

Implementing The Wifi-Guided Approach To Limb Preservation: A Practical Framework For The Multidisciplinary Team

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Abstract: Diabetic foot ulcers (DFUs) remain a leading cause of hospital admission, limb loss and reduced life expectancy in patients with diabetes, often carrying a prognosis as severe as many common cancers. Despite established guidelines, the complexity of managing these wounds—compounded by neuropathy, ischemia and infection—can lead to fragmented care and delayed interventions. This article proposes a practical framework for limb preservation organized around the Society for Vascular Surgery’s WIfI (Wound, Ischemia and foot Infection) classification system. We define a WIfI-guided approach not just as a staging tool, but as a clinical mindset that dictates urgency and prioritizes three core domains: offloading, debridement/wound hygiene and perfusion optimization. By mapping standard interventions—such as non-removable offloading devices and point-of-care fluorescence imaging—to the WIfI components, clinicians can better recognize early signs of deterioration. This framework emphasizes that advanced therapies should only be introduced once this foundational care is optimized. Ultimately, utilizing WIfI-guided triage helps multidisciplinary teams communicate more effectively, react faster to changes in the wound bed and move toward a more proactive model of amputation prevention.

Key words: *diabetic foot ulcer, limb preservation, WIfI classification, multidisciplinary care*

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Diabetic foot ulcers (DFUs) are among the most serious complications of diabetes. Global point prevalence among people with diabetes is around 6.3%,¹ and major reviews estimate that about 19–34% of people with diabetes will develop a foot ulcer at some point in their lives.² Once a DFU develops, outcomes can be severe. Long-term survival after ulceration or amputation can be poor, sometimes comparable to outcomes seen in major cancers.³ DFUs also recur frequently, creating an ongoing cycle of breakdown and risk to both limb function and limb survival.^{2,4} DFUs also place a major burden on patients and health systems. People with DFUs often require more clinic visits, hospital care, surgery and long treatment courses than people with diabetes without ulcers, and costs increase

further when infection or amputation occurs.⁵⁻⁷ The impact is not only financial. DFUs can reduce mobility and independence and cause ongoing stress; depression is common in this group.⁸ Global analyses also highlight substantial geographic and sociodemographic disparities in DFU burden.⁹ Most DFUs develop when several problems happen together. Neuropathy reduces awareness of pain and pressure, so rubbing, minor trauma or poor-fitting footwear may not be noticed.¹⁰ Structural problems such as clawed toes, bony prominences and Charcot-related deformity can increase local pressure and promote ulcer formation.¹⁰ Many patients also have peripheral artery disease (PAD), which reduces blood flow and is linked with delayed healing and higher risk of major amputation.¹⁰ Outcomes

also vary between countries and health systems, likely reflecting differences in prevention programmes, access to vascular assessment and how diabetic foot services are organised.⁹ Infection often marks a turning point in the course of a DFU. Diabetic foot infection is a leading reason for hospital admission and a major contributor to amputation risk.¹¹ In chronic wounds, bacteria can persist as organised communities (biofilm), which may sustain inflammation and delay healing.^{12,13} Studies in DFUs describe mixed organisms, including anaerobes and resistant strains, that can contribute to persistent inflammation and poorer response to treatment.^{14,15} Culture results from superficial swabs may not reflect deeper infection, especially when samples are taken before proper debridement.^{14,15}

Guidelines recommend structured multidisciplinary care, including offloading, repeated debridement, prompt infection management and perfusion assessment with revascularisation when indicated.^{10,16-19}

The IWGDF 2023 Healing Guideline Update also stresses that advanced therapies should be considered only after good basic care has been delivered.¹⁹ Follow-up and prevention are essential, especially for people in remission after healing.²⁰ The Toe and Flow model—developed and advanced by David G. Armstrong, Lee C. Rogers and colleagues—was pivotal because it translated limb preservation into a practical, team-based pathway rather than a series of siloed consultations.²¹ Its core insight was that ulcer outcomes are rarely determined by toe (local wound care) or flow (perfusion) alone; they depend on coordinated, time-sensitive execution of both. In doing so, it helped crystallize the modern limb-salvage clinic mindset: rapid identification of ischemia, early vascular engagement when needed and disciplined high-quality wound care in parallel. It also provided a common language that aligned podiatry, vascular surgery, infectious diseases and wound teams around shared goals and handoffs. Our WiFi-guided approach builds directly on

Progression of plantar ulcer formation in diabetic foot disease

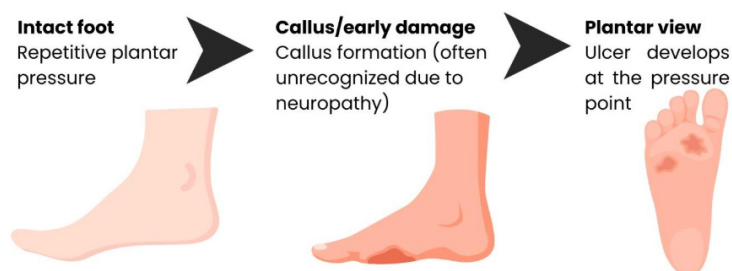


Figure 1: Progression of plantar ulcer formation in diabetic foot disease (pathways leading to DFU development).¹⁰

this foundation by adding a standardized threat-stratification framework to set urgency and sequence the same core actions—offload, debride and perfuse—more consistently across settings.²¹ Building on this practical model, we organise limb preservation using the WiFi (Wound, Ischemia and foot Infection) way of thinking, delivered through three core domains: offloading, debridement and wound hygiene and perfusion assessment with optimisation.²²

What We Mean By Wifi-Guided Limb Preservation

WiFi is a simple way to look at a threatened limb by focusing on three things: the *Wound* (how much tissue is involved), *Ischemia* (how poor the blood flow is) and *foot Infection* (how severe infection is).²² A ‘WiFi-guided’ approach means we use this mindset to set urgency and priorities. If any one of the three gets worse, the plan should escalate—often faster than a routine follow-up schedule. In day-to-day practice, many problems happen between visits: patients may not wear the offloading device consistently, dressings may get wet, redness may spread or swelling may increase. Between visits, brief phone/video check-ins, supported by structured wound photos, can help teams catch early deterioration and trigger earlier in-person review when needed. Telemonitoring appears feasible for selected patients and may achieve healing outcomes comparable to standard follow-up in some settings, but it should complement—not replace—hands-on assessment and objective evaluation of perfusion and infection.²³

The Three Core Domains

The three domains are:

- *Wound & Offloading*: protect the wound and reduce pressure and shear.
- *Debride and Clean*: improve the wound bed and control surface contamination/biofilm; address infection promptly when present.
- *Perfuse*: assess ischemia and restore blood supply when it is limiting healing.²²

In most patients, offloading and repeated debridement are needed from the start to manage the wound component. Perfusion assessment and revascularisation become critical when ischemia is present or when healing stalls.

Offload: Reducing Mechanical Stress

Even when blood flow is adequate, DFUs may not heal if they are exposed to repeated pressure and shear. Neuropathy, deformity and mechanical stress are key contributors to DFU development and recurrence.^{2,10} When protective sensation is lost, patients may continue walking on the ulcer without realising the damage.² High plantar pressure under metatarsal heads, or in the midfoot with Charcot deformity, can maintain a hostile environment and prevent healing.¹⁰ For neuropathic plantar ulcers, guidelines recommend non-removable knee-high devices as first choice.¹⁷ When non-removable devices are not suitable—because of infection, severe PAD, or balance concerns—removable knee-high walkers can be used, but outcomes

depend on how consistently they are worn.¹⁷ Other options (ankle-high devices, custom footwear) are generally less reliable for active plantar ulcers.¹⁷ For ulcers on the dorsum, heel or sides of the foot, offloading is usually more local and depends on location and cause.¹⁷ After healing, preventive footwear is essential to reduce recurrence.¹⁶

Debridement And Wound Hygiene: Managing Wound (W) And Foot Infection (fi)

Many DFUs stall because of slough, callus, and biofilm. Regular debridement removes devitalised tissue, reduces bioburden and supports granulation.¹⁰ In a comparative study by Nube and colleagues, weekly debridement did not clearly outperform debridement every two weeks when care was structured and wounds were reassessed regularly; however, the study was underpowered, so equivalence should be interpreted cautiously.²⁴ Superficial swabs taken before debridement may miss deeper pathogens, particularly when biofilm and anaerobes are present.^{10,14,15} Biofilm consists of mixed bacterial communities within a protective matrix.¹²⁻¹⁵ Chronic DFUs may show increased matrix-degrading enzymes (including MMP-9) with relatively reduced inhibitor activity (TIMPs), sustaining inflammation and impairing healing.^{25,26} Portable fluorescence imaging (F-I) can identify clinically meaningful bacterial burden ($\geq 10^4$ CFU/g) in wounds that may appear uninfected, helping target wound hygiene and debridement. It detects endogenous fluorophores associated with bacterial burden and has supported the concept of chronic inhibitory bacterial load (CIBL)—high bacterial load that suppresses healing without overt infection. Clinical studies suggest F-I-guided care can improve detection and guide more appropriate debridement, with better healing trajectories when positive findings prompt action.²⁷⁻²⁹ Wound hygiene should include cleansing and appropriate antiseptics to slow biofilm re-formation.^{14,15}

In non-infected, slow-progressing ulcers with heavy exudate, protease-modulating strategies may help protect the wound environment.^{19,26}

WIFI grading for DFUs

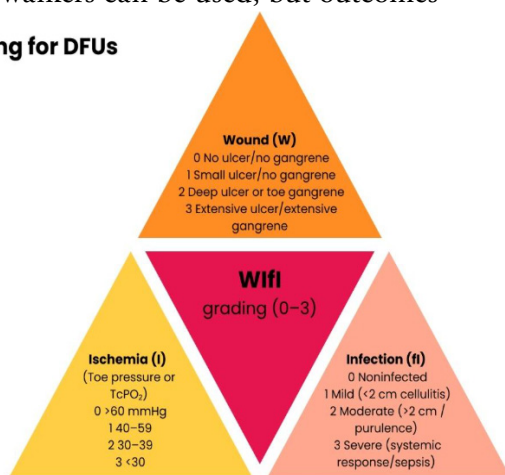


Figure 2: WIfI grading for diabetic foot ulcers (Wound, Ischemia, and foot Infection components; 0–3 severity scale).²²

Perfusion Assessment: Managing Ischemia (I)

A core part of WIfI thinking is recognising the ischemia component. Peripheral artery disease (PAD) is associated with slow healing and major amputation.^{10,18} Outcomes are particularly poor in chronic limb-threatening ischaemia.³ Clinical examination can miss disease in diabetes due to arterial calcification and altered hemodynamics.^{10,18} Non-invasive tests (ABI/TBI) are recommended to detect reduced perfusion.¹⁸ Vascular imaging is considered if findings suggest ischaemia or if an ulcer fails to improve despite good care.¹⁸ Guidance advises prompt vascular specialist assessment for DFUs with limb-threatening ischaemia because delays increase the risk of major amputation and death.¹⁸ Revascularisation can make offloading and wound care more effective, and guidelines recommend improving blood flow before escalating advanced wound therapies.^{18,19}

Multidisciplinary Care And Reassessment

This framework works best when the team is coordinated. If a DFU is not progressing, reassessment should be routine: check offloading fit/adherence, repeat debridement, reassess infection, and re-check ischemia.

Advanced Therapies After Foundational Care Is Optimised

Advanced interventions should be considered only after standard care is fully optimised.¹⁹ Negative-pressure wound therapy may help in selected postoperative wounds but is not recommended over standard care in non-surgical DFUs.^{19,30,31} Protease-modulating dressings such as collagen-based products may help in selected wounds when standard care is optimised.^{32,33} Syntheses of randomised evidence support NPWT and collagen/ORC in appropriately selected DFUs, but the benefits depend on wound type and context.^{34,35} The key point is that these therapies sit on top of the basics: offloading, debridement/wound hygiene and perfusion optimisation.^{10,17-19,30-35}

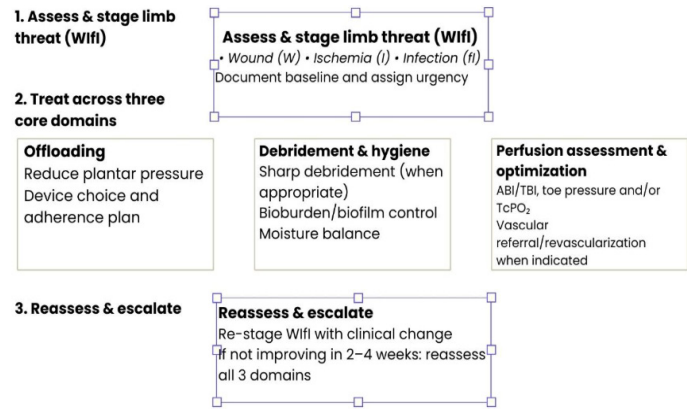


Figure 3: Integrated management pathway for active diabetic foot complications using a Wifl-guided approach.^{10,22}

Conclusion

A practical way to organise limb preservation is to keep focus on WIfI: the Wound, Ischemia and foot Infection components.²² In daily practice, that translates into three repeatable domains—offloading, debridement/wound hygiene and perfusion assessment/optimisation—with escalation when any WIfI component worsens. Used this way, WIfI helps clinicians set priorities, communicate clearly within the team and encourages them to act sooner when the limb is becoming more threatened. Given the central role of biofilm in chronic DFUs, ongoing attention to wound hygiene and infection control remains essential even as advanced therapies evolve.³⁶

Abbreviations

ABI – Ankle–Brachial Index
 CFU – Colony-Forming Units (in >10 CFU/g)
 CIBL – Chronic Inhibitory Bacterial Load
 CLTI – Chronic Limb-Threatening Ischemia
 CSWD – Conservative Sharp Wound Debridement
 CTA – Computed Tomographic Angiography
 DFU – Diabetic Foot Ulcer
 DFUs – Diabetic Foot Ulcers
 ECM – Extracellular Matrix
 FI – Fluorescence Imaging
 IWGDF – International Working Group on the Diabetic Foot
 MDT – Multidisciplinary Team
 MMP-9 – Matrix Metalloproteinase-9
 MMPs – Matrix Metalloproteinases
 MRA – Magnetic Resonance Angiography
 NPWT – Negative-Pressure Wound Therapy
 ORC – Oxidized Regenerated Cellulose (as in collagen/ORC dressings)
 PAD – Peripheral Artery Disease
 RCT – Randomized Controlled Trial
 TBI – Toe–Brachial Index
 TIMP / TIMPs – Tissue Inhibitors of Metalloproteinases
 Wifl – Wound, Ischemia, and foot Infection (SVS threatened limb classification)

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