation, often described as porcelain white scars. Atrophie blanche is common, occurring in a third of patients with venous disease, but also may represent livedoid vasculopathy. This livedoid vasculopathy is associated with coagulation abnormalities in 50% of cases. The most common location for this is the medial malleolus extending to the dorsal aspect of the foot. Atrophie blanche is painful due to vascular occlusion.
	**Venous ulcer:** This full-thickness defect of the skin, most frequently in the ankle region, fails to heal spontaneously and is sustained by CVD.

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patients' health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easurable, **A**ttainable, **R**elevant and **T**imely.

2.1 Set goals for prevention, healing, non-healing and non-healable wounds

Examples of Preventative Skin and VLU Goals:

- Skin care regimen in place within one day
- Foot care and footwear plan established, with a focus on prevention of trauma to skin
- Leg edema reduced by elevating the affected limb above heart level for 30 minutes, three times per day
- Leg edema reduced through continuous use of compression therapy (wraps or pumps) within two weeks; including care and management of wraps
- Leg edema prevented through long-term use of garments once edema is reduced
- Calf muscle and calf-muscle pump activation exercises using elastic bands 10 times, three times per day
- Walking using heel-toe gait for 20 minutes two times per day
- The risk of injury reduced through the reduction of environmental hazards within two days
- Activities of daily living modified in two weeks to renew activity and full ADLs resumed within one month

Healing wounds require sufficient vascular supply, correction of underlying causes and optimized general health. Goals may include:

- Leg edema management goals, as in prevention
- Wound closure within three months
- Infection managed with antimicrobials within two days
- Exudate managed through dressing selection within two days
- Pain managed though analgesia within one day
- Awareness of signs and symptoms of infection learned within one day
- Planning purchase of lower leg compression stockings and application device to don stockings within seven days
- Hand hygiene education to reduce infection (cellulitis) within one day
- Proper hand-washing, hanging to dry of stockings and or garments within two days. (Note daily washing helps the elastic in the garment return to its original shape and may increase the life of the garments)
- Mental health screening for distress, depression, anxiety and supports within two weeks

Non-healing wounds have the potential to heal, but wide-raging patient or health-care system factors may be compromising wound healing (e.g., the inability to accept or consistently wear compression therapy). Goals for the patient may include:

- Leg edema managed (e.g., identify specific approach patient and care partner is able to achieve and maintain)
- Independence established with dressing changes using clean technique

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

- Drainage, itchiness and odour managed with recommended dressings
- Pain managed using analgesia
- Awareness confirmed of signs and symptoms of infection and/or deterioration, and to whom to report concerns
- Infection prevented and/or treated with antimicrobial dressings
- Mental health screening done for distress, depression, anxiety and hope, and referrals made to appropriate supports
- Lower leg compression stockings and donning application device purchased and appropriate education provided
- Hand hygiene to reduce risk of infection (cellulitis)
- Proper hand-washing and hanging to dry the compression stockings and garments supports the elastic in the garment to return to its original shape (this may extend the life of the garment)

Non-healable wounds have no ability to heal due to untreatable comorbidities (for example, severe PAD, CHF or a terminal illness). Goals for the patient may include:

- Same as for non-healing VLUs
- Attendance at a chronic disease-management support group, as able
- Attendance at smoking cessation session(s), as able
- Continue to reassess to identify if wound status moves to non-healing or healable

2.1.2 Identify quality-of-life and symptom-control goals

Venous disease management requires patient collaboration to develop goals they can meet around smoking cessation, appropriate garments and footwear, medication management and ADLs such as exercise and physical activity.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

An integrated team is necessary to implement, adjust and sustain a plan to meet the patient-specific goals. The team should include the relevant health-care professionals and other service providers as required as well as the patient, family and their support system.

3.1 Identify appropriate health-care professionals and service providers

Patients with chronic wounds such as VLUs may require the skill of numerous health care disciplines, depending on the patient's needs and the availability in the community, such as nurses, physicians (general, specialized), pharmacists, social workers, psychologists and spiritual advisers, vascular technicians and surgeons, physiotherapists, occupational therapists, pharmacists, mental health and chronic disease self-management groups, registered dietitians, diabetic educators and garment fitters. The team members will change over time depending on the patient's factors and the healing process.

3.2 Enlist the patient and their family and caregivers as part of the team

Enlisting the patient and their care partners within the health-care team is a critical component to the success of VLU prevention and treatment outcomes. Compression therapy and calf-muscle pump exercises are the mainstay in VLU therapy. Education and support are needed about the role of compression and the rationale for wearing life-long compression. Patients and care partners must receive appropriate and regular instructions focused on the mechanics of wearing compression therapy daily and why it is essential to do so.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

Organizational and system support requires that decision-makers, and those who oversee financial budgets, understand the importance of providing evidence-based, cost-effective care for the prevention and management of VLUs. To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as therapeutic garments, patient education and clinical visits***
- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in executing an effective wound management program.***
- ***Establish a pathway for referral of people with venous leg problems to a multidisciplinary wound care service.***
- ***Work with the community and other partners to develop a process to facilitate patient referral and access to local resources and health professionals with specialized knowledge in wound management.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of preventative venous ulcer care including preventative and treatment garments.***
- ***Ensure wound care services and programs exist for the assessment and continuing surveillance of those considered at increased risk in order to prevent VLUs and to support management in their healthc-are or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of venous disease complications.***
- ***Establish and sustain a communication network between the person with venous disease and the necessary health-care and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

Ensure that care addresses the goals and considers patient needs, factors relating to the skin and wound (if applicable), as well as the environment and the system in which the team is situated.

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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

Prevention of, and early intervention in, venous disease remains key for physical and mental quality of life. Venous leg skin care, leg elevation to manage edema and wearing of compression socks are considered proactive, preventative care.

Basic Skin Care for Persons with Venous Hypertension

Maintaining healthy skin for people living with venous leg disease is essential. Whether they have an ulcer or not, lower leg skin and the skin surrounding venous leg ulcers requires impeccable skin care and hygiene, as it is at risk for breakdown due to dermatitis and moisture-associated skin damage.

Leg Hygiene and Cleansing: In provision of care for patients living with venous leg edema, routine skin care as well as wound cleansing is part of care planning. When compression bandages and garments are removed from the patient's leg, it is essential that the full leg receive a careful cleansing.

Compression Therapy

Patients with venous insufficiency and/or lymphedema require the life-long use of therapeutic compression that may include compression bandaging systems, compression garments (stockings or loop and fastener systems) or compression devices/pumps. Compression improves CMP function and decreases reflux in the incompetent veins. See Wounds Canada's Product Picker: Control of Venous Leg Edema for details.

Important Note: Compression bandages/wraps and devices/pumps are primarily used to reduce edema; compression garments are fitted to the leg once the edema is controlled to prevent recurrence.

Calf-muscle Pump Activation

A treatment program that addresses the range of motion around the ankle joint, muscle strength and gait training are integral components of the overall care plan for the patient at risk for or currently living with a VLU. Exercise programs tailored to address venous hypertension need to include stretches and strengthening for the gastroc/soleus muscle complex in preferably weight-bearing positions but may also be of benefit done in a non-weight-bearing position. It is best if the exercises are monitored by someone specifically trained in exercise prescription, but the intervention can be successful when incorporated in an overall self-management program. Exercises are particularly beneficial when done while wearing compression.

Pharmacologic Treatment

The medications that have been studied in randomized control trials to support VLU healing include flavonoids, horse chestnut seed extract, pentoxifylline and glycosaminoglycans. Of these, pentoxifylline and micronized purified flavonoid fraction (MPFF) have been shown to improve VLU healing in RCTs.

Pain Control

Pain can be chronic and challenging due to ulcer factors or dressing changes, cleansing or debridement procedures. Pain in leg ulcers is ranked as the most severe when compared to other wounds, and removal of dressing causes the greatest pain. Specific management strategies should be targeted to the cause of pain specific to venous disease.

4.2 Optimize the local wound environment: cleansing, debriding, managing bacterial balance and managing moisture balance

4.2.1 Cleansing

Patients living with venous leg edema or ulcers require routine skin care as well as wound cleansing as part of their care planning. When compression bandages and garments are removed from the patient's leg, it is essential that the full leg receive a careful cleansing with a pH-appropriate skin cleanser. Wound cleansing should be done at each dressing change and wound assessment, and prior to the application of a new dressing. Wound cleansing reduces the odour that is very common in highly exudative venous ulcers. Cleansing of the periwound skin and surrounding skin allows for visualization and management of tissue surrounding the ulcer. See Wounds Canada's Product Pickers, below.

4.2.2 Debriding

Evidence for the benefit of debridement of VLUs is limited. The choice of debridement method depends on the expertise of the clinician, availability of resources, and patient and wound factors. See Wounds Canada's Product Pickers, below.

4.2.3 Managing bacterial balance

It is recommended that infected ulcers be treated with topical agents if local infection is evident, and systemic agents for spreading or more systemic infection (refer to IWII (2022) for more information). See Wounds Canada's Product Pickers, below.

4.2.4 Managing moisture balance

Moisture balance can be challenging in patients with VLUs with excessive exudate that may be the result of inflammation/infection or edema. Excessive drainage should be managed by using appropriate products and dressings, along with compression to control edema. See Wounds Canada's Product Pickers, below.

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

4.3 Select the appropriate dressings and/or advanced therapy

Dressing Selection

Dressings play an important role where there is a wound, along with compression. Once the wound is cleansed, leg hygiene is conducted and the wound assessed, the decision can be made as to which dressing to use. Dressings are chosen for a variety of reasons, including wound bed and periwound protection, exudate absorption and management, pain reduction and management, infection and odour control, and patient preference. See Wounds Canada's Product Pickers, below.

Advanced Therapies

For VLUs that are failing to progress toward healing despite optimal treatment and certainty of the diagnosis, advanced wound therapies should be considered. These therapies include hyperbaric oxygen therapy, ultrasound, shock wave therapy, direct wound bed electrical stimulation, biologic skin equivalents, negative pressure wound therapy, pulsed electro-magnetic fields, laser therapy, growth factors and platelet rich plasma injections, stem cells, and low frequency nerve stimulation (muscle pump activator), and topical wound oxygen therapy.

Surgical Management

The role of surgery is to remove the incompetent superficial vein and divert venous flow to the deep system, thereby mitigating the effect of venous hypertension on the ulcerated skin. Surgical interventions include ligation and stripping, endovenous laser or radiofrequency ablation, and injection with foam or cyanoacrylate glue to chemically ablate the superficial veins. In patients with deep venous occlusive disease, surgical interventions may include stenting of the deep veins or creation of a venous bypass.

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

To engage the patient as the key team member, health-care professionals can employ effective communication strategies, including the following:

- Provide education and engage the patient in the care plan process
- Screen for mental health and well-being, hopelessness, depression, anxiety
- Plan footwear and clothing changes ahead of initiating compression
- Refer patient to physiotherapy to assess gait and equipment needs ahead of initiating compression
- Provide effective education about the benefits of compression and leg hygiene
- Where possible, have consistent, well-trained nurses wrapping and caring for this patient group. This builds trust on which health-care planning can be more effectively built.

Self-Management with Venous Leg Disease and Ulcers

- Self-care is the ability of people with venous leg disease to care for themselves. Building self-care capacity is done with the patient, care partner, family and health-care professional(s). This may be done one-on-one, or in a small group.
- Managing preventative skin care, associated socking and garments, medications (oral, topical) and wound care and associated compression puts demands on the patient and care partner.
- See a supportive toolkit https://wounds-uk.com/best-practice-statements/personalised-self-care-for-people-with-venous-leg-ulcers-a-toolkit-for-change/ for change focused on personalized self-care for people with VLUs.

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

5 Evaluate Outcomes

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

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

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goals. If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.***

5.1 Determine if the outcomes have met the goals of care

Using validated and responsive tools and feedback from the team, clinicians should determine if all goals previously set have been met. If goals have been met, the team should continue with discharge planning and ensure self-management strategies are effective and in place.

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

If the goals and response to the current management have been partially met or unmet, the team needs to return to Step 1 and reassess. The specific activities required will depend on patient and wound factors, but could involve further blood work, more in-depth evaluation of circulation, a wound biopsy or the involvement of other clinicians. Benchmark data show that, when compression is optimized, a VLU healing rate of 11 weeks is possible. Reassessment needs to consider gaps in care or the person's ability to adapt to their condition and engage in self-management.

If the plan of care is appropriate and the wound is not improving, consider a biopsy to rule out skin disorders or a malignancy.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence.

Recurrence rates of VLUs have been reported as high as 70%. The ongoing use of compression is required to prevent VLU recurrence. Compression can be underutilized due to the lack of clinician knowledge and unavailability of bandages/hosiery. The ideal compression system should be:

- Affordable
- Comfortable
- Easy to apply
- Non-allergenic
- Able to fit into the patient's footwear (seasonal)

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

A systematic approach to the prevention and management of VLUs—made possible by the Wound Prevention and Management Cycle—supports the team to make the correct diagnosis by evaluating the patient's risks and knowing the characteristics and pathophysiology of venous disease. Management of venous disease of the lower leg can be complex as it is important to ensure arterial disease has been fully evaluated by physical exam and supported by quantitative vascular assessment before any treatment is initiated.

Additional Wounds Canada resources, including a variety of Product Pickers and brochures, are available online at: www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

Care at Home Series:

- Caring for Your Swollen Legs at Home: Preventing and Managing Venous Leg Ulcers
- Caring for Your Wound at Home: Changing a Dressing

For the complete version of Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers, visit here.

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BPR BRIEFS

Venous Leg Ulcers

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BPR BRIEFS

Peripheral Arterial Ulcers

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers**. In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

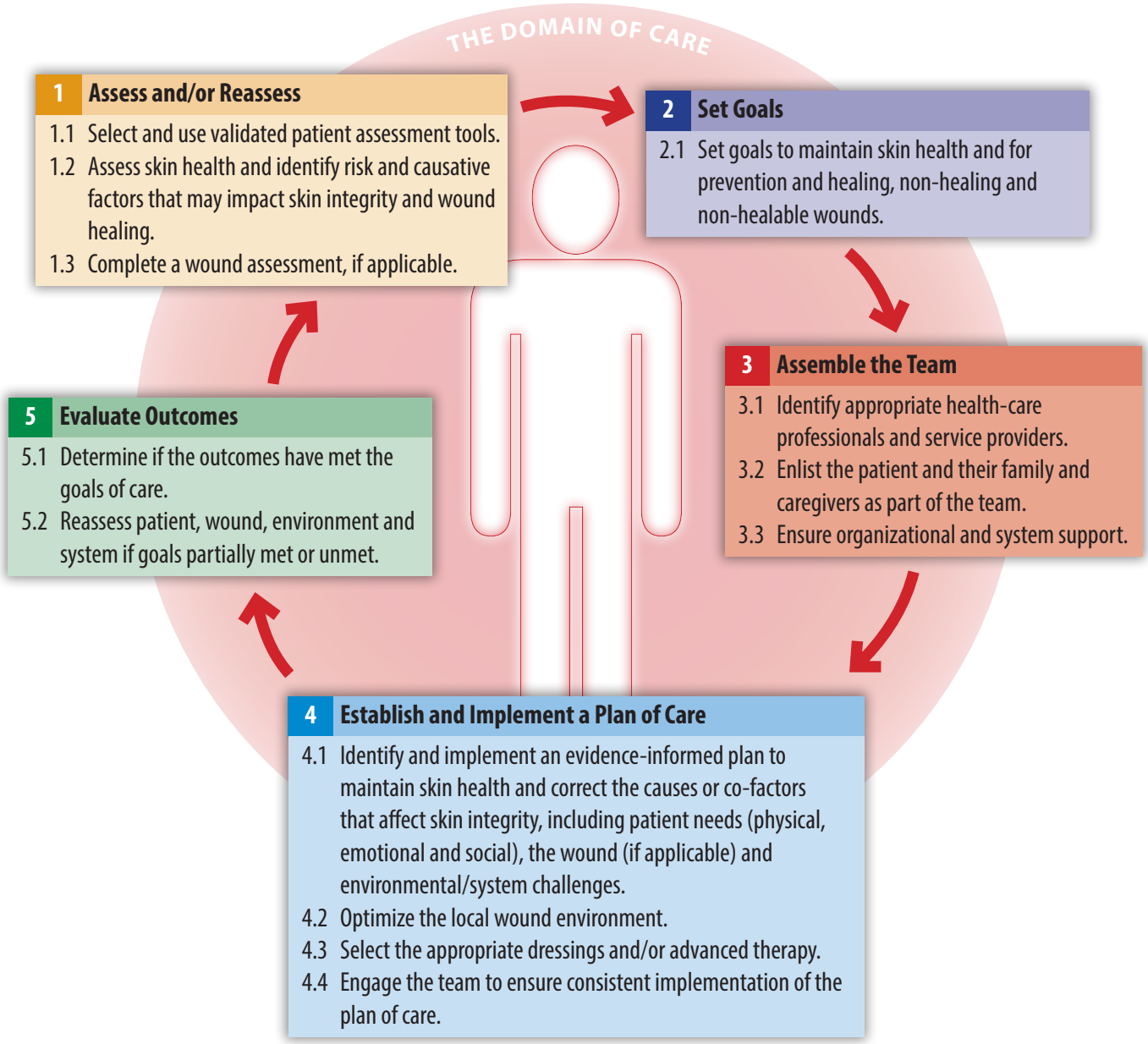
For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1690-wc-bpr-prevention-and-management-of-peripheral-arterial-ulcers-1921e-final/file.

Introduction

Peripheral arterial disease (PAD) is a chronic disease of the cardiovascular (CV) system that can impact both the upper and lower extremities; it is more common in the lower limbs. PAD occurring in the lower extremities is referred to as LEAD (lower extremity arterial disease) and often results in tissue ischemia and ulceration. LEAD may develop spontaneous ulcerations that fail to heal or that progress to gangrene and critical limb-threatening ischemia (CLTI), amputation and even death. Smoking and diabetes are the two primary risk factors predisposing an individual to LEAD and the development of an arterial ulcer.

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must take place to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status, skin status (and wound status, if applicable), environmental factors and system factors. If, after the WPMC has been completed, the goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC steps. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools

Table 1 describes some of the tools available for use in the assessment of persons with or at risk for lower extremity arterial ulcers. Note: This list is not exhaustive.

Table 1. Vascular Assessment Tools

Category	Tool	Purpose
Ischemia	Rutherford Classification System	Assesses degrees of ischemia and tissue loss
	Fontaine Classification System	Assesses degrees of ischemia
	Lower Extremity Threatened Limb Classification System	As above plus assessment of diabetes and severity of infection
Pain	Rose Questionnaire	Assesses extent of ischemia related to activity and pain experience
	Edinburgh Claudication Questionnaire	

1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing

1.2.1 Patient: Physical, emotional and lifestyle

Assessment should include a lower extremity threatened limb classification staging system such as the WIfI classification system that grades the complexity of wounds, including wound extent, degree of ischemia and severity of infection to guide clinical management in all patients with suspected CLTI.
The International Working Group of the Diabetic Foot guidelines (2023) also recommends use of two classification systems for diabetic foot ulcers that includes ischemic ulcers. The use of these classification systems is important to standardize assessment of ulcers and to improve communication among health-care professionals. The IWGDF recommends use of:

- SINBAD (Site, Ischaemia, Bacterial infection, Area and Depth) classification (first option)
- WIfI (Wound, Ischaemia, foot Infection) systems

Assessment needs to include baseline information pertaining to patient health status, knowledge, beliefs, perceived learning needs and possible risk factors, including:

- General health, including co-existing diseases such as diabetes, nutritional status, smoking history
- Mobility level
- Dependence related to activities of daily living
- Skin (skin tone), including fragile skin and previous injuries

It is critical to provide a culturally sensitive environment for care.

Pain is an important indicator of CLTI. A thorough pain assessment can determine extent of ischemia (e.g., intermittent claudication, pain at rest, night pain) as well as level of pain through the use of a standardized tool (see Table 1). It is also significant to assess what relieves the pain, such as dependency of the limb.

Clinical diagnosis may be made through physical assessment of symptoms through a complete lower leg assessment as well as diagnostic testing by trained professionals that may include: ABPI, ABPI with treadmill, toe pressures, duplex ultrasound, PVR, Doppler waveforms, $TCPO_2$, leg segmental pressure, CTA, MRA, conventional angiography.

1.2.2 and 1.2.3 Environment and System Factors

Environment and systems factors need to be assessed, including food security; access to housing that accommodates disabilities; social supports; health behaviours; funding for preventative or treatment supplies, equipment and services; and access to and availability of health-care services. Ensuring that the appropriate professional, community-based support services and resources are accessible may be critical to the overall success of a plan of care designed to prevent and manage vascular disease.

The level of arterial disease can be established once the assessment is complete by using a standardized classification system (see Tables 2 and 3).

Table 2. Acute Limb Ischemia Classifications

Viable	Limb not immediately threatened; no sensory loss; no muscle weakness; audible arterial and venous Doppler
Threatened	Mild to moderate sensory or motor loss; inaudible arterial Doppler; audible venous Doppler May be further divided into IIa (marginally threatened) or IIb (immediately threatened)
Irreversible	Major tissue loss or permanent nerve damage inevitable; profound sensory loss, anesthetic; profound muscle weakness or paralysis (rigor); inaudible arterial and venous Doppler.

Table 3: Assessing Arterial Flow and Perfusion

Grade	Ankle-Brachial Pressure Index	Toe Brachial Index	Toe Pressure	Waveforms	Transcutaneous Oxygen Pressure (indicating perfusion)
Non-compressible	> 1.40 Be aware of possible **falsely** elevated measures	Preferred when vessels are non-compressible	Preferred when vessels are non-compressible		Preferred when vessels are non-compressible
Normal Range	1.0–1.40	> 0.7	> 70 mmHg	Triphasic	> 40 mmHg
Borderline	0.91–0.99	> 0.6	> 70 mmHg	Biphasic/monophasic	> 40 mmHg
Abnormal	< 0.90	< 0.6	< 70 mmHg	Biphasic/monophasic	< 40 mmHg
Mild	0.7–0.9	> 0.4	> 50 mmHg	Biphasic/monophasic	30–39 mmHg

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Moderate	0.41–0.69	> 0.2	> 30 mmHg	Biphasic/monophasic	20–29 mmHg
Severe	< 0.4 critical limb ischemia (CLI/CLTI)	< 0.2	< 30 mmHg	Monophasic	< 20 mmHg

1.3 Complete a wound assessment, if applicable

The assessment of an arterial ulcer should include the location, shape, size, tissue type, presence and nature of wound exudate, presence of malodour, periwound tissue characteristics and wound pain.

Characteristics of an arterial (ischemic) ulcer include the following:

- Often on the lower extremities; less frequently on the upper extremities but can occur
- "Punched out" appearance with well-defined borders
- Often associated with little or no exudate or periwound edema
- Often deep, with possible exposure to tendon and/or bone
- Often has yellow slough or black eschar, with minimal or no granulation (figures 2, 3 and 4)
- Often associated with moderate to severe pain
- Ischemic regions may appear as dry gangrene
- Periwound tissues may be pale, shiny, dry, with loss of hair and dystrophic nails
- Often appear over boney prominences or other areas being traumatized by external pressures

Figure 2: Large, dry arterial ulcer (eschar) on the leg of a male, heavy smoker, non-diabetic

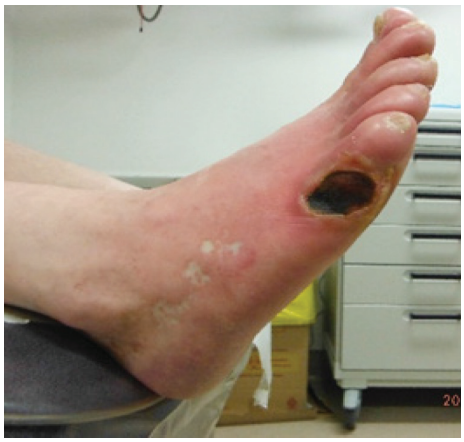

Figure 3: 51-year-old female with diabetes, heavy smoker, ischemic pain, TBPI: 20 mmHg

Figure 4: 57-year-old male with type 2 diabetes with sensitive neuropathy, waiting for revascularization

Figures 2–4 used with permission from Maryse Beaumier.

The presence or absence of infection and osteomyelitis should be assessed. Assess for infection using the International Wound Infection Institute (IWII) continuum. Other tests may include swabs, bone biopsy, x-rays, blood tests for inflammatory markers, MRI.

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Following a comprehensive assessment of the patient's physical, emotional and environmental risk factors, goals for prevention and management of arterial ulcers can be determined in a collaborative process carried out between the health-care team, the patient and his/her care partners.

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds

Prevention should always be considered a patient safety goal. Goals need to be determined from the patient's perspective and be created using the SMART principle: **S**pecific, **M**easureable, **A**ttainable, **R**elevant and **T**imely.

2.1.1 Identify goals based on prevention or healability of wounds

Table 4 describes some of the goals that may be associated with the quality of the arterial flow to the lower leg. This list is not exhaustive and needs to be patient specific. For individuals with PAD/CLTI, goals should be centred around preventing all skin breakdown and the development of wounds.

2.1.2 Identify quality-of-life and symptom-control goals

Table 4. SMART Goals related to Perfusion

LEAD Status	Perfusion	Examples of Goals
Borderline*	Adequate	▪ Wound closure within 12 weeks following revascularization ▪ Satisfaction with local wound care with every dressing change ▪ Pain management regimen implemented within 12 hours ▪ Appointment with a vascular surgeon as soon as possible ▪ Prevention strategies implemented immediately in relation to wound infection ▪ Prevent new trauma and pressure injury
Post revascularization (remains patent)	Adequate	▪ Wound closure within 12 weeks following revascularization ▪ Pain management regimen implemented within 12 hours ▪ Appointment with a vascular surgeon in accordance with surveillance ▪ protocols; potential re-stenosis monitored as per protocol ▪ Prevention strategies implemented in relation to wound infection ▪ Prevention of new trauma and pressure injury
Post revascularization (re-stenosis)	Inadequate	▪ Pain management regimen implemented within 12 hours ▪ Vascular appointment for reassessment (surveillance) and pending revascularization ▪ Prevention strategies implemented in relation to wound infection ▪ Prevention of new trauma and pressure injury ▪ Satisfaction with local wound care with every dressing change

cont'd. . . .

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Pending revascularization	Inadequate	▪ Timely and successful revascularization to optimize blood flow ▪ Prevention strategies implemented in relation to wound infection ▪ Prevention of new trauma and pressure injury ▪ Satisfaction with local wound care with every dressing change ▪ Ischemic pain controlled in conjunction with primary health-care provider
Not a candidate for revascularization	Inadequate	▪ Wound care appropriate for a non-healing wound initiated immediately ▪ Prevention strategies implemented in relation to wound infection ▪ Prevention of new trauma and pressure injury ▪ Satisfaction with local wound care with every dressing change ▪ Optimization of management of ischemic pain in conjunction with primary-health-care provider
Undetermined		▪ Timely vascular assessment ▪ Satisfaction with local wound care with every dressing change ▪ Prevention strategies implemented in relation to wound infection ▪ Prevention of new trauma and pressure injury ▪ Ischemic pain controlled in conjunction with primary health-care provider

* Borderline *here would refer to patient with just enough blood flow for healing; this assessment is difficult to make and should be part of the expert opinion regarding adequate perfusion to heal even though circulation may not be within optimal ranges.*

2.1.2 Identify quality-of-life and symptom-control goals

Table 5 describes some of the goals that may be associated with quality of life (QoL) and symptom control. This list is not exhaustive and needs to be patient specific.

Table 5. SMART Goals for Quality of Life and Symptom Control

Patient Concern	Examples of QoL goals
Comorbid conditions	▪ Self-management of glucose control following education and teaching within 3 weeks ▪ HbA1c ≤ 7.0 (unless contraindicated as per specialist) within 6 months ▪ LDL-C < 1.8 mmol/L (70mg/dL) or less within 6 months, or decrease by > 50% if baseline measures are 1.8–3.5 mmol/L (70-135 mg/dL) ▪ Optimal BP control: < 130/80mmHg within 3 months ▪ Smoking cessation within 6 months supported by PHC provider or risk reduction team
Rest/ walking pain	▪ Pain decreased to 1/10–2/10 at rest within 1–2 weeks. ▪ Taking anticoagulant medication as prescribed within 1–2 weeks. ▪ Taking maximally tolerated statin as prescribed within 1–2 weeks to improve walking distance. ▪ Keeping legs in a dependent position (below heart level) as much as possible
Activities of daily living	▪ Walking 10–15 minutes longer before experiencing PAD claudication symptoms within 3–6 months of initiating a tailored exercise program ▪ Participating in supervised exercise at a level recommended by a health-care professional within 3 months ▪ Patients should be instructed to avoid long periods with the hip or knee bent (e.g., gardening). ▪ They need to move about every 30 minutes to avoid a thrombosis of the vessel or the graft ▪ Maintaining a healthy diet to support glucose levels that are stable and within the target range and support appropriate body mass index (BMI) and healthy skin within 3–4 months

cont'd. . . .

Emotional, cognitive, behavioral and mental health	▪ Participating in a smoking cessation program to reduce cigarette consumption to less than one pack a week within 3 months ▪ Engaging in self-care activities and adhering to a plan of care aimed at prevention and management of ulceration and amputation within 1–2 months
Infection prevention	▪ Participating in activities to maintain healthy feet, including not walking in bare feet, daily foot inspections and skin care immediately after assessment with a multidisciplinary team or foot specialist ▪ Regular professional foot care every 4-6 weeks ▪ Footwear fitted by a qualified health-care professional immediately following the closure of a foot ulcer plus planned follow-up ▪ Follow-up with primary care provider at first sign of ulceration or foot infection ▪ Acquisition of knowledge of signs and symptoms of infection and complications and changes that may be affecting blood flow to the lower extremities ▪ Keeping feet clean and dry; no soaking of feet

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

Preventing and managing arterial ulcers can be challenging and can often require the consideration of multiple health-related and lifestyle factors that require the interventions of many health-care professionals and service providers, as well as the patient and their care partners.

3.1 Identify appropriate health-care professionals and service providers

Patients with, or at risk for, arterial ulcers have specific concerns and risks that require a team of health-care professionals and supportive services that can work collaboratively with each other, the patient and their care partners. These team members might include a family physician, vascular surgeon or specialist, orthopedic surgeon, plastic surgeon, internal medicine specialist, risk reduction and modification specialist (internal medicine physician with a specialty in vascular medicine), infectious disease specialist, nurses specialized in wound and foot care, nurse practitioners, physical therapist, occupational therapist, diabetes educator, pharmacist, dietitian, pedorthist, orthotist, prosthetist, podiatrist or chiropodist, pain management specialist, psychologist, social worker and spiritual care leaders.

3.2 Enlist the patient and their family and caregivers as part of the team

The team must include the patient and/or their family and care partners, as successful care hinges on their collaboration and communication with other members of the team.

For the complete version of Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers, visit here.

3.3 Ensure organizational and system support

Wounds Canada aligns with population health management, which is the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes, based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructre.

To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as smoking cessation programs, patient education and clinical visits***
- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a PAD/CLTI management program.***
- ***Establish a pathway for referral of people with CLTI at risk for arterial ulcers to a multidisciplinary service***
- ***Work with community and other partners to develop a process to facilitate patient referral and access to local resources and health professionals with specialized knowledge in prevention and management of CLTI***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of care, including prevention and treatment***
- ***Ensure services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent arterial ulcers and to support management in their health-care or community setting***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of arterial ulcers***
- ***Establish and sustain a communication network between the person with or at risk for arterial ulcers and the necessary health-care and community systems***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care***

In order to meet these goals, establish or adopt a system-wide care pathway.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

A successful plan of care should take into consideration the complexities of the condition, such as multiple comorbidities, as well as individual preferences and the lifestyle of the patient. An effective plan of care needs to be both evidenced-based and allow for patient participation throughout the decision-making process.

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

An individual diagnosed with PAD/CLTI may be asymptomatic. In such cases the integrated, interprofessional health team should still work collaboratively to monitor and to manage risk factors and to ensure that appropriate strategies are implemented to prevent the loss of skin integrity. Once the CLTI status is determined treatment plans are developed to reflect goals. To achieve these outcomes, most patients will require that some of the following are addressed:

- Daily foot inspections and skin care (e.g., hydrating skin with hypoallergenic moisturizer after bathing, with the skin still damp, not wet; using warm, not hot, water for bathing)
- Assistance with activities of daily living (e.g., providing protection from trauma during routine care and ADLs)
- Nutritional concerns (e.g., promoting and monitoring nutrition and fluid intake)
- Pain control associated with an arterial ulcer should include local, regional and system modalities, such as encouraging the patient to position the lower limb in a dependent position to reduce pain and optimize perfusion to the wound.
- Smoking cessation if applicable (including no smoking in the patient environment)
- Pharmaceutical intervention that may include thrombosis-directed agents, cholesterol-lowering agents, antiglycemics, anti-hypertensives
- Surgical intervention such as dilatation (with or without the placement of stents), endarterectomy, bypass surgery or extra anatomic bypass
- Major amputation (above the ankle) in patients with CLTI when there is overwhelming infection that threatens the patient's life, rest pain cannot be controlled, and when there is extensive tissue loss

For the complete version of Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers, visit here.

4.2 Optimize the local wound environment

4.2.1 Cleansing

Cleanse the wound and assess. The cleansing of non-healable arterial ulcers that present with dry eschar or dry gangrene is not recommended (for more information, refer to Wounds Canada's Product Pickers, below).

4.2.2 Debriding

Debride nonviable tissue to promote wound closure **(note: only if adequate blood flow is present).** Current literature on arterial ulcers is consistent with the practice of not debriding stable black eschar. Debridement prior to revascularization in poorly perfused extremities should be performed only in a septic foot with and without ischemic signs (for more information, refer to Wounds Canada's Product Pickers, below).

4.2.3 Managing bacterial balance

Any local, spreading or systemic infection must be treated, including osteomyelitis if present. The application of topical antimicrobial dressings should be considered to minimize the proliferation of bacteria in the open wound (for more information, refer to Wounds Canada's Product Pickers, below). Povidone iodine (10% PVP-I) is one of the most extensively used broad-spectrum topical antiseptics used to minimize the bacterial burden in long-standing wounds with an inadequate blood supply.

4.2.4 Managing moisture balance

Maintaining moisture balance is recommended for arterial ulcers that are considered to have **adequate perfusion** to heal or after a successful revascularization. Non-healable arterial wounds should be painted with 10% PVP-I and covering with a gauze or breathable cover dressing to maintain a dry wound environment. (See Wounds Canada's Product Picker: Skin and Wound Clean-Up and Product Picker: Dressings.)

4.3 Select the appropriate dressings and/or advanced therapy

If adequate blood flow is present to support healing, select products that promote moist wound healing while protecting the fragile skin of those at risk. If adequate blood flow is NOT present, select products that keep the area dry and prevent infection while protecting the fragile skin of those at risk (for more information, refer to Wounds Canada's Product Pickers, below). There is a lack of strong evidence to support the routine use of advanced therapies for arterial ulcers. However, it is recommended that advanced therapies be considered to augment the wound healing progress for patients who are at a high risk for amputation.

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

Arterial ulcer prevention programs across all age groups and levels of care must include a plan for engaging individuals, families, care partners, health-care professionals and organizations to ensure that best practices are implemented. All stakeholders must collaborate to ensure that the plan of care is successful and sustainable.

Wounds Canada's Product Pickers

- Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations.
- Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals.
- Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions.

For the complete version of Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers, visit here.

Table 6: Summary of Treatment Plan

CLTI Status	Perfusion	Treatment Plan
Prevention	Adequate	▪ Treat CV risk factors ▪ Manage diabetes mellitus ▪ Smoking cessation ▪ Activity
Borderline*	Adequate	▪ Treat CV risk factors ▪ Early vascular referral ▪ Offload ulcer site and manage PI risk ▪ Cautious moist wound care
Post revascularization (remains patent)	Adequate	▪ Treat CV risk factors ▪ Monitor for re-stenosis (surveillance) ▪ Offload ulcer site and manage PI risk ▪ Cautious moist wound care
Post revascularization (re-stenosis)	Inadequate	▪ Treat CV risk factors ▪ Refer for vascular assessment ▪ Manage ischemic pain ▪ Offload ulcer site and manage PI risk ▪ Monitor vigilantly for infection ▪ Avoid moist wound healing ▪ Keep ulcer clean and dry with antiseptic ▪ Consider adjunctive therapies
Pending revascularization	Inadequate	▪ Avoid moist wound healing ▪ Keep clean and dry with antiseptic ▪ Offload ulcer site and manage PI risk ▪ Manage ischemic pain ▪ Treat CV risk factors ▪ Consider adjunctive therapies
Not a candidate for revascularization	Inadequate	▪ Treat CV risk factors ▪ Monitor for increasing symptoms ▪ Manage ischemic pain ▪ Offload site and manage PI risk ▪ Monitor vigilantly for infection ▪ Avoid moist wound healing ▪ Keep ulcer clean and dry with antiseptic ▪ Consider advanced therapies
Undetermined		▪ Treat CV risk factors ▪ Refer for vascular assessment

* Borderline *here refers to a patient with just enough blood flow for healing; this assessment is difficult to make and should be part of the expert opinion judging healability of the wound based on the presence of adequate perfusion to heal even with impaired circulation.*

For the complete version of Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers, visit here.

5 Evaluate Outcomes

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

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

Regular evaluation of patient outcomes is an important aspect of care to determine whether or not the goals of care are being met. This should be an ongoing process carried out collaboratively with the patient and other members of the health-care team to ensure that the goals of care are clearly understood and are shared. If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.***

5.1 Determine if the outcomes have met the goals of care

Regular evaluation of patient outcomes is an important aspect of care to determine whether the goals of care are being met. This should be an ongoing process carried out collaboratively with the patient and other members of the health-care team.

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

When goals of care are not met, the team should go back to Step1 of the Wound Prevention and Management Cycle for re-assessment to identify barriers to wound healing, e.g., gaps in care, repeat trauma to the area, comorbidities that may delay healing. Reassessment needs to consider gaps in care or the person's ability to adapt to their condition and engage in self-management.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Ensuring access to ongoing vascular risk screening, foot care and primary health care will support the management of the associated risk for recurrent ulceration and infection.

Arterial ulcer prevalence and incidence should be monitored and tracked to allow for benchmarking and evaluation of care.

It is important to recognize that the goals of care are not merely to treat an existing arterial ulcer. Of equal importance is managing the underlying disease process and employing preventative measures to optimize function and ensure the patient's ability to carry out activities of daily living. The management of pain and associated complications of PAD/CLTI, including the recurrence of arterial ulcers requires careful consideration. ***Reducing the recurrence of ulcers has been shown to reduce hospital admissions, the costs associated with treatment for wound infection, community-based home visits, as well as having a significant impact on health-related quality of life.***

Additional resources to support use of this enabler can be found at www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

Care at Home Series:

- Caring for Your Wound at Home: Changing a Dressing

For the complete version of Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers, visit here.

BPR BRIEFS

Peripheral Arterial Ulcers

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Moisture-associated Skin Damage

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage.** In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1814-wc-bpr-prevention-and-management-of-moisture-associated-skin-damage-1949e-final/file.

Introduction

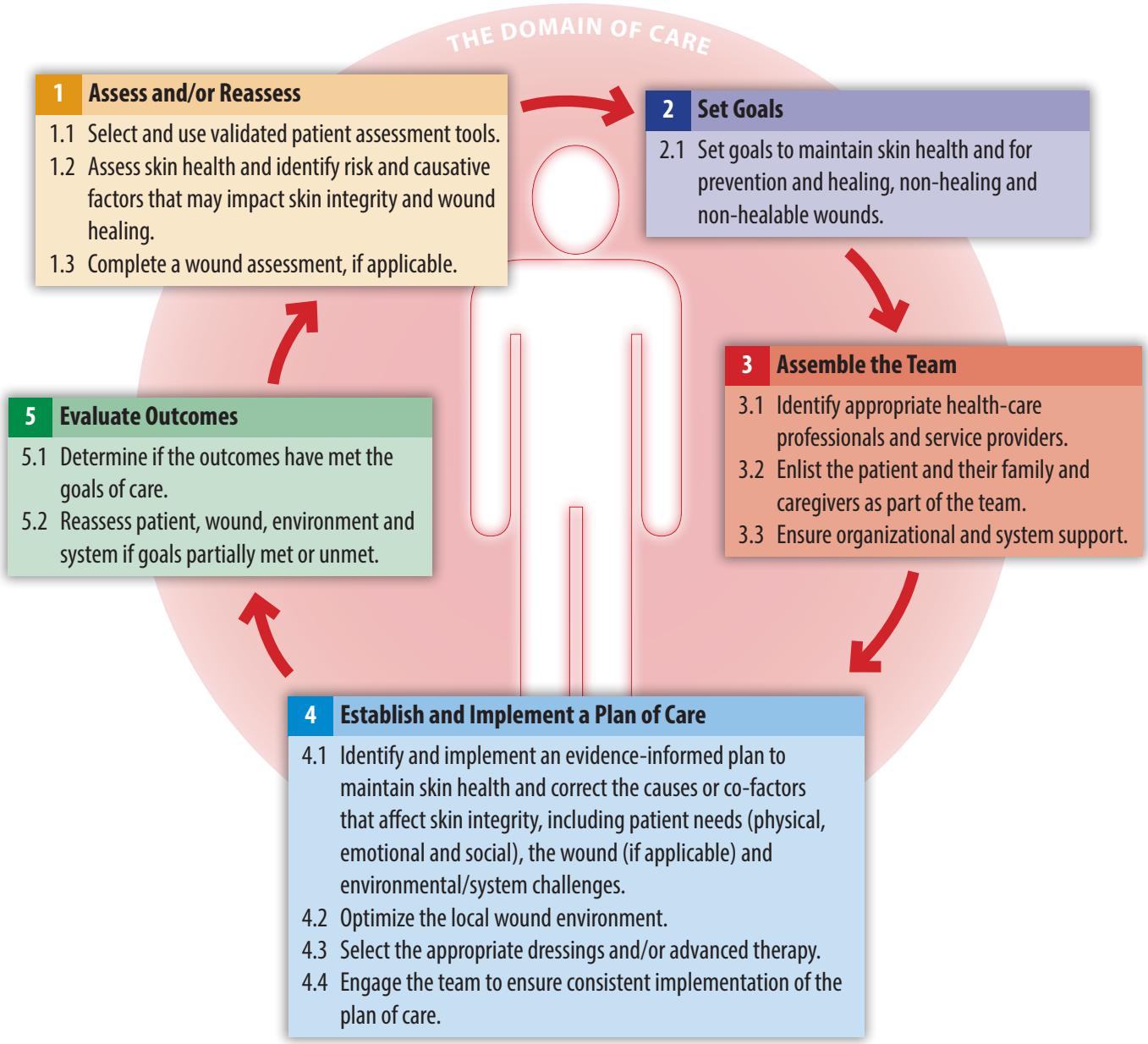
Moisture-associated skin damage (MASD) occurs when skin is exposed to moisture—such as water, perspiration, urine and/or feces, wound exudate, saliva and mucous—for prolonged periods of time. This can result in over-hydrated or eroded skin that causes a separation of the skin layers, also known as maceration. The key factors in the development of MASD include the length of time moisture is in contact with the skin, previous skin injury, and mechanical and/or chemical factors such as friction, shear and the composition of fluid.

There are five specific types of MASD, and it is imperative that clinicians are able to identify the type to provide proper prevention activities, diagnosis and management interventions. The five different types of MASD are:

- Incontinence-associated dermatitis (IAD): a type of irritant contact dermatitis (inflammation of the skin) found in patients with fecal and/or urinary incontinence.
- Intertriginous dermatitis (intertrigo or ITD): the result of friction in the presence of moisture. Susceptible areas are those where the skin is warm, where moisture can accumulate, and where the skin is prone to friction. May include the axilla, inframammary, abdominal, skin and inguinal folds.

Disclaimer: *This document provides a brief clinical enabler for the content provided in the relevant chapter(s) of Best Practice Recommendations for Skin Health and Wound Management 2025. It is not intended to provide comprehensive information on the given topic(s). For more complete information on specific best practice recommendations, refer to the full publication at: https://www.woundscanada.ca/news/752-bpr-new*

Figure 1: Wound Prevention and Management Cycle (WPMC)



- Periwound (including peri-tube/drain and peri-fistula) MASD: multifactorial and often associated with irritant or allergenic contact dermatitis of the surrounding wound skin secondary to moisture, usually related to wound exudate
- Peristomal MASD: damage around a stoma resulting from enzyme-containing effluent or other contributory factors such as mechanical trauma or medical-adhesive-related skin injury from appliances, bacteria, underlying skin disorders such as psoriasis or eczema, and the possibility of allergies to chemicals or fabrics
- Frostbite injury will not be discussed in this brief (See Chapter 8: Prevention and Management of Burns).
- Immersion Foot (IF): a syndrome secondary to prolonged foot exposure to moisture; occurring only with prolonged exposure to water (IF)

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status; skin status (and wound status, if applicable); environmental factors and system factors. If, after the WPMC has been completed, the goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC steps. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools

Recent validated assessment tools pertaining to MASD have been identified in the literature.

Table 1: Categorization and Assessment Tools for the Different Types of MASD

	Categorization Tool	Assessment Tool	Tool validation
Incontinence Associated Dermatitis (IAD)	Ghent Global IAD Monitoring Tool Perineal Assessment Tool (PAT)	Ghent Global IAD Monitoring Tool	Yes Yes (valid, reliable)
Intertriginous dermatitis (ITD)	None available	None available	
Periwound Moisture-Associated Dermatitis (MASD)	None available	None available	
Peristomal MASD	The SACS™ Instrument DET Score AIM (Ostomy Skin Tool)	The SACS™ Instrument DET Score AIM (Ostomy Skin Tool)	Yes Yes Yes
Immersion Foot (IF)	None available	None available	

1.2 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds

Obtaining a detailed history in all areas of the biopsychosocial spectrum, in combination with a comprehensive physical examination, is essential in discovering all causative intrinsic and extrinsic factors of MASD.

1.2.1. Patient: Physical, emotional and lifestyle

Physical Assessment

A physical assessment should include a focused skin assessment (skin tone) that takes into consideration the level of nutrition and hydration, redness, areas of denudement, number of lesions, symmetry, location of changes, odour, periwound skin and skin colour changes and the patient's ability to perform head-to-toe skin care. It is important to assess and identify the source of moisture to determine the correct type of MASD, as the plan of care to prevent and treat MASD depends on the source of moisture. For those experiencing peristomal or periwound MASD, removal of any dressings or appliances and thorough cleansing of the area will be required prior to inspection of the skin.

Table 2: Modifiable, Non-modifiable and Causative Factors for MASD

Type of MASD	Modifiable Risk/Causative Factors
IAD	▪ Urine and or feces are the two primary sources of moisture ▪ Urinary and/or fecal incontinence combined with friction between the skin and an absorbent product ▪ Urinary incontinence ▪ Fecal incontinence provides greater risk of exposure to digestive enzymes present in feces that accelerates skin breakdown ▪ Aged skin, altered skin oxygenation, fever, air flow restriction, decreased mobility ▪ Prolonged use of steroids, antibiotics or promotility agents ▪ Impaired functional, emotional or cognitive status and/or mobility
ITD	▪ Perspiration is the most associated source of moisture ▪ Often the result of moisture combined with areas of high friction ▪ Risk factors include high body mass index, lymphedema, multiple skin folds, pendulous breasts ▪ Those who are malnourished, immobile, have poor hygiene or diabetes mellitus ▪ Hyperhidrosis, or profuse perspiration ▪ Hot and humid climates
Periwound MASD	▪ Wound exudate is the most common source ▪ Chronic wounds contain higher amounts of proteolytic enzymes ▪ Occlusive wound care dressings or products that increase the level of moisture to an excessive amount ▪ Individuals at higher risk include the elderly, the immunocompromised, or those with previous environmental skin damage (radiation, sun exposure), skin disorders (eczema, psoriasis), underlying pathology and congenital disorders (epidermolysis bullosa)
Peristomal MASD	▪ Primary source of moisture is stoma effluent: urine, feces or mucus ▪ Saliva and respiratory secretions in those with tracheostomies ▪ Ill-fitting or leaking appliance ▪ Stoma placement embedded within skin folds, flat or retracted stomas ▪ Fluctuation in weight, change in abdominal circumference6 ▪ Untrained clinicians and new ostomates applying appliances ▪ Gastric leakage from gastrostomies ▪ Peri-drain/tube drainage

cont'd. . . .

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IF	▪ Wearing wet footwear and or socks for prolonged periods of time ▪ Leg edema, skin filds, higher body mass index (obesity) ▪ Urine and/or feces (both) accumulating on legs and in footwear ▪ Reduced mobility ▪ Lack of support to perform foot hygiene ▪ Excessive foot perspiration ▪ Insecure housing and experiencing homelessness ▪ Plaster casts ▪ Long wear time of combat, construction, fishing, or rubber boots

Emotional and Lifestyle Assessment

MASD can have an effect on psychological and social functioning of the patient, which can result in social isolation and loss of independence, leading to depression. Psychological assessment should be performed to assess the level of impact of MASD on quality of life (QoL) of the patient, the family, and the care partner(s). MASD can result in severe limitations on activities of daily living as well as various other social activities such as dining out, travelling or engaging in intimate and/or sexual activity. Including the patient in identifying risk factors can help them move towards better overall health.

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

In Canada, populations at higher risk for MASD are those who have decreased access to their health-care system (e.g., accessing home care in remote and rural regions), those new to Canada, undocumented immigrants, those of low socio-economic status, uninsured or underinsured persons, and individuals with low literacy. It is critical to provide a culturally sensitive environment for care.

1.2.3. Systems: Health-care support and communication

Support from all levels of health care is imperative for effective prevention and management strategies related to all forms of MASD. Currently, provincial legislation mandates organizations report on the incidence and prevalence of PIs, but not for other nosocomial-acquired injuries such as skin tears or MASD. Although guidelines exist in some provinces, it is not mandated that organizations report metrics. Standardized language is a critical component of effective communication between clinicians. Clinicians require education and tools to be able to differentiate not only among pressure injuries, skin tears and MASD, but also among the types of MASD.

1.3 Complete a skin/wound assessment, if applicable

It is important to complete a comprehensive and focused skin assessment to determine the specific subtype of MASD and etiology. This should include, but may not be limited to, maceration, erythema and level of erosion. Thorough cleansing of the area prior to a focused wound assessment will improve accuracy in identifying the level of tissue involvement and drainage type. A skin biopsy can be an important tool in the diagnosis of a wide array of inflammatory skin conditions and irritant dermatitis such as IAD and ITD; however, it cannot reliably discriminate between the two. Diagnosis should be based on clinical features with judicious use of percutaneous skin testing for contact dermatitis related to irritants and allergies.

Table 3: Comparison of MASD Clinical Subtypes

MASD Type	Appearance	Clinical Features
IAD		▪ Location: perineum, labial folds in women, scrotum in men, buttocks, gluteal fold, medial and posterior aspects of upper thigh, lower back ▪ Erythema and inflammation of the affected area(s) with or without skin breakdown ▪ Discomfort, pain, itching, burning. Prone to secondary infections ▪ Extreme cases: swelling and blister formation may occur
ITD		▪ Location: axilla, inframammary, abdominal and inguinal folds, pubic panniculus, gluteal cleft and areas prone to harbour moisture ▪ Less common locations include interdigital, eyelids, antecubital, retroauricular ▪ Starts as mild erythema and can progress to severe swelling with maceration, denudation, weeping and crusting with potential secondaryinfection ▪ Centralized erythema with satellite lesions often associated with candida albicans ▪ Itching, burning, pain and odour ▪ Chronic subtle onset of pruritus, burning, tingling and pain in the skin folds
Periwound MASD		▪ Erythema and inflammation of the skin surrounding the wound up to ▪ 4 cm from the wound edge ▪ Maceration appears as reversible pallor secondary to excessive moisture and wrinkled skin ▪ Edge migration may be diminished ▪ Hypergranulation tissue may be present within the wound edges ▪ Hyper- or hypo-pigmentation of the surrounding intact skin
Peristomal MASD		▪ Location begins at the stoma-skin junction and may extend outward by up to 10 cm around the stoma ▪ Includes urinary and fecal diversions, tracheostomies and other stomas ▪ Erythema and inflammation of the peristomal skin with or without skinbreakdown
IF *Photo compliments of LM Parsons*		▪ Begins as tingling, itching and/or numbing feeling ▪ Erythema or cyanosis with appearance ▪ Feet may appear doubled in size as a result of edema ▪ Burning, pain ▪ Mild to moderate to severe blistering ▪ Petechiae ▪ Numbness

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

Goals of care need to revolve around the patient. Achieving goals will depend on the interplay of the patients' health status and lifestyle, the availability of resources and the knowledge and ability of care partners to provide optimal interventions. If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable. The team should aim to set goals according to the SMART principle: **S**pecific, **M**easureable, **A**ttainable, **R**elevant and **T**imely.

2.1 Set goals to maintain skin health and for prevention healing, non-healing, and non-healable wounds

Although patients experiencing any subtype of MASD may face intrinsic and extrinsic barriers to healing, clinicians should always recognize the opportunity to promote healing despite these factors, with adequate barrier protection and further skin barrier maintenance. Goals should always include prevention and support regular application of a distinct skin care routine in conjunction with methods of reducing friction and moisture within the affected areas.

Table 4: Examples of SMART Goals

Type of MASD	Goals
IAD	▪ Prevent skin breakdown related to IAD ▪ Manage incontinence within 1 week ▪ Restore skin integrity within 2 weeks
ITD	▪ Prevent skin breakdown related to ITD ▪ Keep skin folds dry within 1 day ▪ Reduce the amount of friction in intertriginous areas within 1 day ▪ Resolve secondary infection if appropriate within 5 days
Periwound MASD	▪ Prevent periwound skin maceration ▪ Manage periwound skin maceration ▪ Resolve secondary infection if appropriate within 5 days
Peristomal MASD	▪ Prevent peristomal skin maceration ▪ Restore healthy peristomal skin ▪ Resolve secondary infection if appropriate within 5 days
Immersion Foot (IF)	▪ Prevent further damage related to IF ▪ Restore skin barrier function ▪ Ensure wearing of appropriate footwear and socks within 2 days

2.1.1 Identify goals based on prevention or healability of wounds

All types of MASD should be considered healable, as the underlying factor is moisture secondary to a variety of mainly controllable factors, and the primary goal should be the prevention of future episodes of skin breakdown through methods of moisture control. ***In settings where licensed health-care professionals are present, all new cases of MASD should be given independent consideration and be considered nosocomial injury to the patient.*** Prevention of all categories of incontinence-associated dermatitis begins with a continence assessment, including a functional assessment of the patient's ability to toilet and regain or maintain their ability to toilet.

2.1.2 Identify quality-of-life and symptom-control goals

Clinicians must acknowledge patient values and develop an individualized plan of care that always considers the patient's quality of life, values and wishes for treatment. ***Organizations investing in evidence-based skin care protocols are more likely to improve patient experience, increase the number of positive clinical outcomes and drastically increase the quality of life for those suffering from MASD.***

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

An integrated team ***is necessary to implement, adjust and sustain a plan to meet the patient-specific goals.*** The team should include the relevant health-care professionals and other service providers as required as well as the patient, family and their support system.

3.1 Identify appropriate health-care professionals and service providers

Respectful and trusting partnerships between patients and health-care professionals are crucial in obtaining patient buy-in and agreement to engage in self-care strategies. ***It is essential for clinicians to know their community and the resources available within their catchment area to better facilitate seamless transition across sectors (e.g., from hospital to home or home to respite).*** Potential team members include a nurse specialized in wound, ostomy and continence care (NSWOC), clinician with advanced wound education, physician or nurse practitioner, registered dietitian, personal support worker, physical therapist, occupational therapist, pharmacist, social worker, psychologist.

3.2 Enlist the patient and their family and caregivers as part of the team

Patient participation is shown to increase positive patient outcomes and experience within health-care systems. As well, including the patient in their own plan of care can empower them, resulting in better overall health and building relationships with the health-care providers. Clinicians must therefore initiate the conversation about self-managed MASD care at the initial interaction to promote independence and encourage patients to actively participate in their care. The team must then define roles for each member. Next, the team should collaboratively establish expectations from each member to ensure engagement and co-ordination of all activities related to MASD prevention or management. To be a contributing member and

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

to optimize outcomes, the patient and their care partners must fully understand their health-related conditions and all components of the plan of care.

3.3 Ensure organizational and system support

Wounds Canada's resources and education align with a population health management model. This model encourages the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes. The interventions are based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructure.

Organizational acknowledgement of risk factors and implementation of prevention strategies for the various types of MASD are crucial to prevent occurrence. Access to and implementation of products and evidence-based protocols are necessary to control the sources of moisture for any type of MASD and reduce negative outcomes in any health organization—public or private. System support also requires organizations to provide adequate staffing to ensure such vital prevention strategies are not missed. To support this model and secure successful outcomes, decision makers must:

- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources for products such as appropriate dressings, incontinence supplies and footwear, patient education and clinical visits.***
- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of an MASD prevention program.***
- ***Establish a pathway for referral of people with skin problems to a multidisciplinary service.***
- ***Work with community and other partners to develop a process to facilitate patient referral and access to local health professionals with specialized knowledge in skin and wound management.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of preventative skin care.***
- ***Ensure services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent skin breakdown, and to support management in their health-care or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of skin complications.***
- ***Establish and sustain a communication network between the person with or at risk for skin complications and the necessary health-care and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

In order to achieve these steps and improve patient outcomes, establish or adopt a system-wide care pathway.

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

Ensure that care addresses the goals and considers patient needs, factors relating to the skin and wound (if applicable), as well as the environment and the system in which the team is situated.

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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

Once the origin of risk or actual MASD has been identified, implement steps to reduce the presence of moisture to protect skin integrity, and support the wound healing process. Preventing and correcting the cause for all types of MASDincludes removing the moisture source or, at a minimum, reducing the length of exposure time of the epidermis to themoisture source. Repairing the epidermal barrier with emollients and humectants and using appropriate products such as skin barriers and dressings to manage the moisture source are essential evidence-based strategies to include in each plan of care. In cases of recalcitrant MASD, percutaneous testing may be necessary to look for potential allergic contact dermatitis. Sources of contact allergens include topical antibiotics, preservatives, antioxidants and fragrances in skin cleansers, emollients and barrier creams. Components of the dressings themselves may act as allergens. Testing for contact allergy may require a referral to a specialized clinic/service (i.e., dermatology). Clinicians should always assess and manage emotional, social and psychological factors associated with MASD. (See Table 5).

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

Table 5: Prevention and Treatment Strategies

Type of MASD	Prevention and Treatment Strategies
IAD	▪ Assess and treat reversible causes of incontinence ▪ Put in place a skin care regimen and ensure all team members are diligent with the plan ▪ Optimize nutrition/fluid management ▪ Provide appropriate containment devices/products and ensure they are applied correctly ▪ Check containment products on a regular basis ▪ Ensure prompt and frequent changes of soiled products and cleanse and protect the skin adequately ▪ Facilitate purchase of highly breathable and absorbent product, ensuring correct fit ▪ Introduce toileting techniques as able, including appropriate equipment, devices and education.
ITD	▪ Apply moisture-wicking product impregnated with silver or PHMB-impregnated gauze between the folds to wick away or absorb moisture (follow manufacturers product supply information) ▪ Select clothing that is loose-fitting and breathable, such as cotton ▪ Make sure antifungal cream or oral antifungal treatment is continued for 7 days after the dis-appearance of clinical signs to prevent recurrence. ▪ Administer pain and antihistamine medication according to pain and discomfort assessment ▪ Reduce or eliminate skin-on-skin contact ▪ Encourage, where able, weight reduction in case of obesity. ▪ Instruct patient and care partners on the importance of bathing, showering (especially after exercise) and carefully drying skin folds.
Periwound MASD	▪ Use appropriate dressing types to manage moisture balance (See Wounds Canada's Wound Dressing Selection Guide) ▪ Apply a skin protectant (no-sting film barrier, petrolatum-based or zinc-based skin protectant) to the periwound skin to reduce the risk of periwound skin maceration.

Peristomal MASD	▪ GI/GU Ostomy:
	  ▪ Maintaining skin integrity relies on proper selection, application and function of ostomy products and skin barrier appliances, for adequate protection
	  ▪ Use appropriate technique and ostomy devices to provide a good seal
	▪ Tracheostomy:
	  ▪ Keep peristomal skin dry, and apply absorbent products that will keep the humidity away from the skin and absorb any leakage
	  ▪ Apply a moisture-wicking product impregnated with silver or PHMB-impregnated gauze
	  ▪ Consider referral to a respiratory therapist and consider non-product-based treatment such as increasing frequency of upper airway suction
	▪ Gastrostomy:
	  ▪ Identify and correct the cause of leakage
	  ▪ Keep peristomal skin dry and apply absorbent products that will keep the humidity away from the skin and to absorb any leakage
	  ▪ Consider referral to NSWOC, stoma or gastroenterology nurse

IF	▪ For acute events address physical and mental status and consider social assessment.
	▪ Warm and dry the affected area.
	▪ Dispose of wet footwear and provide warm, dry clothing.
	▪ Once the initial treatment phase has passed an assessment of quantitative peripheral sensory testing, such as Semmes-Weinstein should be considered in severely affected or symptomatic individuals or those at risk for re-injury.
	▪ For FI:
	  ▪ Re-warm actively and rapidly in a water bath (40–42°C). Passive rewarming is only acceptable when the first option is unavailable.
	  ▪ Have patient avoid nicotine or other vasoconstrictors during the period of rewarming.
	  ▪ Provide thrombolytic therapy to identified candidate patients but only in an appropriate medical setting.
	  ▪ Debride necrotic tissue, if necessary, at a later stage and only after completion of the rewarming cycle and assessment of arterial status.
	  ▪ Provide supportive care of post-injury nerve and skin damage.
	  ▪ Educate patients to prevent repeat injury.

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

In cases of recalcitrant MASD, percutaneous testing to look for potential allergic contact dermatitis may be necessary. Sources of contact allergens include topical antibiotics, preservatives, antioxidants and fragrances in skin cleansers, emollients and barrier creams. Components of the dressings themselves may act as allergens. Testing for contact allergy may require a referral to a specialized centre.

4.2 Optimize the local wound environment: Cleansing, debriding, managing bacterial balance and managing moisture balance.

Table 6: Local Wound Environment

	IAD	ITD	Periwound MASD	Peristomal MASD	IF
4.2.1 Cleansing	▪ Wash with a gentle cleanser* (avoid soap or alkaline products) ▪ Cleanse the surrounding intact skin well ▪ Pat dry; do not rub ▪ Single-use wash cloths are preferred ▪ Use no-rinse skin cleansers.	▪ Use a noncytotoxic agent* (typically potable water, normal saline irrigating solution or an appropriate wound-cleaning agent). ▪ Cleanse the surrounding intact skin well. ▪ Pat dry; do not rub.	▪ Use a non-cytotoxic agent* (typically potable water, normal saline irrigating solution or an appropriate wound- cleaning agent, neutral pH between 6.5 to 7.5). ▪ Cleanse the surrounding intact skin well, 10-20 cm outward from the damaged skin edge. ▪ Pat dry; do not rub.	▪ Wash with potable water. ▪ Use a soft or disposable cloth. ▪ Gently but thoroughly pat dry. ▪ Avoid soaps (especially oily soaps) and other alkaline products.	▪ Use a noncytotoxic agent* (typically potable water, normal saline irrigating solution or an appropriate wound-cleaning agent). ▪ Cleanse the surrounding intact skin. ▪ Pat dry, do not rub.
4.2.2 Debriding	▪ No	▪ No	▪ No	▪ No	▪ Yes, indicated by by the presence of necrotic tissue and adequate blood flow
4.2.3 Managing bacterial balance	▪ Category 1B, where fungal (link to note below) infection is evident, apply a miconazole-containing paste 1–2 times daily. ▪ Category 2B, where signs for increased bioburden is evident, a swab should be done.	▪ Place silver-impregnated fabric between the folds to wick away moisture. ▪ Use PHMB-impregnated gauze. ▪ Antiperspirant, loose clothing, good air flow.	▪ Ensure peri-wound hygiene and protection.	▪ Apply antifungal cream or powder in case of fungal infection. Apply for 7 days after the disappearance of the clinical signs of fungal infection When applying cream, ensure the cream is well penetrated before applying the ostomy pouching system.	▪ Prophylactic antibiotics have no benefit; however, if infection is suspected, target *streptococcal*, *staphylococcal* and *Pseudomonas aeruginosa*.

cont'd. . . .

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

4.2.4 Managing moisture balance	▪ Use polymer-based incontinence products or under pads instead of non-polymer. ▪ In the case of extensive diarrhea, it is preferable to apply pads instead of briefs. ▪ When applied, briefs should not be closed tightly. ▪ Use containment devices when appropriate.	▪ Place silver-impregnated fabric between the folds to wick away moisture. ▪ Apply PHMB impregnated gauze.	▪ Use a cover dressing** designed to absorb the exudate vertically to protect the periwound skin or absorbent enough to avoid any leaking on intact skin. ▪ Use absorbent dressings such as alginate, gelling fibre, polymers and foam. ▪ Protect the skin with no-sting barrier film or ointment-based skin protectant. ▪ Explore the form and function of various products to ensure maximal absorption and skin protection (e.g., not all foam dressings will absorb and lock exudate away from periwound skin)	▪ Ensure the ostomy skin barrier is protecting the peristomal skin Assess pouching device to ensure proper fit and prevention of leakage.	

**See Wounds Canada's Product Pickers, below, for more information.*

Note: Fungal infections: When a fungal infection is diagnosed, apply an antifungal cream/product as prescribed (usually 2–3 times a day). However, in the case of IAD, it is important to apply a skin barrier cream over the antifungal product to protect the skin from stools and urine. The skin barrier should be applied as many times as needed.

4.3 Select the appropriate dressings and/or advanced therapy

The first steps in treating any form of MASD are to control the moisture on the affected skin and prevent the moisture from accumulation.

Table 7: Dressing/Therapy Selection

IAD	ITD	Periwound MASD	Peristomal MASD	IF
▪ Hydrophillic paste dressings Petrolatum, zinc or dimethicone-based barrier ointments or creams. ▪ No-sting film barrier or ointment. ▪ In the case of fungal infection, avoid use of no-sting film barrier until the infection is resolved. ▪ Implement a personalized toileting schedule. ▪ If using containment products, ensure that barrier products are compatible with the containment device.	▪ Moisture-reduction products (4.2.3). ▪ Treat infection by lightly dusting skin with antifungal powder. ▪ Use of anti-inflammatory topical steroids when needed (in case of major inflammation), for a limited period. ▪ Consider referral to a dermatologist for recalcitrant dermatitis.	▪ Apply a non-alcohol-based (or no sting) liquid skin protectant to the periwound skin. ▪ Apply barrier creams. ▪ Control moisture with appropriate absorptive dressings, ideally providing vertical absorption. ▪ In some cases, excessive moisture may be due to edema, which must be controlled (such as using compression in venous leg ulcers and lymphedema).	▪ Refer to a wound care clinician or a stoma care nurse Consider referral to a dermatologist for recalcitrant dermatitis. ▪ Provide adequate oral analgesia (e.g., amitriptyline; however, this is still not well supported).	▪ Provide adequate oral analgesia (e.g., amitriptyline; however, this is still not well supported). ▪ Elevate affected extremity. ▪ Hypothermic cooling. ▪ Slow rewarming. ▪ Pain relief.

***See Wounds Canada's Product Pickers, below, for more information.*

Note: Products NOT recommended for MASD are those that donate moisture to the area such as hydrogels or dressings promoting an occlusive environment, thereby restricting the ability for moisture to evaporate.

Utilize the ACT mnemonic (Assess, Cleanse, Treat). Steps to preventing and treating the cause of IAD includes, as a method of prevention, assessing those not yet experiencing skin breakdown:

- Step 1: Assess the skin after each episode of incontinence to determine the irritant and note the condition of skin.
- Step 2: Cleanse using pH-balanced solution, protect the skin and contain the effluent.
- Step 3: Treat vulnerable, damaged, traumatized skin.

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

It is essential to engage all members of the team in care planning to optimize the outcome. ***Clinical staff education and awareness campaigns that report the outcomes of prevention strategies for MASD can help to change practice.*** Patients and care partners need to be kept engaged, as they will ultimately be the ones to control some of the underlying factors that caused the MASD.

Wounds Canada's Product Pickers

Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions

Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations

Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

5 Evaluate Outcomes

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

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

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goal(s). If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. ***The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.***

5.1 Determine if the outcomes have met the goals of care

Reassessment of MASD helps clinicians determine if prevention and treatment plans have resulted in achieving established goals. If a routine skin care regimen is implemented an improvement should be noted in a two-week period. If subtypes of MASD are not resolving and skin integrity is not maintained, reassessment of causative factors and barriers to healing, and revision of the care plan, are necessary.

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

When goals of care are partially met or unmet, go back to Step 1 of the Wound Prevention and Management Cycle. Reassessment needs to consider gaps in care or the patient's ability to adapt to their condition and engage in self-management. Inclusion of the team members is important in reassessment and exploration of modifiable factors and patient involvement and ability to support the care plan. Timely referral and continued use of categorization and assessment tools can provide a foundation for further development of validated assessment tools able to reliably detect change.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Identifying and managing the appropriate cause of MASD, type of MASD and patient barriers to healing are vital in reducing risk of recurrence. Incorporating prevention strategies into the plan of care can promote preventive behaviour throughout the management process.

- Frequent skin assessments are required, and a bundled approach to care should be implemented, including reassessing mobility, nutrition, continence and possible allergies.
  - Implementation of a consistent and structured skin care regimen is essential, including education to patients, families and care partners for sustainability and reduction of recurrence rates.
  - Ongoing evaluation and education of patients, care partners and families is important so psychosocial concerns can be appropriately averted or managed.
  - Assessment of the patient's environment is crucial to determine whether there is appropriate equipment, capacity to participate in self-care and if the home is conducive to good hygiene practices. Knowledge of community resources that support the patient remaining at home is critical.
  - If risk factors for MASD are not well managed, individuals, care partners and health-care systems will experience increased costs. Often, the focus is on the hard cost of products versus the larger picture of cost-effective care. For nosocomial-related MASD, organizations should not hold the patient accountable for funding their own products to manage situations caused by inadequate health-care resources.

Additional Wounds Canada resources, including a variety of Product Pickers and brochures, are available online at: www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

For the complete version of Best Practice Recommendations for the Prevention and Management of Moisture-associated Skin Damage, visit here.

BPR BRIEFS

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BPR BRIEFS

Lower Limb Lymphedema

This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Wounds Related to Lower Limb Lymphedema**. In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in ***bold italics***) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cost implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: https://www.woundscanada.ca/news/752-bpr-new.

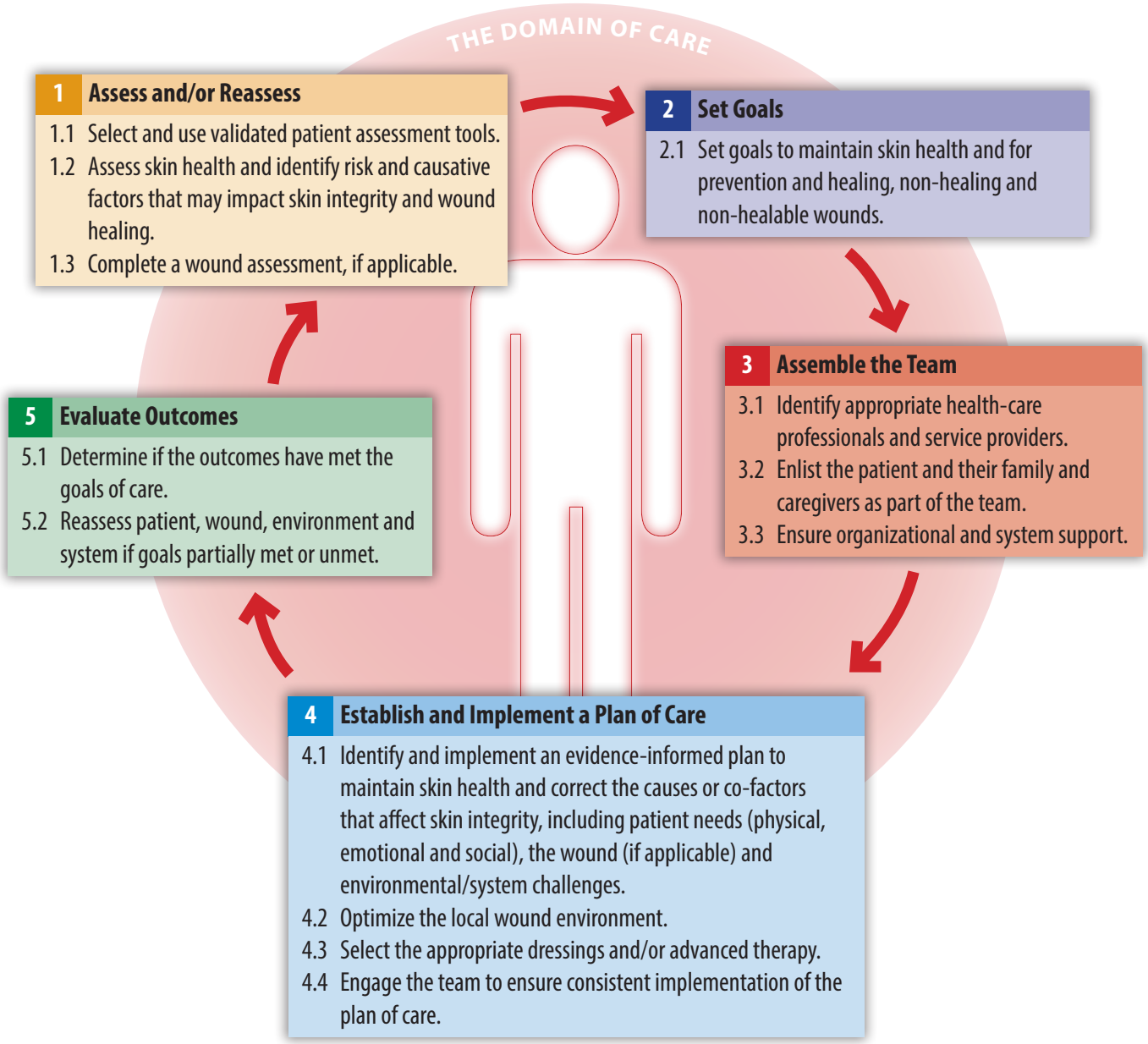
Introduction

Lymphedema, often termed a hidden disease, is generally under-assessed and under-appreciated by health-care providers.

Edema that persists for more than three months and is minimally responsive to limb elevation and/or diuretics is defined as chronic edema. All chronic edema involves lymphatic dysfunction and is appropriately classified as lymphedema (LE).

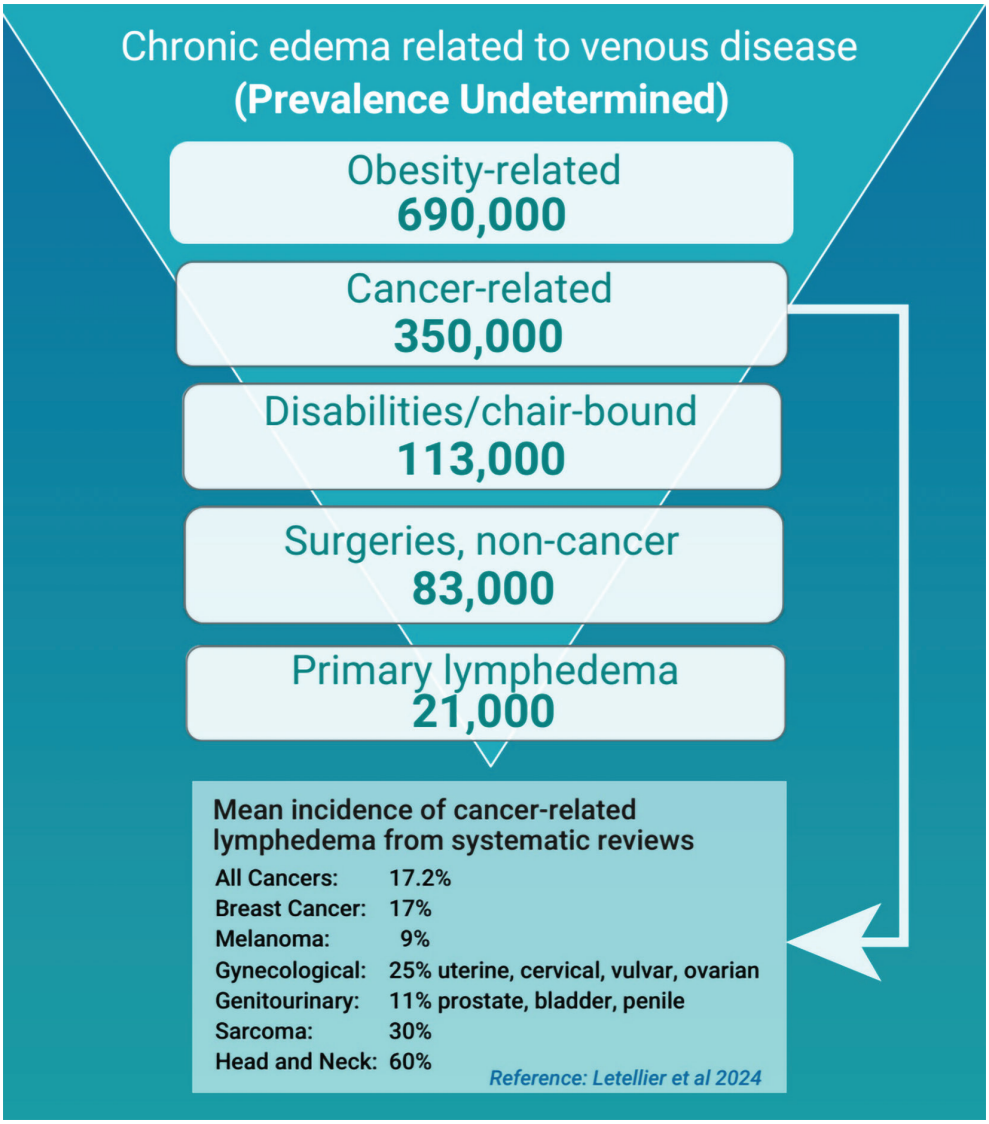
Lymphedema affects more than 200 million people worldwide. The prevalence of LE in Canada is approximately 1.25 million (based on 41.5 million population), but the condition is underdiagnosed and undertreated.LE is associated with obesity, the rates of which are increasing in Canada.Because of these factors it is important that patients receive timely assessment, diagnosis and referrals for activation of treatment, with an important focus on skin health and the prevention and management of wounds related to LE. This is crucial, as wound care is a costly concern to the health-care system and more research is needed to fully appreciate the impact of LE on this issue.

Figure 1: Wound Prevention and Management Cycle (WPMC)



For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

Figure 2: Lymphedema and Chronic Edema Potential Prevalence, Canada 2024



What is Lymphedema?

Lymphedema, whether congenital or secondary, is a serious, debilitating and progressive condition that develops when protein-rich fluid accumulates because the ability of the lymphatic system is inadequate to transport the excessive interstitial fluid. The fluid accumulation is most commonly seen in the extremities. The condition may range from mild to serious and affect patients of all ages, impacting quality of life, employment/employability, mobility and social and emotional wellness. Individuals who develop LE live with chronic, progressive swelling, skin changes, risk of infection, emotional distress and pain. Therefore, a holistic approach to lifelong care is required, including multiple referrals and reports from an interprofessional team whose members may represent lymphology, rheumatology, dermatology, endocrinology (diabetes mellitus), orthopedics and internal medicine (renal, cardiac, respiratory, bariatric) to determine causality.

Early diagnosis of LE is critical, as the disease is progressive. In the past, chronic leg edema (over three months) was not identified as LE. Recently, international experts have determined that though the pathology of chronic edema and LE may differ, the disorder is to be considered similar, as the overload or impairment of the lymphatics is the constant factor.

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

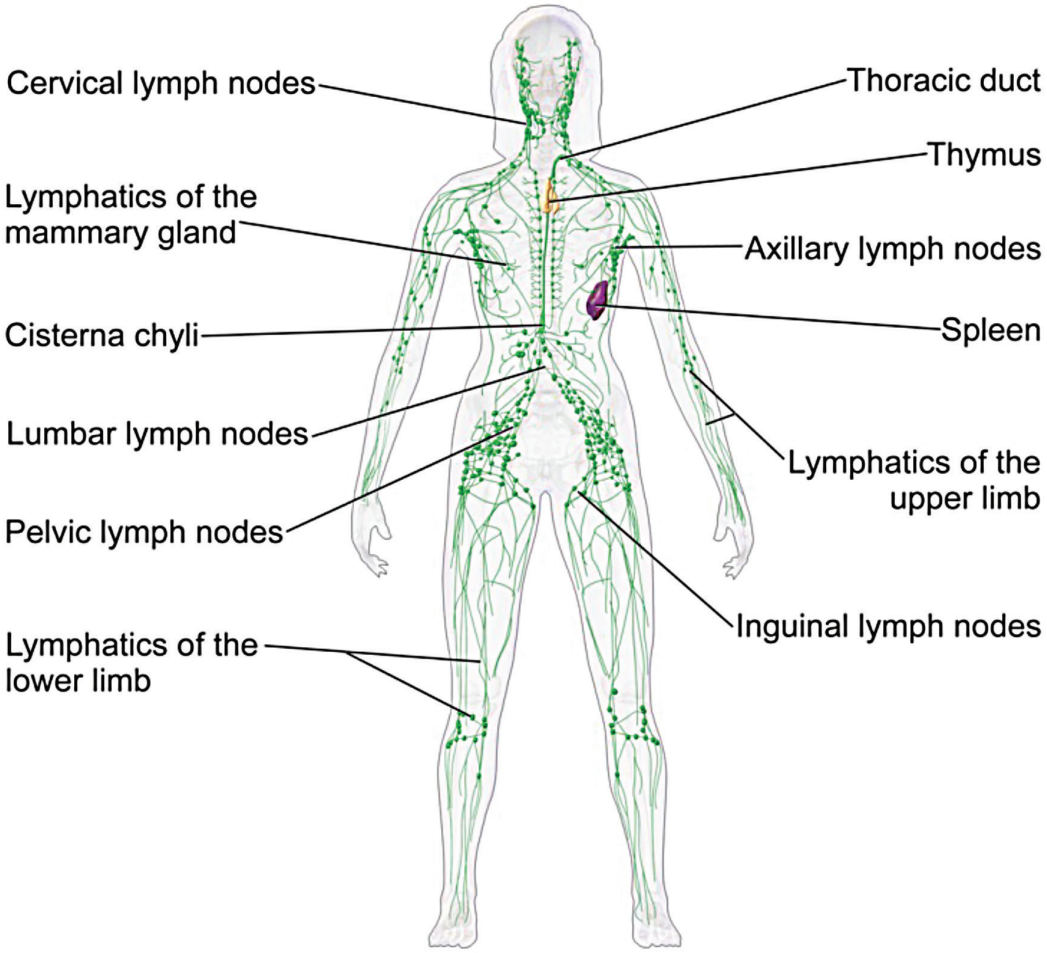
Patients diagnosed with lower limb LE often live with other co-occurring diseases/disorders such as obesity. To understand the state of LE in Canada, Wang and Keast (2016) reviewed 326 LE patients and found an average of 7.3 comorbid conditions that were potentially related to the development of chronic edema; hence the term complex lower extremity edema. Of importance is that they reported that 45% of patients were found to be morbidly obese.

Other causes of lower extremity LE include phlebo-lymphedema, most commonly known as chronic venous insufficiency (CVI) (41.8%), cancer-related lymphedema (33.9%), primary lymphedema (12.5%) and lipedema with secondary LE (11.8%).

Pathophysiology

Understanding the pathophysiology of LE is important for successful assessment and management of the disease. It is important to consider the lymphatics, arteries and veins together. The lymphatics are responsible to, "mobilize all excess tissue fluid...have an immune function and a key role in fat metabolism. Lymphatics absorb fat from the digestive system and transport it as chyle to the circulatory system. It is known that LE and fat metabolism are linked".

Figure 3: The Lymphatic System



For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

Lymphedema and the Development of Wounds

Slow- and non-healing wounds associated with LE are more likely to be identified in the lower extremity than upper limbs (most upper limb LE is related to breast cancer treatment). The higher intravascular hydrostatic pressure related to gravitational forces, chronic dependency and failed calf-muscle pump action in the lower limb result in higher filtration rates. This then leads to accumulation of tissue fluid, overwhelms the lymphatic capacity and results in subsequent inflammatory lymphatic dysfunction.

1 Assess and/or Reassess

1.1 Select and use validated patient assessment tools.
1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing.
1.3 Complete a wound assessment, if applicable.

Assessment must occur to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment include overall health status: skin status (and wound status, if applicable); environmental and system factors. If, after the WPMC has been completed, goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC. ***Assessment tools need to be available and in use in all care settings, supported by staff education and policy.***

1.1 Select and use validated patient assessment tools

Currently, there are no specific validated assessment tools for identifying LE risk factors that may affect intact skin; therefore clinicians should use general skin and wound assessment tools. Circumferential limb measurements are used to monitor progress in reducing chronic edema. The most common method is to measure with a tape measure at the ankle, knee and at a defined distance in centimeters above and below the knee. The points used depend on the areas of the limb that are most edematous.

Health-related quality of life tools must be completed. For a full description of lymphedema-related quality of life tools and further information, see https://rees-france.com/wp-content/uploads/2022/05/Health_related_Quality_of_Life_Measurement_Tools.pdf.

1.2 Assess skin health and identify risk and causative factors that may impact skin integrity and wound healing

Given the complex nature of LE there are many risk factors that impact the health of the patient that clinicians should consider while conducting the holistic patient assessment.

1.2.1 Patient: Physical, emotional and lifestyle

Lower limb LE requires early diagnosis to support goal setting, care planning and the implementation of preventative strategies that include patient education focused on risk factors. A comprehensive physical and lower limb assessment should be completed and communicated to the team members.

For steps on completing a lower limb assessment see Chapter 12: Best Practice Recommendations for the Prevention and Management of Venous Leg Ulcers.

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

Independent risk factors are identified through assessment and impact of risk factors. Assessment includes:

- Health history
- Medications (prescribed, over the counter, other)
- Social history
- Employment

Examination (height, weight, BP, joint mobility, gait, ankle-brachial assment, limb assessment (skin), nail and foot and wound assessment, compression therapy, laboratory findings, and pain assessment.

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

Health-care professionals must have knowledge about the environmental factors that can impact the skin health of a person living with LE. These factors include the ability for self-care, socio-economic conditions (employment type, income and benefits to fund bandaging system or compression garment design), living situation and environmental factors. The understanding of self-management specific to LE is growing, but more research is needed to focus on patient-centred outcomes and the impact of clinicians and systems. The key challenge with self-care approaches is how much the patient and the care partner can manage without it leading to emotional, physical and financial burden overload.

1.2.3 Systems: Health-care support and communication

Health ministries and health-care professionals are responsible for addressing the prevalence of LE, its association with multiple chronic illness and the burden to the health-care system. Yet not all provinces/territories capture the diagnosis consistently using the International Statistical Classification of Diseases and Related Health Problems (ICD codes); some provinces/territories use different billing codes or have no billing codes for LE (assessment and management). As a result, data for research may not be fully available, and prevalence and incidence rates may be significantly underreported.

1.3 Complete a skin and wound assessment, if applicable

Complete a baseline skin/wound assessment as part of the comprehensive lower limb assessment.

Skin Assessment: Fife et al. identified skin disorders related to LE

- Directly caused by LE:
  - LE-related inflammatory processes leading to disfigurement of the associated limb or affected limb, and/or
  - Lymphorrhea – lymphatic fluid that drains directly through the skin that leads to tissue maceration and breakdown
- Indirectly related to LE:
  - Pressure ulceration from the weight of the limb(s)
  - Venous leg ulcers with a mixed venous/lymphatic origin, such as venous stasis
- Associated with the diseases causing LE, such as cancer
- Associated with LE treatment, such as poorly wrapped bandaging and ill-filling compression garments and/or devices.

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

Figure 4: Diagnosis of Chronic Edema/Lymphedema

Lymphedema Classification: Lymphedema can be classified in several ways, with the goal of identifying the disease progression and severity. In this BPR brief we discuss the ISL staging system.

Figure 5: Staging of Lymphedema

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

Wound Assessment

When completing a comprehensive wound assessment it is important to know the underlying LE causes and factors and know the other co-morbidities with which the patient has been diagnosed. To accurately assess all wounds, plan assessment when compression bandaging and garments are being applied as part of the patient's routine. Document wound(s) using validated tools to promote clear communication among team members. Monthly photography assists with the documentation of the full scope of the lower limb LE and associated wound issues.

Determine if the wound is healing or non-healing, healable or unhealable.

A healing wound is progressing through the normal stages of healing on an appropriate timeline.

A wound is considered healable if the LE-related cellulitis of the lower limb is localized and has sufficient vascular supply, underlying causes such as infection can be corrected and overall skin health and compression therapy can be optimized.

A wound is considered to be non-healing if the cellulitis is extensive, healing has stalled and the wound has healing potential, but various factors—such as smoking, high body weight and/or uncontrolled edema—are compromising skin health and wound healing. The patient may not tolerate the compression therapy or compression bandaging or devices may not be available to, or affordable for, the patient.

A wound is considered non-healable when it has no ability to heal due to untreatable causes such as terminal disease, significant peripheral arterial disease, smoking, obesity (morbid) that cannot be treated surgically,end stage malignant disease (such as extensive, inoperable tumours) or end-of-life status.IIf the wound is deemed to be non-healable, goals should be set that reflect management strategies for activities that prevent infection, protect the fragile periwound and other skin to prevent further skin breakdown and provide comfort for the patient.

For more information on wound assessment tools see Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview. **HYPERLINK**

2 Set Goals

2.1 Set goals to maintain skin health and for prevention and healing, non-healing and non-healable wounds.

2.1 Set goals for skin health and for prevention, healing, non-healing and non-healable wounds

Prior to, or in the presence of, diagnosed LE, the primary goal for the integrated team is to promote skin health, prevent the progression of LE and support patient engagement in compression therapy, medical management of underlying co-morbid diseases, physical exercise, weight and medication management and mental health. Though LE is not fully preventable, progression can be slowed.

Holistic goal setting with patients who have LE must involve the integrated team and be based on consistent and effective communication. Goals must be developed according to the SMART principle in col-

laboration with the patient, family and/or care partner, and adjusted as needs change over time. For more information on SMART goal setting, please see Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.

2.1.2 Identify quality-of-life and symptom-control goals

Quality-of-life and symptom-control goal setting requires that the integrated team set realistic goals around smoking cessation, appropriate garment use, medication management, ADLs such as exercise and physical activity and the impact of skin changes and CDT on the patient's daily life.

3 Assemble the Team

3.1 Identify appropriate health-care professionals and service providers.
3.2 Enlist the patient and their family and caregivers as part of the team.
3.3 Ensure organizational and system support.

3.1 Identify appropriate health-care professionals and service providers

Health-care providers working with patients and their caregivers need to be trained in LE assessment and management. When caring for patients living with LE, clinicians need to understand anatomy and physiology, pathophysiology, multi-organ systems (skin, cardiac, renal, respiratory), mental health, mobility and exercise and collaborative care.

Ideally, clinicians would all be in a specialized centre, but in reality patients will be assessed by individual clinicians and specialists using in-person, online, web-based and tele-medicine approaches. Through use of technology and strong communication skills, clinicians specialized in LE can create a community of practice in which the patient and care partner are the centre.

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

Proactive skin health should be a priority for patients living with lower limb LE. For patients who develop skin complications and wounds, healing is often a complex process because of related underlying co-morbidities. Providing early encouragement and education to patients and their care partners enhances their engagement and understanding of how they can participate effectively in the LE care process. It's important to note that some patients who have had a delay in diagnosis may be frustrated when clinicians try to engage them in efforts to improve their quality of life through education and resources.

3.3 Ensure organizational and system support

Successful LE programs are patient-centred and include an integrated team of clinical practice leaders, educators, researchers, policy makers and administrators at a local, regional, provincial/territorial and national level. Organization and system support is required to ensure patients with LE to receive co-ordinated transition of care through community and health-care agencies. This level of collaboration and co-operation is essential as patients' needs will change as their LE progresses and as they live with other co-morbidities.13

Patients with LE require relevant home and community care services focused on improving and maintaining their quality of life,42 along with adapting and modifying their work and engagement in life.

Organizations must support the education of staff so they obtain and maintain the required knowledge and skills to be effective members of the lymphedema care team. It is essential that LE health-care provider education includes a needs assessment to identify knowledge, skill and attitude gaps. Education should address the identified short and long-term gaps and be provided using the principles of adult learning.

The Canadian Lymphedema Framework lists several private schools that provide LE education and training that meet the Lymphology Association of North America requirements. See https://www.canadalymph.ca/health-professionals/schools/ for more information

4 Establish and Implement a Plan of Care

4.1 Identify and implement an evidence-informed plan to maintain skin health and 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.
4.2 Optimize the local wound environment.
4.3 Select the appropriate dressings and/or advanced therapy.
4.4 Engage the team to ensure consistent implementation of the plan of care.

4.1 Identify and implement an evidence-informed plan to maintain skin health and correct the causes or cofactors that affect skin integrity, including individual needs (physical, emotional and social), the wound (if applicable) and environmental/system challenges

Standard prevention and treatment of LE involves patient-centred Complete Decongestive Therapy (CDT) with the overarching principles of promoting and supporting patient engagement in daily activities.The patient and care partner should receive skin health education related to handwashing and meticulous skin care to prevent skin breakdown, as well as information on the anatomy and physiology of the skin and other relevant areas of the body, management and wearing of individualized compression garments, proper footwear, exercises and management of wounds. They should also receive mental health and well-being support.

Based on a comprehensive assessment, care approaches begin with phase 1. Treatments may include:

- Meticulous skin care using pH-balanced soaps and unscented emollients (moisturizers)
- Routine nail care
- Education focused on using, managing and daily washing of garments
- Specific light manual massage – manual lymphatic drainage (MLD) with a therapist or taught to the patient (termed self-MLD)

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

- Limb elevation, range of motion and calf-muscle- and ankle-pumping exercises
- Deep-breathing exercises
- Compression therapy typically applied with multilayer wrapping (short-stretch) and hook-and-loop devices, taught by a trained therapist.

For more information on short short-stretch compression bandaging see Appendix D: Parkwood Wound Clinic Protocol for Application of Short-Stretch Compression Bandages.

Phase 2 treatments, may include:
- Continuing phase 1 activities and optimizing education
- Compression therapy: low-stretch elastic stocking or sleeves and reusable, adjustable or fastened devices may be used once taught by a trained therapist.
- It is important to note that compression garments or massage therapy alone may not be effective. These approaches require further research.

Wounds Canada: Care at Home Series provides additional information for the prevention and care of wounds at home. https://www.woundscanada.ca/patient-or-caregiver/resources/care-at-home-series

Skin Care

Patients or their care partners will be doing most of the basic skin care at home, so they need to be confident about their knowledge and skills related to hand hygiene, meticulous leg skin care, lotion application (medicated, non-medicated), identifying new skin changes, completing nail and foot care and managing compression garments, including daily washing of compression (circular and flat) garments, resetting the elastic and returning the garment to its original shape.

Patients wearing reusable (hook and loop) systems need to know the 'under stocking' requires daily washing for cleanliness.

Many patients with LE stage 2 or 3 frequently have deep skin tissue folds in the lower extremity and may have loss of the normal space between their toes. Therefore, care must be taken to clean skin folds daily with a mild pH-balanced cleanser, and ensure folds are carefully dried to prevent skin breakdown. Daily inspection of these folds is necessary to prevent local and deep tissue infections as a result of disruption to the normal skin barrier function. Patients may need mirrors and personal assistance to conduct their daily lower limb inspection.

Monthly photography of skin is encouraged to monitor for changes. Care partners can assume some of this responsibility but should not be the sole provider due to partner fatigue and burnout.

Skin-related prevention strategies must be regularly reassessed to ensure they remain appropriate.

Wounds Canada: Caring for Your Swollen Legs at Home is an excellent patient resource that is part of the Care at Home Series: https://www.woundscanada.ca/patient-or-caregiver/resources/care-at-home-series. It can be used as a teaching tool and left with patients and care partners to refer to when needed.

More patient information can be found at The Canadian Lymphedema Framework: Hints and Tips https://www.canadalymph.ca/hints-and-tips/ and Skin Care available https://www.canadalymph.ca/skin-care/.

Manual Lymphatic Drainage

Manual lymphatic drainage (MLD), also called lymphatic drainage massage, is a gentle massage done to stimulate the lymphatic vessels and to relieve or reduce the swelling in the limb. This can be done by a trained therapist or the patient or care partner with training.

Exercise

Exercise programs should be part of a long-term commitment for a patient living with LE. The programs should be relevant to the patient's underlying co-morbidities and stage of LE and should engage care partners and family members, as appropriate. Exercise programs should be individualized by a physical therapist and may be unsupervised or supervised, depending on the patient's health status and co-morbidities.

Compression Therapy

Prompt application of compression therapy is the cornerstone of LE treatment and lifelong edema management. It is essential that the clinician obtain an ankle-brachial pressure index (APBI) prior to application of compression therapy to the lower limb(s). In cases where obtaining an APBI is challenging, vascular studies should be considered in collaboration with the team and patient.

After a holistic assessment, and if vascular status permits, discuss compression therapy with the patient as one of the essential components for the treatment and management of lymphedema. If the patient agrees, compression therapy can be initiated.

Table 1: Compression Garment Design

Type	Properties
Circular knit garment	▪ Ready to wear (stocking, arm sleeves) ▪ Manufactured in a cylindrical form ▪ Supplied with compression gradients of 15–20 mmHg, 20–30 mmHg and 30–40 mmHg in standardized sizes for average-shaped limbs ▪ Due to their elastic nature, pressure variations under circular knit garments are minimal with movement
Flat knit garment	▪ Custom measured and designed to fit the patient's specific anatomical extremity dimensions ▪ Elastic, and the knit design provides significantly higher resistance to stretch, providing more containment of edema under the garment ▪ Options for compression levels for flat knit garments are similar to circular knit; however, because the garment is custom engineered specifically to accommodate the size and shape of the limb, there is a more predictable pressure distribution. The stiffer construction results in slightly larger pressure variations with movement ▪ Flat knit garments are typically easier to apply as they are form fitting and specific to the patient
Inelastic adjustable wraps (hook-and-loop technology)	▪ Designed to provide patients with adjustable compression levels along the length of the leg ▪ The adjustable design, often with hook-and-loop inelastic adjustable bindings, allows for easier application of the garment by the patient or care partner and permits adjustments throughout the day as needed ▪ These compression devices provide the stiffest construction, producing larger pressure variations with movement. Inelastic adjustable wraps can be worn during the day and nighttime hours
Nighttime garments	▪ Designed for use when the patient is supine or sleeping ▪ Garments are designed to provide containment of the edema with lower compression levels during sleep ▪ They are specifically engineered with textured fabrics to soften fibrotic tissue

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Source: Hettrick H, Ehmann S, McKeown B, Bender D, Blebea J. Selecting appropriate compression for lymphedema patients:American Vein and Lymphatic Society position statement. Phlebology. 2023 Mar;38(2):115-8.

Key Points

- Compression therapy needs to be designed specifically for each patient.
- The team must be aware that compression is essential for managing LE in the long term.
- Compression therapy should be assessed for, prescribed and applied by the patient, care partner, knowledgeable clinician or certified LE therapist.
- Education and training with the patient and/or care partner must be relevant and repeated to reinforce the proper use of compression therapy.
- Education for the patient must include identified risks and complications and to whom the patient and care partner should communicate any changes.

Compression Bandaging: The disposable compression bandage is commonly employed during the initial phase of LE management. Its primary objective is to decrease edema to ensure an optimal fit of compression garments for long-term maintenance. Inelastic disposable systems should be administered by trained health-care professionals.

Adjustable Compression Garments/Wraps: Adjustable or modifiable garments/wraps are also available to help reduce edema. As the volume of the limb reduces throughout the day, the garment can be modified and readjusted to provide a better fit and comfort, bringing the patient closer to a permanently fitted garment.

For more information about adjustable compression wraps see the Canadian Society for Vascular Surgery resource Adjustable Compression Wraps: Applications & Benefits https://canadianvascular.ca/resources/Documents/Sponsor-Showcase/MOHFocus_Wraps.pdf

Self-bandaging by Patients: Self-bandaging with compression bandages, adjustable wraps or garments may be done by some patients and their care partners after they have been taught how to safely wrap by a trained team member. Patients need to be taught the signs and symptoms of an infection and not to wrap until they have been assessed by a health-care provider. Self-bandaging supports the patient's independence, enhances their self-management abilities, reduces the number of therapist visits and generally increases their knowledge about LE treatment and management.

Teaching a patient to self-bandage takes preparation and time, and the provider must use a teaching technique most appropriate for the person. The University Health Network provides an example of a visual and written teaching tool: How to Self-Bandage Your Legs and Feet to Reduce Lymphedema (Swelling). https://www.uhn.ca/PatientsFamilies/Health_Information/Health_Topics/Documents/How_to_Self-bandage_legs_feet_to_Reduce_Lymphedema.pdf

Compression Garments: A standard guideline for selecting LE compression garments includes having the affected limb measured and fitted by a professional garment fitter when the limb is in a decongested (baseline) state. There is no straightforward answer when it comes to choosing a compression garment for LE management. Various options are available in the consumer market, including circular knit, firmer circular knit, flat knit, adjustable wraps, night garments and decongestive garments.

Key Points about Compression: Meticulous skin care, daily exercises and consistent application of compression garments are more important than choosing a garment with high pressure and stiffness.

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Daily Care of Compression Garments: Proper care includes washing by hand, hanging to dry, folding and storage of LE compression garments daily. Daily washing helps return the elastic in the garment to its original shape and may increase the life of the garment. The Canadian Lymphedema Framework outlines key teaching points for the handwashing, drying, storing and replacement of garments at https://www.canadalymph.ca/hints-and-tips/. They also discuss how to protect the garments in warm weather and when travelling.

The best compression garment is the one that CONTROLS THE EDEMA and that THE PATIENT WILL WEAR daily.

Table 2: Summary of Key Components of a Care Plan for Patients with Leg Wounds and LE

Component	Discussion
Manage underlying conditions	▪ Volume overload conditions such as congestive heart failure require management and may require diuretics; otherwise, diuretics do NOT help to reduce edema ▪ Manage glycemic control in persons with diabetes mellitus ▪ Consider referral to vascular surgery in arterial or venous insufficiency; ligation of veins may increase wound healing and reduce risk of recurrence in eligible patients with venous leg ulcers (VLU)[112] - low threshold for referral in peripheral arterial disease (PAD)
Compression therapy	▪ Vascular status permits compression therapy and is the key intervention to reduce edema, improve the skin condition, and stimulate wound healing; in general, modified compression can be used up to the point of critical ischemia, in trained hands[1] ▪ Risks of compression therapy primarily includes skin irritation, discomfort and pain – severe adverse events are rarely seen if compression is applied correctly, but use caution in severe cardiac heart failure (risk of decompensation), severe neuropathy and ischemia (risk of pressure injuries and/or compromised arterial function) ▪ Modified/reduced compression in ABPI 0.5–0.8 – bandaging usually contraindicated ≤0.5 (critical ischemia). Multi-component bandage and hosiery systems are more effective than single (for VLU)[116] ▪ Garments are essential to prevent new edema formation and wounds; life-long treatment usually necessary; patient encouragement and education; renewal of garments necessary due to wear
Other edema management	▪ Edema-related drugs: consider change of medication (risk-benefit) ▪ Intermittent pneumatic compression can supplement compression bandaging in selected cases
Wound care	▪ Debridement ▪ Removal of non-viable tissue/slough at every dressing change where possible by clinicians with the skill and appropriate scope of practice can help prevention of overwhelming bioburden and biofilm ▪ Therapeutic cleansing at every dressing change with appropriate solutions (tap water, saline, antiseptics, depending on the care setting, home, community, rehabilitation)
Microbial management	▪ Control of bioburden usually satisfactory with debridement and irrigation ▪ In high bacterial colonization or wound infection, local dressings/products are added containing antiseptics (e.g. silver, cadexomer iodine, PHMB, vinegar); antibiotics appropriate only in presence of cellulitis or wound infection that cannot be controlled by local antiseptics; treatment supported by cultures and antibiotic resistance

cont'd. . . .

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Exudate control	▪ Main reduction of exudate production is through compression—treat infection if this is the reason for excessive exudate ▪ Manage exudate through appropriate choice of dressings and frequency of dressing changes, usually from once weekly to daily
Skin care	▪ Proactive hand hygiene ▪ Prevention of broken skin and development of cellulitis ▪ Use of pH balanced soaps, cleaning and drying between toes and in all crevices to prevent fissures/ mycosis that can lead to cellulitis ▪ Gentle emollients to restore skin barrier function; if the skin is dry ointments are preferably used, otherwise a cream—carbamid or salicylic acid products can be used in hyperkeratosis ▪ Control excessive inflammation/dermatitis (e.g., by topical corticosteroids, zinc or tar); steroids to be applied before usage of emollients ▪ Barrier films to protect periwound skin from exudate ▪ Diabetics and patients with neuropathy are encouraged to frequently inspect skin at pressure points from footwear, bandaging, garments, especially between toes.
Promote exercise/ mobility	▪ Physiotherapy consult may help to maximize calf muscle pump activity; otherwise, pamphlets and discussion of appropriate exercises can be provided ▪ Support donning and doffing of day and nighttime compression
Promote lifestyle change/ choices	▪ Smoking cessation program ▪ Diabetes mellitus management ▪ Control substance use (e.g., alcohol) ▪ Adherence encouragement with compression, mobilization, exercise, weight control, nutrition, and offloading footwear ▪ Weight loss, especially in obesity-induced LE ▪ Sexual health
Pain management	▪ Nociceptive and neuropathic pain important to distinguish from each other to initiate proper treatment (See Table 2: Medications)
Offloading pressure	▪ Proper offloading footwear mandatory for diabetic foot ulcers, and pressure injuries—encouragement, and education are important ▪ Empowerment strategies
Psychological and spiritual impact	▪ Psychosocial and spiritual care and referrals made in collaboration with the patient

Adapted with permission from Dr. D. H. Keast.

4.2 Optimize the local wound environment

Local skin health and wound management strategies need to be part of the plan of care and fit within the context of the overall healability of the identified skin issue or wound. To optimize the local skin and/or wound environment, clinicians must consider periwound skin, wound cleansing and debridement, management of bacterial burden and moisture control to support prevention and healing goals. See the Wounds Canada: Care at Home Series on Wound Management https://www.woundscanada.ca/patient-or-caregiver/resources/care-at-home-series.

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

4.2.1 Cleansing

Skin care can be particularly challenging in LE due to the presence of edema and altered limb/foot shapes, creases and contours.Patients with LE are at risk of infections such as cellulitis, which can exacerbate lymphatic dysfunction and lead to greater edema, sepsis and increased mortality. Therefore, it is important to daily cleanse and moisturize (unscented, non-allergic) the skin of the affected areas, or more often, depending on the plan of care.

Skin care regimes should be updated regularly depending on the skin condition(s) and when treatments (creams, ointments) need to be applied. Skin care should be done before donning garments and the skin checked upon removal of garments.

Areas with new onset of pain should be examined for evidence of deep fissures and assessed clinically for the possibility of infection.

4.2.2 Debriding

Discussion: Debridement serves to remove microbes, foreign bodies, debris and non-viable tissue from a wound to promote wound closure. As with wound cleansing, the appropriate method of debridement should be determined based on the patient's needs and vascular status. This includes consideration of the periwound condition, wound, the environment, available resources and the scope of practice of the healthcare clinician completing the debridement.

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

The Wounds Canada Skin and Wound Clean-up Product Picker is a useful tool to help clinicians choose the most appropriate form of wound debridement. Product Picker: Skin and Wound Clean-Up.

4.2.3 Managing bacterial balance

Patients living with LE are at specific risk of soft tissue infections, which may include erysipelas, lymphangitis or cellulitis in the affected areas.The stagnation of lymph limits bacterial clearance and may impair host immunity to bacteria due to limited lymphatic flow. Although these three entities (erysipelas, lymphangitis, cellulitis) have some clinical differences, they are treated similarly with directed antibiotics against usual skin bacteria of Staphylococcus aureus (including MRSA) and Streptococcus species (e.g., S. pyogenes). Soft tissue infections most commonly affect the limbs, but in some cases may occur in other areas affected by LE (e.g., genitals, groin area). In those cases, other bacteria may need to be considered and will guide treatment decisions.

4.2.4 Managing moisture balance

Managing moisture on the skin and in a wound is an important aspect of care. Lymphatic fluid can drain directly onto the skin through microscopic skin defects known as lymphorrhea.110 Lymphorrhea drainage will collect in skin folds, especially if deep and in gravity-dependent areas, such as feet and toes, leading to skin irritation and excoriation. This results in moisture-associated skin damage (MASD). For more information on MASD see Chapter 5: Best Practice Recommendations for the Prevention and Management of Moisture-Associated Skin Damage.

4.3 Select the appropriate dressings and/or advanced therapy

Advancements in technology and innovation are rapidly evolving within the wound care sector. When choosing suitable dressings for LE-related wound care, it is crucial to ensure that the wound contact layer is compatible with the compression therapy being used and that the secondary dressing has the capacity to absorb and retain significant volumes of lymphorrhea to preserve periwound skin integrity.

For the complete version of Best Practice Recommendations for Lower Limb Lymphedema, visit here.

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

An individual who has been diagnosed with LE is living with a progressive condition that will require their entire team, including the patient themselves and their care partners, to be engaged in the plan of care. Trust, communication and collaboration among team members are essential for ensuring the success of any care plan. The team will need to encourage the patient to participate in management of underlying conditions, compression therapy, skin care, weight management, physical activity and other self-care activities while supporting their mental health throughout their lifelong journey with the LE.

5 Evaluate Outcomes

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

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

5.1 Determine if the outcomes have met the goals of care

Clinicians need to determine if the skin health, limb volume, skin thickness, compression therapy and wound goals have been met, using general and specific validated tools accompanied by patient/care partners and team communications. Where possible, practitioners should aim to co-develop and document goals of care with the patient (and/or caregiver or family member) early in the patient-health-care-professional encounter.

It is important to remember that continued support of the patient with long-term compression therapy and psychosocial, physical activity and relevant therapies, proactive skin care and self-management strategies must take place and needs to be part of the determination of outcomes of the goals that have been set.

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

If the LE goals and response to the current therapies have been partially met or unmet, the team needs to return to Step 1 to reassess. The specific activities will depend on the skin status, wound factors and the impact on the patient's ability to manage daily activities (employment, social and home). Re-assessment should include a holistic review that includes reviewing underlying disease processes. Further assessment may include repeating diagnostic tests and laboratory tests relevant to the patient's co-morbidities, arterial/vascular assessment and psychosocial assessment. The latter may include the patient and/or care partner, as burnout may be occurring.

5.2.1 Determine if the outcomes have met the care goals of care

Evaluation of patient outcomes should take into consideration factors originally set in patient goals. Goals may need change over time based on management of LE, environmental factors, access to bandaging and compression therapies and overall health status (e.g., mobility, employment). Frequent reassessment of outcomes and their intersection with patient goals of care is recommended to develop a longitudinal understanding of the patient's care context and trajectory.

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

Consider several factors when reassessing the patient, wound, environment and system. Identify whether acute physical management goals have been met through thorough reassessment of limb volume (tape measurements) and related measures using validated tools. Also assess lymphorrhagia, wound exudate, allergic reaction/sensitivity to dressings, skin integrity and levels of wound comfort.

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

Early discharge planning communications and integrated team collaboration are key in building a sustainable maintenance plan to reduce the risk of recurrence. A detailed discharge or transition in care (setting or unit) plan should be co-designed (with the initial plan of care) to accommodate the patient's unique physical, financial, social and accessibility needs. Ensure community-based care plans and referrals for follow-up have been established prior to discharge to promote smooth transitions in care and prevent patients from returning to hospital.

Conclusion

Outcome evaluation is a stepwise process that engages the patient and care team across several aspects of the health continuum. Health-care professionals must be mindful of the many tools that can be used in the assessment of LE and corresponding wounds, while tailoring care to the unique needs and goals of the patients they encounter. Research is needed to develop assessment tools that integrate aspects of both lymphatic health and wound care in order to optimize the wellbeing of patients living with complex, combined presentation of lymphedema and wounds.

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Wounds Canada is the voice for Canadian people at risk of or living with wounds and their providers.

Established in 1995, Wounds Canada is a charitable organization dedicated to the advancement of wound prevention and management for all Canadians. We accomplish this by advocating for a population health approach that promotes best practices to support persons at risk of or living with wounds, health decision makers and frontline clinicians. We develop and provide educational programs and resources, and support research to further advance this holistic, risk-based approach. We foster relationships with interested individuals and organizations to expand and sustain a robust wound community in Canada that with mutually beneficial global connections. Our goal is to reduce the prevalence and incidence of wounds of all types and the negative consequences they bring—including patient suffering and wasted health-care dollars.

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