Diabetic Foot Ulcers

A guide for Alberta with a focus on Indigenous health.

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

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

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

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

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

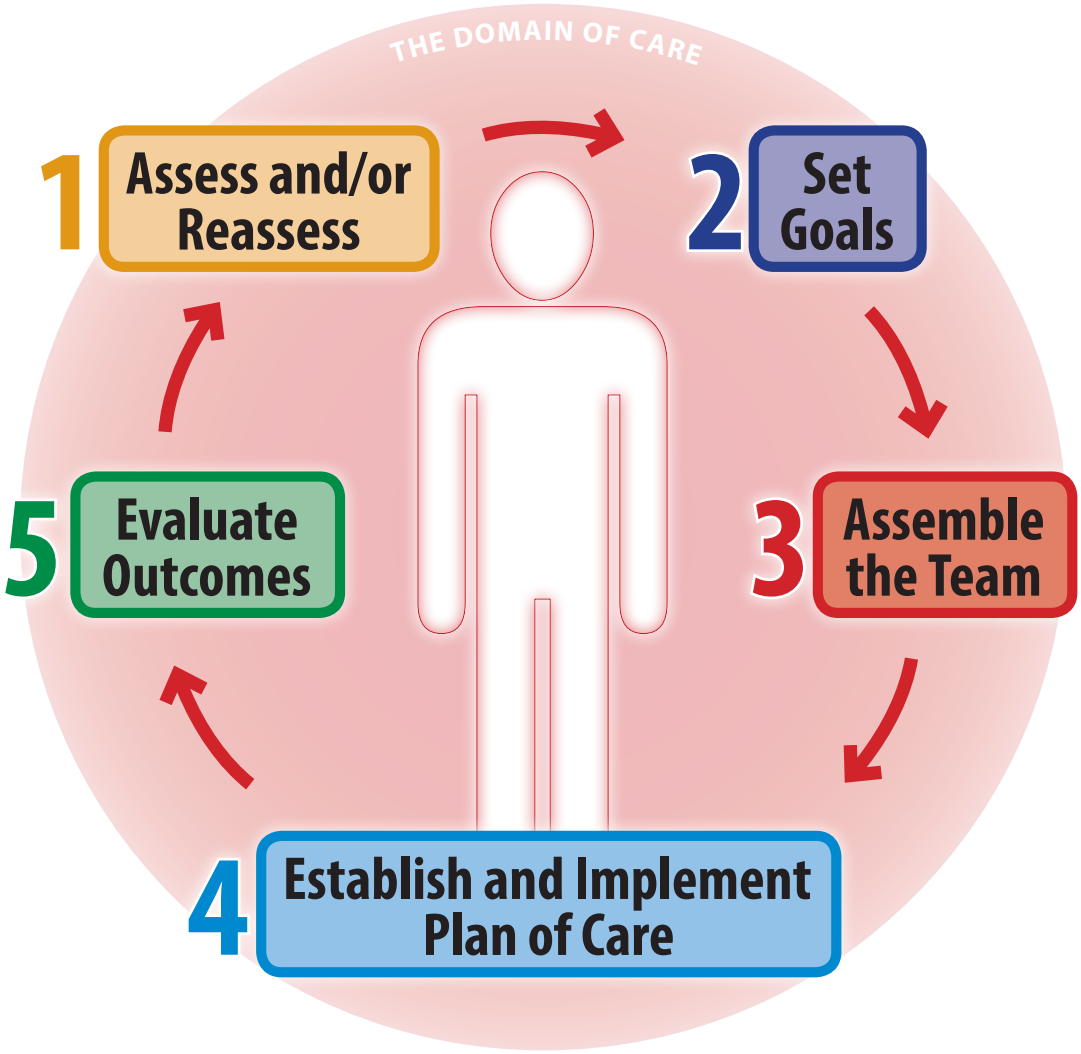
Introduction

Foot health should be a major consideration for people with diabetes and for those who care for them. Foot complications in this high-risk population can lead to a cascade of complications, potentially resulting in loss of limb and life. The lifetime risk for foot ulceration in people with diabetes is 15 to 25%. According to the International Diabetes Federation, persons with diabetes are 15 to 40 times more likely to require lower-extremity amputation compared to the general population. Approximately 85% of amputations are preceded by the development of a neuropathic foot ulcer.

It is important to remember that skin and wound care is to be collaborative, using a patient-centred approach based on respect, dignity, empathy, compassion, cultural appropriateness and shared decision making.

Disclaimer: *This document provides a clinical enabler for the recommendations outlined in the Best Practice Recommendations (BPRs) for the Prevention and Management of Diabetic Foot Ulcers. It is not meant to provide comprehensive information on the given topic. For more information on a particular recommendation or a copy of the full document go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/895-wc-bpr-prevention-and-management-of-diabetic-foot-ulcers-1573r1e-final/file.*

Figure 1: Wound Prevention and Management Cycle (WPMC)



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

1 Assess and/or Reassess

- Assess the patient, the wound (if applicable), as well as environmental and system challenges.
- Identify risk and causative factors that may impact skin integrity and wound healing.

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

1.1 Select and use validated patient assessment tools.

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

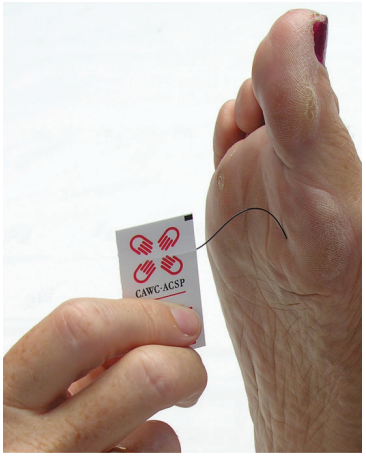
1.2 Identify risk and causative factors that may impact skin integrity and wound healing.

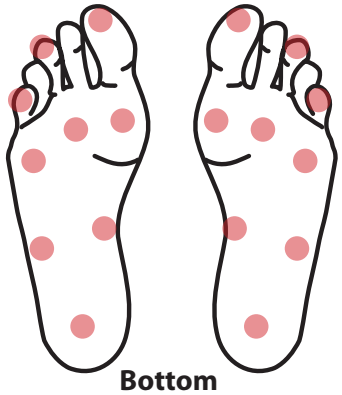
1.2.1 Physical

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

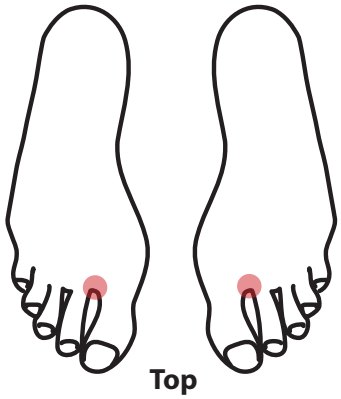
- Health history and current health status including A1c, hypertension, coronary artery disease (CAD), renal disease
- Risk factors, including skin and nails, sensory deficits, arterial status, bony changes and footwear, followed by a stratification of risk level.
- Lifestyle, environment and activities of daily living (including smoking, use of alcohol/drug, stress)

Figure 2: Monofilament Testing for Neuropathy





Bottom
right foot left foot



Top
right foot left foot

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Table 1: Assessing Arterial Flow and Perfusion

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

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

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

1.2.3 Systems: Health-care support and communication

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

1.3 Complete a wound assessment, if applicable.

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

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

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

Table 2: Diabetic Foot Ulcer Assessment Tools

System	Characteristics
Wagner	▪ Assesses ulcer depth along with presence of gangrene and loss of perfusion using six grades (0–5)
University of Texas	▪ Assesses ulcer depth, presence of infection and presence of signs of lower extremity ischemia using a matrix of four grades combined with four stages
PEDIS	▪ Assesses perfusion, extent (size), depth (tissue loss), infection and sensation (neuropathy), using four grades (1–4)
SINBAD	▪ Assesses site, ischemia, neuropathy, bacterial infection and depth, using a scoring system to help predict outcomes and enable comparisons between different settings and countries

2 Set Goals

• prevention	• healing • non-healing • non-healable	• quality of life and symptom control

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

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

2.1.1 Identify goals based on prevention or healability of wounds

Prevention goals might include:
- Diabetic foot ulcers are prevented.
- Foot wear is appropriate for fit and function.
- Foot care regimen is implemented within one day.
- Blood glucose within normal range

Healable goals may include:
- Skin care regimen in place in 2 days
- Blood glucose normalized within 2 weeks
- Diabetic foot screening every 3 months
- Offloaded within 2 days
- Wound infection managed within 1 week
- Wound closure within 2 months

Non-healing goals might include:
- Diabetic foot ulcer remains stable and not infected.
- Exudate and pain are controlled within one day.
- Further skin breakdown is prevented.
- Blood glucose controlled, as able

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

Non-healable goals might include:
- Diabetic foot ulcer is clean and dry (to reduce risk of infection).
- Further skin breakdown is prevented

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

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

3 Assemble the Team

• Select membership based on patient need.

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

3.1 Identify appropriate health-care professionals and service providers.

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

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

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

3.3 Ensure organizational and system support.

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

To support this model and secure successful outcomes, decision makers must:
- ***Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as therapeutic shoes, patient education and clinical visits.***
- ***Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a diabetic foot management program.***
- ***Establish a pathway for referral of people with diabetes with an active foot problem to a multidisciplinary foot care service or foot care service within one working day and triaged within one additional working day.***

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

- ***Work with community and other partners to develop a process to facilitate patient referral and access to local diabetes resources and health professionals with specialized knowledge in diabetic foot management.***
- ***Work with community and other partners to advocate for strategies and funding for all aspects of preventative foot care, including preventative and treatment footwear.***
- ***Ensure foot care services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent diabetic foot ulcers, and to support management in their health-care or community setting.***
- ***Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of diabetic foot complications.***
- ***Establish and sustain a communication network between the person with diabetes and the necessary health-care and community systems.***
- ***Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care.***

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

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

4 Establish and Implement a Plan of Care

- Establish and implement a plan of care that addresses:
- the environment and system
- the patient
- the wound (if applicable)
- Ensure meaningful communication among all members of the team.
- Ensure consistent and sustainable implementation of the plan of care.

Provide Local Skin/Wound Care (if applicable)

Cleansing/ debridement:
- Remove debris and necrotic or indolent tissue, if healable.

Bacterial balance:
- Rule out or treat superficial/ spreading/ systemic infection.

Moisture balance:
- Ensure adequate hydration.

Select appropriate dressing and/or advanced therapy

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

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

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

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

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

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

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

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

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

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

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

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

4.3 Select the appropriate dressings and/or advanced therapy

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

Wounds Canada's Product Pickers

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

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

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

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

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

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

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

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

5 Evaluate Outcomes

Goals Met:	Goals Partially Met or Not Met:
• Ensure sustainability. • ✓Cycle is completed	• reassess

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

5.1 Determine if the outcomes have met the goals of care

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

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

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

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

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

5.3 Ensure sustainability to support prevention and reduce risk of recurrence

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

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

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

Diabetes, Healthy Feet and You:
- www.woundscanada.ca/about-dhfy.

Additional Resources

Diabetes Support and Resources
- Alberta Diabetes Foundation (ADF)
- Alberta Diabetes Institute
- Alberta Diabetes Link.ca
- Alberta Health Advocates
- Athabasca Tribal Council Health Division
- College of Podiatric Physicians of Alberta
- Diabetes Canada
- Indigenous Wellness Clinic Anderson Hall Edmonton
- Little Red River First Nation Health Department
- Maskwacis Health Services
- National Indigenous Diabetes Association
- NECHI Institute: Centre of Indigenous Learning
- OKAKI Diabetes Virtual Care Clinic

Resources for Clinicians
- BPR Brief: Prevention and Management of Wounds
- *Limb Preservation in Canada:* A Foot Health Pathway for People Living with Diabetes: Integrating a Population Health Approach.
- *Wound Care Canada*:
  - The role of a certified orthotist in wound care.
  - Too few, too many or just right? How many sites should be tested to detect diabetic peripheral neuropathy?
  - Mental health and patients living with diabetic foot complications.

Resources for Patients
- Wounds Canada: Care at Home Series: Caring for Your Wounds at Home
  - Caring for Your Wound at Home: Changing a Dressing
  - Preventing and Managing Skin Injuries: Minor Trauma (Cuts, Scrapes, and Bruises)

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

- Caring for Your Feet: Safe Foot Care if You Have Diabetes
- Diabetic Foot Complications: When is it an emergency?
- Wounds Canada: Do-it-Yourself Series: Wound Prevention and Treatment: Do It Yourself (DIY) or Call in a Pro?
- For All Wound Types
- Neuropathic/Diabetic Foot Ulcer

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Indigenous Services Canada
Services aux Autochtones Canada

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