How to assess feet to prevent foot ulceration in people with diabetes

by Jane Diggle, Specialist Diabetes Nurse Practitioner, West Yorkshire

1 in 3 people with diabetes develop a foot ulcer[1]

- People with diabetes are at increased risk of developing peripheral arterial disease (PAD), especially when other associated risk factors are present (e.g. smoking, hypertension and hyperlipidaemia).
- Poor blood supply damages nerves, resulting in numbness, loss of protective sensation and peripheral neuropathy. Losing the ability to feel pain results in susceptibility to minor trauma.
- Poor circulation means such wounds, or ulcers, are more difficult to heal.
- High blood glucose levels impair the immune response. If a wound is invaded by bacteria, infection can spread rapidly, causing overwhelming tissue destruction and gangrene.

Time is tissue!

- A severe infection or severe ischaemia can lead to limb- or even life-threatening conditions within days.
- Many amputations are avoidable if ulcers are either prevented or healed very quickly.[6]

What and why

- Between 2015 and 2018, there were 7545 major amputations in people with diabetes in England.[1]
- There is a postcode lottery for amputation rates, with a sevenfold difference between geographical locations even after correcting for age and ethnicity.[2,3]
- 84% of lower extremity amputations result from complications of a foot ulcer.[4]
- In 2014–15, management of ulceration and amputation in diabetes cost almost £1 bn.[5]
- Amputations are associated with prolonged hospitalisation, rehabilitation and an increased need for home care and social services. They have a devastating impact on quality of life, often leading to reduced independence, social isolation and psychological distress.

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Foot screening

The purpose?

- To identify the presence of risk factors for diabetic foot complications that could lead to ulceration (e.g. neuropathy, PAD, significant structural abnormalities or callus, previous ulceration and the inability to self-care).
- To determine a person's risk of foot problems.
- To ensure the individual is made aware of their risk status.
- To provide education and support for self-management (including when to seek advice).

By whom?

Any healthcare professional/worker involved in the care of a person with diabetes – providing they have the competence and training to do so and know how to act appropriately on their findings.

In 2015, NICE published *Diabetic foot problems: prevention and management* (NG19), providing clinicians with a guide to up-to-date and evidence-based practice.[7]

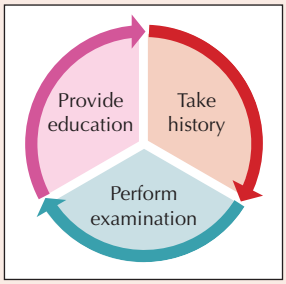
When?

According to NICE, children and adults with diabetes should have their risk of developing a diabetic foot problem assessed at the following times:

- When diabetes is diagnosed and at least annually thereafter.
- If any foot problems arise.
- On any admission to hospital and if there is any change in their status while they are in hospital.

How?

STEP 1: Take history



Questions to consider asking:

- How often do you check your feet?
- Have you ever had a foot problem?
- Have you noticed any changes (to colour, shape, temperature or pain/discomfort)?
- Any blisters, cuts, cracks or nail problems?
- Do you attend a podiatrist regularly?

The inability for somebody to self-care or have help to self-care can increase the risk of them developing a foot problem. The following factors may contribute to this situation:

- Visual impairment
- Arthritis
- Inability to maintain personal hygiene
- Inability to check feet for any problems
- Learning difficulties

STEP 2: Perform visual inspection

- Carefully inspect both lower legs and feet, including soles, heels and between toes.
- Look for signs of:
  - Skin colour/hair growth
  - Swelling/inflammation
  - Broken skin, including any wounds or fissures (cracks in the skin)
  - Bruising, signs of rubbing from shoes, etc
  - Pressure points
  - Blisters
  - Deformity
  - Hard skin, callus
  - Nail dystrophy or paronychia
  - Fungal infections

STEP 3: Perform examination

Vascular screening

- Ask about signs of intermittent claudication (cramping in the calf muscle, or occasionally the thigh or buttock, after walking a certain distance). Check the condition and colour of the skin, and lifestyle factors, such as smoking status.
- Palpate the two main pulses in the foot, the posterior tibial and dorsalis pedis (*see right*). Doppler ultrasound can improve pulse identification and may be more reliable than manual palpation alone, as a pulse can be heard even if (owing to oedema or calcification) it cannot be felt.
- PAD should not be excluded in people with diabetes based solely on a normal or raised ankle brachial pressure index, as calcification of the arteries can render blood vessels stiff and difficult to compress.

If you can palpate either of these pulses on each foot, and the skin is well perfused and the is foot warm, it is deemed that the foot is sufficiently perfused vascularly and no further action needs to be taken, apart from recording this.

If the pulses are **not** palpable, then consider referral to a specialist for further investigation, especially if the patient is symptomatic or has any wounds.

Peripheral neuropathy screening

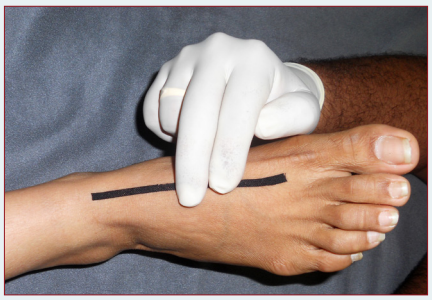
There are three main types of neuropathy: **sensory**, **motor** and **autonomic**.

Many who develop **sensory neuropathy** have no symptoms whatsoever and may be unaware of its presence. Annual screening for any signs of neuropathic change is, therefore, important. The aim is to assess for a loss of sensation or lack of awareness of pain.

The simplest and most evidence-based way to determine if a person has peripheral neuropathy is to test them with a 10-g monofilament.

The examination should take place in a quiet and relaxed setting.

- Lay the person flat.



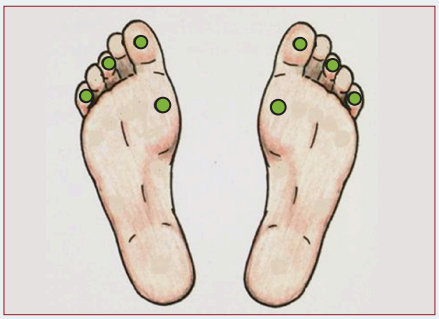
- Ask them to close their eyes.
- Do not apply to any site where a callus or ulceration is present.
- Apply the monofilament perpendicular to the surface of the skin, until it buckles. Record the person's response.

  The four testing sites (*see image*) are the:*
  - Plantar aspect of the great toe.
  - Plantar aspect of the middle toe.
  - Plantar aspect of the little toe.
  - Plantar aspect of the first metatarsal head.

  *There is no consensus and sites may vary according to local guidelines.

Failure to feel the filament at any tested site indicates significant sensory loss. Some sites may be felt and other not ("patchy" neuropathy).

Paradoxically, although loss of pain sensation is a prominent symptom, there may be an increase in painful sensations (peripheral painful neuropathy). In some, the skin may be very sensitive to light touch. Typical symptoms include shooting, burning or tingling sensations (pins and needles) that are often worse at night.



Several pharmacological agents can improve symptom control and quality of life in people with diabetic peripheral neuropathic pain. If this is suspected, refer to a specialist for further investigation and treatment.

Motor neuropathy is less common. It can cause weakness of the small muscles that maintain normal foot shape. Signs include muscle weakness and loss of coordination/balance. It may lead to a change to foot shape (high arched shape with clawing/retraction of the toes), which can lead to increased pressure on the metatarsal heads in the forefoot and the apices of toes, leading to an excessive build-up of callus, tissues breaking down and ulcer development. In severe cases, pressure can also develop over the dorsal aspects of toes as a result of poorly fitting footwear.

The main effect of **autonomic neuropathy** on the feet can be loss of sweating, resulting in dry, inelastic skin less capable of resisting shearing and pressure. The skin may then split and crack (fissures), particularly around the heels, providing a portal for infection.

The classic signs of autonomic neuropathy in the feet are:

- Dry, split skin.
- Distended veins over the top of the foot and ankle.
- Bounding pulses.

STEP 4: Risk stratify

Foot screening should lead to the patient being assigned a risk category and being informed of that risk category, with the introduction of a treatment/management plan according to that risk level formulated in consultation with the patient and tailored to suit the individual's needs.

Level of risk		Frequency of screening
Active	• Ulceration or • spreading infection or • critical limb ischaemia (severe peripheral arterial disease) or • gangrene or • suspicion of acute Charcot foot or an unexplained hot, red, swollen foot with or without pain.	Very frequently (e.g. every 1–2 weeks [for people who are at high risk]), if there is immediate concern.
High	• Previous ulceration or • previous amputation or • on renal replacement therapy (dialysis or transplant) or • neuropathy (loss of sensation) and lower limb peripheral arterial disease together or • neuropathy (loss of sensation) in combination with callus and/ or deformity* or • lower limb peripheral arterial disease in combination with callus and/or deformity*.	More frequently (e.g. every 1–2 months [for people who are at high risk]), if there is no immediate concern.
Moderate	• Deformity* or • neuropathy (loss of sensation) or • lower limb peripheral arterial disease.	Frequently (e.g. every 3–6 months [for people who are at moderate risk]).
Low	• No risk factors, as listed above, present. • Callus alone is considered low risk.	Annually (for people who are at low risk).

*A change in foot shape that results in difficulty in fitting a standard shoe, as assessed by the practitioner.

⚠ People at moderate or high risk of developing a diabetic foot problem should be under the care of a specialist foot protection service.

STEP 5: Provide education

Every person with diabetes should be given verbal and written information (in their own language, if possible) regarding their risk status and basic foot care advice to cover the following:

- Foot health (e.g. daily checking; hygiene and nail care; risks of walking barefoot; wearing suitable, well-fitting footwear).
- Reporting any new lesions or foot emergencies, and who to contact and how quickly.
- Diabetes and the importance of a healthy lifestyle, optimal HbA_{1c}, blood pressure and cholesterol levels.
- Education and support for self-management, especially when and how to seek advice. Provide emergency contact details/phone numbers and what to do if out of hours (e.g. emergency GP, walk-in centre, A&E).

For people with diabetes

Information from the iDEAL group on feet and how to care for them: bit.ly/3ix1KRa

Videos and other resources on diabetes and foot health from The College of Podiatry: https://cop.org.uk

The COVID-19 challenge

Annual foot assessments (undertaken by a trained healthcare professional) should be continued, where possible.

In a remote review, ask about:

- ❑ Previous lesion or leg/foot ulcer?
- ❑ Burning or tingling in legs or feet?
- ❑ Leg or foot pain, with activity or at rest?
- ❑ Swollen feet, ankles or legs?
- ❑ Changes in skin colour in the foot/leg or between left and right foot?
- ❑ Discoloured, ingrown or elongated nails?
- ❑ Skin lesions, calluses or corns?
- ❑ Is there hair growth on the foot dorsum or lower limb?
- ❑ Is there a temperature difference between the calves and feet, or between the left and right foot?

With a referral, consider including a photograph, along with details such as glycaemic control, wound site and description, and wound measurement/depth.

A quick-and-easy test for sensation that can be performed at home with a carer or family member. A short video shows how: bit.ly/2Bcb6Pc

Improving foot care for people with diabetes

The IDEAL group has published recommendations to improve foot care for people living with diabetes. The goal is to reduce the number of major amputations in those with diabetes by 50% within 5 years.

ACT NOW helps recognise the warning signs that might lead to amputation. If identified, urgent referral to specialist multidisciplinary diabetic foot care team should be made.

A – accident?
Recent or history of an accident, injury or trauma?

C – change?
Is there any new swelling, redness or change of shape of the foot?

T – temperature?
Is there a change in temperature present? Could this be an infection or possible Charcot?

N – new pain?
Is there pain present? Is it localised or generalised throughout the foot?

O – oozing?
What colour is any exudate? Is there an odour?

W – wound?
Can you document the size, shape and position of the wound in the foot affected?

Resources

Publications and education resources from iDEAL: https://idealdiabetes.com

Videos

How to perform a neurological and vascular assessment: bit.ly/3bAYFLC

How to carry out a diabetic foot check and an annual diabetic foot screen: bit.ly/3vbj3us

Diabetic foot ulcers: the role of primary care teams: bit.ly/3pg6kVt

Training

Foot Risk Awareness and Management Education (FRAME) is a validated training programme developed by the Scottish Foot Action Group to support healthcare professionals to perform foot screening effectively: www.diabetesframe.org

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