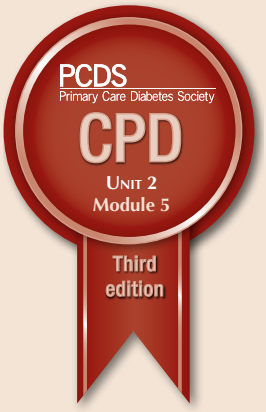

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See page 243

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Learning objectives

After reading this article, the participant should be able to:

1. Perform foot screening quickly and effectively using validated and accepted screening tools.
2. Understand foot ulcer risk stratification following foot screening.
3. Understand referral pathways and describe when, where and whom to refer to.
4. Discuss effective and targeted foot health education for people with diabetes.

Key words

- Diabetic foot
- Diabetic peripheral neuropathy
- Peripheral arterial disease
- Screening
- Ulcer risk status

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Unit 2 Comorbidities and complications

Prevention, screening and referral of the diabetic foot in primary care

Neil Baker, Colin Kenny

Costs associated with diabetic foot complications place a disproportionately large burden upon the health economy, particularly if amputations occur, with associated prolonged inpatient care. There is a very considerable human cost with amputations, as well as pain, related to diabetic ulceration and neuropathy, and an associated significant morbidity and mortality risk for those affected. Robust screening programmes that are integrated with comprehensive and structured foot care pathways may lead to significant reductions in lower extremity amputations. This article provides effective tools for identifying and stratifying the risk of foot ulceration in people with diabetes, and signposts referral pathways for people with diabetic foot conditions.

Recent data from Diabetes UK (2015) show that there are 4 million people living with diabetes in the UK, which is one in 16 of the population. These data confirm a sharp increase year-on-year, with Diabetes UK (2016) predicting one in ten of the population will have the condition by 2034. The total cost (direct care and indirect costs) associated with diabetes in the UK currently stands at £23.7 billion (Diabetes UK, 2016).

Diabetes UK is promoting a campaign to prevent "foot attacks". Underpinning this campaign is the information that in excess of 7000 leg, foot or toe amputations are still being carried out each year on people with diabetes in England, 80% of which are reported to be preventable (NICE, 2015a). Approximately 50% of all foot amputations are performed in people with diabetes and these can incur very high healthcare costs. A recent report has shown that around £650 million (or £1 in every £150 the NHS spends) is spent on foot ulcers or amputations each year (Kerr et al, 2014). A considerable portion of this cost is incurred through inpatient ulcer care, which is estimated at £219 million, and amputation care estimated at £55 million (Health and Social Care Information Centre [HSCIC], 2016b).

It also highlights the devastating consequences of foot problems in people with diabetes. Diabetic foot ulcers are linked to an increased risk of death, unexplained by other common risk factors (Walsh et al, 2015). Around 7% of people with diabetes currently have, or have had, a foot ulcer, which can lead to amputation, and half of those who have a major amputation will die within 2 years when such amputations could be avoided with the right care. Emerging evidence suggests that individuals with diabetic foot ulcers have fewer cognitive resources than individuals with diabetes without this complication (Natovich et al, 2016).

In Scotland, the Scottish Diabetes Foot Action Group introduced a national inpatient foot care campaign called "CPR for diabetic feet". This

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involves a strategy of foot "checks", "protection", and "referral" (Stang and Leese, 2014).

From its onset, the Quality and Outcomes Framework (QOF) diabetes clinical indicators have included peripheral pulses and neuropathy testing in people with diabetes. In the 2009–10 QOF update, earlier foot indicators were modified and a mandate was added that patients' feet be risk stratified according to the clinical findings. This remains the case for England, Wales and Northern Ireland in the 2016–2017 QOF diabetes indicators. The diabetic foot indicator is DM012 (see *Box 1*). In Scotland, as of 1 April 2016, QOF has been dismantled. The remaining points have been retired and the funding has been moved to a global sum.

The NICE guidance for diabetic foot disease (NICE, 2015b) was updated in 2015, along with other diabetes-related guidance (e.g. NICE, 2015a). The diabetic foot guidance recommends that everyone with diabetes over the age of 12 should have an annual foot check, have risk stratification and, if at increased risk, be referred for specialist assessment by community foot protection services. The reason for the rapid update from the 2011 NICE guidance was the emerging evidence that people with diabetes should also have rapid access to multidisciplinary teams (MDTs) specialising in foot care when they have an ulcer or other acute foot problem. Evidence shows that the longer the delay to MDT referral, the more likely foot ulcers will be severe and slow to heal (HSCIC, 2016a) and that rapid access to MDTs can reduce amputations by up to 62% (Krishnan et al, 2008).

A National Diabetes Foot Care Audit for England and Wales (HSCIC, 2016a) has assessed uptake of evidence. Over a quarter (27%) of people with type 1 diabetes and 13% of people with type 2 and other diabetes did not receive an annual foot check in 2014–15. There is significant variation between GP practices and between care commissioning groups (CCG) areas. The variation between CCGs is even greater for people with type 1 diabetes where there are 34 percentage points between the best and worst performing areas (HSCIC, 2016a) This has been referred to as a "postcode lottery" for diabetic foot amputations (Kenny, 2014). This audit mirrors the results from a similar audit conducted in Scotland in 2013 (Information Services Division Scotland, 2013).

Box 1. QOF indicators relating to diabetic foot disease (British Medical Association, 2014).

DM012: "The percentage of patients with diabetes, on the register, with a record of a foot examination and risk classification: 1) low risk (normal sensation, palpable pulses), 2) increased risk (neuropathy or absent pulses), 3) high risk (neuropathy or absent pulses plus deformity or skin changes or previous ulcer) or 4) ulcerated foot within the preceding 12 months."

NICE 2010 menu ID: NM13

Foot checks

The foundations of good foot care in people with diabetes involve adequate monitoring and the opportunity to reinforce messages of self-care and daily foot examination (Boulton and Malik, 1998). Foot examination by clinicians should focus on the presence of peripheral neuropathy, peripheral arterial disease (PAD), previous ulceration and abnormal foot anatomy, all of which may predict individuals at high risk of developing foot ulcers (Abbott et al, 2002). As such, regular examination of the diabetic foot by a suitably trained professional should include the following outline:

- Examination of the feet, including assessment of foot sensation using a 10-g monofilament or tuning fork, palpation of foot pulses, inspection of any foot deformity and inspection of footwear (NICE, 2015b).
- Identification of any factors predisposing to foot complications to enable education and, if appropriate, intervention to be given to prevent such problems. It is an invaluable time to give advice.
- Identification of pre-existing complications that may require treatment.
- Emphasis of the importance of foot examination and teaching individuals how to examine their own feet.
- Identification of more general medical problems, such as the presence of PAD, which would indicate more general vascular pathology.

Foot screening

The rationale for diabetic foot screening is to identify individuals with risk factors for ulceration or amputation and to initiate directed levels of care and education. There is very little in the way of robust UK data supporting this approach; however, two systematic reviews have examined risk

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Page points

1. There are two commonly used methods for detecting sensory loss associated with foot ulcer risk in clinical practice: the 10-g monofilament; and vibration perception using a 128-Hz tuning fork.
2. Monofilaments are easy to use but there are some potential areas for incorrect use or misuse.
3. The evidence is unclear regarding the number and locations of sites that are required to reliably determine foot ulcer risk status, with the literature citing between one and 14 sites per foot.

stratification for foot ulceration (Arad et al, 2011; Monteiro-Soares et al, 2011). Evidence from a large Scottish population-based study suggests that risk stratification is highly effective in identifying and reducing foot ulceration (Leese et al, 2006), and that there has been a fall in the incidence of amputation in Scotland, perhaps reflecting a well-integrated healthcare system (Kennon et al, 2012).

Healthcare professionals should also consider hard-to-reach groups who may not be able to directly access healthcare providers such as older people. There are some data to suggest that many older people with diabetes are unable to perform daily foot examination owing to poor eyesight and reduced mobility, making it difficult to inspect their feet (Thomson and Masson, 1992). Although it is ideal to have a trained nurse, podiatrist, GP or hospital doctor undertake foot screening, it can be undertaken by non-professionals provided they have been trained, and governance and care pathways procedures are in place. Irrespective of who does the screening, people with diabetes who have undergone foot screening must be told what their risk category is and have understood what it means, along with what actions they need to take if changes occur in the foot.

Physically examining the feet of people with diabetes gives them a clear message that feet are important, and what you are doing and why should be explained. This should be reinforced at each subsequent visit. An ideal structured and standardised foot screening model such as the following should be adopted:

- Check for sensory loss.
- Check for foot pulses.
- Soft tissue examination.
- Identify previous ulceration or amputation.
- Ascertain each person's attitude to, and knowledge of, foot health and ulceration risk status.

All of these findings should be recorded in the clinical record – ideally on a standardised template – in a clear, concise and structured manner, with any proposed interventions clearly outlined.

Clinical screening tests

Sensation

There are two commonly used methods for detecting sensory loss associated with foot ulcer risk in clinical practice: the 10-g monofilament, the Ipswich Touch Test and vibration perception using a 128-Hz tuning fork. The more widely used and reported is the 10-g monofilament (Mayfield and Sugarman, 2000; Miranda-Palma et al, 2005). This device is widely available, relatively cheap and reliable, with very little training or expertise required.

Using either a 10-g monofilament or a 128-Hz tuning fork is not without its limitations or pitfalls, usually operator error or poor technique, such as hitting the tuning fork hard, meaning that it can be easily heard and alerts the recipient that the test is imminent (so a positive response is very likely). Asking individuals if they can feel the applied tuning fork is equally misleading as they may feel pressure, cold or vibration. It is important, therefore, to be very precise in sensory testing tool methodology.

The 10-g monofilament

The 10-g monofilament was originally invented for testing for sensory loss in the hands of people with leprosy. Monofilaments are easy to use but there are some potential areas for incorrect use or misuse; a 10-g monofilament that is jabbed against the skin or wriggled will evoke coarse light touch or even pain receptors and give false positives. It is important to know that not all available 10-g monofilaments deliver a 10-g force. One study suggests that those manufactured by Bailey Instruments and Owen Mumford are the most accurate devices (Booth and Young, 2000).

Which are the best sites?

The evidence is unclear regarding the number and locations of sites that are required to reliably determine foot ulcer risk status, with the literature citing between one and 14 sites per foot (Baker et al, 2005a). It is clear, however, that inability to detect light pressure stimulus is strongly associated with ulcer risk (Birke and Rolfsen, 1998; Perkins et al, 2001). International guidelines suggest the plantar surfaces of the first toe and the first and fifth metatarsal heads as appropriate testing sites (International Working Group on the Diabetic Foot, 2011). By nature, peripheral sensory neuropathy originates distally; therefore, a recommendation for monofilament testing at the plantar surface of the first, third and fifth toe tips is presented here (*Figure 1*). Testing the heel or arch does not add any

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information to the screening data and, therefore, is unnecessary. If the monofilament is not detected, even at one site, it is safe to assume that there is a loss of sensory perception. It must also be remembered that any callused, indurated or scarred areas should be avoided.

Monofilaments should be allowed to rest after 10 applications, be renewed regularly (as a rough guide, once every 6 months), be stored with the monofilament straight and not be placed on hot surfaces.

How to use a 10-g monofilament

- Upon initial use, or after rest, it is best to buckle the monofilament a few times prior to applying to the person's skin as this will remove any residual stiffness. If this is not done the monofilament will deliver more than 10 g of force.
- Explain what are you going to do and why. Then apply the monofilament to somewhere else on the person, such as the forearm, so that the sensation of the monofilament can be experienced.
- Ask the person to close his or her eyes and to say "yes" every time the monofilament is felt.
- Apply the monofilament to the tips of the first, third, and fifth toes on the weight-bearing surface of each foot in any order.
- Record the person's ability to detect the light pressure of the monofilament.
- Re-check any sites that do not invoke a response.

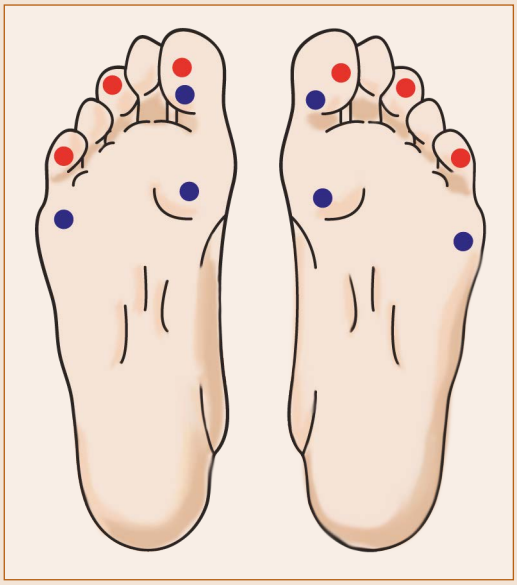

Figure 1. Testing sites using a 10-g monofilament. Blue dots are testing sites recommended by the International Working Group on the Diabetic Foot (2011); red dots are testing sites recommended here.

Monofilament technique

- The monofilament must be placed at 90 degrees to the skin surface.
- It should be applied, held and released in a controlled manner, over a period of 1–2 seconds.
- When applied and held, the monofilament should buckle at about 1 cm from the horizontal.
- It must not "wiggle" or slide when held in place.

Inability to detect one or more sites in each foot indicates sensory deficit and increased ulcer risk.

The Ipswich Touch Test

The Ipswich Touch Test (Sharma et al, 2014) involves simply lightly resting a finger on individuals' toes while their eyes are closed. They are instructed to respond when they feel anything, so the technique is similar to using a 10-g monofilament. The technique has been validated and does not require specialist equipment, so can be used easily in nursing homes and community hospitals.

Tuning fork

To use a tuning fork to test for vibration sense, hold the fork by gripping the flat-ridged area with your thumb and forefinger. With your thumb and forefinger, press the limbs of the tuning fork together at its tip. Then pull your thumb and forefinger away sharply and let the limbs resonate.

Place the tuning fork on a bony area away from the foot, such as the elbow, so that the individual can identify the sensation of the vibrating tuning fork. Repeat this process but now place the tuning fork plate on the tip of the individual's big toe and ask what he or she can feel. There is little need to test anywhere else, for the same reason outlined for 10-g monofilament use.

Note that the person's eyes should be closed during this procedure. Do not ask "can you feel anything?" because the person may feel pressure, cold or vibration.

The VibraTip™

NICE has recently evaluated the VibraTip™, which is a vibratory stimulus for the purpose of detecting diabetic peripheral neuropathy (DPN) in people with type 1 or type 2 diabetes. It is intended to

Page points

1. Recently, a novel and simple screening test has been validated, and it is one that could be used where equipment is not available such as in nursing homes and community hospitals. This is the Ipswich Touch Test.
2. Defining foot deformity in the context of foot ulcer risk screening should be as simple as possible and should not focus on particular conditions, such as hallux valgus.
3. A simple working definition of deformity is the inability for a foot to be adequately accommodated in a high-street shoe.

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Page points

1. Frictional forces cause blisters and, usually, identifying and removing the cause will prevent further injury.
2. Infections must be identified and addressed rapidly by taking a microbiological sample, prescribing antibiotics and ideally conducting daily reviews for the first 3 days to determine a positive response to treatment.
3. The most commonly used and accepted method for determining the possibility of peripheral arterial disease is by palpation of the pedal pulses.

replace the current practice of using the 128 Hz tuning fork or a 10-g monofilament. Research has shown that it has potential to improve the detection of DPN and may provide cost savings. Willits et al (2015) concluded that although VibraTip™ appears to be easy to use, portable and reliable in its functionality, more evidence is needed on its clinical benefits and economic advantages to support the case for its routine adoption in the NHS.

Deformity

A simple working definition of deformity is the inability for a foot to be adequately accommodated in a high-street shoe. Defining foot deformity in the context of foot ulcer risk screening should be as simple as possible and should not focus on particular conditions, such as hallux valgus. The importance of this is that an individual with neuropathy will not be able to detect the trauma from an inadequate shoe rubbing over a prominent area.

Skin and nail care

The presence of callus over weight-bearing areas of the foot in the presence of DPN increases the risk of ulcreation by up to 77 times (Murray et al, 1996). The presence of blood-stained callus and DPN is highly predictive of ulceration, which is present in up to 80% of cases after callus removal (Rosen et al, 1985; Harkless and Dennis, 1987).

Additionally, the presence of dry skin may also increase ulcer risk, as it is unable to absorb frictional and shear forces that occur during gait – dry skin around the heels is particularly problematic. Dry skin is very common in people with DPN because of reduced or absent sweating owing to autonomic dysfunction or because of PAD. The daily use of urea- or glycerine-based moisturisers helps to overcome this (Loden, 1996; Miettinen et al, 1999; Baker and Rayman, 2008).

Good nail care in people with DPN, and especially those with PAD, is essential and can be managed by carers if the nails are normal, provided that clear advice is given and understood. Thickened nails should be thinned down regularly to prevent pressure sores in the nail bed.

Blisters

Frictional forces cause blisters and, usually, identifying and removing the cause will prevent further injury. As a rule of thumb, if the blister is very tense it should be drained; otherwise it should be covered firmly with thin gauze dressing and monitored. Most blisters should resolve with basic wound care, without developing to ulceration, provided that the cause is identified and removed. However, if there is little sign of healing within 3–5 days, referral to a specialist diabetic foot clinic should be considered.

Infections

All infections must be treated very swiftly, and this is an important task within primary care. Infections must be identified and addressed rapidly by taking a microbiological sample, prescribing antibiotics and ideally conducting daily reviews for the first 3 days to determine a positive response to treatment (*Box 2* provides a case report relating to a suspected infection). As a guide, any infection that shows no signs of resolving within 3–5 days of treatment should be referred to the specialist foot clinic as a matter of urgency (ideally a same-day referral). A non-resolving infection should be considered for admission with intravenous antibiotics administered if the specialist foot clinic is not available, such as at weekends or bank holidays.

The NICE (2011) guideline on the inpatient management of the diabetic foot recommends treating the infection according to local guidelines, beginning with oral antibiotics that work against gram-positive organisms for mild infections.

Fungal infections of the skin must also be treated in a similar way, as secondary bacterial infection is not uncommon. It is not as important to treat fungal nail infections.

Peripheral vascular assessment

PAD is characterised by the deposition of atheroma on the intimal lining of lower-limb arteries, leading to a significant reduction in blood flow and tissue vitality (NICE, 2012). Screening for the presence of significant arterial disease can be confusing and difficult. In people with diabetes, for every 1% (11 mmol/mol) increase in HbA_{1c} there is a corresponding 26% increased risk of PAD (Selvin et al, 2004; Muntner et al, 2005). It is suggested to be concomitant with DPN and it is the most likely cause of diabetes-related lower-extremity amputations in the developed world (Chaturvedi, 2006). It also coexists in approximately 45% of

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people with neuropathic foot ulcers (LeMaster and Reiber, 2006).

The distribution of arterial occlusive lesions is commonly described as multi-segmental, affecting the femoral arteries and the tibio-peroneal trunk and crural arteries. Interestingly, the foot vessels are very often spared. Aneurysms of the aorta, iliac and popliteal arteries are not uncommon and can often be felt as a wide, very pulsatile artery mass.

Screening method

Palpating foot arteries

The most commonly used and accepted method for determining the possibility of PAD is by palpation of the pedal pulses. The two significant arteries entering the foot are the dorsalis pedis and posterior tibial vessels. It is not uncommon for the dorsalis pedis artery to be misplaced anatomically or absent. Inability to detect both of these in either foot may signify PAD (Norgren et al, 2007). A very common cause of the inability to palpate pedal pulses is the presence of marked lower-limb oedema, which can also mask the true character of Doppler signals. So if the skin looks healthy and is pink and warm, PAD is unlikely to be present.

It is useful to feel the individual's radial pulse, or your own, when examining foot pulses to ensure that it is not your own finger pulse you are feeling. This is especially true when clinical presentation leads you to suspect PAD. The clinical signs and symptoms of PAD are discussed more fully by Baker et al (2005b), but a summary is given below.

Clinical features of PAD

In addition to pulse palpation, some clinical features and symptoms that may help in screening for PAD include the presence of:

- Thin, hard, glassy callus.
- Very dry skin.
- Thin atrophic or thickened dystrophic nails with dark red or very pale nail beds.
- Lesser toes that look like "beef chipolatas".
- No hair growth on the lower leg, the foot or both.
- A loss of substance to the plantar surface of the foot.
- Pale, sunset-red, deep red or purple skin coloration.

If individuals experience intermittent claudication or rest pain, then determine how far they can walk before claudication, the recovery time and the level of claudication (foot, calf, thigh or buttock). Patients with intermittent claudication should be encouraged to exercise daily and coronary heart disease (CHD) risk factors should be addressed.

Any individual with open or previous ulceration, PAD or a history of cardiovascular disease may significantly benefit from anti-platelet and statin therapy (Young et al, 2008). This is reinforced by NICE (2012) guidelines that outline the need to measure the ankle–brachial pressure index, reinforce smoking cessation and refer for angioplasty and stenting where appropriate. Referral to a vascular surgeon should only be made if:

Box 2. Case report

Narrative

A 64-year-old man with insulin-treated type 2 diabetes presents with cyanosis of the distal third of his left second toe, and erythema and slight oedema to the dorsal aspect of his skin just proximal to his second metatarso-phalangeal joint. He has a palpable posterior tibial pulse and is insensate to a 10-g monofilament. He says this condition has occurred within the past 2 days. His glycaemic control is poor with a recent HbA_{1c} level of 81 mmol/mol (9.6%).

Discussion

What are the most likely causes of this presentation and what action should be taken (assuming that an acute embolic episode has been ruled out)?

- This man's foot is neuropathic with a palpable foot pulse, and although he may have some peripheral arterial disease it is arguably not very significant at this stage.
- His toe is cyanosed at the distal third with some localised cellulitis/erythema; this clearly should raise a high suspicion of infection and thus a portal of entry for pathogens should be looked for, and, when located, a swab should be taken as a minimum. It is always important to look between the toes.
- Assuming that infection is the most likely cause, the most probable infections are *Streptococci* or *Staphylococcus aureus*. Antibiotics such as cephalexin, flucloxacillin, amoxicillin–clavulanate, or clindamycin can be effective choices and should be continued for at least 2 weeks.
- An urgent specialist referral should be considered as this picture may represent "septic vasculitis" and in this case intravenous antibiotics would be the optimal treatment to try to prevent digital gangrene. If gangrene occurs and is dry, it should be left to auto-amputate and covered with a non-adherent dry dressing and redressed 2–3 times weekly. If gangrene occurs and it is wet, immediate admission and amputation is urgently required.

Other possibilities: *It is possible that this lesion is embolic and thus conditions such as aortic, iliac or popliteal aneurysms, infective endocarditis, vasculitis and clotting disorders should be considered. If an aneurysm is detected, intervention should be determined by the vascular surgeons and interventional radiologists.*

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Table 1. Features of peripheral arterial disease symptoms and diabetic peripheral neuropathy.

	Intermittent claudication	Ischaemic rest pain	Neuropathic pain
Site	Calf/thigh	Foot/calf	Foot/shin
Onset of pain	On exercise	Upon elevation	Especially night-time but can be constant
Type of pain	Cramp-like	Constant gnawing ache	Tingling, burning, shooting; skin hypersensitivity
Relief of pain	Rest	Lowering foot and leg	Exercise
Clinical features	Weak/absent pulses, ABPI <0.8, reduced tissue vitality	Cold, pulseless, ABPI <0.5, poor tissue vitality	Warm foot, palpable pulses, ABPI >0.8, good tissue vitality

ABPI=ankle–brachial pressure index.

1. Intermittent claudication is worsening or impacting upon lifestyle.
2. There is an open foot ulcer with clinical signs or symptoms of PAD.
3. Rapid deterioration following any radiological or vascular surgery intervention.
4. Worsening symptoms of chronic critical limb ischaemia.
5. Acute critical limb ischaemia.

Peripheral sensory neuropathy

DPN is the most common (approximately 50%) complication that affects the feet of people with diabetes, and the prevalence of neuropathy has been shown to increase with diabetes duration (Kumar et al, 1994). DPN is thought to be linked to 50–75% of non-traumatic amputations (Vinik et al, 2000). DPN is a reduced ability or total inability to determine certain stimuli such as light touch, vibration, hot or cold, and pain (for example, a sharp sensation). Its pattern is distal and symmetrical, and it is often described as having a glove and stocking distribution, where DPN is characteristically observed affecting the lower limb initially in the forefoot but can extend to the mid-thigh and also the hands, to wrist level, when nerve damage is severe. Additionally, people sometimes describe pins and needles, numbness in their feet or toes, or cold feet, even when they are warm to the touch.

The ability to feel protective pain sensations and retract is so reduced that injuries such as burns, cuts, blisters and shoe rubs often go unnoticed until they have deteriorated to ulceration or become infected. Identifying this loss of sensory perception is a cornerstone of ulcer and amputation prevention.

Symptomatic neuropathy

Although DPN is generally thought to be a reduction or loss of sensory perception, up to 16–26% of people with diabetes can develop painful peripheral neuropathy – the differing rates reflect variation in the criteria used to diagnose neuropathic pain (Daousi et al, 2004; Davies et al, 2006).

It is important to differentiate PAD and painful neuropathy (*Table 1*). Symptoms of painful neuropathy are varied but are commonly described as burning, shooting, electric shocks, stabbing pains, or intense pins and needles. Other forms include hypersensitivity to light touch and an over-exaggerated response to a mild noxious stimulus. These symptoms are frequently described as being worse or more intense at night, but in contrast to critical-limb ischaemia, are relieved by exercise. It is important to determine whether painful neuropathy is due to diabetes or other causes, such as cancer, vitamin B12 deficiency, HIV, herpes or alcoholism.

Painful neuropathy may be divided into acute and chronic. The acute form commonly occurs following a sudden and significant improvement in glycaemic control, and as the terms suggest it is relatively short-lived and usually resolves in 12 months. The chronic form, however, has no clear aetiological pattern, does not resolve and may become progressive. It is also difficult to diagnose and treat, and it is considered to be under-reported as individuals are likely to only complain of moderate-to-severe symptoms. A simple screening tool has been developed to help healthcare professionals screen for painful neuropathy (*Figure 2*; Malik et al, 2011a). The tool is a very simple, quick questionnaire that can be completed by patients in primary care.

Management of neuropathic pain is complex

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and NICE (2013) recommends offering a choice of amitriptyline, duloxetine, gabapentin or pregabalin as initial treatment (except for trigeminal neuralgia), with subsequent switches to another of these agents if the choice is not effective or not tolerated. Referral to a specialist pain service should also be considered (NICE, 2013).

Paradoxically, painless and painful neuropathy can coexist, and can be very difficult for individuals to accept: "How can I have lost feeling but have so much pain?"

Risk stratification

Screening for foot ulcer risk is important; however, it is meaningless if the results are not translated into risk status and then acted upon to provide appropriate interventions where required. A study by Leese et al (2006) showed that, compared with those identified as low risk, ulceration was 83 times more common in people at high risk and six times more common in people at moderate risk. The criteria for these categories are outlined in *Table 2*.

People with no risk factors for foot ulceration should be rescreened annually. All those identified with risk factors should be referred to a community foot protection team and the following interventions considered:

- **Low risk:** foot health education; encourage safe foot self-care; and reinforce danger signs and method of emergency service access.
- **Moderate risk:** repeat specific education; refer to podiatry according to risk need; reinforce danger signs and method of emergency service access; provision of special footwear or insoles if required; and regular reviews for new risk factors.
- **High risk:** as above, plus more frequent podiatry and reviews by diabetes specialist podiatrists; and a direct unhindered access to the specialist MDT.
- **All active foot ulceration should be referred to an MDT within a working day (24 hours).**

The patient's level of risk should be documented and shared with them, so that they understand and are empowered to take appropriate actions should the foot's condition deteriorate. *Tables 3* and *4* summarise care pathways and appropriate referrals for various diabetic foot conditions. Once a person

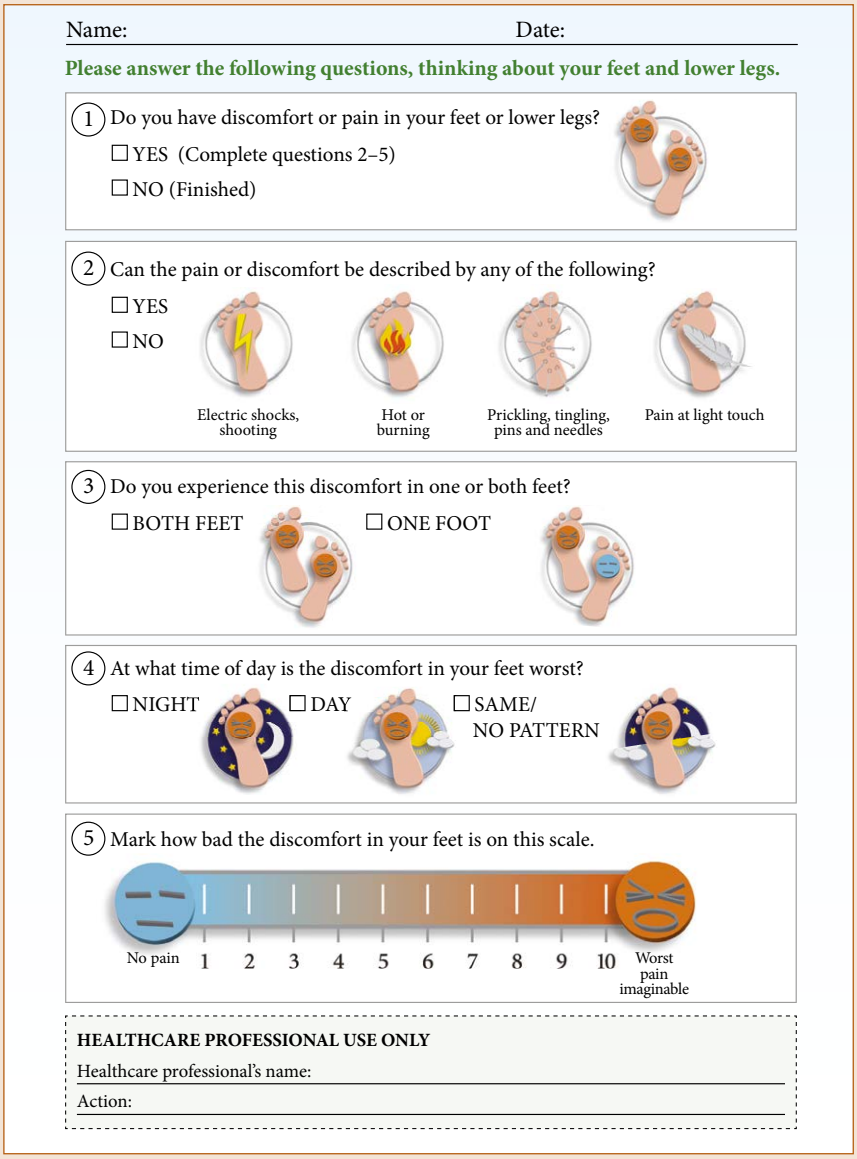

Figure 2. A screening tool to determine painful neuropathy (Malik et al, 2011b).

Table 2. Risk stratification (adapted from Leese et al, 2006).

Low risk	Moderate risk	High risk
Able to detect at least one pulse per foot AND Able to feel 10-g monofilament AND No foot deformity AND NO physical or visual impairment WITH **No previous ulcer**	Unable to detect both pulses in a foot OR Unable to feel 10-g monofilament OR Foot deformity OR Unable to see or reach foot WITH **No previous ulcer**	**Previous ulceration or amputation** OR Loss of sensation (e.g. inability to feel 10-g monofilament) OR Signs/symptons of PAD (e.g. absent pedal pulses) AND Callus/skin changes OR Foot deformity

PAD=peripheral arterial disease.

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Table 3. Care pathway for various diabetic foot conditions.

Observation	Suggested care pathway
No evidence of arterial impairment	Annual review
Intermittent claudication (no ulcer or gangrene)	Encourage exercise, monitor CHD risk and review
PAD with ulcer or gangrene	Refer to specialist foot clinic or vascular surgeon
Non-healing ulcer at neuro-ischaemic site	Refer to specialist foot clinic
Rest pain with or without ulcer or gangrene	Refer for further investigation to a vascular surgeon
Acute critical ischaemia (sudden white waxy leg)	Rapid same-day referral or admission
New ulceration and/or infection	Refer within 24 hours to an MDT clinic (NICE, 2015b)

CHD=coronary heart disease; MDT=multidisciplinary team; PAD=peripheral arterial disease.

Table 4. Appropriate specialist referrals.

Condition	To whom	Urgency
Active foot ulcers	MDT	24 hours
Unresolving infection	MDT	Same day
Acute Charcot neuroarthropathy	MDT	24 hours
Previous ulcer or amputation	Specialist podiatrist/ foot protection team	Routine
Acute critical-limb ischaemia	Vascular surgeon	Same day
Chronic critical-limb ischaemia	Vascular surgeon/MDT	Next clinic
Deformity	Shoe fitting	Within 2–4 weeks
Painful diabetic neuropathy	Diabetologist/MDT	Routine

MDT=multidisciplinary team.

has lost sensation it is futile to continually test for it; however, PAD should always be reviewed as this has the greater potential for deterioration.

Conclusion

Diabetic foot disease can incur high human and healthcare costs. Screening and risk stratification for foot ulcer risk in people with diabetes should be easy to undertake without the need for extensive training. Clear guidance should be given to all people with diabetes. Integrated care pathways with established education and good communication between primary and secondary care should be fostered. There is a need for clinical governance and ongoing updating of knowledge and skills. This CPD module is an important resource to help facilitate effective diabetic foot screening and care. ■

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Online CPD activity

Visit www.diabetesonthenet.com/cpd to record your answers and gain a certificate of participation

Participants should read the preceding article before answering the multiple choice questions below. There is ONE correct answer to each question. After submitting your answers online, you will be immediately notified of your score. A pass mark of 70% is required to obtain a certificate of successful participation; however, it is possible to take the test a maximum of three times. A short explanation of the correct answer is provided. Before accessing your certificate, you will be given the opportunity to evaluate the activity and reflect on the module, stating how you will use what you have learnt in practice. The CPD centre keeps a record of your CPD activities and provides the option to add items to an action plan, which will help you to collate evidence for your annual appraisal.

1. According to the National Diabetes Foot Care Audit, what **APPROXIMATE** percentage of people with type 1 diabetes had an annual foot check in the year 2014–15? **Select ONE option only.**

A. 10%
B. 25%
C. 50%
D. 75%
E. 90%

2. A 49-year-old woman with diabetic peripheral neuropathy has developed a blood-stained callus under the tip of her right great toe after wearing new, ill-fitting shoes over the past 3 weeks. After callus removal, what **APPROXIMATE PERCENTAGE** of people in this situation are likely to have underlying ulceration? **Select ONE option only.**

A. 10%
B. 20%
C. 40%
D. 60%
E. 80%

3. A 59-year-old man has had type 2 diabetes for 5 years and developed peripheral arterial disease 6 months ago. His claudication distance remains stable at 500 metres and does not affect his lifestyle. He takes regular aspirin 75 mg once daily, atorvastatin 80 mg once daily and metformin 1 g twice daily. Which of the following is the **MOST** appropriate management plan? **Select ONE option only.**

A. Add clopidogrel 75 mg once daily.
B. Refer to a supervised exercise programme
C. Refer routinely to a vascular surgeon
D. Refer urgently to a vascular surgeon
E. Switch aspirin to clopidogrel 75 mg

4. A 61-year-old woman has well-controlled type 2 diabetes on diet alone. At her routine annual review, she has some callus and no pulses in her right foot but the skin condition is good with no foot deformity and normal sensation. She is otherwise active and well, regularly walking her dog. What is her diabetic foot risk stratification? **Select ONE option only.**

A. Low risk
B. Moderate risk
C. High risk
D. Unable to classify without ABPI measurement

5. Which of the following is the LEAST appropriate area to touch with a 10-g monofilament when screening for altered foot sensation? **Select ONE option only.**

A. First metatarsal head
B. Fifth metatarsal head
C. Plantar surface of the third toe
D. Plantar surface of the fifth toe
E. The heel

6. After **HOW MANY** applications should a 10-g monofilament be rested before re-use? **Select ONE option only.**

A. One
B. Two
C. Five
D. Ten
E. No resting recommended

7. Which **ONE** of the following does the Ipswich Touch Test recommend to use for assessing foot sensation?

A. Blood testing lancet
B. Finger
C. Green needle
D. 10-g monofilament
E. 128-Hz tuning fork

8. A 27-year-old man with type 1 diabetes has developed localised infection around a blister on the sole of his right foot. He is treated with flucloxacillin 250 mg qds, but 5 days later there is no sign of improvement. His temperature is 37.1 ºC, his pulse is 66 bpm and he feels well. Which of the following is the **MOST** appropriate management option? **Select ONE option only.**

A. Admit for intravenous antibiotics
B. Increase flucloxacillin to 500 mg qds
C. Switch to clarithromycin 500 mg bd
D. Switch to clindamycin 300 mg qds
E. Urgent referral to specialist foot clinic

9. Which ONE of the following painful conditions is MOST LIKELY to be relieved by exercise? **Select ONE option only.**

A. Ischaemic claudication
B. Ischaemic rest pain
C. Metatarsalgia
D. Neuropathic pain
E. Spinal stenosis

10. According to the 2006 classification (Leese et al), a 57-year-old woman with type 2 diabetes has no foot deformities and no previous history of foot ulceration. Which of the following findings **MAINTAINS** her diabetic foot risk stratification at the level of "low-risk"? **Select ONE option only.**

A. Absence of one dorsalis pedis pulse
B. Being registered blind
C. Inability to reach her own feet
D. Inability to feel a 10-g monofilament
E. Inability to feel a 125-Hz tuning fork