

Best Practice Recommendations For Skin Health and Wound Management 2025

CHAPTER 4



Prevention and Management of Wounds: An Overview

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INTRODUCTION

Skin health can be challenging, particularly when the individual is living with complicating factors that may increase their risk of skin breakdown or the development of wounds. However, by using the following three guiding principles, health-care professionals can support optimal skin health and the prevention and management of skin breakdown:

1. the use of a logical and systematic approach to prevent and manage skin breakdown
2. the application of a constant, accurate and multidirectional flow of meaningful information within the team and across care settings, and
3. the affirmation of the patient as the core of all decision making.

Wounds Canada uses an integrated team care model of care. Assessing, screening, care planning, care delivery and self-management are essential elements that need to be considered to address the beliefs, values, traditions and biases of health systems, care providers, patients, families and communities, all of which influence delivery of high-quality care.

This document is written with the intent to encompass the quintuple aim for health care improvement. This is to enhance the patient experience, reduce costs, improve population health, improve the clinician experience and enhance equity. This equity piece is particularly important for patients living with skin health and wounds (See Table 1). Ensuring all patients receive care, supplies and ongoing preventative strategies needs to be recognized and communicated to policy makers.¹

Table 1: Quintuple Aim

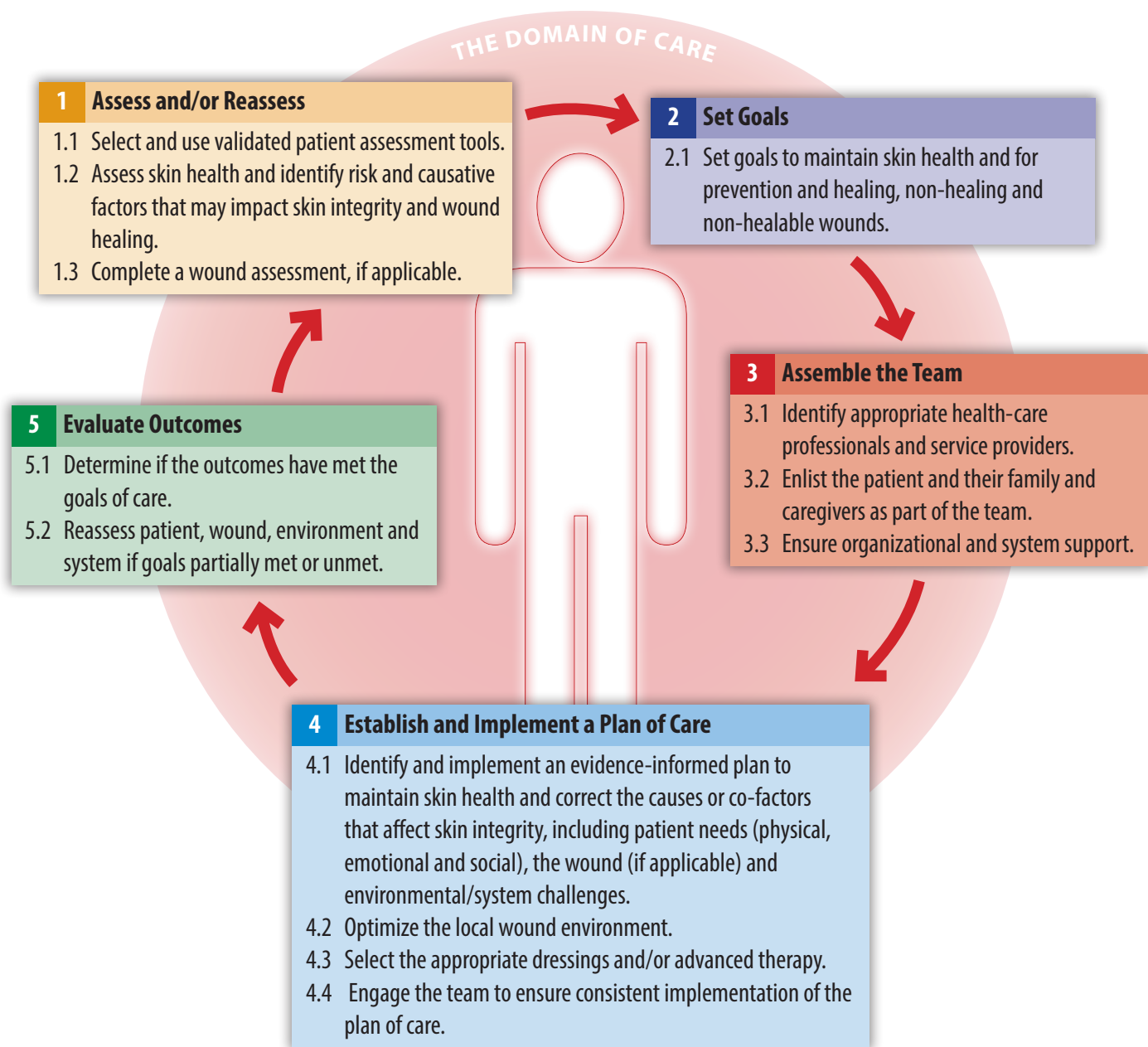
5 components	Applied to Skin Health and Wound Prevention and Management
Improving population health	Through prevention, education and self-management strategies
Reducing costs	Application of best practice to ensure most effective treatment. Appropriate use of resources-examples skin health products, dressings, pressure redistribution surfaces, devices
Advancing health equity	Application of principles to all those at risk for or affected by skin changes and wounds
Care team wellbeing	Providing clinically usable information for frontline clinicians
Enhancing the patient experience	Providing a supportive process of care for all those with skin and wound issues

THE WOUND PREVENTION AND MANAGEMENT CYCLE

This chapter outlines a process—or series of consecutive steps—that supports the individual as part of the integrated team. These steps are organized into a methodical framework called the Wound Prevention and Management Cycle (See Figure 1), which aims to guide the clinician through a logical and systematic method for developing a customized plan for skin health and the prevention and management of wounds. This cycle enables the team to move from the initial screening and assessment, to goal setting, to developing and implementing a sustainable management plan and, finally, to identifying successes and areas for improvement.

In the event the plan of care fails to meet the needs of the individual, the team returns to step one and reassesses and modifies the plan as required.

Figure 1: The Wound Prevention and Management Cycle



Health-care professionals must recognize that many internal and external stressors can affect the promotion of skin health and the prevention and healing of wounds. Effective use of the Wound Prevention and Management Cycle will take all factors into account and will result in a more complete, person-focused, sustainable process. Personal health, the environment and the context in which individuals live all impact skin integrity and wound healing. Available local and regional resources also contribute to skin health and wound healing. Ultimately, the body must heal itself, so the purpose of the health-care team is to optimize the body's ability to prevent or heal a wound.

Screening and assessments must identify risk and all relevant factors, while interventions must acknowledge and align with a person's culture, beliefs and values. This approach, which treats people as experts in their own lives, assists in the development of attainable goals of care and supports self-management across the person's continuum of care.

This chapter outlines general principles that apply to all types of wounds. The chapters that follow contain best practice recommendations for specific wound-related etiologies, with details relevant to each of those wound types.

The recommendations are based on the best available evidence and are intended to support the health team in planning and delivering the best clinical practices. They are organized using the same format as this chapter, which is based on the steps from the Wound Prevention and Management Cycle, allowing readers to become familiar with the process regardless of wound type.

Step 1: Assess and/or Reassess

Assessment is an in-depth evaluation of the individual's health issue(s) and current presentation. Assessment occurs, in part, to determine any risks, causes or co-factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status (physical, emotional); skin status (and wound, if applicable); environmental factors, such as socio-economic status, culture, lifestyle, spirituality, family status; care setting; access to services and system factors, such as government policies, supports and programs. Screening for risk, though often grouped together with assessment, includes specific processes. For example, clinicians screen for risk of pressure injuries, or risk of diabetic foot ulceration.

Reassessment can take place at any time, but *must* take place once all the steps in the Wound Prevention and Management Cycle have been completed. This may occur many times up to and including the individual's discharge from care.

Discussion: Assessment is the foundation for care planning and is most effective when:

- cultural and ethnic considerations, which may impact assessment and planning of care, are assessed, acknowledged and incorporated^{2,3}
- standardized admission protocols and comprehensive screening and assessment tools are used by clinicians, patients and their care partners
- patients are encouraged not only to be the object of these screens or assessments, but also to become active participants in the process.

Maintenance of healthy skin in health-care settings has become an Accreditation Canada quality-of-care indicator.⁴ A standard for early screening and identification of those at risk for skin breakdown to support prevention is now required for most health-care settings. Clinicians must be aware of the individualized risk factors (physical, psychosocial, spiritual, environmental, cultural and systemic) that can lead to skin breakdown or interfere with healing should breakdown occur.^{5,6}

The term *care partner* in this document refers to a person who supports an individual in their direct care or any aspect of their life. The care partner may be a family member, community member, or a person from the patient's spiritual care/faith-based community, a neighbour or close friend.⁷

NOTE: All skin and wound assessments must be documented based on institutional/agency policies and procedures. If it is not documented, the assessment is not considered delivered.

A Holistic Assessment

'Listen, look, then touch' provides a holistic assessment approach that is used by health-care providers. A contextual interpretation of the assessment that is grounded in communication principles is important to establish a relationship of trust and inclusivity.

Listen

Health-care providers must **listen** and give the patient and/or their care partner time to tell their story. This helps to identify what promotes their skin health or puts them at risk of skin breakdown and for wounds. They can describe what works to maintain healthy skin, what they feel may put them at risk for skin injury, how their wound started, evolved and what has made it better and worse.

Providers should always listen to the patient’s perception of what is happening and how it is affecting their quality of life. Trauma-informed approaches, including realizing the impact of trauma and paths for healing and recognizing signs and symptoms, are useful and should become part of every care provider’s skill set. Leaders need to develop policy and procedures and educational opportunities to support knowledge integration into practice. Together, these principles, when applied, improve patient engagement, build trust and, thereby, potentially improve patient health outcomes.⁸

Important information the clinician needs to gather in the assessment includes:

- Overall health: changes in height or weight, new or existing comorbidities (short or long-term), as well as family history
- Medication and drug history and known allergies and sensitivities
- Lifestyle factors such as smoking, use of substances, level of physical activity, high-risk activities and choices, topical medications and skin care products
- Level of physical function: mobility, gait, fatigue, eyesight, hearing, activities of daily living, use of assistive devices (and funding support, if applicable)
- Housing security and income to meet needs
- Nutritional factors: appetite, hydration, food security, cultural preferences, functional barriers to eating and swallowing (See Appendix A: Nutrition for Skin Health, Wound Prevention and Wound Healing)
- Spiritual factors, including supports such as a community group, faith-leader, spiritual leader and related activities⁹
- Psychological factors such as stress, anxiety and depression, diabetes-distress and pain—which are all associated with delayed wound healing¹⁰
- Experience with racism, sexism, agism or other types of discrimination (systemic, individual)
- Psychosocial factors, including motivation of the patient/family/care partners; social supports and coping mechanisms; culture and traditions; past adherence to treatment modalities; behavioural conditions affecting ability to participate in self-care
- Ability to participate in decision-making, understand, retain and utilize health information and instructions.

Look

What should a health-care provider **see** when looking at a patient and their environment? Observation begins as soon as you see the patient and/or family members in order to identify any visual cues of concern. An overall impression of a patient can reveal a lot about them; body language (posture, gait), facial affect (eye contact, or lack of eye contact), style of interaction with family members or care partners, demeanour and technologies used all contain vital clues about the patient’s physical condition, state of mind, social supports and environment in which they live.

Only after interacting with the person, interpreting their non-verbal cues and doing the holistic patient assessment can the clinician move on to complete a full skin assessment. A skin assessment—including appendages—requires observation from head to toe.¹¹ The clinician should:

- Assess skin, skin folds and mucous membranes for colour, moisture, temperature, texture, mobility, turgor, lesions and potential yeast or bacterial infection¹²
- Inspect for bruising and altered or broken skin, which could indicate bleeding disorders, trauma, injury, pressure injuries
- Check for red, shiny skin on the lower legs that blanches with elevation, which could indicate insufficient peripheral arterial flow (PAD) and/or hypo-perfusion
- Assess for lower leg edema as it can impair healing and may be signs of a venous and/or lymphatic disorder
- Check nails for thickness, splitting, discolouration, breaking, separation (fungus)
- Assess hair for distribution and condition and the scalp for lesions and infestation
- Check for perineal/perianal inflammation, rash, redness, pain, itching that could be indicative of incontinence (urine/ fecal, both)
- Assess for signs of pressure, friction, shear that could be damaging to skin integrity
- Assess feet for redness that could be signs of rubbing or irritation.

Once observed, skin trauma findings should be discussed with the patient to identify reasons for the injury. Particular care should be taken in patients with, or suspected of, impaired sensation related to either central or peripheral nerve function or that induced by medication, disease or underlying illness. Extreme sensitivity should be exercised if physical abuse is suspected.

Touch

Not everything can be seen or heard with the patient, so strategies that involve clinician contact or blood work may need to be considered. Ask permission and maintain the patient's privacy to promote comfort and minimize embarrassment.

Note: A fear of being touched during a health assessment could indicate anything from the presence of pain, previous negative health-care experiences, traumatic events and/or adverse childhood events (ACEs) or historical and cultural trauma.¹³ These are important for the clinician to understand in order to optimize care.^{14,15}

The clinician should be aware that:

- Limbs that are cool to touch or pulses that are difficult to feel may be indicators of vascular compromise and require a more complete arterial assessment
- Lower leg pitting or non-pitting edema may require a duplex ultrasound to assess for venous reflux and lymphatic compromise. Note: Edema can be multifactorial and other health-related causes may need to be considered, such as congestive heart failure.¹⁶

Nutritional status may include lab investigations, for example:

- Albumin levels below 30 g/L put skin at risk for trauma, and albumin below 20 g/L puts wound healing at risk. Both require a screen for nutritional status to determine albumin levels¹⁷
- Hemoglobin levels below 100g/L (anemia) can cause delayed wound healing. Levels below 70 to 80g/L may lead to very hard-to-heal or non-healing wounds.¹⁷

Recommendations

1.1 Select and use validated patient screening and/or assessment tools

Discussion: The use of validated* tools provides a standardized process for the screening and assessment of patients and supports effective communication within the team, ensuring all factors and co-factors are addressed. **Screening tools** discriminate between individuals on the basis of parameters that are designed to screen the person to predict the likelihood or risk of future development of an outcome (such as a pressure injury or diabetic foot ulcer).

Assessment tools are designed to measure the amount of change that occurs over time (such as assessment of skin health or wound healing).⁶

The validated tools used in each facility/agency should become policy, part of staff orientation/education and be used in all subsequent screenings or assessments for ongoing comparison. The use of validated and standardized patient screening and risk assessment tools is essential for not only identifying risk for altered skin integrity and providing common communication terms but also for providing a template for preventative screening, care or management. Greatex-White and Moxey, in their investigation of 14 wound assessment tools, stated that even though a tool has benefit(s), it cannot be a substitute for clinical knowledge and expertise, and outcomes must be considered based on the clinical situation and contents of care.¹⁸

*For more on the definition of *validated* in relationship to assessment tools, please read "Clinimetrics and Wound Science" (Flahr et al., in *Wound Care Canada* starting on page 18) at:

<https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/2005-vol-3-no-2/612-vol3no2full/file>.

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

Discussion: The multifactorial nature of physical, psychosocial and environmental factors that affect skin integrity and wound healing requires health-care providers to build trust-filled relationships and focus on communication (written,

verbal, in person, through technology,) with strong interpersonal skills in order to identify various elements that may impact their patients. Ideally, clinicians need to recognize the key risk factors that may either lead to or cause skin breakdown so that prevention strategies become the priority, rather than waiting until skin breakdown has occurred and wound management strategies are required.

Examples of tools to screen and identify the risk for skin breakdown include:

- Braden Scale for Predicting Pressure Sore Risk has undergone rigorous evaluation and meets the standards outlined above.¹⁹ Braden Scale: www.bradenscale.com/
- Inlow's 60-second Diabetic Foot Screen has undergone rigorous evaluation and meets the standards outlined above.^{20,21,23} Inlow's Screen: <https://www.woundscanada.ca/docman/public/2642-2022-wc-inlow-foot-ulcer-screen-tool-1101r6e-copy-nov4/file> (pdf fillable)
- Waterlow Scale has demonstrated poor inter-rater reliability, high sensitivity and low-specificity levels.²⁰
- Waterlow Scale: https://scireproject.com/wp-content/uploads/2022/04/worksheet_waterlow_pressure_risk_assessment_scale.pdf

Examples of tools to screen for risk of pediatric and neonatal skin breakdown include:

- Braden Q:²⁴ http://www.marthaaqcurley.com/uploads/8/9/8/6/8986925/braden_q_scale.pdf
- Glamorgan Scale:²⁵ https://media.starship.org.nz/glamorgan-scoring/Glamorgan_Scoring.pdf
- Neonatal Skin Risk Assessment tool (NSRA):²⁶ https://media.starship.org.nz/nsra-neonatal-skin-risk-assessment-tool/NSRA_Neonatal_Skin_Risk_Assessment_Tool.pdf

1.2.1 Patient: Physical, emotional and lifestyle

Discussion: As discussed above, assessments begin with a systematic and detailed history of the patient's general health and specific issues related to the skin condition from the patient, care partner and/or previous medical records. Patient co-morbidities that increase the risk for skin breakdown, interfere with healing and/or impair immunity should be identified.²⁷ These include, among others, diabetes mellitus, advanced age, peripheral arterial disease (PAD), obesity, collagen vascular diseases (lupus, scleroderma, dermatomyositis), organ transplants, cancer, hormone therapy, chemotherapy and therapeutic radiation.²⁸

Pain

A systematic approach is required to assess the factors that are causing or exacerbating pain.²⁹ A standard pain assessment should be considered before and after physical activities and other aspects of patient care, medication or treatment.³⁰ There are two types of pain: **nociceptive** (an appropriate physiological response to painful stimuli, either acute or chronic) and **neuropathic** (an inappropriate response caused by a primary lesion or dysfunction in the nervous system). Pain is often associated with local wound-related factors such as dressing changes, debridement, infection and lack of moisture balance. At dressing changes, pain can be caused by the dressing material or sticking to the wound base.^{31,32}



Psychosocial factors such as age, sex, culture and traditions, anxiety and depression, as well as environmental factors such as availability of resources and the setting and timing of a procedure can all affect the patient's unique pain experience. Describing pain and monitoring the impact of management strategies for pain control begins by listening to how the patient

describes the pain. When wounds are present, pain is consistently reported by patients as one of the worst aspects, and it often has a significant impact on their quality of life.³³ Chronic, persistent pain between dressing changes, even

at rest, also occurs. This type of pain can be precipitated by periwound,³⁴ contact-irritant skin damage from enzyme-rich wound exudates or infection/inflammation. Pain may also be termed *ischemic pain* and be related to poor perfusion.³⁵ As well, the impact of pain and related stress delays the wound healing.^{17,36}

Some older adults live with numerous complicating factors such as sensory deficits and cognitive impairments, so when assessing pain in the older adult population, simply worded questions and visual tools that can be easily understood may be the best approach. The use of open-ended questions will provide a clearer understanding of the person's pain experience. Instead of asking, "Do you have pain?" a better approach might be, "Can you please describe your pain." Subjective tools such as the Visual Analogue Scales (VAS) and the Faces Scale are highly effective for this population and for those with language and cultural barriers.

Young children benefit from the use of the Faces, Legs, Activity, Cry and Consolability (FLACC) pain scale, which is completed through visual and behavioural assessment by the clinician.

For First Nations Elders, youth, children and parents (n=188), pain and hurt experiences were explored in a community based study. "Participants describe experiencing pain and hurt in all four dimensions of health and from a historical, cultural, and spiritual identity, as well as from a community, family, and individual perspective. The FIRST approach captures Indigenous knowledge relating to Family, Information, Relationship, Safe-Space, and Two-Eyed treatment in the health-care encounter."³⁷

Examples of pain assessment tools include:

- The Visual Analogue Scale (VAS): https://www.physio-pedia.com/Numeric_Pain_Rating_Scale
- Numeric Rating Scale (NRS): <https://www.sralab.org/sites/default/files/2017-07/Numeric%20Pain%20Rating%20Scale%20Instructions.pdf>
- Verbal Rating Scale (VRS): [www.jpsmjournal.com/article/S0885-3924\(11\)000145/abstract](http://www.jpsmjournal.com/article/S0885-3924(11)000145/abstract)
- McGill Pain Questionnaire (PRQ): https://www.physio-pedia.com/McGill_Pain_Questionnaire
- Faces, Legs, Activity, Cry and Consolability (FLACC): <https://www.dshs.wa.gov/sites/default/files/ALISA/stakeholders/documents/duals/toolkit/forms/Pain%20Scale%20FLACC.pdf>
- Faces Pain Scale-Revised (FPS-R): <https://www.ncbi.nlm.nih.gov/books/NBK269606/figure/practicesheets.f17/>
- NOPPAIN: http://prc.coh.org/PainNOA/NOPPAIN_Tool.pdf
- Pain diary (e.g., Toronto Academic Pain Medicine Institute): <https://tapmipain.ca/TAB%20-%20Reflective%20Practices.pdf>
- Wong-Baker FACES Scale: https://wongbakerfaces.org/wp-content/uploads/2016/05/FACES_English_Blue_w-instructions.pdf

A pain scale tool is also available for neonates: <https://www.uwhealth.org/healthfacts/parenting/7711.pdf>.

Changes in pain levels may indicate a need to reassess the choice and timing of analgesics and/or other interventions used in pain management.³⁸ Pain can also be anticipatory and can lead to anxiety, especially in children.³⁸

Quality of Life

Quality of life (QoL) refers to all aspects of patients' lives, including where they live, how they live, how they work and how they play. It encompasses life factors such as family circumstances, food security, culture, finances, spiritual/religious activities, housing, job and employment opportunities and satisfaction. Health-related quality of life (HRQoL) usually refers to aspects of patients' lives that are dominated or significantly influenced by mental or physical wellbeing.³⁹ Examples of tools to assess quality of life (QoL) and health-related quality of life (HRQoL) include:

- The Cardiff Wound Impact Schedule⁴⁰ is a validated questionnaire that measures the impact of chronic wounds (leg ulcers and diabetic foot ulcers) on patient HRQoL and identifies areas of patient concern. Cardiff Schedule: www.ncbi.nlm.nih.gov/pubmed/16722893
- The Wound-QoL is a tool to assess quality of life in those with chronic wounds.⁴¹ Wound-QoL: www.ncbi.nlm.nih.gov/pubmed/24899053

- The Freiburg Life Quality Assessment is a wound module to measure disease-specific, health-related quality of life parameters in patients with chronic wounds.⁴² Freiburg Assessment: www.ncbi.nlm.nih.gov/pubmed/15197001
- Würzburg Wound Score (WWS).⁴³

Nutrition

Nutritional support plays a vital role in the prevention and management of wounds. Without adequate nutritional intake, the body is unable to maintain tissue integrity, repair damaged tissue or mount an offence against microbial invasion and infection.^{44,45,46}

Please see [Appendix A: Nutrition for Skin Health, Wound Prevention and Wound Healing](#) for more detailed information on nutrition in skin health and wound healing.

Examples of nutritional screening tools include:

- The Canadian Nutrition Screening Tool is a simple two-question screen with good sensitivity and specificity to predict adverse outcomes.^{47,48} <https://nutritioncareincanada.ca/resources-and-tools/hospital-care-inpac/screening>
- Link to Professional Guide for nutritional screening tools that are population specific. *Wounds Canada: Nutrition*: <https://www.woundscanada.ca/health-care-professional/resources-health-care-pros/nutrition>

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

Discussion: An environmental assessment is imperative to determine if the patient and/or family has socio-economic support to meet any goals of care that will be set. Determinants that should be assessed include:⁵⁰

- Income and social status
- Employment and working conditions
- Education and literacy
- Childhood experiences (Adverse Childhood Events-ACEs)
- Physical environments
- Social supports and coping skills
- Healthy behaviours
- Access to health services
- Biology and genetic endowment
- Gender
- Culture
- Race/Racism.

Persons or families with very low total incomes often lack resources and consistent access to nutritious food, adequate housing and safe physical environments such as accessible walking paths with adequate lighting. Any of these factors can negatively impact skin health and wound healing. Financial and life stress can have health consequences such as high blood pressure and immune and circulatory complications.

In general, those with adequate incomes and employment are likely to have better health outcomes, particularly if they feel they have control and influence over decision-making in the home, at work and in social settings and when intersecting with the health-care system. Increased exposure to stress (experiencing distress), as well as a lack of resources, coping strategies, skills, social support and trust-filled connection to the community can contribute to poor health and potentially harmful coping skills, such as smoking, over-consumption of alcohol and unhealthy eating habits.

1.2.3 Systems: Health care support and communication

Discussion: The collective health of Canadians has a significant impact on economic performance and the health-care system. Systems assessment considers access to funding, availability of services and skin and wound-related products, diagnostic services, service delivery personnel and co-ordination of care, all of which vary considerably from one province/territory to another and from region to region, or even one service delivery site to another (for example, from acute care to home care). Therefore, standards relating to assessment and care need to be based on available regional resources. For example, negative pressure wound therapy or government-provided special dietary allowances might not be available in all regions or all sectors of care.

1.3 Complete a wound assessment, if applicable

Discussion: The occurrence of a skin condition or wound is considered an incident and should be reported and recorded in compliance with institutional/agency policy.

There are many components of wound assessment and many validated and standardized assessment tools available. Using the tools sanctioned by your facility/agency, assess the wound to determine the impact of trauma, wound size (length, width, depth), presence of any foreign bodies and quality of the wound bed. A complete wound assessment should also include: edges, undermining, tunnelling, induration, exudate (amount, type, colour), peripheral edema, periwound skin, odour, wound pain and tissue type: granular, slough, necrotic. The degree of skin trauma or injury is usually described by the depth of the injury, however, bruising, induration, boggy and changes to skin turgor can indicate deep tissue damage without a break in the skin.^{51,52}

Examples of wound assessment tools include:

- Bates-Jensen Wound Assessment Tool (BWAT) formerly known as the Pressure Sore Status Tool (PSST).^{53,54} <https://www.woundscanada.ca/docman/public/health-care-professional/1428-bwat/file>
- The Leg Ulcer Measurement Tool (LUMT):⁵⁵ <http://pda.rnao.ca/sites/pda/files/images/legulcrmesr.pdf>
- Pressure Ulcer Scale for Healing (PUSH) tool has been validated for use in all wound types:⁵⁶ <https://bpgmobile.rnao.ca/sites/default/files/Pressure%20Ulcer%20Scale%20for%20Healing%20%28PUSH%29%20Tool%203.0.pdf>
- The Photographic Wound Assessment Tool (PWAT) has been found to be very responsive to change and can be used as a bedside tool as well as to assign a score to a photograph of a wound.⁵⁷ www.southwesthealthline.ca/healthlibrary_docs/B.9.3c.PWATResources.pdf

Assessments may be quantified and qualified based on the tool used. It is important to ensure that it is the wound being assessed and not the dressing debris.^{58,59}

The Applied Wound Management tool categorizes most wounds healing by secondary intention using three different continuums⁶⁰

- Wound Healing Continuum (WHC): is represented by the tissues in the wound and is a colour-based continuum
- Wound Infection Continuum (WIC): is subdivided into named stages representing varying host responses to bioburden, each identified by clinical clues
- Wound Exudate Continuum (WEC): is represented by volume and consistency parameters, and each can be graded according to a 'matrix' continuum.

The National Wound Assessment Form⁶¹ is designed to be used with digital pen technology with tick boxes. It includes a body map for quick visual location of the wound and easy numerical identification if more than one wound is present. Wound assessment data categories include:

- Date of assessment
- Wound number (if more than one wound present)
- Has the wound been traced?

- Type of wound
- Duration of the wound
- Tissue type and percentage
- Clinical signs of infection, eight indicators of infection
- Swab sent and result
- Wound moisture levels
- Surrounding skin condition
- Wound pain (level and frequency)
- Wound odour
- Current status of the wound (deteriorating, static, improving, healed)
- Treatment objectives.

The MEASURE⁵³ mnemonic (See box) may be useful, but it is important to note that not all mnemonics translate well in a multilingual environment and that MEASURE is not a standardized tool. Completing a wound assessment using a common, validated tool such as one of the examples below, creates a visual indication for clinicians and patients of wound healing, stalling or deterioration that can prompt a change in the plan of care.

The **MEASURE** mnemonic provides a trigger to assist the clinician when completing a wound assessment. It addresses:

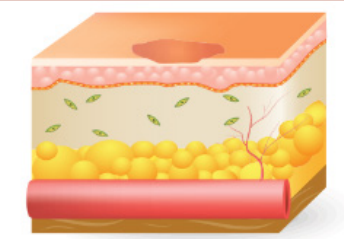
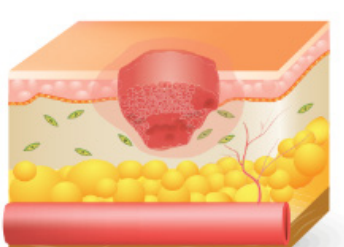

- M**easure (length, width, depth and area)
- E**xudate (quantity and quality)
- A**ppearance (wound bed, including tissue type and amount)
- S**uffering (pain type and level)
- U**ndermining (presence or absence)
- R**e-evaluate (monitoring of all parameters regularly)
- E**dge (condition of edge and surrounding skin).

A healing wound typically has granular tissue that is pale pink to beefy red, is glistening and has a rough surface due to blood vessels and collagen deposits. Often there is yellow tissue in the wound, which can be confusing to the clinician and can impact intervention decisions. Yellow tissue that is stringy and non-adherent to the wound bed may be slough (non-viable tissue), while firmly attached yellow tissue may be fibrinous tissue and a precursor to granular tissue, which indicates normal healing.⁵⁴ Eschar is the hardened or soft black crust of necrotic tissue that may form over the wound and may interfere with healing and may be a source for bacterial growth. [Chapter 3: Skin: Anatomy, Physiology and Wound Healing](#) discusses the phases of normal wound healing in detail.

Note: Pressure injuries, diabetic foot ulcers, surgical wounds, burns and skin tears employ specific wound staging, categorization or classification systems to describe injury. See the specific chapters on these subjects for discussions on these systems.

Once a comprehensive assessment has been completed the wound depth can be determined. Tissue depth will have an impact on care planning (See Table 2).

Table 2: Depth of Injury

Superficial thickness	 <p>Superficial thickness</p>	Superficial-thickness skin loss involves only the epidermis and may present as an abrasion or blister
Partial thickness	 <p>Partial thickness</p>	Partial-thickness skin loss involves the epidermis or dermis (or both) and may present as a shallow crater
Full thickness	 <p>Full thickness</p>	Full-thickness skin loss is the result of extensive destruction, tissue necrosis or damage to deep underlying structures such as muscle, tendon or bone. It may present as a deep crater and may tunnel into surrounding subcutaneous tissue

Assessing Bacterial Balance⁶⁰

The International Wound Infection Institute (IWII)⁶⁰ is a group of international wound leaders, including Canadians, who have developed tools that enable clinicians to assess and treat infection in both acute and wounds of long duration. The IWII details categories of bacterial burden and their activities in a continuum of bacterial invasion, from contamination to systemic infection (See Table 3). Since bacteria are normally found on skin and in wounds they may or may not cause problems for the patient, depending on a number of factors and conditions.^{61,62} The IWII provides tools to assess for risk of wound infection and wound infection assessment.

Examples of tools to assess *risk* of wound infection include:

- International Wound Infection Institute (2022). Eight tools are listed for consideration depending on wound type, risk variables, and predictive power:

<https://woundinfection-institute.com/wp-content/uploads/IWII-CD-2022-web-1.pdf>

Examples of wound infection assessment tools:

- International Wound Infection Institute (2022). Eight tools are listed for consideration depending on wound type, description, and psychometric testing:

<https://woundinfection-institute.com/wp-content/uploads/IWII-CD-2022-web-1.pdf>

Table 3: Categories of Bacterial Burden⁶⁰

Contamination	<i>Contamination</i> is used to refer to a stage in which there is presence within the wound of micro-organisms that are presumed not to be proliferating. No significant host reaction is evoked and no delay in wound healing is clinically observed. In a contaminated wound, the host defences destroy micro-organisms through a process called phagocytosis
Colonization	<ul style="list-style-type: none">• <i>Colonization</i> is used to refer to a stage in which the presence of micro-organisms within the wound that are presumed to be undergoing limited proliferation. In a colonized wound, no significant host reaction is evoked, and no delay in wound healing is clinically observed.• Due to the protective function of the skin microbiome, all open wounds are colonized with micro-organisms at the time of skin breakdown, but at this stage the virulence appears to be low• Micro-organisms that colonize a wound may also arise from exogenous sources or as a result of environmental exposure
Local Infection (Covert and Overt)	<p><i>Local infection</i> is used to refer to a stage of infection in which there is presence and proliferation of micro-organisms within the wound that evoke a response from the host, often including a delay in wound healing. Local infection is contained within the wound and the immediate periwound region (less than 2cm)</p> <ul style="list-style-type: none">• Local infection is divided into covert (subtle) that may progress to overt, or classic, signs and symptoms that are more recognizable. (See Table 3 for signs and symptoms)
Spreading infection	<ul style="list-style-type: none">• <i>Spreading infection</i> (also referred to as cellulitis) describes the stage of infection in which there is invasion of the surrounding tissue by infective micro-organisms that have spread from a wound• Micro-organisms proliferate and spread to a degree that signs and symptoms extend beyond the wound border. Spreading infection may involve deep tissue, muscle, fascia, organs or body cavities. (See Table 4 for signs and symptoms)
Systemic infection	<p><i>Systemic infection</i> refers to the stage of infection in which micro-organisms spread throughout the body via the vascular or lymphatic systems, evoking a host response that affects the body as a whole. In the context of wound infection, micro-organisms spread from a locally infected wound. Systemic inflammatory response can also be triggered by a local wound infection through other pathways, for example release of toxins or a dysregulated immune system. (See Table 4 for signs and symptoms)</p>

Used with permission of the International Wound Infection Institute (2022).

The bacterial burden of a wound can be assessed and a diagnosis of infection can be made using a variety of methods: clinical observations, laboratory testing (wound culture and susceptibility and/or blood cultures) and, occasionally, radiological assessment.⁶⁰ The classic signs of wound infection are often absent (covert) in wounds of long duration, so it is up to the clinician to evaluate other clinical signs (See Table 4) along with risk factors specific to the patient to fully evaluate for infection. Wound deterioration or failure to progress toward healing can also be indicators of potential wound infection and should always be considered clear signs that further investigation is warranted.⁶⁰

Table 4: Stages of the Wound Infection Continuum⁶⁰

Note: Microbial burden increases from contamination to systemic infection⁶⁰

Contamination	Colonization	Local Infection		Spreading Infection	Systemic Infection
		Covert (subtle) signs of local infection:	Overt (classic) signs of local infection:		
All wounds may acquire micro-organisms. If suitable nutritive and physical conditions are not available for each microbial species, or if they are not able to successfully evade host defences, they will not multiply or persist; their presence is therefore only transient and wound healing is not delayed	Microbial species successfully grow and divide but do not cause damage to the host or initiate wound infection	Hypergranulation (excessive vascular tissue)	Erythema	Extending induration	Malaise, lethargy or non-specific general deterioration
		Bleeding, friable granulation	Local warmth	Spreading erythema	Loss of appetite
	No delay in wound healing is clinically observed	Epithelial bridging and pocketing in granulation tissue	Swelling	Inflammation or erythema (greater than 2 cm) from wound edge	Fever/pyrexia
		Increasing exudate	Purulent discharge	Crepitus	Severe sepsis
		Delayed wound healing beyond expectations	Wound breakdown and engagement	Wound breakdown/dehiscence with or without satellite lesions	Septic shock
		New or increasing pain	Organ failure	Death	
			Increasing malodour	Lymphangitis (swelling of lymph glands)	

Used with permission of the International Wound Infection Institute.⁶⁰

The host's resistance to the bacteria is the single most important determinant of a wound moving from the states of contaminated, colonized to local, spreading and systemic infection. Pain should be assessed regularly in conjunction with infection since an increase and or change in pain can be a warning sign of wound deterioration and may indicate the presence of infection.⁶⁰ Wounds of long duration are often polymicrobial (more than one infective agent), especially in patients with diabetes, making management challenging.^{63,64} The unique health status of each patient is also a factor for infection risk and impact (See Table 5). Patients with serious compromises or multiple factors will be at higher risk for the presence and higher levels of infection.

Factors Associated with Increased Risk of Wound Infection

Characteristics of an individual with increased risk of wound infection include poorly controlled diabetes, prior surgery, radiation therapy or chemotherapy, conditions associated with hypoxia and/or poor tissue perfusion such as anemia, cardiac or respiratory disease, arterial or vascular disease, renal impairment, immune system disorders (e.g., rheumatoid arthritis, acquired immune deficiency syndrome), malignancy, shock, inappropriate antibiotic prophylaxis, particularly in acute wounding protein-energy malnutrition, alcohol, smoking and substance use.⁶⁰ Finally, Upton (2020) states the mechanism of malnutrition may be attributed to complex factors such as physiological, psychological, social, educational and economics (See Table 5).⁶⁵

Table 5: Factors Associated with Increased Risk of Wound Infection⁶⁰

Characteristics of the Individual (host)

- Poorly controlled diabetes mellitus (DM) (hyperglycemia)
- Peripheral neuropathy (sensory, motor, and autonomic)
- Neuroarthropathy
- Prior surgery
- Radiation therapy or chemotherapy
- Conditions associated with hypoxia and/or poor tissue perfusion (e.g., anemia, cardiac or respiratory disease, peripheral arterial disease (PAD), renal impairment, shock)
- Immune system disorders (e.g., rheumatoid arthritis, acquired immune deficiency syndrome)
- Malignancy
- Connective tissue disorders (e.g., Ehlers-Danlos syndrome)
- Corticosteroid use
- Inappropriate antibiotic prophylaxis, particularly in acute wounding
- Malnutrition and obesity
- Alcohol, smoking and substance (illicit) drug use
- Poor engagement or participation in the treatment plan

Wound Risk Factors

- Contaminated or dirty wounds
- Traumatic injuries with delayed treatment
- Operation is classified as contaminated or dirty
- Inappropriate hair removal
- Operative factors (e.g., prolonged surgery, blood transfusion or hypothermia)
- Duration of wound (degree of chronicity)
- Large wounds
- Anatomically located near a site of potential contamination (e.g., perineum or sacrum)
- Foreign body (e.g., drains, sutures or wound dressing fragments)
- Hematoma
- Necrotic and sloughy wound tissue
- Impaired tissue perfusion
- Increased exudate or edema that is not adequately managed
- Wounds over bony prominences or probing to bone
- Involvement of tissue deeper than skin and subcutaneous tissues (e.g., tendon, muscle, joint or bone)

Environmental Factors

- Unhygienic environment (e.g., dust, unclean surfaces, or presence of mould/ mildew)
- Hospitalization (due to increased risk of exposure to antibiotic resistant micro-organisms)
- Inadequate hand hygiene and aseptic technique
- Inadequate management of moisture (e.g., due to exudate, incontinence [fecal/urine or both, drooling] or perspiration)
- Interface pressure that is inadequately offloaded

Used with permission of the International Wound Infection Institute.⁶⁰

Practice tool: The Bioburden checklist was developed by Keast and Lindholm to determine the level of bioburden and assist in selecting the correct intervention. It can be found at:

<https://www.swrwoundcareprogram.ca/Uploads/ContentDocuments/BioburdenChecklist.pdf>

NOTE: Inflammation versus Infection

Clinicians sometimes confuse normal inflammation with infection, and it is essential to understand the difference between the two to support clinical decision-making (See Table 6).

- Inflammation is an important immune response of the body that supports wound healing and removes harmful stimuli, including damaged cells, irritants or pathogens. In cases where there is continued tissue trauma, prolonged inflammation and delayed healing can result.
- Infection, on the other hand, is the invasion of tissues by disease-causing agents, their multiplication and the reaction of host tissues to these organisms and the toxins they produce. An untreated infection impedes healing.

Persistent inflammation may also indicate the presence of increased levels of metalloproteinases (MMPs), elastase and other inflammatory substances that impair or delay wound healing. Point-of-care diagnostic testing has been developed to identify increased MMPs. Topical dressings exist to reduce MMPs and can be used in combination with topical antimicrobials or systemic anti-inflammatories/antimicrobials.

Table 6: Differences between Inflammation and Infection

	Signs and Symptoms
Inflammation	Redness, warmth, swelling and pain (the four classical signs of inflammation) and decreased function are seen in injured, infected or irritated tissues. Inflammation is also the first mechanism used as a type of nonspecific immune response
Infection	Multiplication and invasion of an infectious agent within the body tissues causing signs and symptoms of disease. In wounds the most common are Gram-positive cocci such as staphylococci and streptococci. In long-duration wounds and where co-morbid conditions exist, gram negative bacteria and anaerobes may be more of a concern

In Wound Infection in Clinical Practice: Principles of Best Practice the IWII identified the types of wound specimens that can be used to support microbiological analysis including: tissue biopsy or curettage, wound fluid aspirate (pus collection), debrided viable tissue from the ulcer base via sharp debridement, and wound swab. The Levine method is the preferred method of wound culture (See Table 7).⁶⁰

Table 7: Levine Method of Wound Culturing⁶⁰

Step	Taking a swab for culture	Further Information Begin and end the procedure with hand hygiene
1	Cleanse and debride wound prior to wound culture	<ul style="list-style-type: none">• Inform and seek permission from the patient to obtain specimen• Cleanse wound using warm normal saline• Debride non-viable tissue as required• Cleanse wound again
2	Moisten the swab tip	<ul style="list-style-type: none">• Moisten tip with sterile normal saline, especially with dry wounds
3	Obtain the sample specimen	<ul style="list-style-type: none">• Obtain the specimen from the cleanest area of the wound• Do not obtain the sample from pus, slough or necrotic tissue
4	Apply correct technique	<ul style="list-style-type: none">• Inform the patient that procedure may cause discomfort• Firmly press swab into wound and rotate• Using a sterile technique, place the swab into the culture container

5	Label the sample appropriately	<ul style="list-style-type: none"> Place the patient label on the culture container and pathology slip Provide site location (e.g., left medial malleolus), time and initials of the person who obtained the specimen Provide as much relevant history as appropriate: <ul style="list-style-type: none"> current antibiotic or medication(s) (steroid) co-morbidity (e.g., DM) specific microbe suspected (Pseudomonas) provisional diagnosis of wound duration of wound
6	Apply dressing as appropriate	<ul style="list-style-type: none"> Use local wound-care principles to select an appropriate dressing Use medicated dressings if appropriate Document wound assessment, measurements, and procedure performed

Used with permission of the International Wound Infection Institute.⁶⁰

The IWII also outlines potential diagnostic investigations and the purpose of each to support wound assessment (See Table 8).

Table 8: Potential Diagnostic Investigations and Purpose⁶⁰

Diagnostic Investigations	Purpose
Hematological (blood) markers	
White blood cell (WBC) counts (e.g., granulocytes, lymphocytes, monocytes)	<ul style="list-style-type: none"> Detect presence of infection in the body WBC's indicate an immune response
C-reactive protein (CRP)	<ul style="list-style-type: none"> Detect inflammation related to infection
Erythrocyte sedimentation rate (ESR)	<ul style="list-style-type: none"> Detect inflammation related to infection
Blood cultures	<ul style="list-style-type: none"> Detect an infection in the blood and identify the causative organism(s) A positive blood culture indicates bacteremia
Microbiology	
Wound culture	<ul style="list-style-type: none"> Identify causative organism(s) of infection Construct an antibiogram based on sensitivity testing
Radiological investigations	
Plain x-rays	<ul style="list-style-type: none"> Identify presence of osteomyelitis or abscess
White cell /bone scan	
Magnetic resonance imaging (MRI)	
Computerized tomography (CT)	
Fluorodeoxyglucose positron emission tomography (PET)	
Leukocyte scintigraphy (with or without CT)	
Ultrasound	
Ultrasound	<ul style="list-style-type: none"> Identify extent of abscess, fluid collection or hematoma

Used with permission of the International Wound Infection Institute.⁶⁰

Tip: Only after a complete assessment has been completed can a working diagnosis be formulated, after which focused lab investigations can confirm and guide treatment if necessary.

Biofilms

A biofilm consists of a complex network of bacteria and fungi embedded in a thick, slimy barrier of sugars and proteins that begin to form within minutes to hours of skin breakdown. The biofilm barrier protects the micro-organisms from external threats, making them resistant to standard treatment. Biofilms are present in the majority of wounds of long duration (60–90%) and have the potential to delay healing.^{66–69} The organisms within the biofilm cannot be detected using a normal wound culture method. The only definitive techniques available to detect biofilm involve advanced microscopy or specialized culture. See Table 9 for criteria indicative of potential biofilm in a wound.

Table 9: Criteria Indicative of Potential Biofilm in a Wound⁶⁰

- failure of appropriate antibiotic treatment
- recalcitrance to appropriate antimicrobial treatment
- recurrence of delayed healing on cessation of antibiotic treatment
- delayed healing in spite of optimal wound management and health support
- increased exudate/moisture
- low-level chronic inflammation
- low-level erythema
- poor granulation/friable hypergranulation
- secondary signs of infection

Used with permission of the International Wound Infection Institute.⁶⁰

Moisture Balance

A moist wound environment is necessary for wound healing⁷⁰; however, too much or too little moisture (or exudate) in the wound environment can adversely affect wound healing.^{71,72} Identifying the optimal moisture balance for the wound and periwound skin is a necessary part of wound assessment.

Assessing Exudate

The quality of the exudate is also an important aspect of assessment:⁷³

- Serous drainage is clear, thin and watery plasma and is considered normal during the inflammatory stage of wound healing. Small amounts are considered normal throughout healing. However, a moderate to heavy amount may indicate repetitive trauma or a high bioburden.
- Sanguineous exudate is fresh bleeding. A small amount may be normal early in the injury and during the inflammatory stage. It may indicate trauma to the wound bed.
- Serosanguineous exudate is thin, watery and pale red to pink in colour that indicates damage to the capillaries, usually with dressing changes.
- Seropurulent exudate is thin, watery, cloudy and yellow to tan in colour. It is considered abnormal and may indicate infection.
- Purulent exudate is thick, opaque and tan, yellow, green or brown, is considered abnormal and almost always indicates infection.

Discuss Assessment/Screening Findings with Patient

At the end of the skin and wound assessment it is important to discuss and summarize the findings with the patient and/or care partner. This may include current skin status, wound type and status, and if the wound is improving or deteriorating based on assessment or reassessment. The clinician needs to assess how aware the patient is of his/her health status and ensure that there has been a meaningful exchange with the patient and or care partner during this assessment.

Step 2: Set Goals

Discussion: Goals of care need to be developed with the patient and/or their care partner. Achieving goals will depend on the interplay of each patient's health status and lifestyle, the availability of resources and the knowledge and ability of care providers and care partners to provide optimal interventions.⁷⁴⁻⁷⁶ If these factors are not taken into consideration the goals of care may be unrealistic and unrealizable.

Tip: Prevention: Even if the patient has a wound, there should always be a plan of care focused on skin health in place to prevent further skin breakdown in other areas.

Recommendations

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

Discussion: Goals are not static and can often transition with various co-morbidities and conditions over time. Goals must be reviewed regularly and adjusted accordingly. The team should aim to set goals according to the SMART principle:⁷⁷

Specific: The goals must be specific and clearly state what needs to be accomplished, how, when and where

Measurable: The results should be able to demonstrate quantifiable results—how much, how many, and how often—to help measure progress

Attainable: All goals must be realistically achievable

Relevant: Goals must be relevant to overall outcome goals

Time bound: A clear and realistic timeframe should be set for each goal

Table 10 provides some samples of goals of care.

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

Discussion: Determine skin- and wound-related goals based on prior assessment and team discussion. For example, goals related to skin management might be:

- For healthy skin: Goals should be developed based on patient preferences and consideration of what has been working and what can be improved. See Wounds Canada - Care At Home Series. <https://www.woundscanada.ca/patient-or-caregiver/resources/care-at-home-series>
- For intact skin at risk: Preventative goals should be developed based on identified risk and implemented to avoid skin breakdown
- For a healing wound: Plan of care goals should be developed to support the patient who has the physical capacity to heal. Choices should be made based on optimal wound healing principles and where the system can support optimal wound healing
- For a non-healing wound: If the patient **does have** the physical capacity to heal, but due to patient or health-care system factors optimal healing is not happening at this time, the plan of care goals should address the factors inhibiting the healing process and prevention of deterioration

For a non-healable wound: If the patient **does not have** the physical capacity to heal, the plan of care goals should be centred around supportive care, prevention of deterioration and enhancement of quality of life.

2.1.2 Identify quality-of-life (QoL) and symptom-control goals

Discussion: Anything that impacts a patient’s daily life, such as the ability to engage in normal activities and maintain an adequate level of emotional well-being, need to be addressed (See Table 10). Regular screening and assessment using validated, responsive and standardized tools allow the clinician to access essential information at a glance and set realistic goals with the team.⁷⁸⁻⁸⁰ These may include QoL and symptom control goals that:

- support healthy lifestyle choices (e.g, smoking cessation, alcohol consumption, nutrition and hydration, activity, mental health),
- promote skin health,
- decrease numbers of dressing changes,
- support symptom control (e.g., pain, odour, infection, exudate) and
- support a return to and/or maintenance of a specified quality of life.⁸¹

Table 10: Examples of Goals of Care

Status	Example	Examples: Goal of care
Healthy skin	No skin-related risk factors present	<ul style="list-style-type: none"> • Maintain existing healthy skin routine • Schedule regular health status screenings as per protocols
Intact at-risk skin: Screen for risk of skin breakdown	Diabetes with peripheral neuropathy that includes loss of protective sensation to feet	<ul style="list-style-type: none"> • Maintain existing healthy skin • Perform daily skin assessment • Modify skin protocol as necessary • Provide instruction to the patient on daily foot care practices they can perform themselves or with the care partner within 48 hours • Access funding for foot care and footwear (if necessary) • Schedule an appointment for fitted footwear by trained professional within 2 days
Healing wound: Wound is healing in a predictable fashion	Pressure injury where pressure and other factors such as incontinence are being managed	<ul style="list-style-type: none"> • Maintain existing healthy skin • Wound closure within 3 weeks • Prevent recurrence or new pressure injury • Continence status is assessed regularly and issues of concern are addressed within 24 hours
Non-healing wound: Wound has healing potential, but causes and co-factors that can interfere with healing have not yet been removed	Neuropathic diabetic foot ulcer where patient does not wear plantar pressure redistributing footwear	<ul style="list-style-type: none"> • Maintain existing healthy skin • Source funding for offloading footwear within one week • Prevent infection • Reassess wound progress on a regular basis and address issues of concern within 24 hours • Prevent new skin breakdown • Arrange for the patient to engage in a support group within 2 weeks
Non-healable wound: Causes and co-factors that can interfere with healing cannot be removed, e.g., in cases of terminal disease or end-of-life care	Fungating breast cancer	<ul style="list-style-type: none"> • Maintain existing healthy skin • Prevent infection • Reduce odour by 50% within 3 days and by 90% within one week • Provide emotional support at each visit • Prevent worsening of existing wounds • Link to new Professional Guide - Malignant Wounds https://www.woundscanada.ca/dhfy-doc-man/public/2957-professional-guide-malignant-wounds/file

Step 3: Assemble the Team

An integrated team is necessary to meet the goals that have been set. 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.⁸² Because patients, their care partners and other service providers in the community are part of the team, the term *integrated team* is preferred over *interprofessional team* or *multidisciplinary team*.⁸³⁻⁸⁵

Discussion: Teams complete screening/assessing, goal setting, treatment plans, assessing outcomes and sustainability to maintain and manage skin integrity and to optimize wound healing. This is especially true in cases for persons at risk for or with skin breakdown, where interventions by multiple disciplines and of varying levels of care are required. Also, teams support patients to achieve goals that may be directly or indirectly related (co-factors) to skin and wound issues (e.g., lifestyle factors, housing, food security, mental health and wellness).

Given that the patient, their care partners and many other team members may be outside the clinical setting, the ‘team without walls’ approach is often the only way to achieve optimal patient outcomes. This is especially true because some of the team members work together in a clinical setting while other members of the team work across a variety of service delivery sites or use web-based platforms. In all cases, the effectiveness of any team depends on having a well-functioning communication strategy in place with common goals between ALL team members.

Ongoing professional development is necessary to maintain a best-practice approach to patient care. Wounds Canada offers educational programs through the [Wounds Canada Institute](#) and [conferences](#) to support team member knowledge and skills development.

Recommendations

3.1 Identify appropriate health-care professionals and service providers

Discussion: Best practice care for skin health and for persons at risk for the development of wounds, or for those who have wounds, demands a systematic, team approach from knowledgeable health professionals and other providers with expertise not only in skin health and wound management but also in any of the factors that may be impacting or have the potential to impact skin health and wound management.

The selection of team members will be based on thoughtful analysis of the results of the patient’s screening, assessments, individual needs and goals and the plan of care. All team members must support the plan of care and be an active part of revisions to the plan as necessary. Members of the team will contribute to patient care in their specific area of expertise, but in a co-ordinated way.⁸⁴

Potential Team Members

Health-care professionals on the team may include: nurses, physiotherapists, occupational therapists, language translators, orthotists, dietitians, podiatrists/chiropractors, social workers, traditional compounders, recreational therapists, pharmacists, diabetes educators, nurse practitioners, nurses specialized in wound, ostomy and continence care providers, psychologists, and physicians—both generalists and specialists, including dermatologists, plastic surgeons, physiatrists and vascular surgeons—depending on patient need.

Unregulated health care providers such as health-care aides and personal support workers can play a vital role as the ‘eyes’ of the team, as they often have daily contact with the patient and assist with bathing and skin-care activities. Spiritual care providers and traditional healers offer emotional and spiritual care. Laboratory and radiology teams may be part of diagnostic investigations and reporting.

Other important community-based service providers in the integrated team may include shoe fitters, meal delivery personnel, homemakers, garment fitters, medical aid specialists, financial aid workers and transportation providers.

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

Discussion: The patient, family and any formal or informal care partners need to be at the core of the integrated team.⁸⁵ This approach may be a new concept to the patient, so the first step is to ensure they recognize the role of individual team members and responsibilities in their care, as successes in health care can be dependent on early, trust-filled, effective and shared communication between health-care providers and patients.⁸⁶

While all patients want to be seen, heard, supported and connected, truly effective communication must be individualized to accommodate the person's needs and environment. Some strategies and techniques to optimize the provider-patient relationship and communication require the clinician to:

- Create a safe environment and allocate adequate time
- Identify language needs, the need for an interpreter, cultural sensitivity, hearing ability and literacy needs
- Identify the need for care partners, parents, and/or legal guardians to be present
- Consider access to and use of technology (phone, computer, devices, e-platforms)
- Avoid medical terminology and jargon
- Listen, and indicate that you have allowed time for questions through frequent pauses and check-ins where you might ask questions such as, "What do you want to know about?" or, "What worries you the most?"
- Use open-ended questions such as, "Can you please describe your pain" or, "Can you tell me about your pain"; rather than, "Do you have pain?" Use visual analogue scales, when appropriate
- Allow for pauses for reflection, on both sides, between questions
- Encourage engagement and maintain good non-verbal communication
- Avoid cultural stereotyping while respecting potential differences
- Confirm information received from the patient by saying, "In other words what you are telling me is..."
- Verify information given to the person by having them provide feedback such as, "What you are asking me to do is ..."
- Follow up to ensure the care plan is successful and adapt as required.

3.3 Ensure organizational and system support

Discussion: Organizational and system support is required to ensure that patients receive a co-ordinated transition of care through community and health-care agencies as well as the development of specialized, knowledgeable, integrated teams. Ongoing knowledge mobilization of the latest evidence through education, policy and procedure development, evaluation of outcomes and availability of appropriate resources requires system support.^{87,88}

The development and implementation of a successful wound prevention and management program involves collaboration with practice leaders, educators, policy makers, researchers and administrators at a local, regional, and national level.⁸⁹ See [Chapter 2: How to Use Wounds Canada's Best Practice Recommendations for Skin Health and Wound Management 2025](#) for more on implementation of these recommendations.

Supporting an individual successfully requires proactive, risk-based interventions at a variety of levels: individual, organizational and cultural. To secure successful outcomes:

- Decision makers must establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor all elements related to skin health, prevention and management of wounds.
- Frontline clinicians must communicate with decision makers through appropriate channels about the needs and concerns of their patients, as well as about workplace issues that may impact their ability to deliver best practice-based care.

Step 4: Establish and Implement a Plan of Care

Ensure that care addresses the goals that have been set and considers individual needs (physical, emotional, spiritual, cultural and lifestyle), factors and co-factors related to skin health and the prevention and management of wounds, if applicable.

Discussion: Best practice-based skin health, wound prevention and wound management are both a science and an art because of the individual circumstances of each person. Therefore, the plan of care required needs to be guided not only by the evidence, but also through documented clinical decision-making involving patient input regarding preferences, circumstances, values and rights.

The Care at Home series: <https://www.woundscanada.ca/patient-or-caregiver/resources/care-at-home-series> developed by Wounds Canada provides easy-to-use resources for patients and their families who need to provide skin health and wound care activities in their own homes.

Recommendations

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

Discussion: Promotion of skin health to prevent breakdown is always a priority. Daily skin care generally involves:

- Ensuring the individual's skin is kept clean and dry and appropriately moisturized
- Skin is protected against injury due to incontinence or other types of excessive or corrosive moisture, pressure, thermal assault, skin tears, inappropriate clothing and poor-fitting footwear
- Lubricant is used when shaving
- Nails are kept well cared for, with no ragged edges (to protect against skin tears)
- Hair is clean and well-kept.

For more on basic skin health, please see Skin Health and Hygiene: Keeping Skin Healthy https://www.woundscanada.ca/doclink/professional-guide-skin-hygiene/eyJ0eXAI0iJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJzdWliOiJwcm9mZXNza-W9uYWwtZ3VpZGUtc2tpbi1oeWdpZW5lliwiaWF0IjoxNjg3MTkyODMwLCJleHAiOiJlE2ODcyNzkyMzB9.fBOnkzHo_dJt-NyzSdsyysTw3wVJj4ecT6QRNsOGnCAM

Individuals at risk for or with wounds may have multiple co-morbidities that can interfere with skin integrity or that can lead to prolonged or stalled healing of existing wounds. Addressing the co-morbid conditions that affect the health of skin and/or its ability to heal is paramount in the development of a plan of care that will effectively meet goals relating to maintenance of skin integrity and or the prevention and management of wounds.

Physical Activity

Appropriate levels and types of exercise have beneficial effects, both physically and mentally. Exercise can improve weight control, cardiorespiratory function, blood pressure, cholesterol levels as well as mood, sleep and mental function.^{90,91} Chronic illnesses have strong links with inactivity. While there is limited evidence linking improved physical fitness to better wound healing, there is strong research associating exercise with a reduction of the effects of chronic diseases, which could impact skin health. Exercise also positively affects impairments such as pain, stress, circulation, neuropathy, blood glucose levels and well-being, which can be directly linked to issues of skin integrity.⁹²⁻⁹⁶

Given the potential risks of ill effects associated with unsupervised exercise in certain patient populations, it is imperative that high-risk patients be closely supervised by a skilled health professional. With guidance, exercise can be an empowering and safe intervention to enable patients to improve their overall well-being.

Nutrition

If a nutritional deficiency is thought to be significant enough to impact the health of skin or impair wound healing, a registered dietitian should be consulted^{45,46,97} to develop an individualized nutrition plan as part of the plan of care, with the goal of optimizing the person's nutritional status. Management of deficiencies may make the difference between a healing and non-healing wound even in the presence of best clinical practice. The nutritional component of the plan of care must account for the patient's needs, beliefs, preferences, health status, ability to secure and eat food and fluids, along with socioeconomic, cultural and psychosocial status. As well, the availability of care partners, community and system support (e.g., community food banks, meals-on-wheels, meal plans) must be considered.

For more on nutrition and skin health and wound healing please see [Appendix A](#) and the Nutrition page on the Wounds Canada website:

<https://www.woundscanada.ca/health-care-professional/resources-health-care-pros/nutrition>

Moisture Control

As mentioned above, skin should be kept clean and dry, but hydrated appropriately.

Intertrigo, which occurs when there is too much moisture, is a common condition that leads to skin erosions, primarily in skin folds. It is caused by the combined impact of moisture, friction and shear. Researchers recommend the following prevention and management strategies:⁹⁸

- Implement a skin-fold-hygiene program to keep skin dry and minimize skin-on-skin contact and friction
- Avoid the use of or contact with any skin irritants
- Wick moisture away from affected and at-risk skin; consider silver impregnated textiles (not to be confused with silver dressings)
- Control or divert the moisture source
- Prevent or treat secondary fungal or bacterial infection.

Incontinence-associated dermatitis (IAD), caused by feces, urine or both, can create a type of irritant contact dermatitis that requires reduction and management of incontinence. According to the Global IAD Expert Panel, two key interventions are critical for the prevention and management of IAD.⁹⁹

Management of incontinence requires that the clinician identify and treat reversible causes (e.g., urinary tract infection, constipation, dehydration, diarrhea, use of diuretics) to reduce or eliminate skin contact with urine and/or feces. A structured skin care regimen should be implemented to protect the skin exposed to urine and/or feces and help restore an effective skin barrier function. Skin care regimens must be supported with education, policy and measurement of improvements.

For more on moisture and the skin, please see [Chapter 5: Best Practice Recommendations for the Prevention and Management of Moisture-Associated Skin Damage](#)

For more information please see: [Assessment and Management of Persons Living with Continence Issues](#)

Pain Management

The intensity and impact of pain on the patient's quality of life of all assessed pain must be taken into consideration when creating a personalized plan of care.^{12,21,63} Table 11 summarizes some of the causes of pain and strategies for person-centred management.

Table 11: Causes and Management of Pain^{17,30,31,85,100-102}

Causes of Pain	Characteristics	Management Strategies
Background pain	Pain at rest (related to wound etiology, infection, ischemia)	Treat the underlying etiology of the wound and associated pathologies
Incident pain	Pain during day-to-day activities (walking, coughing, friction, dressing slippage, device wear)	Utilize pharmaceutical and non-pharmaceutical approaches considering integrative therapies
Procedural pain	Pain from routine procedures (e.g., anticipatory pain, dressing removal and application, debridement)	Preparation and planning of the procedure are key to preventing pain
Operative pain	Pain associated with an intervention, such as cutting of tissue or prolonged manipulation, that would require an anesthetic	Analgesics should be administered before a procedure and may be required post procedure Dressing selection is key to pain management related to dressing removal and application

Additional Strategies to Promote Patient Health

The plan of care may require referrals to programs relating to mental health, social support, spiritual care, smoking cessation, weight management and stress management, among others, to optimize patient health to prevent skin breakdown or support wound healing. Table 12 outlines several examples. Check local and regional links to programs.

Table 12: Examples of Lifestyle Strategies for Optimizing Patient Health

Strategy	Impact and Benefits
Smoking cessation programs	Smoking cessation benefits a patient’s long-term health by reducing the risk of disease development. There is also evidence that quitting smoking may reduce wound complications, such as infection, and increase rates of bone healing ¹⁰³
Weight management programs	Obesity and associated co-morbidities increase the likelihood of impaired skin integrity and slow-to-heal wounds due to poor blood supply to adipose tissue. ¹⁰⁴⁻¹⁰⁶ Patients diagnosed with obesity may have protein malnutrition, which further impedes the healing Effective weight management can decrease a patient’s risk of developing pressure injuries, irritant dermatitis due to urinary and/or fecal incontinence, candidal intertrigo, cellulitis or more serious skin infections such as necrotizing fasciitis, venous ulcers, diabetic foot ulcerations and surgical site infections
Stress management programs	Stress can have a negative impact on the development of wounds and wound healing ³³ The most prominent impact is on cellular immunity. Stress management programs have demonstrated reduced distress and improved quality of life
Mental health and other programs	Programs that support the management of anxiety, addiction, chronic illness, pain, palliative care, healthy living and sleep disorders can improve skin integrity, wound healing and quality of life ¹⁰⁷
Spiritual health programs	Programs that spiritual health care can improve their well-being, hope, outlook on life and optimism, and help manage spiritual distress ¹⁰⁸⁻¹¹⁰
Alcohol consumption/ use	Patients should be informed about the risks of alcohol use. The Government of Canada has guidelines ¹¹¹ to support patients in making informed decisions about alcohol and substance use

4.2 Optimize the local wound environment (if applicable)

Discussion: Local wound management strategies should fit within the context of the overall goals of care. For a wound to heal, it is first essential to determine the reason(s) the wound developed and to identify any factors that are impairing or might impair healing. The first step is to protect the area from further trauma. Following that, the wound environment needs to be optimized, which involves the four basic components in wound hygiene: cleansing, debridement of necrotic or indolent tissue, managing bacterial balance and managing (controlling) moisture through the selection and application of appropriate dressings.¹¹²

4.2.1. Wound Cleansing

Discussion: Wound cleansing solutions vary and should be used at body temperature. Cleansing solutions should be nontoxic, hypoallergenic, readily available, cost-effective and easy to use.^{21,60,63}

Wound cleansing solutions commonly used in wound management include: sterile normal saline, sterile water, potable tap water¹¹³ and antiseptics (See Table 13). A therapeutic irrigation with a force of 4–15 psi has been demonstrated to be effective and generally safe.^{60,114-121}

When wound infection is suspected, a solution with a surfactant, antiseptic or antimicrobial agent may be recommended. Antiseptics should be used short term and with caution since they are non-selective and may damage healthy tissue. Some commonly used antiseptic solutions are polyhexanide (PHMB), betaine/PHMB (a surfactant), povidone-iodine and octenidine with ethylhexyl glycerine (a surfactant). Clinicians should be aware of the cytotoxicity of each solution, appropriate concentrations and the individual wound requirements when choosing the most appropriate solution.⁶⁰

Wound cleansing may cause pain during the dressing change. The routine practice of using abrasive materials and gauze to scrub the wound surface is discouraged. It is important that clinicians use the most appropriate solution and technique to minimize harm to the wound bed and periwound skin.

Table 13: Cleansing Solutions⁶⁰

Solution	Type	Cytotoxicity	Effect on biofilm	Comments
Potable tap water	Varies in content	• unknown/ variable	• none	• not sterile • once opened product is no longer sterile
Sterile normal saline (0.9%)	Isotonic	• none	• none	• sterile, non-antiseptic solution • once opened product is no longer sterile
Sterile water	Hypotonic	• none	• none	• sterile, non-antiseptic solution • once opened product is no longer sterile
Polyhexamethylene biguanide (PHMB)	Surfactant anti-microbial	• low to none	• surfactant qualities disrupt biofilm attachments	• lowers liquid surface tension, allowing greater spread and facilitating separation of non-viable tissue • does not promote bacterial resistance

Octenidine dihydrochloride (OCT)	Surfactant anti-microbial	<ul style="list-style-type: none"> • <i>in-vitro</i> tests show high toxicity • lack of absorption suggests no systemic effects • not shown to disrupt healing 	<ul style="list-style-type: none"> • prevents formation of new biofilm for at least 3 hours • inhibits planktonic and bacterial biofilm growth for up to 72 hours 	<ul style="list-style-type: none"> • comes in a gel, irrigation and surfactant preparations and irrigation preparation that can be used together or separately • lowers liquid surface tension, allowing greater spread and facilitating separation of non-viable tissue
Super oxidized solutions (Sodium hypochlorite [NaOCl] antimicrobial preservative) (Hypochlorous acid [HOCl] antimicrobial preservative)	Antiseptic	<ul style="list-style-type: none"> • may vary depending on concentrations 	<ul style="list-style-type: none"> • penetrates biofilm rapidly, killing formations from within • does not promote resistant bacteria strains 	<ul style="list-style-type: none"> • purported to provide desloughing and antimicrobial activity • comes in a gel and irrigation preparation that can be used together or separately
Povidone-iodine	Antiseptic Iodophor	<ul style="list-style-type: none"> • varies depending on concentration 	<ul style="list-style-type: none"> • inhibits development of new biofilm • eradicates young biofilm colonies • significantly reduces mature biofilm colonies 	<ul style="list-style-type: none"> • modulates redox potentials and enhances angiogenesis, thereby promoting healing • may inhibit excess protease levels in chronic wounds

For more on cleansing agents, see [Wounds Canada Product Picker: Skin and Wound Clean-up](#)

4.2.2 Debriding

Discussion: The European Wound Management Association defines debridement as the, “act of removing necrotic material, eschar, devitalized tissue, serocrusts, infected tissue, hyperkeratosis, slough, pus, hematomas, foreign bodies, debris, bone fragments or any other type of bioburden from a wound with the objective to promote wound healing.”¹²²

In some wounds debridement is required to eliminate moist necrotic tissue, which provides a medium for bacterial growth, initiates an inflammatory response, places a phagocytic demand on the wound and retards wound healing. The ensuing infection and biofilm formation limit the effectiveness of topical and systemic antibiotics.

It is important to note that debridement of a wound that does not have adequate vascular supply is not recommended. **Therefore, a thorough assessment of vascular supply to the wounded area is imperative prior to debriding.** If there are concerns regarding vasculitis or pyoderma gangrenosum, debridement should not be done.

In the case of diabetic foot plantar ulcers or calluses, debridement is part of offloading, unless there is evidence of PAD. See [Chapter 10: Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers](#) for more on arterial disease.

Caution: Sharp debridement should never be performed by unskilled clinicians. Clinicians require proven training, documentation and agency support through policy and procedure prior to performing conservative sharp wound debridement.

Debridement may be selective (removing only non-viable tissue) or non-selective (potentially harmful to healthy tissue). More than one debridement approach may be used. See Table 14 for the common types of debridement.

Table 14: Types of Debridement⁶⁰

<p>Biological Debridement (Biosurgical) Or Maggot debridement therapy (MDT)</p>	<p>Maggots possess enzymes that liquefy necrotic tissue and secrete substances that destroy bacteria¹²³</p> <ul style="list-style-type: none"> • First described by Pare in the 1500s • During World War I, successful treatment of leg ulcers and osteomyelitis • The development of antibiotics and improvements in surgical techniques reduced MDT to a treatment of last resort • MRSA has renewed interest in MDT, being beneficial and cost-effective <p>There is substantial literature available on larval therapy; however, large-scale clinical trials supporting the evidence are lacking. The largest deterrent to the use of larval therapy appears to be the ‘yuck’ factor¹²⁴</p>
<p>Mechanical Debridement</p>	<ul style="list-style-type: none"> • Uses mechanical forces to remove bacteria and non-viable tissue • One of the most common forms of debridement, usually performed by removing ‘wet-to-dry dressing’ along with adherent debris <ul style="list-style-type: none"> - As it may cause unnecessary trauma and added pain, it is strongly discouraged • Spray wound cleansers or non-traumatic irrigation systems deliver irrigation pressure with a force of 4 – 15 (psi), demonstrated to be effective and safe at the wound surface to dislodge bacteria and debris <ul style="list-style-type: none"> - Pressure greater than 15 psi must be used with great care - In the case of fragile elderly or newborn skin, a psi of 8 or less is recommended⁶⁰ - Syringe irrigation (30 – 35 cc) and needle (18 – 19 gauge) can also be used for wound irrigation⁶⁰ • Polyacrylic microfibre pads have recently been employed^{125,126} but most wound professionals today prefer more selective methods of debridement • Low-frequency ultrasound, a noncontact mechanical debridement method using sound waves transmitted through a constant flow of saline that removes necrotic tissue, fibrosis, exudate and bacteria with minimum bleeding and pain. It is performed at a distance between 5 mm and 15 mm from the wound surface^{127,128}
<p>Hydrosurgical Debridement</p>	<ul style="list-style-type: none"> • Specialized, powered surgical tool that enables a surgeon to precisely select, excise and evacuate nonviable tissue, bacteria and contaminants from wounds, burns and soft tissue injuries using pulsed lavage irrigation^{129,130}
<p>Chemical Debridement</p>	<ul style="list-style-type: none"> • Use of a chemical agent, such as sodium hypochlorite, to remove necrotic tissue • Non-selective and can be harmful to healthy cells and granulating tissue • More selective debridement methods are preferred¹³¹
<p>Autolytic Debridement</p>	<ul style="list-style-type: none"> • Autolysis allows natural physiologic processes to occur where the body uses neutrophils aided by macrophages and enzymes (proteases and collagenase) to self-digest dead tissue • Scoring or crosshatching of the eschar with a scalpel is necessary to assist in the autolytic process • Some dressing promote autolytic debridement and also support the rehydration and softening of the devitalized tissue^{132,133} <p>Note: Must be used with care in wounds that are actively infected</p>

Enzymatic Debridement	<ul style="list-style-type: none"> • Uses the topical application of proteolytic substances (enzymes such as collagenase) to break down devitalized tissue • Can be used to remove necrotic tissue from the wound through its ability to digest the collagen fibres that anchor necrotic tissue to the base of the wound. In the process, necrotic tissue is separated from the wound, leaving behind a clean base to support an increased rate of healing • The activity level of enzymatic agents decreases in a dry environment; therefore, dry eschar should be scored (cross-hatching) and kept moist • Can be used alone or in combination with sharp debridement and autolytic debridement when combined with a foam dressing topper¹³⁴ <p>Note: Collagenase-based products are available only in Canada</p>
Surgical Debridement	<ul style="list-style-type: none"> • Fastest way to remove devitalized, contaminated or infected tissue. It may also be used to convert a non-healing wound environment into a healing wound¹³² • Must be performed by a properly trained health professional (e.g., a surgeon), usually in the controlled conditions of an operating room or properly equipped clinic (i.e., with sterilized equipment and coagulation equipment) • Costly because it requires an operating room or specialized clinic • May be contraindicated for individuals who are medically unfit or who have uncontrolled blood clotting disorders <p>Note: Delays in wound healing can arise when wait times for operating rooms are long</p>
Conservative Sharp Wound Debridement (CSWD)	<ul style="list-style-type: none"> • CSWD involves the removal of only devitalized tissue, usually with a scalpel or scissors. Blood is not an expectation of CSWD • Sharp debridement should <u>never</u> be performed by unskilled clinicians. Clinicians require proven training, documentation and agency support through policy and procedure prior to performing conservative sharp wound debridement • Clinicians must verify within their health-care institution or agency that sharp debridement is within their scope of practice and whether there is a policy indicating who may perform CSWD¹³⁵⁻¹³⁷ • The patient must provide informed consent (written or verbal) based on information that includes why the procedure is being conducted, the benefits and risks

Table 15 reviews key factors in determining which type of debridement would be best suited to which patient situation and whether the type of debridement is selective or non-selective. For clinicians not skilled in sharp debridement, autolytic or enzymatic debridement may be the preferred option. In all cases, the method used needs to suit the clinical situation based on patient and wound assessment.

Table 15: Key Factors in Deciding Method of Debridement^{60,135,137}

	Surgical/sharp	Enzymatic	Autolytic	Biologic	Mechanical
Speed	1	3	5	2	4
Tissue selectivity	3	1	4	2	5
Painful wound	5	2	1	3	4
Exudate	1	4	3	5	2
Infection	1	4	5	2	3
Cost	5	2	1	3	4

1 is most desirable and 5 is least desirable

For more on debriding agents, see [Product Picker: Skin and Wound Clean-up](#)

4.2.3 Managing Bacterial Balance

Discussion: Bacterial balance is essential for wound healing. Management of a wound needs to address the interaction between the individual and the infecting pathogen by:

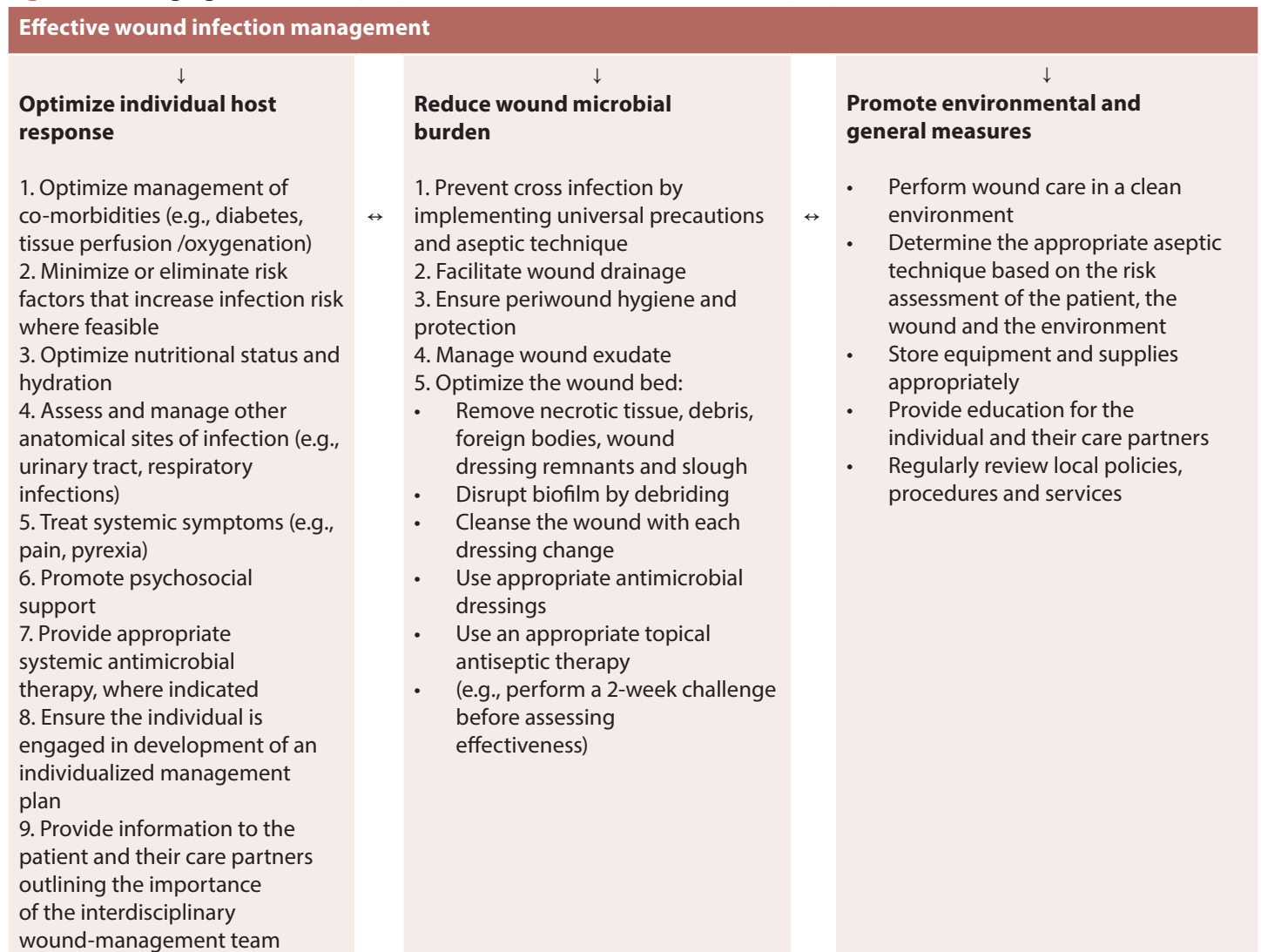
- optimizing the host response optimizing the wound environment
- reducing the number or virulence of micro-organisms in the wound.⁶⁰

Terminology related to bacterial management can be confusing. For clarification:

- Antibiotics are agents that kill selectively and require metabolic activity for action
- Antibiotics can be bacteriostatic (suppress) or bactericidal (kill)
- Antiseptics are non-selective agents that may affect normal human cells and do not require metabolic action for efficacy
- Antiseptics are always bactericidal and usually act on the surface
- *Antimicrobial* is an umbrella term often used to group antibiotics and antiseptics.

Tip: To prevent the development of resistance it is important when selecting topical antimicrobials to avoid those that may be used systemically⁶⁰

Figure 2: Managing Wound Infection

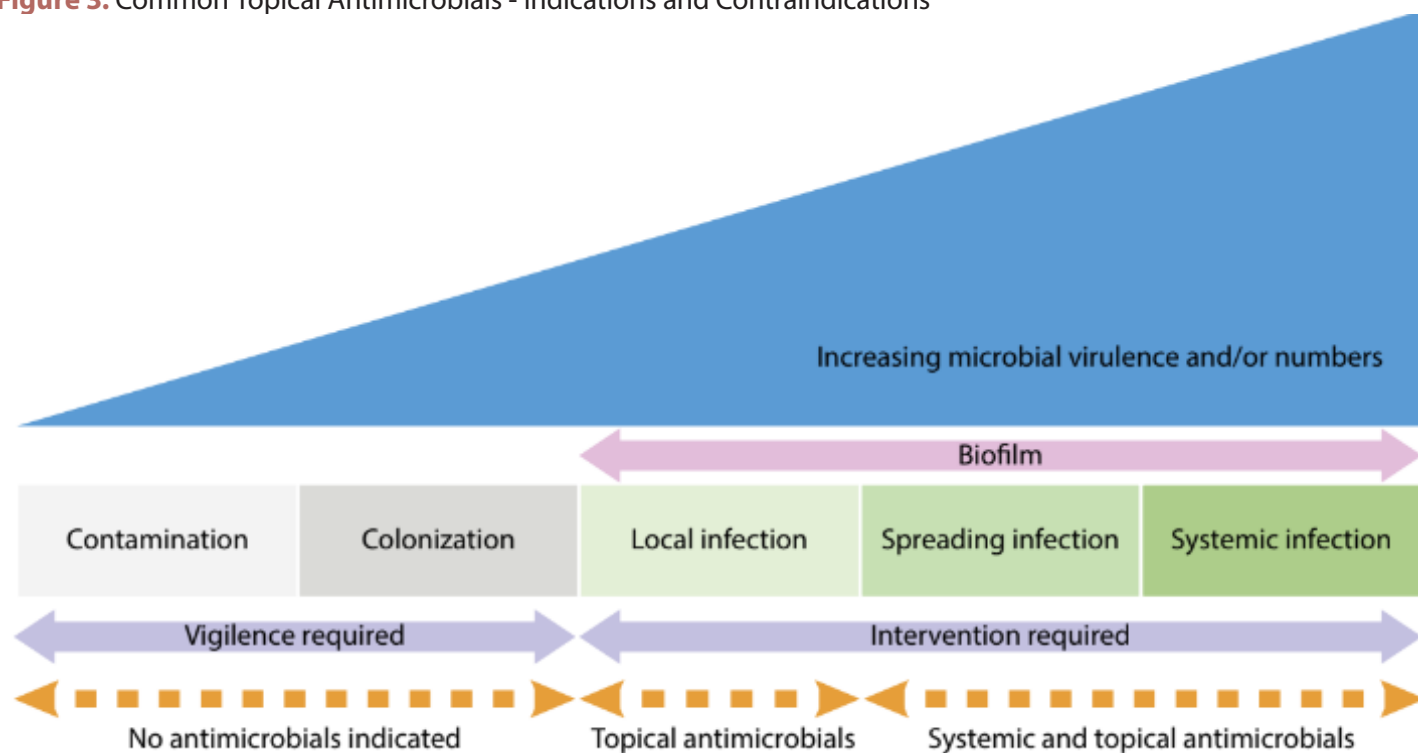


Regular reassessment

- Diagnostic interpretation requires holistic knowledge of the individual and their wound
- Evaluate interventions based on efficacy in resolving signs and symptoms of wound infection and the overall condition of the individual. Consider:
 - Has the individual's pain decreased?
 - Has exudate decreased?
 - Has malodour resolved?
 - Has erythema and edema decreased?
 - Is there a reduction in non-viable tissue?
 - Is the wound reducing in size and/or depth?
- Monitor condition of the periwound, particularly in heavily exuding wounds
- If there is limited or no improvement in signs and symptoms of wound infection, reassess the individual and their wound and adjust the management plan
- Consider referring the individual to specialized services (e.g., a wound clinic)
- Consider if further investigations are required
- Document wound assessments (e.g., serial digital photography)

Used with permission of the International Wound Infection Institute.⁶⁰

Figure 3: Common Topical Antimicrobials - Indications and Contraindications⁶⁰



Used with permission of the International Wound Infection Institute.⁶⁰

Note: The characteristics of topical antimicrobials will change depending on the use and type of dressing used. Dressings that absorb wound exudate and wick infectious material away from the wound bed can provide additional benefit due to the reduced number of endotoxins that often impede healing. Drainage absorption by dressings may have synergistic effects by disrupting the bacteria's ability to attach and form a biofilm.⁶⁰

Topical Antimicrobial Therapies⁶⁰

See International Wound Infection Institute (IWII) Wound Infection in Clinical Practice. Wounds International. 2022. <https://woundinfection-institute.com/wp-content/uploads/IWII-CD-2022-web-1.pdf> for the current list of antiseptics (medicated and non-medicated) commonly used in wound treatment.

Use the following link <https://woundinfection-institute.com/wp-content/uploads/IWII-CD-2022-web-1.pdf> to view the solution, in vitro/bench activity, how it is used in wound treatment (cleansing/ irrigation, topically, or in biofilm-based wound care (BBWC)).⁶⁰

For a current list of Canadian products see the series of Wounds Canada Product Pickers:
www.woundscanada.ca/Product-Pickers

For a list of international products visit the International Wound Infection Institute website (2022)
www.woundinfection-institute.com/

In addition to topical antimicrobials and commercially available topical antimicrobial/antibiotic dressings, the management of wound and skin infections may also require oral and systemic antibiotics. The choice of antibiotic will depend on current antibiotic stewardship principles: using the correct antibiotic, for the correct length of time. Consideration should be made for:

- patient factors such as allergies, hepatic and renal function,
- patient goals (e.g., whether the wound is a healable or non-healable wound) and co-morbidities; pregnancy and breastfeeding status are also considerations,
- infection factors such as severity of the infection, involvement of bone, risk for drug-resistant bacteria (e.g., MRSA) and recent antibiotic use and
- drug factors such as drug interactions, cost, safety profile and frequency of dosing, system factors such as drug coverage, available route of administration (e.g., oral versus intravenous) and available resources required for IV administration and management.

Figure 4 outlines some options for empiric management of cutaneous and cellulitis infections.

Figure 4: Empiric Management of Cutaneous and Cellulitis Infections¹³⁸

Drug	Dosage
Cutaneous infections – Uncomplicated (adults)	
Folliculitis and Furuncles (boils)	
Hot compresses and antiseptic cleanser	
Mupirocin 2% oint/cream or Fusidic acid 2% oint/cream	tid topically until resolved (max 7 days) tid – qid topically until resolved (max 7 days)
Carbuncles (moderate to severe)	
Hot compresses and antiseptic cleanser	
<ul style="list-style-type: none"> • Cephalexin • Cloxacillin 	500 mg PO qid for 7 days 500 mg PO qid for 7 days
If penicillin/cephalosporin allergy:	
<ul style="list-style-type: none"> • Clindamycin • Trimethoprim/Sulfamethoxazole • Doxycycline 	300–450 mg PO qid for 7 days 1 DS tab PO bid for 7 days 100 mg PO bid for 7 days or 100 mg PO bid day 1, then 100 mg PO once daily
If MRSA suspected:	
<ul style="list-style-type: none"> • Trimethoprim/Sulfamethoxazole • Doxycycline 	1-2 DS tab PO bid for 7 days 100 mg PO bid for 7 days

Cutaneous infections – Complicated (adults)		
First Line	ONE of: Trimethoprim/Sulfamethoxazole Ciprofloxacin +/- ONE of: Metronidazole Clindamycin	1-2 DS tab PO bid 500–750 mg PO bid 500 mg PO bid 300–450 mg PO qid
Second Line	Amoxicillin/Clavulanate	500 mg po tid or 875 mg po bid
	Ceftriaxone +/- ONE of: Metronidazole Clindamycin	1 g IM/IV q24h 500 mg PO bid 300-450 mg PO qid
Third Line	Cefazolin PLUS ONE of: Metronidazole Clindamycin	1–2 g IV q8h 500 mg IV/PO q12h 300–450 mg PO qid or 600 mg IV q8h

Caution: Antimicrobial dressings should never be mixed!

A wide variety of active chemical agents (or biocides) are found in antimicrobials, many of which have been used for hundreds of years for antiseptics, disinfection and preservation. They kill micro-organisms and may be bactericidal, fungicidal, virucidal or sporicidal. The antiseptic interacts with the cell surface followed by penetration into the cell and action at the target sites, but some are cytotoxic and can be harmful to healthy tissue. Others are non-cytotoxic in dilute preparations but can be cytotoxic in higher strengths. Mixing two or more of these products in the dressing can change the chemical formula of each, which may be cytotoxic to the healthy tissue or inactivate the antimicrobial effect. Studies on the efficacy and safety of antimicrobial dressings do not include using them with another antimicrobial dressing or antiseptic product. If one product appears to be ineffective, with lack of response or deterioration, it is time to reassess for reasons, which may be other than infection. It may also indicate the need for a different product or systemic antibiotics.⁷³

4.2.4 Managing Moisture Balance

Discussion: The seminal work by Winter in 1962 first described the advantages of moist wound healing that are now recognized in clinical practice.⁷⁰ Dressings should retain enough moisture to stimulate good healing yet not cause maceration or irritation to the surrounding tissues.^{139,140} Some advantages of moist wound healing include:

- Decreased dehydration and cell death. Wound repair requires the activity of a host of cells, from neutrophils and macrophages to fibroblasts and pericytes. These cells cannot function in a dry environment
- Increased angiogenesis. The cells required for angiogenesis require a moist environment. As well, angiogenesis occurs toward regions of low oxygen tension, meaning that occlusive dressings may act as a stimulus in the process^{40, 141,142}
- Enhanced autolytic debridement. In a moist environment, neutrophil cell life is enhanced and proteolytic enzymes are carried to the wound bed, allowing for painless debridement.⁸⁵ The resulting fibrin degradation products are a factor in stimulating macrophages to release growth factors into the wound bed
- Increased re-epithelialization. In larger, deeper wounds, epidermal cells must spread over the wound surface from the edges and have a supply of blood and nutrients. Dry, crusted wounds reduce this supply and provide a barrier to migration, slowing epithelialization⁸⁵
- Decreased pain. A moist wound bed insulates and protects the nerve endings, reducing pain

The use of occlusive dressings, or ones that isolate the wound from the outside environment, is one of the most effective ways to maintain moisture in a wound^{17,85,143} (See Table 16). The potential results are:

- Improved bacterial barrier and decreased infection rates. Occlusive dressings with good edge seals can provide a barrier to the migration of micro-organisms into the wound. It has been demonstrated that bacteria can pass through layers of moist gauze. Wounds covered with occlusive dressings have been shown to have lower rates of infection than those with conventional gauze dressings
- Decreased pain. Occlusive dressings often require fewer dressing changes, which may be uncomfortable for patients
- Decreased costs. While occlusive dressings have a higher per-unit cost than conventional gauze, increased healing rates and the reduced frequency of dressing changes and related costs of nursing care may be cost-effective in the long term
- Moisture-retentive dressings may be used in combination with other products to support healing such as antimicrobials or pain control dressings.

Table 16: Moisture Management in the Wound

How much moisture is there in the wound?		
Too little... dry	Just right... moist	Too much... wet
Use a hydrating dressing such as a gel	Use a moisture-retentive dressing such as a wafer	Use an absorber such as a hydrocolloid fibre or foam
Caution Frequent assessment of the wound is required because the wound's moisture level can change, potentially making the dressing an impediment to healing		

4.3 Select the appropriate dressings and/or advanced therapy

Discussion: Over the past 40 years an ever-expanding list of dressing products has come onto the market. There remains, however, no magic 'one-size-fits-all' dressing.¹⁴⁴ The selection of the most appropriate dressing takes into consideration:

- the goal of treatment (based on whether the wound is healing, non-healing or non-healable),
- wound characteristics (including infection) indications and contraindications for the different classes of dressings and advanced therapies,⁶⁰
- phase of healing,
- the needs (and risk factors) of the patient, patient choice, lifestyle and comfort (during change and with use) and cost-effectiveness,
- product availability and the availability and skill of the patient or care partner and
- safety and effectiveness, ease of use and cost-effectiveness of the dressing available.^{85,145-149}

Health Canada states that wound dressings and surgical barriers containing an antimicrobial agent and wound dressings whose primary purpose is to act as a barrier to pathogens are considered **devices**. Wound dressings whose primary purpose is to deliver a drug are considered **drugs**.¹⁵⁰

Studies have consistently shown that appropriate dressing selection and models of care can improve patient outcomes, decrease pain with dressing changes and demonstrate cost-effectiveness when both the dressing product and human resource costs are factored into the equation.¹⁵¹⁻¹⁵⁵ The patient's response to the dressing requires documented monitoring within a reasonable trial to determine effectiveness before changing to another product.

Dressing selection can be challenging even for the most seasoned clinicians and cannot be made in isolation of the clinical situation. At times, dressings may be used in combination with other products or topical preparations to adequately address patient needs and preferences. Care needs to be taken to ensure that products do not interact with, interfere with or counteract one another.

Wounds Canada has created a series of Product Pickers that address, among other things, (1) product categories, characteristics and contraindications and (2) the clinical situation, local wound care and other care considerations. This tool for clinicians can be posted in the clinical area to assist with decision-making at the point of care.

Dressing Tips: Remember to:

- Change dressing based on patient, wound and dressing assessment, not on standardized routines
- Practise with dressing materials to learn their performance parameters and related 'tricks'
- Check the product information/manufacturer's recommended usage documentation before using any dressing or advanced therapy to ensure it is an appropriate product based on need, costs and availability.

For more on dressings that help with moisture management, please see Product Picker: Wound Dressing Selection Guide & Product Picker: Wound Dressing Formulary: <https://www.woundscanada.ca/health-care-professional/resources-health-care-pros/library/183-resources-industry-partner/288-product-picker>
Wounds Canada Care at Home Series: Preventing and Caring for your Wounds at Home
<https://www.woundscanada.ca/patient-or-caregiver/resources/care-at-home-series>

Wounds Canada Product Pickers use generic names to avoid product bias. Most are pdf fillable and free to download

Advanced Therapies

Some wounds may require advanced therapies such as negative pressure wound therapy, electrical stimulation, ultrasound, electromagnetic therapy, ultraviolet light C, hyperbaric oxygen therapy (HBOT), topical oxygen therapy, warming therapy and biologically active dressings. Though each of these modalities has evidence to support their use in limited situations, cost or the lack of good therapeutic evidence in some may limit their usefulness. Not all advanced therapies are available in every region.

Consultation with local experts familiar with these therapies should be sought before using one as a therapeutic course of action.

Table 17 provides an overview of some of the most common advanced wound therapies.

Table 17: Overview of Common Advanced Wound Therapies

Category	Description	Consideration/ Indications/ Contraindications
Negative pressure wound therapy (NPWT) ^{156,157}	Applies controlled subatmospheric pressure to remove exudate, reduce periwound edema <ul style="list-style-type: none"> • increases local microvascular blood flow/test vascularity, promotes formation of granulation tissue • reduces complexity/size of the wound • optimizes the wound bed prior to and following surgery and reduces complexity and length of surgical wound closure procedures. 	Debridement, including bone if osteomyelitis is present, is necessary prior to the application of NPWT The wound must be free of active, untreated infection (e.g., cellulitis) The wound bed should not involve fistulas to internal organs or body cavities over a blood vessel Caution required in patients receiving anticoagulants Contraindicated with the presence of intracutaneous fistulae, necrotic tissue, untreated osteomyelitis and malignancy
Electrical stimulation (ES) ¹⁵⁸⁻¹⁶⁰	Delivery of a low-voltage electrical current to the wound bed to stimulate healing. Provides benefits in three of the four phases of wound healing Inflammatory: increases circulation affecting phagocytosis and tissue oxygenation, reduces microvascular leakage, stimulates fibroblasts and epithelial cells, stimulates DNA synthesis and may have bactericidal effects Proliferative: stimulates fibroblasts and epithelial cells, stimulates DNA and protein synthesis, increases ATP generation and membrane transport, improves the organization of the collagen matrix and stimulates wound contraction Epithelialization: stimulates epidermal cell reproduction/ migration Electrical stimulation may also address other impairments such as inactive muscles, impaired perfusion, edema and pain to enhance conditions necessary for wound healing	ES should not be applied to areas where it could cause malfunction of electronic devices including cardiac pacemakers, low back or abdomen of pregnant women, acupuncture points of pregnant women, regions of known or suspected malignancy, active DVT or thrombophlebitis, untreated infection or osteomyelitis, recently radiated tissues, to the chest of persons with cardiac disease, arrhythmias or active heart failure, the neck or head region of persons known to have seizures, transcranially without specialized training, areas near reproductive organs or genitalia without specialized training, areas near or over eyes, anterior neck or carotid sinus.
Electromagnetic therapy (EMT) ^{160,161}	Does not involve the use of a current, as electrical stimulation therapy does. EMT works with generators that create an electromagnetic field to stimulate wound healing	Similar indications and contraindications to ES

<p>Ultrasound (US)¹⁶⁰</p>	<p>Delivers high-frequency mechanical vibration to facilitate healing at a cellular level in all phases of healing</p> <p>Inflammatory: facilitates the release of histamine to attract fibroblasts and endothelial cells and accelerates this phase</p> <p>Proliferative: stimulates fibroblast migration and proliferation, promotes angiogenesis</p> <p>Epithelialization: releases growth factors</p> <p>Remodeling: improves tensile strength of healing tissue</p>	<p>US should not be applied over eyes, genital areas, exposed neural tissue; avoid in thromboembolic diseases</p> <p>Should be distinguished from low frequency ultrasound debridement</p>
<p>Ultraviolet light C^{162,163,164}</p>	<p>There are three forms of ultraviolet light: UVA, UVB and UVC. UVC is the most frequently used for chronic wounds and its bactericidal effect has been demonstrated</p>	<p>Can be used for a short period when traditional therapies have failed</p> <p>Contraindications include active cancer in the area</p>
<p>Hyperbaric oxygen therapy (HBOT)¹⁶⁵⁻¹⁶⁸</p>	<p>In HBOT the patient breathes 100% oxygen intermittently while the pressure in the chamber is increased to greater than one atmosphere absolute (atm abs)</p> <p>Reverses hypoxia by increasing the oxygen diffusion in blood plasma and local tissues</p> <p>The benefits include angiogenesis, collagen synthesis, osteoclastic activity and the release of vascular endothelial growth factor</p> <p>Current information indicates that pressurization should be at least 1.4 atm abs. This may occur in a monoplace (single-person) or multiplace (two or more people) chamber</p>	<p>Indications for use include ‘air or gas embolism, carbon monoxide/cyanide poisoning, clostridial myositis and myonecrosis, crush injury, compartment syndrome and other acute traumatic ischemias, decompression sickness, enhancement of healing in selected problem wounds, exceptional blood loss, intracranial abscess, necrotizing soft tissue injuries, refractory osteomyelitis, soft tissue/ bone radiation necrosis, compromised skin grafts and flaps and thermal burns.’</p> <p>Should be closely managed by certified hyperbaric physicians/clinicians</p> <p>Considerations include patient selection, monitoring of wounds, contraindications and risks of HBOT use and indications for discontinuation</p>
<p>Topical pressurized oxygen therapy^{160,169}</p>	<p>Differs from HBOT in that topical pressurized oxygen therapy delivers a regulated, pressurized oxygen flow directly to a specific wound area using a portable device (e.g., a soft plastic sleeve or hard plastic chamber) that can be secured to a body surface or around an extremity to create an airtight seal</p>	<p>Controversy exists as to the therapeutic value of topical pressurized oxygen delivery to local tissues/wounds</p>

<p>Warming Therapy¹⁷⁰</p>	<p>Application of a heating element in the dressing that increases heat in the wound bed, inducing vasodilatation of the original blood vessels</p>	<p>Contraindications:</p> <ul style="list-style-type: none"> • very large areas or at sufficient intensity to raise core temperature in pregnant women, persons with severe cardiac disease or cardiac failure • regions of known or suspected malignancy • infected tissues or persons with TB • persons with active DVT or thrombophlebitis (in the area) • areas of impaired sensation that prevent the patient from giving accurate and timely feedback • areas of active bleeding or persons with untreated hemorrhagic disorders • recently radiated tissues • persons with cognition or communication impairments that prevent the patient from giving accurate and timely feedback
		<ul style="list-style-type: none"> • areas with significantly impaired circulation • tissues inflamed as a result of recent injury or exacerbation of chronic inflammatory condition • areas affected by heat-sensitive skin diseases (e.g., eczema) • areas of severe edema • reproductive organs (e.g., testes) <p>Precautions:</p> <ul style="list-style-type: none"> • areas near or over eyes • anterior neck and carotid sinus • pregnant women • people with cardiac failures • areas of skin breakdown or damage that produce uneven heat conduction across the skin

<p>Biologically active dressings 143,171-174</p>	<p>Developed to find adjunctive exogenous factors to induce and stimulate healing or to produce a skin substitute for use in acute and chronic wounds</p> <p>Living skin equivalents (LSE), or tissue-engineered skin is a bilaminar structure of epithelium cultured on a dermal equivalent. It has characteristics that closely resemble a skin graft and is used in that capacity (This is not currently available in Canada.)</p> <p>Protease modulating dressings: Rebalance high protease activity levels in a stalled, healable wound.</p> <p>Isolated growth factors: Platelet-derived growth factor (PDGF), available as recombinant human PDGF-BB, reduces healing time and improves the incidence of complete wound healing in stage 3 and 4 pressure injuries</p>	<p>Used alone, these dressings will not effectively produce results if proper wound bed preparation does not first occur</p> <p>Contraindications:</p> <ul style="list-style-type: none"> wounds with infection, sinus tracts or excessive exudate patients known to have hypersensitivity to any of the product components <p>Cultural issues related to the source of the biologically active dressing may be of concern to some patients</p>
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4.4 Engage the team to ensure consistent implementation of the plan of care

Discussion: Ensure that all team members have well-defined roles and responsibilities, are making contributions, documenting care, and communicating effectively with the larger team, including discussing outcomes. The team needs to show continuous progress toward the goal(s) of the plan of care and provide regular feedback to all team members.^{21,85}

To ensure optimum care, health-care professionals need to recognize the need for their own continuing education to keep abreast of changes in the skin and wound management community. Researchers and industry partners are key ancillary team members that support clinicians in providing innovations for wound management. Because of ongoing developments in the areas of treatment and medication, all professional members of the team have a responsibility to remain up-to-date and share information on the latest evidence, practice and self-management strategies.

Knowledgeable and effective advocates can influence policies that support best practice in all areas of wound prevention and management. This can be accomplished by:

- working within individual institutions and agencies to influence decision making regarding policies, procedures, culture and resource allocation
- presenting a unified voice to governments and actively leveraging collaborative relationships to develop and implement public health policy related to prevention, assessment, prevention, assessment and management of wounds
- raising the profile of wounds in Canada with the public and decision makers.

Step 5: Evaluate Outcomes

Evaluation of the plan of care should be routine and ongoing to identify whether the plan is effective in meeting the goal(s).¹

Discussion: Routine reassessment and potential modifications of the plan of care need to be built into the plan to ensure it continues to meet the patient's needs and is sustainable. Changes to the plan of care should be documented and shared with the team. Promotion of skin health and prevention of skin complications and wounds is a priority. Since wound healing is only one outcome parameter and wound closure is not always realistic, other outcomes outlined in the goals of care, such as symptom control (pain, odour, depression, anxiety) should also be routinely measured with standardized tools.

Recommendations

5.1 Determine if the outcomes have met the goals of care

Discussion: The use of validated and responsive tools as well as patient feedback can assist in determining if the goals of care have been met. These tools provide benchmark assessments to determine the improvement or deterioration of a condition or wound and if outcomes have been met.^{21,63}

Documentation determines whether the goals of the plan of care have been met because it verifies progress from admission to discharge.^{11,175} Documentation must address the patient's needs, track clinical performance and support a defence in the event of a lawsuit. Therefore, chart entries need to be thorough, accurate, factual, objective and follow agency policy and procedures.

If goals of care have been met, discharge planning may proceed and must include a discussion of new goals and relevant self-management strategies (See 5.3).

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

Discussion: When goals of care are not being met, go back to Step 1 of the Wound Prevention and Management Cycle. Reassessment needs to consider the level of adherence to the plan of care by anyone involved in either the planning or implementation of interventions, and the appropriateness of the goals of care. Careful exploration may reveal modifiable factors that can be addressed. These issues should be discussed utilizing trust-filled communication strategies, and in a non-confrontational and sensitive manner, otherwise the patient or health-care colleagues may not be able to support progress to the desired outcome.

Key documentation areas to address include the following:

- patient and or family engagement and support, as this may change over time,
- all communication with the patient and care partners,
- completed assessment tools,
- consistently followed protocols,
- all communication with health-care professionals and service providers,
- patient response to care and
- changes in the delivery of care, access to products, providers, costs.

5.3 Ensure sustainability to support skin health, wound prevention and reduce risk of recurrence

Transitions in care are when transfer of responsibility and accountability for some or all aspects of patient care occurs among providers, institutions, and/or sectors (e.g., federal and provincial jurisdictions, or education, judicial and other environments). Canadian health systems are organized in a way that requires individuals to receive health services from a number of care providers, in a number of locations, leading to multiple transitions in care over time. This is especially true for individuals with long-term health complications, those experiencing changes to their health status or a change in care need and/or a change in their location of care.¹⁷⁶

Discussion: Discharge planning begins at admission and should include collection of comprehensive data to ensure transitions of care are communicated and smooth for the patient and/or care partner. For patients with skin and wound care issues, transitions of care must be communicated clearly between team members. Team membership may change, but communication must be organized, continuous and documented and include the patient and family. This is especially important when patients transition to and from emergency, acute care, rehabilitation units, assisted living and long-term care locations. Those living unhoused, in shelters or in challenging housing scenarios may require additional interventions for care and safety.

Information collected from any patient encounter contributes to successful transitions in care. Discharge teaching information for patients and care partners should be written in plain language and made available in relevant languages. Pamphlets with discharge instructions should be reviewed with the patient, and they should be given an

opportunity to ask questions and provide feedback to ensure that the instructions are understood. Education may include web-based resources, videos and peer support groups. Patients should also receive clear instructions about whom to call should complications arise.

To ensure sustainability, consideration needs to be given to the patient's ability to manage their own care, comfort and cosmetic appearance, patient preference, product availability and the presence and ability of the care partner to provide care and/or assist in the patient's care.

Summary

Best practice includes the patient voice, evidence, clinician expertise and resources and does not occur innately; it requires substantial work as well as a framework for implementation. Sustainable best practice requires even more work and involves the patient at every step. Collaboration is required not only in the short and intermediate terms with all members of the team, but also in the longer term with stakeholders such as researchers, educators, researchers, practitioners and policymakers at individual, organisational and systems levels. By using the Wound Prevention and Management Cycle the integrated team will have a systematic process to provide individualized best practice-based care to support skin health and wound healing.

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Appendix A

Nutrition for Wound Prevention and Healing

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Introduction

Maintaining healthy, intact skin and promoting wound healing is a complex and energy-demanding process; therefore, understanding and supporting the nutritional status of the patient is essential.¹

Although often overlooked, nutrition is a key component of care.² Eating well and staying hydrated will help patients at risk for skin breakdown, support wound healing and prevent complications such as slow healing, prolonged inflammation, infection and reduced tensile strength of the scar.³ Nutrition support is a low-risk, cost-effective strategy that not only helps improve overall health but also has the potential to reduce length of stay in hospitals and reduce rates of hospital readmission.⁴

Nutrition deficiencies may lead to dermatological changes (dryness, itching, cracking, inflammation, infection, bleeding, pain).^{5,6} In a recent review, researchers highlight the links between protein-energy and micronutrient-related malnutrition (vitamin and mineral deficiencies) and skin changes.⁵ Early Nutritional screening, including identification of any skin changes, may decrease or reverse the risk of further skin breakdown and reduce risk of complications (infection). As such, its importance should not be underestimated. Individualized nutritional care plans are crucial to promote skin health and to promote wound healing.⁷⁻⁹

For patients that develop wounds, the process of wound healing includes timely assessment and development of an individualized care plan. This includes educating the patient, care partner and family.

Wound healing phases included coagulation, inflammation, proliferation of new cells and remodeling.² Nutrients are required at all stages of the wound healing cascade and are vital for all wound types, regardless of the cause. Nutrient requirements are increased when a wound is present or the skin is at risk for breakdown. Macronutrients (protein, energy [calories] and fat), micronutrients (e.g., iron, zinc, vitamins A, C, and D) and fluids are needed to support skin integrity and wound healing.¹⁰⁻¹³ As the wound healing cascade may take up to a year to complete, enhanced nutrition support needs to be sustained in patients who have had wounds.

Patients living with overweight or obesity need special nutrition consideration as their risk for wounds may be increased; they may have a greater incidence of pressure injuries, venous ulcers, wound dehiscence and skin infections.^{14,15} Due to the increased nutritional demands of wound healing, a patient's effort at weight loss should be discouraged at this time. Weight maintenance or gain, where indicated, may be appropriate.

Malnutrition

Approximately 2.5% of Canadians are malnourished¹⁶ and 20% to 50% of individuals are malnourished on admission to the hospital, with additional decline expected during hospitalization.^{4,17} Therefore, nutritional screening and appropriate interventions, such as referrals to the registered dietitian (RD), nutrition support, monitoring and evaluation of the patient and healing outcomes are required for patients at risk for skin alterations or living with skin breakdown or a wound.¹⁸

The Canadian Malnutrition Task Force states:

Malnutrition includes both the deficiency and excess (or imbalance) of energy, protein and other nutrients. In clinical practice, undernutrition, and inadequate intake of energy, protein and nutrients is the focus. Undernutrition affects body tissues, functional ability and overall health. In hospitalized patients, undernutrition is often complicated by acute conditions (e.g. a trauma), infections and diseases that cause inflammation. Such complications worsen undernutrition and make it more challenging to correct due to extensive physiological changes and increased nutritional needs when appetite is decreased.⁴

Malnutrition, or undernutrition, is a common risk factor that contributes to the development of wounds and prolonged healing of wounds, in addition to other health concerns.¹⁹ Patients at risk for malnutrition include those hospitalized and extremes of age (infants, children, youth, elderly).²⁰ As well, patients living with changes to their ability to ingest (e.g., poor appetite, swallowing or chewing concerns), digest, and/or absorb (e.g., crohn's, colitis) food and fluid are at a high risk of malnutrition.⁹ In a recent review focused on older adults/geriatrics, researchers emphasized the complexity of malnutrition and the need for multi-factorial assessment to address the challenges.²¹

Diabetes

Hyperglycemia impairs wound healing and may increase risk for infection, malnutrition and other vascular complications. Diabetes Canada suggests an A1C target of equal to or less than 7% for most individuals with diabetes. Individualized targets need to be considered for those at risk for severe hypoglycemia, hypoglycemia unawareness, frail elderly or those who are functionally dependent (A1C target 7.1-8.5%).

Clients may need support adjusting diabetes medications, assessing blood glucose levels (capillary blood glucose or continuous glucose monitoring), learning the sources of carbohydrate in the diet, choosing lower glycemic food options and spreading carbohydrate through the day.

Malnutrition Screening

All patients with, or at risk for, a wound should be screened using a validated nutritional screening tool (See Table 1). Screening can be completed by any member of the health-care team.^{11,12} Due to the relationship between malnutrition and poor patient health outcomes and health care costs, leaders and policy makers should have nutrition screening, and subsequent RD assessment of patients at nutritional risk, imbedded into standard interdisciplinary practice, policy and outcome measurements for persons across the lifespan.³ Leaders should establish interprofessional education and training, alongside RDs, for health-care team members to maintain their understanding on the importance of screening for nutrition risk, referring to RDs and involving the patient and care partners.

Registered Dietitians and Wound Care

The role of the Registered Dietitian (RD) on the wound care team is essential.^{22,23} RDs assess patient nutritional status and use evidence-based guidelines to co-create patient-centred interventions and monitor and evaluate skin and wound healing outcomes.^{11,12}

The Team

The integrated health-care team includes the patient, care partner(s), family, RD, health-care personnel, primary care providers, speech-language pathologists and occupational therapist (for swallowing assessment), as well as staff that prepare and serve food in institutional settings and home settings.

Barriers to skin health and wound healing include a range of modifiable and nonmodifiable factors that must be assessed and addressed by an interprofessional health-care team alongside the patients and care partners.²

The Role of the Patient and Care Partners

In the community setting, key to nutritional success is to engage the patient and care partners and community services available. In the home environment, families and regular caregivers can promote optimal intake, provide meals and snacks and document food and fluid intake records to share with the RD. This includes supporting patient positioning while eating/feeding.²⁴ Care partners and family members benefit from education to help them understand their role in food and fluid intake, especially to support skin health and wound healing.

Section A of this Appendix uses the Wound Prevention and Management Cycle as a framework for providing best practice as it relates to nutrition for the prevention and management of wounds.

Section B contains information aimed specifically at registered dietitians.

Section A

Step 1: Screen for malnutrition risk and conduct a comprehensive patient nutrition assessment as part of an overall patient assessment

Screening for risk of malnutrition is part of baseline data collection and should be conducted using validated tools. Choice of screening tool will vary depending on the patient. See Table 1 for Nutrition Screening Tools. Positive screens for malnutrition should trigger a referral to the registered dietitian (RD) for individual nutrition assessment and intervention.^{25,26}

For care partners and families, this may include having them complete a basic nutritional data collection form. This information can then be used by the health-care professional to support baseline data collection alongside their completion of a validated tool. For more information Chapter 4: Best Practice Recommendations for the Prevention and Management of Wounds: An Overview.

Table 1: Nutrition Screening Tools

Screening Tool	Population
Mini Nutrition Assessment SF (MNA®-SF)	Identifies adults 65 years or older, living in long-term care or community dwelling, who are malnourished or at risk of malnutrition
Self-Mini Nutritional Assessment (Self-MNA)	Identifies adults over 65 years of age who are at risk of nutritional compromise
Malnutrition Universal Screening Tool (MUST)	Identifies adults who are underweight and at risk of malnutrition (acute, long-term care or community)
Malnutrition Screening Tool (MST)	Identifies adult patients in acute or ambulatory care who are at risk of malnutrition
Canadian Nutrition Screening Tool (CNST)	Identifies adult patients in acute care at risk of malnutrition
Short Nutritional Assessment Questionnaire (SNAQ)	Identifies adults who are underweight and at risk of malnutrition (acute)
Short Nutritional Assessment Questionnaire 65+ (SNAQ 65+)	Identifies adults over 65+ in the community who may be at risk of malnutrition
Short Nutritional Assessment Questionnaire for Residential Care (SNAQ-RC)	Identifies adults over 65+ in residential care who may be at risk of malnutrition
Nutri-eSCREEN (online)	Used for self-screening eating habits for adults aged 50 and over

Assess the patient's body weight and height, as able, to help assess nutrition risk and aid the RD in estimating nutrient requirements for skin health and/or wound healing.

While the RD will provide individual assessment, health-care team members support the patient and care providers. This includes:

- Discussing food choices, medication(s) that may affect their desire to eat or drink, access to food and fluid, finances and meal planning and preparation with the patient and family. This includes access to a kitchen, meal services available in the community (e.g., with a fee or not) and social activities where food is included
- Determining if the patient has been referred to RD services in the past or present. Re-refer as appropriate
- Assessing the patient's appetite and food preferences based on personal and cultural preferences
- Assessing for food allergies, sensitivities and intolerances (e.g., Celiac disease)
- Determining if the patient is following any potentially restrictive diet (e.g., a weight-loss diet, low-carbohydrate diet, periods of fasting)
- Assessing for barriers to food intake, such as chewing or swallowing difficulties, nausea, pain, taste changes or shortness of breath
- Assessing for additional fluid and nutrient losses through diarrhea, vomiting, fever, heavily draining wounds (e.g., document losses with negative pressure wound therapy) or high output ostomies
- Determining use of nutritional supplements such as oral nutrition supplement drinks, modular/powdered protein supplements, or vitamins or minerals tablets
- Assessing glucose management (e.g., capillary blood glucose, continuous glucose monitoring data or A1C) and use of insulin and/or other diabetes medications
- For persons with cognitive changes and/or disabilities, reviewing medications and their side effects. As well, consider how their medications may be impacting their cognitive function and appetite (e.g., anti-seizure medications may affect one's desire to eat or drink)
- Documenting findings as per policy
- Discussing any concerns with the RD and the team (including the patient, care partner and family).

Step 2: Set goals for skin health or wound healing

The importance of nutrition and fluid intake cannot be understated to promote wound healing.¹⁸ Nutritional interventions should be specific, timely and provided in a culturally sensitive manner. For example, Clark et al., reported that patients with wounds who received daily wound-specific oral nutritional supplementation had wounds that closed sooner.²⁷

Ensure the patient and their care partners are actively involved in the goal-setting process²⁸ by:

- Providing education to the patient, care partners and family members on the importance of food and fluid for skin health and wound healing
- Outlining the importance of additional nutritional needs while healing
- Discouraging efforts at weight loss while a wound is healing.

Once the patient and care partners have the information they need, the team can begin the goal-setting process following SMART principles.

- In consultation with the RD, set goals for desired outcomes such as regular meals and snacks, fluid intake in 24 hours or intake of nutrient-dense foods. The RD may suggest liberalizing restrictive diet patterns or plans
- Review strategies to address food intake barriers and set specific goals to address them
- Review glucose management targets. Refer to a diabetes educator, most responsible clinician or visit Individualizing Your Patient's A1c Target: <https://www.diabetes.ca/managing-my-diabetes/tools---resources/individualizing-your-patient%E2%80%99s-a1c-target>] from Diabetes Canada website for more information
- In consultation with the RD, determine if the patient qualifies for nutritional products to support wound healing and, if so, set goals with specific targets
- If appropriate, consider goals related to collaboration with community-based food programs to support food access.

Step 3: Assemble the team

Effectively addressing issues of malnutrition or appropriate nutrition management for at-risk individuals or those healing a wound requires a knowledgeable team working together to help patients and their care partners meet nutritional needs and overcome any barriers to meeting those needs. For some individuals, these barriers can be significant. Based on the results of the assessments and goal-setting process, assemble a team that will have the ability to address the challenges presented by the patient's individual situation. For many individuals, the members of the team will need to be outside the health-care system and involve community-based professionals or personnel from other government agencies.

To improve the team's knowledge about skin and wound-relevant nutrition, useful resources may include:

Nutrition and Malnutrition Resources for Health-care Providers

Wounds Canada. Nutrition

<https://www.woundscanada.ca/health-care-professional/resources-health-care-pros/nutrition>

- Eating well for wound healing <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/wcc-2022-v20-n1/2576-wcc-summer-2022-v20n1-final-p-46-51-eating-well/file>
- Feeding the foot: nutrition and diabetic foot ulcers <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/2020-v19-n3/1857-wcc-fall-2020-v18n3-final-p-40-47-nutrition/file>
- Nutrition and pressure injury healing: updated recommendations <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/2020-vol-18-no-1/1656-wcc-spring-2020-v18n1-final-p-20-27-nutrition/file>
- Malnutrition and wound healing <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/2019-v17-no3/1591-wcc-fall-2019-v17n3-final-p-33-37-malnutrition/file>
- Healing with hydration <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/2018-vol-16-no-2/1343-healing-with-hydration/file>
- The power of protein in wound healing <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/wcc-2019-v17-no1/1407-wcc-spring-2019-v17n1-final-p-34-37-protein-pdf/file>
- Nutrition and negative pressure wound therapy: improving outcomes <https://www.woundscanada.ca/doclink/wcc-summer-2023-v21n1-final-p-15-19-nutrition-and-negative-pressure-wound-therapy-improving-outcomes/>

Wounds Canada. Professional guide focused on Indigenous health. Nutrition for wound prevention and healing. 2022.

Nutrition Resources for the Patient, Care Partners and Family

- Wounds Canada. Eating well for wound healing: a patient resource. <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/wcc-2022-v20-n1/2576-wcc-summer-2022-v20n1-final-p-46-51-eating-well/file>
- Alberta Government. High-protein foods for wound healing. <https://myhealth.alberta.ca/Health/pages/conditions.aspx?hwid=abs1199>
- Canadian Digestive Health Foundation. Diet and nutrition - tips for seniors and their caregivers. <https://cdhf.ca/en/diet-nutrition-tips-for-seniors-and-their-caregivers/>
- Sinai Health and University Health Network (Healthy Ageing and Geriatrics). Why is nutrition important to consider as you age? <https://sinaigeriatrics.ca/patient-resources/improving-nutrition-as-you-age/>
- Government of Canada. Healthy eating for seniors. <https://food-guide.canada.ca/en/tips-for-healthy-eating/seniors/>
- Canadian Nutrition Society. Protein foods for older adults. <https://cns-scnc.ca/sites/default/uploads/files/Protein%20Resources%202020/Protein%20Foods%20Handouts%20older%20adults%20EN.pdf>

Step 4: Establish and implement a plan of care

Consider interdisciplinary, collaborative and patient-centred treatment, utilizing an evidence-informed approach that is aligned with the overall goals of care to maintain skin health and/or promote wound healing.

Some elements of a care plan might include:

- Meal planning: Encourage meal plans that include preferred foods, are culturally appropriate and address identified nutritional deficits to support skin health or wound healing
- Communication: Discuss how the support person(s) can be of assistance in achieving the goals, such as offering the patient smaller, more frequent meals, snacks or fluids more often, or adding specific types or quantities of food to address nutritional deficits
- Blood glucose management: Engage diabetes educators, physicians, nurse practitioners for glucose management, as needed
- Navigation: Support the patient in attending web-based appointments related to nutrition and skin health/wound healing
- Toileting: Promoting toileting routines and management of bowel and bladder routines
- Connections: Partner with community-based food services for additional nutritional foods/fluids
- Contact government agencies regarding food assistance eligibility if needed
- Referrals: Refer to a speech language pathologist for swallowing difficulties, and occupational therapy for positioning/seating while eating, and other professionals as appropriate
- Education: Provide nutrition information that is appropriate for the patient and family using credible resources (see Nutrition Resources for the Patient, Care Partners and Family above).

Step 5: Evaluate Outcomes

On a regular basis and in discussion with the patient, care partner, family and RD/health-care team determine if the goals set are being achieved or require adjustment. For example:

- Has skin health been maintained?
- Is the wound healing?
- Is the patient achieving and maintaining their food-related goals?
- Is the patient hydrated?
- Is the patient maintaining or gaining weight, as appropriate?
- Are nutrition supplements recommended by the RD being used and/or tolerated?
- Have the barriers to eating being successfully addressed? (e.g., swallowing safety, access to food, cost, feeding support and meal preparation?)
- Is there an established toileting routine to promote bowel and bladder hygiene?
- Are the blood glucose targets being met?

Regular communication (in person, web-based, email, phone) with the family and/or support persons will aid in determining if any suggested changes they implemented have been beneficial and/or successful for the patient.

If, after the steps above have been completed, and the nutrition goals have not been fully met, go back to the assessment step. It is then necessary to reassess causative factors, barriers to promoting nutrition support and revise the care plan. Ask the patient, family or the support person(s) for feedback. Discuss reassessment with the RD, patient, family and health-care team.

Revising the care plan may highlight a single hygiene product, food access or behaviour that was not identified in earlier care plans, or may identify several areas where new goals need to be set and a revised plan implemented.

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Section B

Nutrition for Wound Prevention and Management for Dietitians (Adults)

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This section is specific to registered dietitians. The British Columbia Provincial Interprofessional Skin and Wound Committee - Registered Dietitians sub-committee has developed guidance for the nutrition and wound prevention and management for adults.

Introduction

This section will review the key nutrition requirements common to all wounds. Note: burns greater than 10% total body surface area are beyond the scope of this document. For more information please refer to specialized burn nutrition, such as discussed in [Chapter 8: Best Practice Recommendations for the Prevention and Management of Burns](#).

Wound healing is an anabolic process requiring a steady supply of nutrients and fluid to the wound bed. Nutrients are required at all stages of the wound healing cascade and are vital to preserve skin integrity. Nutrition is an important part of the care plan for prevention and treatment of all wounds. While a wound may result from a variety of different etiologies (e.g., venous stasis, diabetes mellitus, arterial insufficiency, post-surgical, pressure injury, burns, skin tears, trauma, moisture associated skin damage, lymphedema, etc.), the nutrition considerations for prevention and treatment remain consistent. Cultural considerations and understandings should guide assessment and care planning to support patient (client, resident) preferences, cultural safety and relevance.

Malnutrition

Poor nutrition and malnutrition can increase the risk of wound development, interrupt the healing process, reduce the tensile strength of a wound, contribute to wound chronicity and severity and can increase the risk of infection.

Malnutrition is usually diagnosed when two or more of the following nutrition characteristics are identified: unintentional weight loss, loss of muscle mass, loss of subcutaneous fat, fluid accumulation (that may mask weight loss) and diminished functional status (as measured by hand-grip strength). See validated malnutrition screening tools in Table 1. Risk factors contributing to malnutrition include poor appetite, the inability to eat or cook independently, pain, dehydration, dementia, disordered eating, dysphagia, gastrointestinal disorders and food insecurity, among others.

When a patient/client/resident is identified with malnutrition and at risk of developing a wound, the nutritional focus is to optimize energy, protein and fluid intake in order to maintain overall health and skin integrity. The nutritional approach includes promoting a balanced diet where intake meets the dietary reference intakes (DRIs) for macro- and micronutrients, including energy dense foods, liberalizing diet restrictions and correcting suspected or confirmed nutritional deficiencies through the diet or vitamin-mineral supplementation. Recommendations should be adapted for cultural and personal preferences. Nutrient needs are best met through a 'food first' approach, meaning offering nutrient-rich foods before offering fortified foods or oral nutrition supplements (ONS).

Management

Early identification and diagnosis of malnutrition followed by nutritional intervention by an RD has the potential to reduce the prevalence of wounds, improve a person's quality of life, support wound healing and reduce health-care costs and hospital admission/readmission rates. See Dietitians of Canada for more information:

<https://www.dietitians.ca/>

When a wound is present, nutritional requirements are increased. Individual energy needs are based on the number and severity of the wound(s), body weight, degree of weight loss (if applicable) and other comorbidities. Energy from carbohydrates and fat is needed to 'spare' protein, thereby allowing protein to be used for wound healing and preserving skin integrity. Hydration status impacts wound healing, as dehydration can reduce blood volume and

circulation, resulting in reduced delivery of nutrients to the wound bed and elimination of wastes, thereby impairing wound healing and increasing risk of further skin breakdown. Protein and fluid requirements may be further increased with heavily exudative wounds and/or use of negative pressure wound therapy (NPWT). Assessment of fluid status through a review of laboratory markers and/or clinical signs is recommended. As protein and fluid needs are impacted by renal and hepatic disorders and other comorbidities, caution is advised when recommending protein and fluid to people with these diseases/disorders. To enhance communication and collaboration, consider consulting the most responsible physician/nurse practitioner to review recommendations and to ensure consistent messaging for the patient.

While all micronutrients are essential for health, there are several key vitamins and minerals associated with wound healing, including vitamin A, vitamin C and zinc. Vitamin D intake can also be low in the Canadian population and warrants attention, particularly for those living with diabetes. As anemia can lead to delayed or non-healing wounds, intake of iron, vitamin B12 and folate should be assessed. When interpreting laboratory data, it is important to note that micronutrient levels and certain biomarkers are sensitive to the presence of inflammation (particularly if C-reactive protein [CRP] levels are greater than 20 mg/L). For example, ferritin levels could be falsely elevated in the presence of inflammation, while zinc, vitamin D and vitamin A levels may be falsely decreased. While correcting known deficiencies is essential, single vitamin or mineral supplementation above the DRIs has not shown benefit. If an individual cannot meet the DRIs through a balanced diet, supplementation can be considered. Of note, not all physicians can order vitamin or mineral assays, and results may take several weeks to complete. Clinical judgement and other nutrition assessment data may prove more useful in the near-term when recommending vitamin and mineral supplementation.

Recent evidence supports use of ONS that include arginine, zinc and antioxidants in adults when a pressure injury is present (Category/Stage II or greater), as these have been shown to improve healing. However, these arginine-enhanced or other ONS specifically formulated for wound healing are not currently available in Canada.

Optimal glycemic control for people living with diabetes and wounds is strongly recommended, as hyperglycemia can impair wound healing. Ensure a balanced diet with adequate fluid intake and modify carbohydrate intake. Include lower glycemic carbohydrate choices, whenever possible, while optimizing the diet.

People with larger bodies need special nutrition consideration as their risk for wounds may be increased and they may have a greater incidence of pressure injuries, venous ulcers, wound dehiscence and skin infections.

In addition, malnutrition risk may be higher in those individuals who undertake long-term efforts at weight loss or have unbalanced diets. Weight maintenance or gain, where indicated, is recommended during wound healing.

Guidelines

Screening

1. Screen all clients with a wound, or at risk for a wound, for malnutrition. Choice of screening tools will vary depending on the population screened: inpatient, living in a residential facility or community dwelling (See Table 1).
2. Subscales of the Braden Risk and Skin Assessment and the Pressure Injury Prevention Points (NPIAP) can also be helpful in delineating those at risk for wounds as a result of nutrition complications. These scales, however, do not specifically screen for malnutrition.
 - a. Braden score of 3 or less: recommend high protein/high calorie diet
 - b. Braden score of 2 or less: requires a RD referral.

Assessment

3. Perform Subjective Global Assessment (SGA) or Nutrition Focused Physical Exam (NFPE).
4. Review recent bloodwork, focusing on the following values:
 - a. Complete blood count (CBC)
 - b. Electrolyte panel, blood urea nitrogen (BUN) and creatinine
 - c. Fasting blood glucose and hemoglobin A1c

- d. Vitamins/minerals such as vitamin D, zinc, and iron panel, with or without ferritin, as available
- e. Monitor for signs and symptoms of dehydration (thirst, dizziness, dry lips and mouth, fainting, flushed skin, low blood pressure, tiredness, increased heart rate, irritability, headache, dark strong-smelling urine, decreased urine output).

Note: albumin and prealbumin levels are not reflective of protein stores and may be altered by inflammatory conditions.

5. Review weight history. Watch for significant weight loss indicated by more than 5% weight loss in one month, 7.5% in three months or 10% in six months.
6. Review number and staging of wounds.
7. Nutrition Requirements:
 - a. Energy. Recommend 30–35 kcal/kg to meet energy requirements and maintain/regain body weight.
 - i. If BMI is greater than 30:
 1. The Mifflin-St. Jeor equation may be more appropriate for predicting resting metabolic rate,
OR
 2. Use adjusted body weight to calculate energy needs, **OR**
 3. Use 11–14 kcal/kg actual weight
 - ii. Consider high energy/high protein ONS between meals if nutrition requirements cannot be met through food alone.
 - iii. Calculate energy requirements using indirect calorimetry if available.

Note: Adjusted body weight for BMI >30 = IBW + 0.25 x (actual body weight - IBW)

Ideal Body Weight (IBW) = weight at BMI of 24.9.

Consider use of Diabetes Canada – Calculate your Body Mass Index [https://www.diabetes.ca/managing-my-diabetes/tools---resources/body-mass-index-\(bmi\)-calculator](https://www.diabetes.ca/managing-my-diabetes/tools---resources/body-mass-index-(bmi)-calculator)

- b. Protein. Recommend 1.25-1.5 g/kg protein depending on the number and severity of wounds. Caution is advised when determining protein needs in renal or hepatic disorders. Use adjusted body weight when assessing protein requirements for individuals with BMI greater than 30.
 - i. Consider fortifying food with modular protein supplements (e.g., whey, soy, collagen) when protein needs cannot be met through food.
 - ii. Higher protein requirements may be seen with high output NPWT and larger wounds. Closely monitor nutrition status.
- c. Hydration. Recommend 30–35 ml/kg fluid or 1.0 ml/kcal to meet fluid needs. Fluid needs will be increased with heavily exuding wounds, use of NPWT, fever or gastrointestinal losses (e.g., diarrhea, vomiting). Caution is advised when recommending fluid requirements in renal, cardiac or hepatic disorders.
- d. Micronutrients. Correct known or suspected deficiencies. Refer to the DRI for specific nutrients.
 - i. Minerals
 1. Assess iron deficiency anemia by reviewing CBC, iron profile and ferritin. Caution is advised in patients with chronic kidney disease or those with active infection/sepsis.
 - a. Recommend adequate dietary sources of iron or suggest iron supplementation if deficient.
 - b. Consider potential gastrointestinal side effects of oral iron supplementation (e.g., constipation, diarrhea).
 - c. Avoid concurrent oral calcium supplements or calcium-rich foods with oral iron or zinc supplementation.
 2. Assess zinc status if available. Recommend adequate dietary sources of zinc or suggest zinc replacement if deficient.
 - ii. Vitamins
 1. Assess Vitamin C status if available. Recommend adequate dietary sources of Vitamin C or suggest Vitamin C supplement if deficient. Vitamin C requirements may be increased with commercial tobacco use.
 2. Assess Vitamin D status if available. Recommend adequate dietary sources of Vitamin D or suggest Vitamin D supplement if deficient.
 3. Assess Vitamin A status if available. Recommend adequate dietary sources of Vitamin A or suggest Vitamin A supplement if deficient. Consider Vitamin A supplementation with prolonged corticosteroid use.

4. Assess B12 and/or folate level(s) if available. Screen for macrocytic anemia by reviewing CBC (elevated MCV). Recommend adequate dietary sources of B12 and/or folate or suggest supplementation if deficient. Consider a potential for low B12 status for clients over 60 years of age, long-term adherence to a vegan/vegetarian diet, diagnosis of gastrointestinal disorders, or prolonged use of some medications (e.g., proton pump inhibitors, metformin, methotrexate).

iii. Recommend a general multivitamin-mineral supplement if intake is poor (e.g., less than 50% usual food consumed). Consider all sources of vitamin and minerals before recommending (e.g., ONS, fortified foods, single nutrient supplements, tube feeding formula, parenteral multi vitamin preparation).

e. Consider enteral nutrition support for those who cannot meet nutritional requirements orally. Parenteral nutrition must be considered for patients with non-functional GI tract when feeding via oral and enteral routes is not possible. Initiation of enteral and parenteral support must be consistent with the patient/client/resident's goals, priorities, context and resources.

8. Recommend optimal glycemic control for people living with diabetes. For most people, target:
 - a. Capillary blood glucose of 4.0–7.0 mmol/L preprandial and 5.0–10 mmol/L 2 hour postprandial (5.0–8.0 mmol/L if A1c not at target).
 - b. Hemoglobin A1c \leq 7.0%.
 - c. Glycemic targets may need to be individualized with frailty, functional dependence or those living with hypoglycemic unawareness or recurrent severe hypoglycemia. Refer to the client-specific targets as determined by the diabetes team and/or physician.
9. Consider mental, spiritual and emotional wellness factors that are influencing health and healing.
10. For many Indigenous, First Nations, Metis, Inuit peoples, food is considered a medicine. Create space in the conversation to inquire about traditional food(s), fluid(s) and/or traditional medicine use.

Nutrition Care Process

11a. Determine the most appropriate nutrition diagnosis(es) (See Table 2).

Table 2: Nutrition Diagnosis Examples

Inadequate oral intake (NI-2.1)
Inadequate fluid intake (NI-3.1)
Increased nutrient needs. Specify the nutrient(s), (e.g., energy and/or protein) (NI-5.1)
Malnutrition (NI-5.2)
Inadequate protein-energy intake (NI-5.3)
Inadequate protein intake (NI-5.7.1)
Inadequate vitamin intake (specify) (NI-5.9.1)
Inadequate mineral intake (specify) (NI-5.10.1)
Unintended weight loss (NC-3.2)
Acute disease or injury related malnutrition (undernutrition) (NC-4.1.3)
Food- and nutrition-related knowledge deficit (or accepted synonym), limited food and nutrition related knowledge (NB-1.1)

11b. Identify the Problem, Etiology, Signs and Symptom (PES) statement (See Table 3).

Table 3: Problem, Etiology, Signs and Symptom (PES) Statement Examples

Inadequate protein intake related to inability to meet elevated protein requirements secondary to a stage III pressure injury as evidenced by client's estimated protein needs and diet history
Food and nutrition-related knowledge deficit related to previous lack of education around nutrition for wound healing as evidenced by recent dietary intake and food choices

Inadequate oral intake related to decreased appetite and ability to meet macro- and micronutrient needs as evidenced by a 5% weight loss in one month and non-healing diabetic foot wound
Increased protein and hydration requirements related to stage IV wound treated with wound VAC as evidenced by 300 ml exudate accumulating in 24 hours, and prolonged wound healing time
Malnutrition may be related to dysphagia as evidenced by the patient eating less than 50% of minced and moist foods (IDDSI L5) with mildly thick (IDDSI L2) fluids due to the client's report of low appetite for the same
Predicted inadequate vitamin intake (vitamin C) related to reduced intake of fruits/vegetables and increased vitamin C needs with commercial tobacco use, as evidenced by bleeding gums and impaired wound healing
Inadequate mineral intake (zinc) related to malnutrition/inadequate oral intake as evidenced by serum zinc 0.4 mcg/mL, weight loss of 20% in six months, and client report of low intake of zinc-rich foods (e.g., meats, eggs, legumes, etc.)
Unintended weight loss related to increased difficulty purchasing food and preparing meals due to mobility impairment with foot ulcer as evidenced by weight loss of 5% of body weight in the last six weeks
Inadequate oral intake related to limited access to sufficient, appropriate, safe food as evidenced by recent dietary intake
Acute disease- or injury-related malnutrition (coccyx wound) related to poor appetite and cognitive changes/reduced ability to prepare foods as evidenced by moderate loss of subcutaneous fat, moderate muscle loss and total weight loss of 20% of body weight over 12 months

Nutrition Intervention

12. Determine the appropriate nutrition intervention and implement the nutrition care plan. Examples of potential nutrition interventions include: high protein/high energy diet, nutrient-dense diet, texture modified diet, nutrition support, vitamin/mineral supplements, ONS, protein supplements, feeding assistance adaptive feeding aids.
13. Provide nutrition education as needed.
14. Provide nutrition counseling and collaborative goal setting.
15. Co-ordinate nutrition care to support individuals and family to access supports and resources as needed. Consider:
 - a. Referral to community dietitian or other nutrition support upon discharge, such as registered dietitian services through HealthLink as per your province/territory. For example: HealthLink BC. High-protein foods for wound healing. Available from: <https://www.healthlinkbc.ca/health-topics/high-protein-foods-wound-healing>
 - b. Meal-based programs, assisted shopping or cooking services.
 - c. Financial subsidies and assistance. Assess eligibility for the Monthly Nutrition Supplement. Available from: <https://www2.gov.bc.ca/gov/content/governments/policies-for-government/bcea-policy-and-procedure-manual/health-supplements-and-programs/monthly-nutritional-supplement>
 - d. Day programs, respite care, or home support agencies.
 - e. Community organizations, Indigenous and First Nations Friendship Centres or other wellness services, as appropriate. For First Nations individuals living on reserve, co-ordinate care with the nursing team in communities (home care nurse/community health nurse, care support workers) for continuity of nutritional care.

Nutrition Monitoring/Evaluation

16. Rescreen for malnutrition at each encounter or readmission.
17. Ensure nutrition care plan is co-created with the patient/client/resident and/or care provider and reflects their preferences, goals, priorities, context and resources.
18. Monitor intake (energy, protein, fluids, micronutrients), weight, available laboratory data and wound healing.
19. Slow-to-heal wounds require enhanced monitoring and possible adjustments to nutrition requirements, glycemic control and supplementation.
20. Refer to other care providers as needed (e.g., home care nursing, wound care team, social worker, financial personnel, occupational therapist [positioning/equipment], speech language pathologist [dysphagia/communication], dental care professional, mental health care providers, elders or spiritual assistance providers).
21. Refer to the dietitian team.
22. Refer to diabetes education team/clinicians if optimal glycemic control is required for wound healing.

Patient/Client/Resident-Centred Education Resources

Patient resources are listed in Section 1 (above). In addition, consider the following:

- Health Canada. Getting enough vitamin C. <https://www.canada.ca/en/health-canada/services/nutrients/vitamin-c.html#c2>
- Health Canada. Health promotion – facts on fluids: how to stay hydrated. <https://www.canada.ca/en/department-national-defence/corporate/news/regional-news/western-sentinel/2021/08/facts-on-fluids-how-to-stay-hydrated.html>
- Indigenous Diabetes Health Circle. Iron and protein handout. <https://idhc.life/wp-content/uploads/2020/08/2019-10-11-Iron-Protein.pdf>
- First Nations Health Authority. Traditional foods fact sheets. https://www.fnha.ca/Documents/Traditional_Food_Fact_Sheets.pdf
- Fraser Health. Eating to help wounds heal. <https://patienteduc.fraserhealth.ca/file/eating-to-help-wounds-heal-595294.pdf>
- Primary Care Dietitians' Association. Nutrition and hydration tips on your road to recovery. https://nutritioncarein-canada.ca/sites/default/uploads/files/Malnutrition%20Toolkit/Tips_for_Nutrition_and_Hydration.pdf
- University of Waterloo. Older Adult Nutrition Screening. Consider a high protein, high energy diet order for inpatients/residents. [Healthy Eating Factsheet for Older Adults](#)
- Vancouver Coastal Health & Providence Health Care Nutrition for wound healing. <https://vch.eduhealth.ca/PDFs/BB/BB.200.N959.pdf>

Resource Literature (Section B)

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