Inlow's 60-second Diabetic Foot Screen: Update 2022

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Abstract: Eighty percent of lower extremity amputations related to diabetes-related foot disease can be prevented with the integration of prevention and interdisciplinary care, including screening, foot care and footwear education. In Canada, only half of persons with diabetes receive appropriate foot screening, and this estimate may be higher than the reality.

Wounds Canada has updated its diabetic foot screening tool, *Inlow's 60-second Diabetic Foot Screen (2022)* to increase its functionality and, ultimately, its usability in clinical practice. The new version was launched at workshops held at the 2022 Diabetes Canada and the Orthotics Prosthetics Canada national conferences.

For a person with diabetes, the screening results provide a risk level and identify direct associated educational activities and ongoing screening schedules. For clinicians and health-care organizations, the use of the diabetic foot screening tool in all care settings creates a common communication avenue between individuals and interdisciplinary teams supporting the individuals' foot care.

The methodology to update *Inlow's 60-second Diabetic Foot Screen*, including feedback from a primary care network and working experts, and alignment with the International Working Group on the Diabetic Foot (IWGDF) prevention guidelines, are presented in this manuscript.

Key words: *diabetes, foot risk screening, neuropathy, peripheral arterial disease, foot ulcers, amputations, interdisciplinary teams.*

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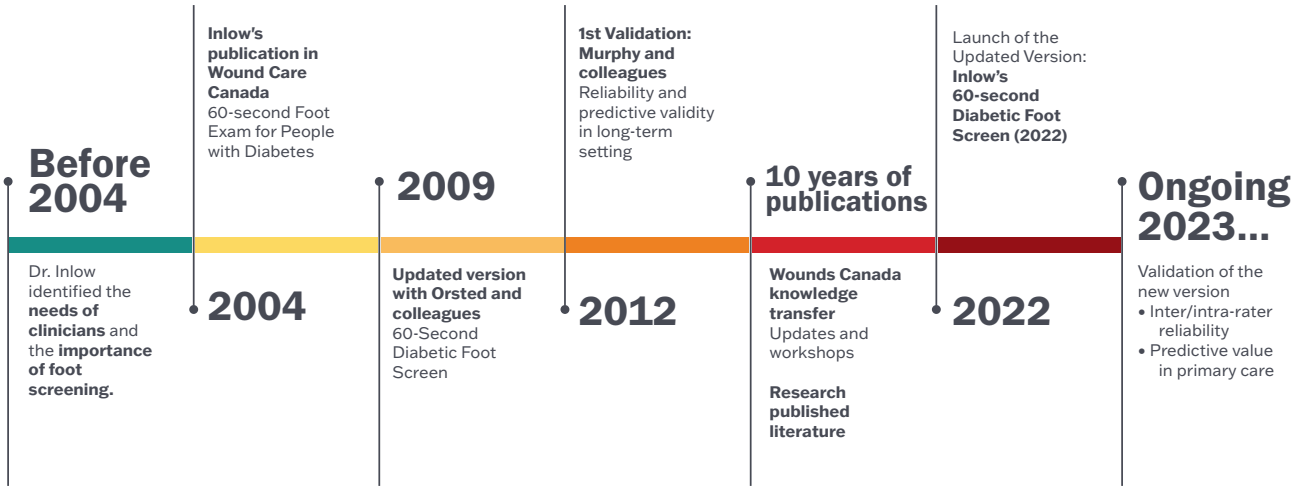
Eighty percent of lower extremity amputations secondary to diabetes-related foot disease (see Diabetic Foot Disease Defined on page 23) can be prevented with the integration of prevention and interdisciplinary care, including foot screening, education and foot care.[1-3] Up to 34% of Canadians living with diabetes will develop a diabetic foot ulcer (DFU) in their lifetime.[1] Unfortunately, the rate of diabetes-related amputation is rising and associated care remains fragmented across Canada.[4] The impacts of amputation deeply touch the lives of the individuals and their families and lead to increased use of health and social services.

The importance of conducting a diabetic foot screen for risk factors and stratification has been established in the literature.[5] The International Working Group on the Diabetic Foot (IWGDF) *Guidelines on the Prevention of Foot Ulcers in Persons with Diabetes* (2019 update) recommend screening and examination frequency in four categories: Very Low, Low, Moderate and High Risk.[2] This is important as in Canada only half of persons with diabetes receive appropriate foot screening, and this estimate may be higher than

Figure 1: Development Timeline of Inlow's 60-second Diabetic Foot Screen



documented.[6] In addition, we do not know if risk stratifications were used for those screened.

Diabetic Foot Disease Defined
The term diabetic foot disease was used to encompass different conditions such as diabetic foot ulcer, neuropathy, Charcot neuroarthropathy and peripheral arterial disease; conditions likely to occur in people with diabetes.

Source: The International Working Group on Diabetic Foot (IWGDF, 2020).

To avoid, or at least reduce complications, including major amputation and premature death, the identification of high risk in people with diabetes by early assessment seems to be a crucial action and some clinical tools have therefore been developed for this purpose.[7] *Inlow's 60-second Diabetic Foot Screen*[8] has garnered a great deal of attention over the years due to its ease of use, the rapid detection of high-risk diabetic feet and clear care planning actions for patients and clinicians to take based on risk category.[9] In addition, *Inlow's 60-second Diabetic Foot Screen* provides a systematic method that can be used by patients and clinicians for foot ulcer prevention and ongoing screening after an ulcer or complication occurs. As such, this evidence-based tool must evolve to conform to best practices to ensure adequate knowledge transfer. Therefore, the objective is to describe the process undertaken to update *Inlow's 60-second Diabetic Foot Screen* and describe the new features and skills needed to support its use and implementation in clinical practice.

Background

Before focusing on the 2022 update, it is necessary to review the history of the tool, which was originally developed by Dr. Shane Inlow (Calgary, Canada), a clinical expert in diabetic foot disease before his retirement. Because of his original contribution, the tool was named in his honour. Dr. Inlow was also very engaged with Wounds Canada.[10] The updated tool was

L to R: Virginie Blanchette, Shane Inlow, and Janet L Kuhnke in Calgary, Canada. (November 2022)

presented to Dr. Inlow in Calgary before its official launch.

The timeline related to *Inlow's 60-second Diabetic Foot Screen* is presented in Figure 1. Wounds Canada updated the tool in 2018[11] and a new update was a priority project in 2022. It was crucial to update this evidence-based tool and to align it with the updated scientific literature to conform to best practices and to ensure adequate knowledge transfer.[12,13]

Wounds Canada has conducted an update based on user needs. We first obtained feedback from a primary care network involved in diabetic foot screening (Seamless Care Optimizing the Patient Experience [SCOPE] Network), and they provided recommendations for change. Next, a working expert group, mainly the authors of this publication, was formed to collaboratively iterate on the feedback and latest evidence. The working group reviewed the comments and recommendations for change, as well as new literature, to align with the updated IWGDF prevention guideline that will be available in May 2023.[2] The updated version was launched at workshops held at the 2022 Diabetes Canada and the Orthotics Prosthetics Canada national conferences.

Updated/Added in 2022

1. Updated risk screening and plan-of-care
2. Created fillable PDF version
3. Expanded demographic section
4. Clarified instructions and improved title
5. Incorporated self-reported risk factors and co-morbidities
6. Improved layout for each limb documentation
7. Removed critical ischemia (the tool does not diagnose this condition) and added pain
8. Incorporated a link to Diabetes Canada fitness and activities (under recommendations)
9. Added links to the relevant patient, caregiver, and clinician resources.

2022 Update: What's new?

The updated *Inlow's 60-second Diabetic Foot Screen* (2022) tool is presented in Figure 2. The tool, available as a fillable PDF in French or English, is freely accessible via this link. The tool has kept its three integrated steps leading to the identification of the risk to patients' feet and recommendations and actions to be taken accordingly. These key categories examined are the known risk factors involved in the pathophysiology of the development of a diabetic foot ulcer.[2]

- **Step 1:** Complete the evaluation of both feet by assessing: 1) the skin of the foot and nail conditions; 2) for loss of protective sensation using a monofilament (following manufacturers' usage instructions); 3) for suspected peripheral arterial disease and 4) for foot deformities. Also ask the individual to self-report risk factors and comorbidities such as retinopathy, nephropathy, smoking, etc.
- **Step 2:** Determine the person's risk of diabetic foot ulcer. This is informed by the previous observations from the previous steps. The risk categories are Very Low, Low, Moderate, High and Urgent.
- **Step 3:** Based on the level identified in step 2, follow the recommendations and action plan. Adapt the care plan to respect the person's needs, values, cultural preferences, experience with trauma and ability to participate. Engage relevant caregivers, as needed, to support the person.

Moreover, the updated version has improved the layout and usability. A fillable PDF format was also developed. The instructions for each step were updated and simplified. We also added a patient identifier. Considering the important effect of certain risk factors on foot health, we decided to incorporate a self-reported risk factor section (Step 1) including retinopathy, nephropathy, poor glycemic management, cardiovascular disease, peripheral arterial disease and tobacco use.[14] This may assist clinicians in their decision-making, as these factors are well-known to contribute to the overall burden of diabetic foot disease and complications. Finally, we have aligned the risk stratification, recommendations, and actions with the IWGDF guidelines.[2]

Figure 2: Inlow's 60-second Diabetic Foot Screen (2022)

Inlow's 60-second Diabetic Foot Screen

2022 RISK SCREENING AND PLAN OF CARE

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Patient Name: **Clinician Signature:**

ID number: **Date:**

▶ Step 1: Complete Screen of the Right and Left Feet

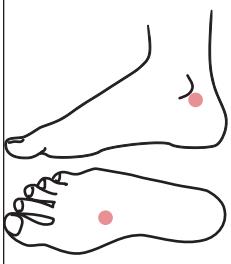
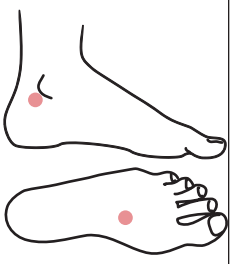
Instructions: Screen both feet using the parameters identified within Inlow's 60-second Diabetic Foot Screen[1] to identify clinical indicators and/or care concerns. Once each parameter has been assessed move on to Steps 2 and 3.

Self-Reported Risk Factors/Comorbidities

☐ Retinopathy ☐ Nephropathy ☐ Poor glycemic control ☐ Cardiovascular disease ☐ Peripheral Arterial Disease ☐ Smoking

RIGHT FOOT	1. Screen for Foot Skin and Nail Changes	LEFT FOOT	Risk Status and Care Planning
	**Skin:** ☐ Intact and healthy ☐ Dry with fungus or light callus ☐ Heavy callus build up ☐ Prior ulceration ☐ Existing ulceration (± warmth and erythema) ☐ Macerated web space **Nails:** ☐ Well-groomed and appropriate length ☐ Unkempt and ragged ☐ Thick, damaged, or infected		

RIGHT FOOT	2. Screen for Loss of Protected Sensation	LEFT FOOT	Risk Status and Care Planning
	**Foot Sensation – do they ever:** ☐ • feel numb? ☐ • tingle? ☐ • burn? ☐ • feel like insects are crawling on them? **Foot Sensation – monofilament testing:** ☐ No: Loss of protective sensation was not detected (sensation was present at all sites) ☐ Yes: Loss of protective sensation detected (sensation was missing at one or more sites)		

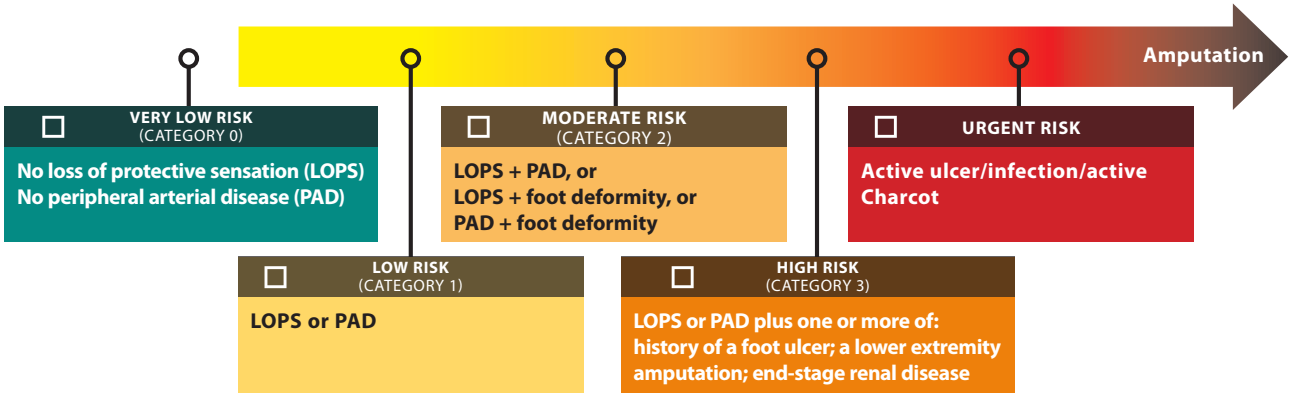
RIGHT FOOT	3. Screen for Peripheral Arterial Disease	LEFT FOOT	Risk Status and Care Planning
	**Pain:** ☐ Pain in the feet or legs when walking, limiting mobility **Dependent rubor:** ☐ No ☐ Yes **Cool foot:** ☐ No ☐ Yes **Pedal Pulses:** ☐ Present ☐ Absent		

RIGHT FOOT	4. Screen for Bony Deformity (and Footwear)	LEFT FOOT	Risk Status and Care Planning
	**Deformity:** ☐ No deformity ☐ Deformity (i.e. dropped metatarsal heads or bunion, chronic Charcot changes, hammertoes) ☐ Prior lower extremity amputation ☐ Acute Charcot (+ warmth and erythema) **Range of Motion:** ☐ Full range in hallux ☐ Limited range of motion in hallux ☐ Rigid hallux **Footwear:** ☐ Appropriate ☐ Inappropriate ☐ Causing trauma		

* Refer to Steps 2 and 3 before completing this area.

▶ Step 2: Determine the Risk for Ulceration and Amputation

Instructions: Review the results from Inlow's 60-second Diabetic Foot Screen to identify parameters that put the patient at risk. *Very low risk involves no loss of protective sensation, peripheral arterial disease or related comobidities/risk factors. If comorbidities exist, consider increasing to Category 1.



▶ Step 3: Create a Plan of Care with Your Patient Based on Identified Risks

Instructions: Based on the risk classification and clinical indicators develop a plan of care with your patient that best meets their needs.

Risk Category	Clinical Indicators	Screening Frequency	Recommendations and Actions**
Very Low Risk (Category 0)	No loss of protective sensation (LOPS) and no peripheral arterial disease (PAD)	Screen every 12 months	☐ Education on: risk factors; daily foot inspection; appropriate footwear and foot- and nail-care;† when/how to seek medical attention if needed ☐ Daily inspection of feet ☐ Appropriate foot and nail care ☐ Well-fitting footwear ☐ Exercise as able
Low Risk (Category 1)	LOPS or PAD	Screen every 6–12 months	☐ Education on: risk factors (including LOPS or PAD); daily foot inspection; appropriate footwear and foot- and nail-care; when/how to seek medical attention if needed ☐ Daily inspection of feet ☐ Professional foot and nail care, including treatment of onychomycosis and Tinea pedis if present ☐ Well-fitting, sensible footwear with custom, full-contact foot orthoses and diabetic socks ☐ Vascular studies ± referral to a vascular investigation +/- vascular surgeon ☐ Pain management for ischemic pain, if present ☐ Referral to a rehab specialist to provide a plan for fitness (exercise prescription) based on risk factors
Moderate Risk (Category 2)	LOPS + PAD, or LOPS + foot deformity, or PAD + foot deformity	Screen every 3–6 months	☐ Education on: risk factors (including LOPS ± PAD ± foot deformity); daily foot inspection; appropriate footwear and foot- and nail-care; when/how to seek medical attention if needed ☐ Daily inspection of feet ☐ Professional foot and nail care, treatment of onychomycosis and Tinea pedis if present ☐ Well-fitting, orthopaedic footwear with custom full-contact total contact casted foot orthoses and diabetic socks. Footwear must accommodate any deformities present ☐ Vascular studies ± referral to a vascular surgeon ☐ Pain management for ischemic or neuropathic pain ☐ Referral to a general, orthopedic or foot surgeon, if indicated, surgically manage foot deformities ☐ Recommend fittness and excercise program
High Risk (Category 3)	LOPS or PAD plus one or more of: • history of a foot ulcer • a lower extremity amputation • end-stage renal disease	Screen every 1–3 months	☐ Education on: risk factors (including LOPS ± PAD ± foot deformity); risk of ulcer recurrence; daily foot inspection; appropriate footwear and foot- and nail-care; when/how to seek medical attention if needed ☐ Daily inspection of feet ☐ Professional foot and nail care, including treatment of onymycosis and Tinea pedis, if present ☐ Well-fitting, orthopedic footwear with custom full-contact total contact casted foot orthoses and diabetic socks. Footwear must accommodate any deformities present ☐ Modified footwear and/or prosthesis based on level of amputation ☐ Vascular studies ± referral to a vascular surgeon ☐ Pain management for ischemic or neuropathic pain ☐ Referral to a rehab specialist to provide a plan for fitness (exercise prescription) based on risk factors
Urgent Risk	Active ulcer/infection/ active Charcot	Urgent care required	☐ Education on: signs of wound infection and wound care; risk factors (LOPS ± PAD ± foot deformity); risk of ulcer recurrence; daily foot inspection; appropriate footwear and foot- and nail-care; when/how to seek medical attention ☐ Daily inspection of feet ☐ Professional foot and nail care, including treatment of onymycosis and Tinea pedis, if present ☐ Offloading with total contact cast, removable cast walker or wound shoe to close ulcers and/or to immobilize Charcot foot ☐ Vascular studies ± referral to vascular surgeon or limb preservation clinic, as indicated ☐ Pain management for ischemic pain or neuropathic pain ☐ Referral to a general, orthopedic or foot surgeon, if indicated, to surgically manage foot deformities ☐ Referral to infectious diseases to manage infection, if indicated, and/or to a general, orthopedic or foot surgeon to debride infectious tissue ± bone, if indicated

** These recommendations and actions are not all-inclusive. Actions need to be customized to meet each patient's needs. Encourage patients (and caregivers) to manage their glycemic levels, triglycerides, weight, hypertension, and lifestyle choices such as smoking. Ensure the patient knows where to access professional assistance in the event of an urgent foot complication.

† Tools and educational materials are available online from Wounds Canada:
For patients (and caregivers): https://dhfy.ca/for-patients-public
For clinicians: https://dhfy.ca/for-clinicians

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In 2022, Wounds Canada released the *Foot Health Pathway for People Living with Diabetes* which integrates preventative foot screening.[15] The pathway takes a risk-based approach consistent with the population health model based on the quintuple aim framework which defines five components: enhanced patient experience, improved health outcomes, improved value to the health-care system, enhanced patient experiences and health equity.[16,17] This approach strongly supports person-centered and preventative approaches and upstream principles. Implementation of this approach should prevent individuals with diabetes from needing complex health and social care in the downstream services. The updated version of *Inlow's 60-second Diabetic Foot Screen* is aligned with the *Foot Health Pathway for People Living with Diabetes* and serves as an easy-to-use tool, allowing care providers to consistently examine and document foot-related issues with the ultimate goal of prevention of complications. Results of the screening inform risk stratification and the need for more specific care to be planned and implemented with the client. For clinicians and health-care organizations, use of the *Inlow's 60-second Diabetic Foot Screen* in all care settings creates a common communication avenue between the person and the interdisciplinary teams supporting the person's foot care, thus addressing issues related to health equity.

Wounds Canada is committed to transferring knowledge to action by facilitating *Inlow's 60-second Diabetic Foot Screen (2022)* tool use and implementation in real context settings. Thus, as a team, we will proceed to the inter- and intra- rater reliability validation, as well as to the evaluation of its predictive value in primary care. This validation will also allow us to better evaluate its implementation, along with barriers and facilitators, in a real context to support the community for its utilization. Wounds Canada will continue to train the community to use the tool in continuing professional development activities (please see: Knowledge into Action: Preliminary Results of an Assessment of Clinicians' Intention to Use Inlow's 60-second Diabetic Foot Screen. *Limb Preservation Journal.* 2023;4(1): 30-36.

Conclusion

Diabetes-related foot complications, such as foot ulcers and amputations, are often leading causes of morbidity in patients with diabetes. While many of these complications are preventable and manageable through early identification of risk and intervention, many patients with diabetes lack the awareness and education to recognize the importance of daily foot care, what to look for, and how to act when problems occur. Compounded with this challenge is the lack of timely consistent and coordinated delivery of health services. Implementing *Inlow's 60-second Diabetic Foot Screen (2022)* and the *Wounds Canada Diabetic Foot Health Pathway*[15] can assist clinicians and decision-makers to allocate resources that support a risk-based approach to support early risk assessment, plan of care and re-screening, re-assessment and evaluation of the interventions typically involved in each aspect of care. ■

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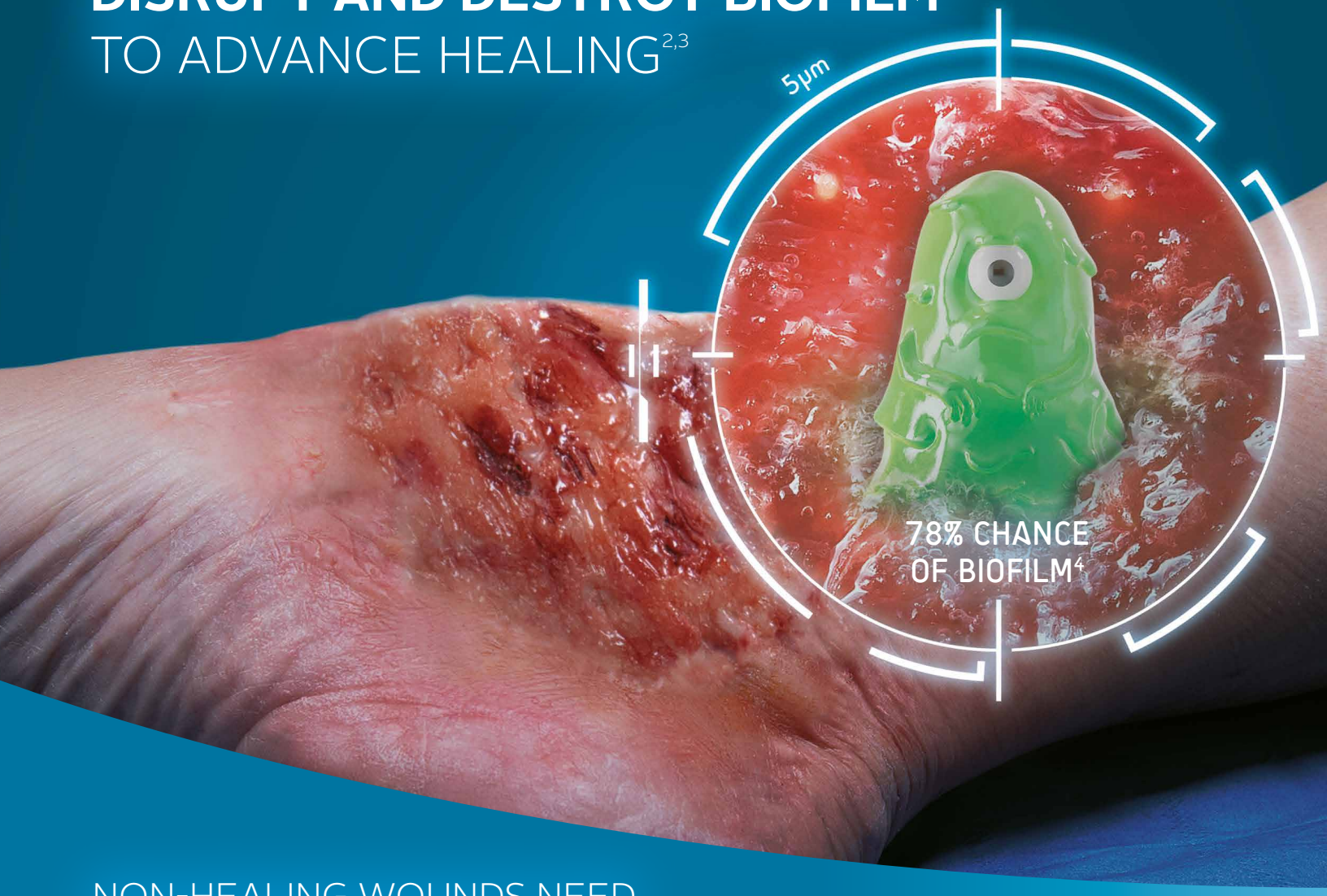

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