

Position Statement from the Australian Diabetes Society:

The Lower Limb in People With Diabetes

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Table of Contents:

- Abstract
- Manifestations of diabetic foot disease
- Identification of the "at risk" foot
- Management of "at risk" feet
- Strategies towards reducing amputation and foot ulcers
- Acknowledgements
- References
- Authors' details

Abstract

- Abstract Diabetic lower-limb problems result in significant social, medical and economic consequences and are the most common cause of hospitalisation for people with diabetes.
- In people with diabetes, amputations are 15 times more common than in people without diabetes, and 50% of all amputations occur in people with diabetes.
- Peripheral neuropathy, vascular disease, infection and deformity of the feet are the major predisposing factors leading to ulceration or amputation.
- All people with diabetes should receive basic footcare education, and regular foot examinations.
- The risk for the development of ulceration can be assessed by basic clinical examination of the foot.
- Management strategies depend on the risk category, and range from basic education and annual review to specialist care by a multidisciplinary team.

Lower-limb problems in people with diabetes delineate a group of conditions in which neuropathy, ischaemia and infection contribute to tissue breakdown, resulting in ulceration and possible amputation. In First World countries, diabetic foot disease is the most common cause of hospital admission in people with diabetes.¹ Amputation is about 15 times more common in people with diabetes and half of all lower-limb amputations are in people with diabetes.²⁻⁴ Nearly half the amputations are "major", involving above- or below-knee amputation; the remainder are designated "minor", involving toes or feet. Diabetic foot complications are common in the elderly, and amputation rates increase with age: by threefold in those aged 45-74 years and sevenfold over 75 years.⁵

Accurate Australian figures are not available, but a recent estimate of the national incidence of lower-limb amputation is about 2800 per annum.⁶

Amputation rates vary around Australia, with rates in north Queensland being twice that of the rest of the State.⁷ Amputation of one limb increases the risk of loss of the second limb and is associated with a 50% five-year mortality.⁸

In Australia, in 1994, the hospitalisation cost for a diabetic foot ulcer was \$12 474, and outpatient treatment of an ulcer by a specialist footcare team was 85% less.⁹ The direct costs of an amputation in the United Kingdom in 1996 were \$27 600 for a major amputation and \$6900 for a minor amputation,¹⁰ and are estimated to be similar in Australia.

Manifestations of diabetic foot disease

The risk factors for diabetic foot disease are peripheral neuropathy, peripheral vascular disease, previous ulceration and foot deformity. Poor glycaemic control, absence of footcare education, low socioeconomic status, other diabetic complications, and poor footcare resulting from other physical and psychological disabilities contribute to the risk of diabetic foot disease.¹¹

A minor tissue injury was reported as the pivotal event in 86% of cases resulting in amputation.¹²

Peripheral neuropathy, which affects about 30% of people with either type 1 or type 2 diabetes, is the major predisposing disorder for diabetic foot disease. Peripheral neuropathy in feet results in loss of sensation and autonomic dysfunction. Neuropathy can occur either alone (neuropathic feet) or in combination with peripheral

vascular disease causing ischaemia (neuro-ischaemic feet). Purely ischaemic feet are unusual, but are managed in the same way as neuro-ischaemic feet.¹³

Infection often complicates neuropathy and ischaemia, and may result in considerable damage to the feet.

Foot deformity includes claw or hammer toes, which commonly result from neuropathy, hallux valgus or varus, prominent metatarsal heads (due to subluxation), and Charcot arthropathy. Callosities which form at pressure areas on the plantar surface of the feet can break down through repetitive shearing forces, resulting in a subkeratotic haematoma and ulceration. Infection can then supervene, most commonly with staphylococci, streptococci and anaerobic organisms. Osteomyelitis may occur in deep infections.

Adequate blood supply is essential for healing of a foot ulcer; insufficient blood flow may contribute to prolonged non-healing of an ulcer. Foot ischaemia (usually in combination with neuropathy) is a major factor leading to amputation. However, severe ischaemia alone can cause ulceration on the margins of the foot and may result in gangrene, and ultimately amputation.

Initial radiographic examination may be normal, but bone scans reveal new bone formation typical of early Charcot arthropathy. Disorganisation of joints and fragmentation of bones in the foot can follow, leading to a chronic deformity, referred to descriptively as the "Charcot rocker bottom foot", with subsequent pressure-induced plantar ulceration (Box 1).



Box 1: Charcot arthropathy.A.
X-ray of a chronic Charcot joint.
"Charcot rocker bottom foot"
with plantar ulceration.

Identification of the "at risk" foot

The assessment of the lower limb includes the detection of peripheral neuropathy, vascular disease, deformities which may predispose to ulceration, any active lesions (ulceration or infection in particular) and the observation of gait and footwear (Box 2).

The neuropathic foot is typically warm, numb, dry and usually painless. Although simple testing of touch, pain, temperature, vibration sense and ankle jerks can be done in the traditional ways, vibration sense can be assessed more quantitatively with a biothesiometer. The presence of protective sensation can be determined by use of the much cheaper Semmes-Weinstein monofilament.¹⁴

The 5.07 monofilament delivers 10 g pressure and is recommended for identifying "at risk" feet as those which fail to register the pressure at one or more testing sites on the plantar surface (Box 3).^{15,16}

The ischaemic foot is often cold, with absent pulses and atrophic skin and dystrophic nails, although clinical signs may be quite subtle. Intermittent claudication is not always present as a symptom in diabetic people with ischaemia.

Box 2: Assessment and management of lower-limb problems in people with diabetes

The "at risk" foot should be identified by assessment of predisposing risk factors:

- Protective sensation, assessed by testing with a Semmes-Weinstein monofilament (Box 3)
- Presence of vascular insufficiency
- Presence of foot deformity
- History of previous ulceration

Management should be based on risk category:

Low risk (normal sensation, palpable pulses)

- general footcare education and annual review

"At risk" foot (neuropathy, absent pulses, or other risk factor)

- more intensive education, regular podiatry care and frequent review

Ulcerated foot

- care by multidisciplinary specialist team

Box 3: Testing for protective sensation with the 10gm Semmes-Weinstein monofilament.

- 1: Test at a site with normal sensation (eg, hand).
- 2: Apply the monofilament perpendicular to the skin surface at the testing sites on the plantar surface of the foot as indicated in the diagram, leaving in contact with skin for 1-2 seconds.



- 3: Apply sufficient force to cause the monofilament to bend.
- 4: Ask the person to respond "yes" or "no" to feeling the monofilament.
- 5: If the person is unable to feel the monofilament at any site, the test is abnormal and indicates an "at risk" foot.

Management of "at risk" feet

The outcome of the "at risk" foot is dependent on both the person's own preventive self-care and access to relevant professionals. The multidisciplinary clinic approach to footcare in high risk people reduces amputations and is cost effective.^{17,18} A person who has had a foot ulcer is at life-long risk of further ulceration.

Inspection of "at risk" feet is necessary at each visit. Foot-care education of people with diabetes increases podiatry attendance and reduces subsequent foot lesions,¹⁹ including amputation. Instructions should include adequate daily moisturising (eg, emulsifying ointment), avoidance of detergents and prolonged washing, and wearing well-fitted shoes at all times.

Regular podiatry care should provide treatment of foot conditions like callus, corns, ingrown toe-nails and protection of pressure areas (eg, by orthotics) and advice on suitable footwear. The Australasian Podiatry Council, in conjunction with Diabetes Australia, has produced Australian Podiatric Guidelines for Diabetes outlining standards of care for the increasing and important role of the podiatrist in the care of people with diabetes.²⁰ Structured education is an established component of diabetes care and specific footcare education should be provided to all people with diabetes until the person can demonstrate and describe footcare practices.²¹⁻²³ A recent review has confirmed the short term benefits of education interventions.²⁴

If a diabetic foot ulcer develops, it may need debridement, appropriate treatment of infection and relief of weight bearing, sometimes by plaster cast or bed rest. If healing is slow despite these measures, vascular assessment is necessary, even in the absence of symptoms of vascular insufficiency. People with disabling intermittent claudication or rest pain require urgent vascular assessment.

Initial investigation for peripheral arterial disease includes doppler studies and measurement of ankle brachial pressure. Angiography can be used to assess the site and extent of vascular blockage and angioplasty or by-pass surgery can improve vascular perfusion. This may allow a non-healing ulcer to heal. In the Charcot foot, after initial immobilisation, lifelong protection of the pressure areas is necessary to prevent ulceration and specialised

reconstructive surgery may be needed.²⁵

Strategies towards reducing amputation and foot ulcers

Several recent local and international initiatives are attempting to reduce the burden of diabetic foot problems. The European St Vincent Declaration on Diabetes has as one of its major goals the objective of reducing amputations by 50% by the year 2010;²⁶

a similar goal has been targeted in the Australian National Diabetes Strategy and Implementation Plan.⁶

A number of systematic reviews have identified evidence to support effective interventions.^{7,27} "The International Consensus on the Diabetic Foot with Practical Guidelines" was published in 1999²⁸ and, in Australia, evidence-based guidelines for general practitioners regarding management of the diabetic foot will soon be submitted to the National Health and Medical Research Council (NHMRC) for national endorsement. The New South Wales Health Department has published Clinical Management Guidelines for the treatment of diabetic foot ulcers.²⁹

The National Diabetes Strategy and Implementation Plan has successfully piloted two programs: one for community-based health service providers, including general practitioners, and one for specialist care of active diabetic foot problems.

The Australian Diabetes Society recommendations for reducing diabetic foot disease are shown in Box 4 (below).

Box 4: Recommendations for reducing lower-limb problems for all Australian people with diabetes

- Promote early diagnosis of diabetes to implement the proven benefits of good glycaemic control in preventing diabetic peripheral neuropathy, and control of hypertension and hyperlipidaemia to minimise macrovascular disease.
- All people with diabetes should have annual screening to establish presence of neuropathy, ischaemia, foot deformity and other predisposing conditions for ulceration (the "at risk" foot). This should commence from the time of diagnosis in people with diabetes.
- The feet of "at risk" people should be inspected at each visit to their general practitioner.
- Footcare education for people with "at risk" feet is essential. This should involve "hands on" demonstration of what to do and written instructions in an appropriate language. Instructions should include advice about the daily application of moisturising cream to the feet and the importance of wearing well-fitted hose and shoes.
- People with "at risk" feet should receive routine podiatry care.
- People with a foot ulcer should ideally be cared for by a multidisciplinary team drawing from a diabetes physician, GP, podiatrist, nurse/educator, vascular surgeon, orthotist and physician with an interest in vascular medicine.
- Health authorities should be encouraged to ensure access to and availability of footcare services in all areas of Australia, noting the special needs of Indigenous Australians and some ethnic groups.
- Primary care professionals should receive adequate undergraduate and postgraduate training in diabetic foot management.
- A widely representative national diabetes footcare committee should be established to promote the implementation of national diabetes footcare activities and to evaluate outcomes.

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