Diabetes-related Foot Ulcers

promoting healthy skin
Champions for Skin Integrity

This guidelines summary has been developed for health professionals caring for persons with diabetes-related foot ulcers. Assessment, management and prevention of foot ulcers should be undertaken by health professionals with expertise in the area.

For this summary, all recommendations have had their levels of evidence classified as follows:

Level I	Evidence from a systematic review or meta-analysis of at least two level II studies
Level II	Evidence from a well-designed randomised controlled trial (for interventions), or a prospective cohort study (for prognostic studies)
Level III	Evidence from non-randomised studies with some control or comparison group
Level IV	Evidence from studies with no control or comparison group
EO	Consensus statements provided by a national or international panel of experts in the area.

This is a summary of guidelines from the following sources, which should be accessed for further details as required:

1. Schaper NC, van Netten JJ, Apelqvist J, et al. IWGDF Guidelines on the prevention and management of diabetes-related foot disease. 2023; www.iwgdfguidelines.org.
2. Botros M, Kuhnke J, Embil JM, et al. Best practice recommendations for the prevention and management of diabetic foot ulcers. Wounds Canada 2017; www.woundscanada.ca/
3. Brouwers JJ, Willems SA, Goncalves LN, Hamming JF, Schepers A. Reliability of bedside tests for diagnosing peripheral arterial disease in patients prone to medial arterial calcification: systematic review. EClinicalMedicine 2022;50.
4. National Institute for Health and Care Excellence. Diabetic foot problems: prevention and management. NICE Guideline 2019; www.nice.org.uk/guidance/ng19
5. Kaminski MR, Golledge J, Lasschuit JWJ, et al. Australian guideline on prevention of foot ulceration: part of the 2021 Australian evidence-based guidelines for diabetes-related foot disease. J Foot Ankle Research 2022;15:53.
6. Mevin S. Diabetic Foot Ulcers: Classification Tools. JBI EBP Database. 2023: JBI-ES-3503-3.
7. Chen P, Carville K, Swanson T, et al. Australian guideline on wound healing interventions to enhance healing of foot ulcers: Part of the 2021 Australian evidence-based guidelines for diabetes-related foot disease. Diabetes Feet Australia, Australian Diabetes Society 2021.
8. Lazzarini PA, Raspovic A, Prentice J, et al. Australian evidence-based guidelines for the prevention and management of diabetes-related foot disease: a guideline summary. Med J Aust 2023;219:485-495.
9. Deng J, Yang M, Zhang X, Zhang H. Efficacy and safety of autologous platelet-rich plasma for diabetic foot ulcer healing: systematic review and meta-analysis of randomized controlled trials. J Orthopaedic Surg Res 2023;18:1-15.
10. Carter MJ, Frykberg RG, Oropallo A, et al. Efficacy of Topical Wound Oxygen Therapy in Healing Chronic Diabetic Foot Ulcers: Systematic Review and Meta-Analysis. Adv Wound Care 2023;12:177-186.
11. Kaminski M, Golledge J, Lasschuit J, et al. Australian guideline on prevention of foot ulceration: Part of the 2021 Australian evidence-based guidelines for diabetes-related foot disease. Diabetes Feet Australia, Australian Diabetes Society 2021.

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Assessment

1. Assess all persons with diabetes for the risk of developing a foot ulcer,[1] including:
   - Peripheral arterial disease (PAD) status, i.e., medical and psychosocial history, pedal pulses, skin characteristics, pedal Doppler waveforms, Ankle-brachial pressure Index (ABPI), or toe systolic brachial index (TBI).[1,2]
     An ABPI <0.9, TBI <0.70, or abnormal Doppler waveform, suggests possible PAD.[1,3] An ABPI >1.3 requires further investigation.[1] Confirm arterial disease with duplex ultrasound scans.[1] (I)
   - Loss of protective sensation (LOPS), using a 10g Semmes-Weinstein monofilament[1] (I), or Ipswich touch test if a monofilament is unavailable[1] (III)
   - Use a 128 Hz tuning fork for vibration perception[1] (EO); assess for sensory, autonomic and motor changes.[2] (EO)
   - Assess for structural abnormality and history of previous lower limb problems[1,2] (III)
2. Classify the level of risk for developing a foot ulcer, using the IWGDF risk stratification system[1] (EO), as:
   - Very low risk: no loss of protective sensation and no PAD
   - Low risk: loss of protective sensation or presence of PAD
   - Moderate risk: loss of protective sensation and PAD, OR loss of protective sensation and foot deformity, OR PAD and foot deformity
   - High risk: loss of protective sensation or PAD, AND one or more of the following: history of a foot ulcer, lower-extremity amputation, end-stage renal disease
3. Assess the risk of developing a foot ulcer when diabetes is diagnosed, if any foot problems arise (e.g., LOPS or PAD), on admission to hospital, or any change in condition while in hospital.[4] (EO)
4. Reassess annually for people at very low risk, every 6-12 months for people at low risk, every 3-6 months for people at moderate risk, and every 1-3 months for people at high risk[1] (EO)
5. Assessment of feet and diabetes-related foot ulcers should be undertaken by health professionals with adequate training in this area.[1] (EO)
6. Aboriginal and Torres Strait Island people with diabetes are considered to be at high risk of developing foot complications and should have their feet checked at every clinical visit with scheduled regular follow-up.[5] (EO)
7. Take a comprehensive health history of all persons with diabetes-related foot ulceration, including the ulcer history, medical history, smoking history, glycaemic control, nutrition, and psychosocial history.[1,2] (EO)
8. Assess ulcer characteristics: site, area, depth, ulcer bed, peri-wound tissue, exudate, signs of infection (superficial, deep wound or systemic), PAD and neuropathy.[1,6] (EO)
9. Classify ulcer as neuropathic, neuro-ischaemic or ischaemic.[2] (EO)
10. Assess severity of infection clinically using IWGDF/ISDA criteria.[1] (II)
    Where resources and expertise are available, consider using the Wound/ Ischaemia/ Infection (WIfI) to communicate ulcer characteristics;[1] and when PAD is present to assess healing prognosis.[1] (II)
11. Use The SINBAD (Site, Ischemia, Neuropathy, Bacterial Infection, Area and Depth) system to classify ulcer severity and for standardised communication between health professionals.[1,6] (II)

12. Use a standardised approach to document foot ulcer characteristics after each assessment to determine progress.[2] (EO)

Management

13. Care of a diabetes-related foot ulcer should be undertaken by a multidisciplinary team, e.g., including GP, podiatrist, orthotist, endocrinologist, vascular & orthopaedic surgeons, nurse specialist, physiotherapist and infectious disease specialist.[1,2] (EO)

14. In rural/remote areas, consider services to ensure access to care (e.g. virtual referral pathways).[1] (EO)

15. Consider the context of care, education and delivery approaches, including cultural safety and telehealth services for those who living in rural and remote areas of Australia that include Aboriginal and Torres Strait Islander people.[5] (EO)

16. Offload pressure points:

- Optimal types for neuropathic plantar forefoot or midfoot ulcers are non-removable knee-high offloading devices or total contact casts.[1] (I)

- If there is a contradiction to the optimal types, consider removable knee-high or ankle-high offloading devices, or third option felted foam combined with appropriate footwear.[1] (EO)

- Options for non-plantar ulcers include specialist surgery, removable offloading devices, footwear modifications or orthoses, as appropriate.[1] (EO)

17. Refer for urgent medical specialist assistance if there is limb-threatening or life-threatening diabetes-related foot disease,[1] i.e.,:

- Ulcer depth down to subcutaneous tissue, cellulitis, gangrene, fever or any signs of sepsis (II)

- Ulcer with severe limb ischaemia (i.e., ABPI <0.4, ankle systolic pressure <50 mmHg, toe pressure <30mmHg, monophasic or absent pedal Doppler waveforms) (EO-IV)

- presence of deep or extensive (moderate to severe) infection (II)

18. Gently cleanse the ulcer using a neutral, non-irritating, nontoxic solution, e.g. warmed sterile water or saline.[2] (EO)

19. Removal of necrotic and devitalised tissue should be undertaken through sharp debridement[1,7] (I), unless revascularisation is necessary.[2,7] (EO) Sharp debridement should only be undertaken by trained health professionals.[2] (EO)

20. Re-assess, re-evaluate treatments, and consider wound specialist referral when there is failure to achieve 50% or more ulcer size reduction after 4 weeks of therapy[1] (EO)

21. Select a dressing that will maintain moisture balance, control exudate, is comfortable and cost effective.[7,8] (EO-I)

22. In cases of ulcers which are clinically infected[1]:

- Obtain a tissue sample for culture for soft tissue infections (II)

- Start treatment of infection with an appropriate antibiotic (I)

- Refer persons with suspected osteomyelitis for further investigations and specialist care (II)

- Hospitalise persons with a severe or complicated moderate foot infection (II)

23. In some cases, additional therapy may be helpful, as follows:

- topical negative pressure wound therapy may increase healing of postsurgical DF wounds (III), however not for non-surgical DF wounds[1,8] (III)

- Platelet-rich plasma may improve healing[9] (I)

- hyperbaric oxygen therapy may improve healing in persons with non-healing ischemic diabetes-related foot ulcers[1,8] (I)

- topical oxygen therapy may improve healing in non-healing diabetes-related foot ulcers [1,10] (II)

Prevention

24. Offer a foot protection program for people who are assessed as at moderate or high risk for foot ulceration, including foot care education, podiatry review and appropriate footwear[1,8] (I)

25. Protective medical grade footwear should be prescribed for persons at moderate risk for ulceration, e.g., those with PAD, neuropathy, or history of plantar ulcers. Consider custom-made orthoses if there is foot deformity or pre-ulcerative sign.[1,11] (I)

26. Consider teaching persons at moderate or high risk of ulceration on home monitoring of foot plantar skin temperatures daily with a digital infrared skin thermometer,[1,8] (I) and consult a health professional if early inflammation is detected (i.e. higher temperatures on two consecutive days).[1] (I)

27. Treat any modifiable risk factors on the foot, e.g. blisters, callus, fissures, ingrown nails, fungal infections.[1,2] (EO)

28. Provide structured foot self-care education to persons with diabetes at risk of ulceration and encourage and remind them to:

- avoid walking barefoot or in socks without shoes or in thin-soled slippers both indoors and outdoors

- inspect feet and inside of shoes daily

- practice safe foot care (wash daily, careful drying, emollients for dry skin, nail care, avoiding agents or techniques to remove callus or corns)

- use appropriate footwear

- promptly seek professional help when signs of problems or lesions occur [1] (EO)