

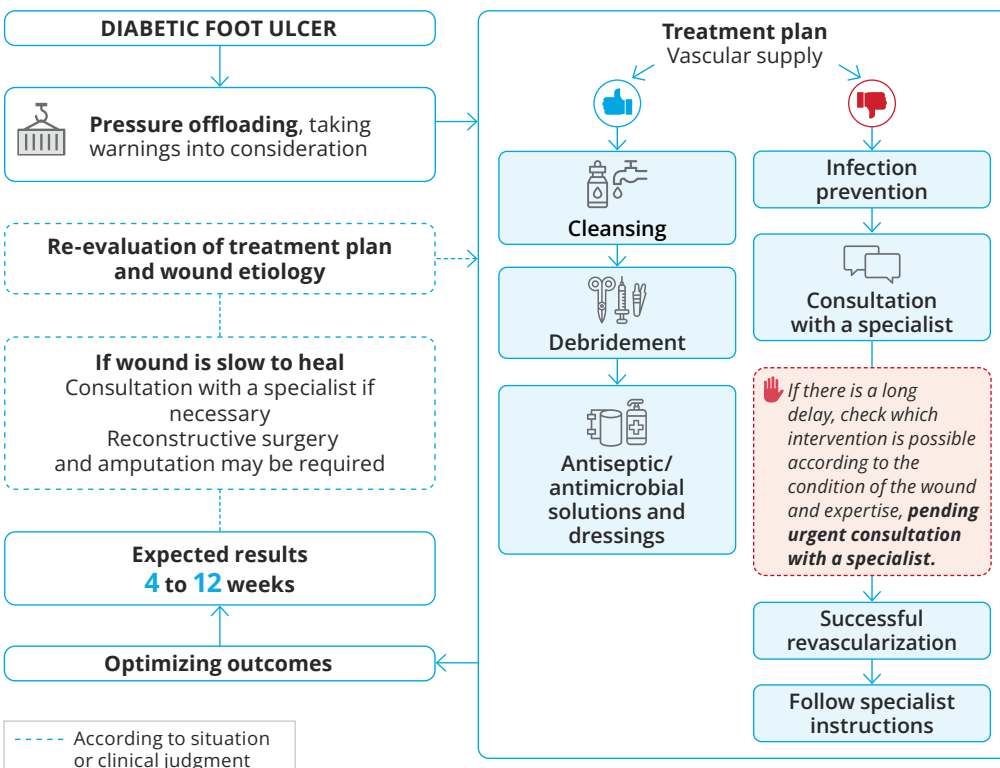
This decision support tool is intended primarily for front-line clinicians. It is provided for guidance only and does not replace the judgment of the clinician performing the activities reserved to him or her by law or regulation. This document has been designed on the basis of clinical recommendations developed by the INESSS using a systematic approach and supported by the scientific literature as well as by the knowledge and experience of clinicians from different specialties and areas of expertise. The content of this tool excludes newborns and young children. Tools to guide wound assessment and the determination of healing potential, as well as decision support on an optimal treatment plan based on wound etiology, vascular supply, and infectious risk, tissue type and exudate quality, are also provided, along with a reminder of dressing specifics. For further details, visit inesss.qc.ca.

PATHOPHYSIOLOGY

- Complication of underlying diabetes resulting in an ulcer of the foot, mainly in the plantar region.
 - Appears in the presence of abnormally high plantar pressures or abnormal friction.
 - usually associated with peripheral neuropathy with
 - sensory damage to the foot and loss of protective sensation;
 - motor impairment of the foot and deformity of the toes;
 - autonomic foot damage leading to dry skin.
- ⚠ *Based on current knowledge, 15-25% of diabetics will develop a foot ulcer*



TREATMENT PRINCIPLES



SUMMARY

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CLINICAL EMERGENCY

- [Signs of sepsis](#)
- [Infected gangrene](#)
- [Necrotizing fasciitis](#)
- Cellulitis/lymphangitis with [warning signs](#)
- Suspected acute Charcot foot - hot, red, unexplained swelling of the foot



HOLISTIC EVALUATION OF THE INDIVIDUAL

! Evaluate and, if necessary, control pain.

1	Medical history	Expected location	Vascular status
	<ul style="list-style-type: none"> • Ask the individual or family members about the wound, lifestyle habits, and health. • Verify relevant history of lab testing results to the etiology of the wound. • Document the location of the wound. 	<p>Face Plantar side Mainly at the base of the 1st or 5th toe</p>  <p>and can be located on :</p> <ul style="list-style-type: none"> - lateral edges - interdigital region - deformed bony region (e.g., top of toes) 	<ol style="list-style-type: none"> 1. General physical examination (initial assessment) Suspect arterial insufficiency if: <ul style="list-style-type: none"> - cold areas pale in colour when lying down, especially at leg elevation, and purple in color when seated; - slow capillary return; - absence of pulse. 2. Subsequent evaluation if arterial insufficiency is suspected in step 1, complete vascular assessment with more than one measurement to detect peripheral atherosclerotic vascular disease (PAD). 3. In-depth investigation by a qualified professional or by a specialized service if abnormal or uncertain vascular supply.

2		Causal and risk factors for diabetic foot ulcers	
Causal factor		<ul style="list-style-type: none"> • Uncontrolled diabetes or diabetes that has been uncontrolled for several years 	
Risk factors		<ul style="list-style-type: none"> • Loss of sensory perception in the foot • Foot deformities • cracked skin • Abnormal friction and shearing forces (mainly in shoes) due to unbalanced loading of the foot. 	<ul style="list-style-type: none"> • Presence of calluses • Long, deformed, and thickened nails • PAD • Inadequate footwear • History of secondary deformities due to Charcot foot • Walking barefoot
Risk factors <i>Leading to delayed or more complex recovery</i>		<ul style="list-style-type: none"> • Smoking • Malnutrition - Obesity or underweight • Dehydration • History of amputation • Kidney disease 	<ul style="list-style-type: none"> • Atherosclerotic cardiovascular disease • Medication (with or without prescription) • Living conditions, reduced mobility, neglected hygiene, cognitive functions, social support • Lack of adherence to treatment

3			Paraclinical examinations and laboratory analyses
• Detection of neuropathy	• Appreciation of nutritional status	• Appreciation of indicators contributing to diabetic foot ulcers	

DETERMINATION OF WOUND HEALABILITY

- Consult the [Wound Assessment and Determination of Healing Potential Decision Support Tool](#) to determine whether a diabetic foot ulcer is **curable**, **under maintenance**, or **incurable**.

ASSESSMENT OF VASCULAR SUPPLY FOR A WOUND LOCALIZED ON A LIMB

- Wound healability is directly associated with the quality of vascular supply.
- A vascular evaluation should be performed in all individuals who present with a **wound on a lower or upper limb**.
- Symptoms and signs of peripheral atherosclerotic vascular disease (PAD) should be investigated **before**:
 - any form of [debridement](#) - e.g., autolytic, conservative sharp, enzymatic;

Further vascular assessment may be required at the onset of a new wound when there is PAD.

Vascular assessment for a wound on an lower limb

Initial assessment

- Check for abnormal clinical signs - e.g., coldness, pallor, pain, slow capillary return.
- Palpation of dorsalis pedis **and** posterior tibial artery pulses.
- Auscultation of femoral sounds and inspection of legs and feet.

When in doubt consult an experienced colleague or a specialist

Subsequent assessment

- Ankle-brachial systolic pressure index (ABPI) at dorsalis pedis and posterior tibial artery in supine position.
- If necessary, toe brachial index or toe pressure.

In-depth assessment

- Clinical signs of inadequate or uncertain vascular supply - non-palpable or weak pulses, critical ABPI values - should be confirmed by arterial wave quality analysis with portable Doppler by an appropriately qualified professional, vascular laboratory, vascular surgeon, or other.



ABPI is less accurate in some *diabetic individuals*, *chronic renal failure* or with *advanced age* or *cardiac arrhythmias* due to possible calcification of the arteries.

Vascular assessment by at least TWO methods to determine adequate vascular supply in a limb

Vascular supply	Presence of palpable pulses	Ankle-brachial systolic pressure index (ABPI)	If available in the setting and if knowledgeable for interpretation of collected values	
			Toe brachial index (TBI)	Toe pressure (TP, mmHg)
Uncertain or inadequate Suggests calcified vessels	No	ABPI > 1.4	If non-compressible arteries identified by ABPI are present, measurement of toe brachial index or toe pressure is recommended.	
Adequate Reduces the possibility of PAD	Yes	1.0 < ABPI ≤ 1.4	TBI > 0.7 ²	TP ≥ 70
Uncertain/grey area ¹ May suggest mild PAD	Weak	0.8 ≤ ABPI ≤ 1.0	0.6 < TBI ≤ 0.7	TP < 70
Inadequate ABPI < 0.5 suggests significant to severe PAD	No	ABPI < 0.8	TBI ≤ 0.6	TP < 70
Critical limb ischemia	No	ABPI < 0.4	TBI ≤ 0.2	TP < 30

Adapted from AHA 2016, HSE 2018 and Wounds Canada (Beaumier *et al.* 2020)

Consultation with a specialist or experienced colleague

1. ABPI values between 0.91 and 0.99 correspond to a grey area that requires assessment of the clinical picture - e.g., modifiable, or non-modifiable risk factors.
2. A toe brachial index value of over 0.75 generally rules out PAD.

WOUND PREPARATION PRIOR TO EVALUATION

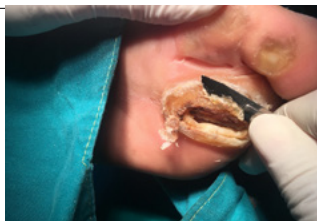
! Evaluate and, if necessary, control pain.

CLEANSING

- With aqueduct water (unless deep structures are exposed) or physiological solution (NaCl 0.9%).
- Applied in large quantities at room or body temperature. Consult [techniques](#) used.
- ✔ **If vascular supply is inadequate or uncertain:** for dry necrosis, disinfection with povidone-iodine (10%) or alcohol-free chlorhexidine (2%) and for moist necrosis, povidone-iodine (1%) or other antiseptic/ antimicrobial solution compatible with the dressing, if necessary and according to clinical judgment.

DEBRIDEMENT

- ✔ **Callus removal** around the wound with conservative surgical debridement.
- ❗ Perform carefully and atraumatically if vascular supply is inadequate or uncertain.



- ✔ **Removal of dry or moist necrosis,** debris, foreign bodies, or blood clots that prevent wound evaluation using tweezers or a pressure stream of aqueduct water or physiological
- ❗ **If vascular supply inadequate or uncertain.**
- ❗ **No debridement of dry black heel necrosis.**

WOUND ASSESSMENT

→ [Wound assessment](#) should consider the following:

1	Appearance of wound and surrounding skin	Identification of tissue type and exudate type	Identify symptoms and signs of an infected wound or biofilm		
	<ul style="list-style-type: none"> • Parameters such as size and depth are ideally quantified before, during, and after treatment for accurate wound monitoring. Visible structures are also documented. • Pain, whether absent (neuropathy) or severe (underlying infection), may indicate an urgent clinic condition linked to severe infection. 	<ul style="list-style-type: none"> • Tissue type influences subsequent steps. • The exudate type in correlation with other clinical symptoms and signs, or with other factors, helps to identify clinical conditions that are urgent (e.g., severe infection) or less urgent (e.g., presence of underlying disease). 	<ul style="list-style-type: none"> • Clinical observations are generally sufficient, and wound culture is not recommended unless systemic antibiotic therapy is to be considered. <table border="1"> <tr> <td> Local infection <ul style="list-style-type: none"> • can be fully managed by front-line healthcare professionals. </td> <td> Deep-tissue infection <ul style="list-style-type: none"> ☞ Immediate consultation with an experienced colleague, and if necessary, referral to an infectious disease microbiologist </td> </tr> </table> <p>Clinical tools to evaluate the severity of infection and risk of amputation in infected diabetic foot ulcers:</p> <ul style="list-style-type: none"> • Wifi • IWGDF/IDSA grid • Scottish Ropp Scale 	Local infection <ul style="list-style-type: none"> • can be fully managed by front-line healthcare professionals. 	Deep-tissue infection <ul style="list-style-type: none"> ☞ Immediate consultation with an experienced colleague, and if necessary, referral to an infectious disease microbiologist
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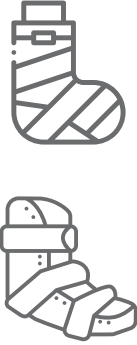

2	Exposure of deep structures (e.g., tendons, nerves or bones)
	<ul style="list-style-type: none"> ☞ Consult a specialist department or experienced colleague about the specifics of management, including the appropriateness of starting antibiotic prophylaxis if a bone is exposed. • Keep exposed area moist but avoid maceration.

👋 Factors to watch out for regarding osteomyelitis

- Risk factors for osteomyelitis:
 - local infection on a prominent bone
 - deep foot injury (e.g., fascia, tendon, muscle, cartilage, bone)
 - exposed bone
 - rough, soft or discoloured bone
 - recurrent wound with deep-lying orthopedic material
- Explore the wound with a sterile metal stylet to exclude any bone contact. This also helps evaluate depth and the presence of underlying sinuses

PRESSURE OFFLOADING

→ Pressure relief on the affected area is the corner stone step in treating diabetic foot ulcers.

Relief methods depending on the location of the diabetic foot ulcer	
On the plantar surface of the foot	Interdigital or dorsal to the foot
<ul style="list-style-type: none"> • Non-removable method (e.g., total contact cast or pressure off-loading boot made non-removable). <ul style="list-style-type: none"> - Evaluate safe use in people at risk of falling, in the presence of controlled infection, minor ischemia, or a macerated or highly exudative wound. • Removable method with an adapted soft sole (e.g., boot or off-loading sandal). <ul style="list-style-type: none"> - Evaluate safe use in people at risk of falling. 	<ul style="list-style-type: none"> • Shoes with sufficient depth and width. • Off-loading sandal. • Custom-made removable orthosis. • Toe spacer.
	
<p><i>Information from stakeholder consultations</i></p>	

DETERMINE TREATMENT PLAN BASED ON VASCULAR SUPPLY, INFECTIOUS RISK, TISSUE TYPE, AND EXUDATE AMOUNT

- **Control pain as needed**
- **Ensure adequate vascular supply BEFORE cleansing, debridement, and dressing application.**

→ The treatment plan steps by tissue type are described in the [Optimal Treatment Plan Decision Support Tool, based on wound etiology, vascular supply, infectious risk, tissue type, and exudate amount](#).

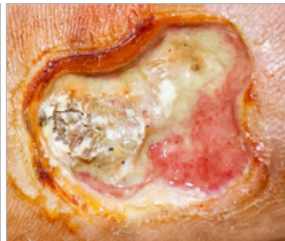
→ The information below complements the treatment plan specific to diabetic foot ulcers.

TISSUE TYPE

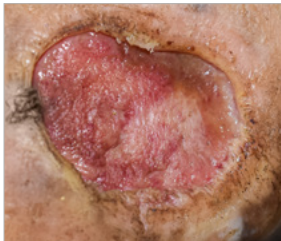
Dry necrosis



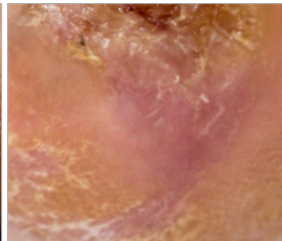
Moist necrosis



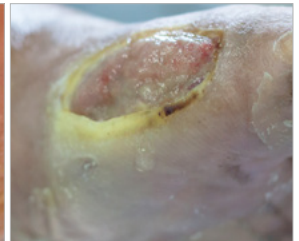
Granulation tissue




Epithelial tissue




Macerated tissue



CHOICE OF CLEANSING AND DEBRIDEMENT


 <p>Cleansing</p>	<ul style="list-style-type: none"> • Aqueous water or physiological solution (NaCl 0.9%) in large quantities and at room or body temperature. • Antiseptic/antimicrobial solution if local infection is present or to facilitate the debridement step (e.g., prontosan) if there is a suspicion of biofilm in the wound. ✓ If vascular supply is inadequate or uncertain: for dry necrosis, disinfection with povidone-iodine (10%) or alcohol-free chlorhexidine (2%); for moist necrosis, povidone-iodine (1%) or other antiseptic/antimicrobial solution compatible with the dressing, if necessary and according to clinical judgment.
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 <p>Debridement</p>	<ul style="list-style-type: none"> ✓ Conservative sharp for curable wounds and maintenance. ✓ Autolytic to be considered if non-infected ulcer and small amount of necrosis present. <p><i>Other debridements are possible, depending on the individual and the wound. Consult debridement methods for details.</i></p>
	<ul style="list-style-type: none"> ✗ Dry necrosis with inadequate or uncertain vascular supply (e.g., weak, or absent pedal pulses). ⚠ After discussion with an experienced colleague or specialist team and evaluation of the risks and benefits, debride non extensively the ischemic moist necrosis according to the ease and skill of the professional and apply an antimicrobial agent pending urgent consultation with a specialist. ✗ Granulation tissue and epithelial tissue not infected. ✗ Dry black necrosis on heel.

APPLICATION OF AN ANTISEPTIC/ANTIMICROBIAL SOLUTION

<p>Local infection or presence of biofilm</p>	<p>Therapeutic use</p> <ul style="list-style-type: none"> • If local infection is confirmed or the presence of biofilm is clinically suspected. Consult antiseptic/antimicrobial solutions for details.
	<p>Prophylactic use</p> <ul style="list-style-type: none"> • Not recommended except in one of the clinical situations that require it. Consult antiseptic/antimicrobial solutions reasons of prophylactic use.

DRESSING CHOICE

 <p>Dressings</p>	<p>Dressings (General)</p> <ul style="list-style-type: none"> • Depending on the amount of exudate, from light ● to heavy ●●●. • Prefer semi-occlusive dressings as suggested in the treatment plan. • If dry necrosis with inadequate or uncertain vascular supply: possibility of protecting the necrosis with a dry, non-adherent dressing (e.g., cotton pad). • If moist necrosis with inadequate or uncertain vascular supply: apply iodine cadexomer. • Consider anatomical location to avoid pressure, friction, and shearing.
	<p>Local infection</p> <ul style="list-style-type: none"> • Antimicrobial dressings : for diabetic plantar ulcers, apply dressings that do not macerate the wound (e.g., gauze, compress, or roll) and ideally are PHMB-based.
<p>Avoid</p>	<ul style="list-style-type: none"> ✗ For diabetic plantar ulcers, hydrocellular foams are not recommended, as they encourage maceration.

OPTIMIZING OUTCOME



- A diabetic foot ulcer may take a long time to heal or may recur if the underlying cause and risk factors are not controlled.
- In addition, it is important to evaluate other [possible underlying causes](#) of the signs and symptoms observed.

CARE RELATED TO THE TREATMENT OF DIABETES FOOT

Pressure redistribution by: <ul style="list-style-type: none"> • devices • footwear • orthotics 	Infection prevention	Revascularization if appropriate	Optimization: <ul style="list-style-type: none"> • Glycemia • Nutrition (important aspect) • hydration
↑ Mobility	Smoking cessation	↓ Cardiovascular risks	Healthy weight

INFORMATION TO BE GIVEN TO THE PATIENT AND FAMILY

Maintain good personal hygiene, while protecting dry necrosis and exposed structures when showering
Foot care <ul style="list-style-type: none"> • Good foot hygiene (cleaning and drying the skin, especially between the toes). • Wear appropriate socks, shoes, and slippers, at home and outdoors. • Avoid walking barefoot. • Do not use heaters or hot water bottles to warm feet. • Consult a health care professional to remove corns and calluses. • Cut nails in a straight line.
Hydration <ul style="list-style-type: none"> • Lubricate intact, dry surrounding skin with an emollient (e.g., urea-based creams), avoiding application between the toes
Frequent and regular visual and palpative inspection of feet and inside of shoes prior to use <ul style="list-style-type: none"> • by a healthcare professional or • by the person or their caregivers

MONITORING AND FOLLOW-UP



Evaluate and, if necessary, control pain

DRESSING CHANGE/FREQUENCY

Any dressing **more than 50%** soiled or detached should be changed, and the change frequency increased.

Non-infected wounds	<ul style="list-style-type: none"> • Wear dressing according to manufacturer's maximum recommended duration or clinical judgment.
Infected wounds	<ul style="list-style-type: none"> • Regular dressing changes depending on wound properties, the individual's condition, and, above all, the action mechanism of the dressing/antimicrobial product.

WOUND MONITORING TECHNIQUES

1. Clinical visual indicators with photographs taken if equipment available.

2. Calculated clinical indicators ([reduction in wound area](#)): a reduction of at least 40% in wound area after 4 weeks of optimal treatment is predictive of diabetic foot ulcer healing at 12 weeks.

Symptoms and signs of local, deep soft-tissue, or systemic infection should be investigated in addition to taking photographs, or measuring wound-area reduction at follow-up.

CONSULTATION WITH SPECIALIST

CLINICAL SITUATIONS REQUIRING CONSULTATION WITH A SPECIALIST

- Gangrene
- Severely infected ulcer
- Charcot neuroarthropathy
- Inadequate or uncertain vascular supply
- Deep structural or bone exposure
- Uncontrollable pain
- No significant improvement after **4 to 12 weeks** despite appropriate treatment and clinical judgment
- Persistent infection despite appropriate treatment; a microbiologist-infectiologist may be consulted

INTERDISCIPLINARY TEAM

- The treatment plan implemented by the care team (nurses, physicians, podiatrists, occupational therapists, physiotherapists) could benefit from the intervention of other healthcare professionals, depending on needs and availability of resources in the community - e.g., dietitian-nutritionist, orthotist, social worker.

MAIN REFERENCES

- References are presented in the INESSS [report](#) associated with this tool.

APPENDIX I – CALLUS REMOVAL WITH CONSERVATIVE SHARP DEBRIDEMENT

Before callus removal



After callus removal



Before callus removal



After callus removal

