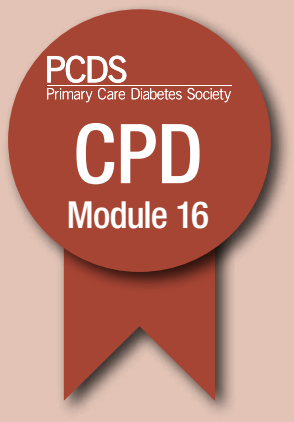
Prevention, screening and referral of the diabetic foot in primary care



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Neil Baker

Diabetic foot complications place an enormous burden upon the health economy but, more importantly, are associated with significant morbidity and mortality risks for those affected. It is clear from published data that with good screening programmes, which are integrated with comprehensive and structured foot-care pathways, significant reductions in lower extremity amputations can be achieved and maintained. This article provides simple but effective tools for identifying and stratifying the risk of foot ulceration in people with diabetes and clarifies how to refer people with a diabetic foot condition.

Learning objectives

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

1. Outline how to perform foot screening quickly and effectively using validated and accepted screening tools.
2. Describe foot ulcer risk stratification following foot screening.
3. Describe when, where and whom to refer.
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

The estimated number of people over 16 years of age with diabetes was reported to be 3.1 million in 2010 with a projected rise to 4.6 million by 2030 (Holman et al, 2011). It is likely that diabetes-related complications will also increase rapidly to about 20–30% above present levels by 2045 (Bagust et al, 2002). Consequently, the cost of health care for people with type 2 diabetes may rise by up to 25% during this period; however, with a potentially smaller proportion of active and working age groups, the possible economic burden could be expected to increase by 40–50% (Bagust et al, 2002).

The latest statistics from Diabetes UK (2010)suggest that each year around one in 20 people with diabetes will develop a foot ulcer in 1 year and more than one in 10 foot ulcers result in the amputation of a foot or a leg.

Together with increasing longevity and other comorbidities, it is inevitable that the risk of foot-related problems will not only increase significantly, but also foot problems will become more complex in their presentation and management.

The awareness of diabetic foot complications and the potential devastating impact to patients their families, together with the health economy, has been steadily increasing over the past few

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Neil Baker is Principal Diabetes Specialist and Research Podiatrist, Ipswich Hospital NHS Trust, Ipswich.

Page points

1. 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.
2. Regular examination of the diabetic foot by a suitably trained professional should include: 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.
3. 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.

years. This is, in part, due to an increase in foot presentations at educational events and published articles, but perhaps also a result of the drive for QOF indicators which included regular diabetic foot examinations (Gadsby and Chadwick, 2011). New and modified diabetic foot QOF indicators now include foot ulcer risk stratification and were introduced on 1 April 2011 (*Box 1*). Although this is a step in the right direction, some feel that an indicator to encourage the referral of any people found to be at risk of diabetic foot disease should also be introduced (Gadsby and Chadwick, 2011). Screening and risk stratifying will now occur nationwide in GP practices but there is no remuneration via QOF for initiating interventions or making referrals.

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). There are some data to suggest that many older people with diabetes are unable to perform this daily task due to poor eyesight and reduced mobility, making it difficult to inspect their feet (Thomson and Masson, 1992). Regular contact between professionals and patients is important (Edmonds et al, 1996). Furthermore, in today's changing healthcare system, targeted and appropriate use of resources, including skilled clinicians, is essential.

Regular examination of the diabetic foot by a suitably trained professional should include:

- 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, 2004).
- 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 teach the patient how to examine their own feet.
- Identification of more general medical problems, for example the presence of peripheral arterial disease (PAD) would indicate more general vascular pathology.

Box 1. QOF indicators relating to diabetic foot disease (British Medical Association and NHS Employers, 2011).

- DM 29: The percentage of patients with diabetes with a record of foot examination and risk classification: 1. Low risk (normal sensation and palpable pulses); 2. Increased risk (neuropathy or absent pulses); 3. High risk (neuropathy or absent pulses plus deformity or skin changes in previous ulcers); 4. Ulcerated foot within the preceding 15 months.
- DM 10: The percentage of patients with diabetes with a record of neuropathy testing in the preceding 15 months.

The reasons for the increased risk to feet in people with diabetes are complex but include neuropathy and PAD as well as more controversial areas such as increased susceptibility to infection.

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 appears to be very little robust UK data supporting this approach, however two recent systematic reviews examined risk stratification for foot ulceration. Both concluded that due to small numbers, poor design and data quality, firm conclusions could not be drawn (Arad et al, 2011; Monteiro-Soares et al, 2011). However, 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).

If success is to be achieved, a structured and standardised foot screening model should be adopted consisting of:

- Checking for sensory loss.
- Checking for foot pulses.
- Soft tissue examination.
- Identifying previous ulceration or amputation.
- Ascertaining each person's attitude to and knowledge of foot health and their ulceration risk status.
- Explaining that a basic foot screening

examination should account for loss of protective sensation, presence of diabetic painful neuropathy, absent foot pulses, deformity, callus and dry skin, infection, current or previous ulceration, previous amputation, ability to bend to look at their feet, poor vision and finally attitudes, beliefs and knowledge towards foot health.

All of these findings should be recorded in a clear, concise and structured manner with any proposed interventions clearly outlined.

Physically examining feet in people with diabetes gives them a clear message that feet are important and it is imperative to explain what you are doing and why. Equally, at each subsequent visit it is useful to ask the individual why you are examining their feet and if they have any concerns.

Clinical screening tests

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. The most 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 are not without their limitations or pitfalls. Most of these are related to operator error or poor technique, such as hitting the tuning fork hard so that it can be easily heard and alerts the recipient that the test is imminent, so a positive response is very likely. Asking a patient if they can feel the applied tuning fork is equally misleading as they may feel pressure, cold or vibration. 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, 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 and was not made from nylon but horse hairs. Monofilaments are easy to use but there are some potential areas for incorrect use or misuse. 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, first and fifth metatarsal heads as appropriate testing sites (International Working Group on the Diabetic Foot, 2011). It must be remembered that any callused, indurated or scarred areas should be avoided.

By nature, peripheral sensory neuropathy originates distally, therefore the author suggests monofilament testing at the plantar surface of the first, third and fifth toe tips (*Figure 1*).

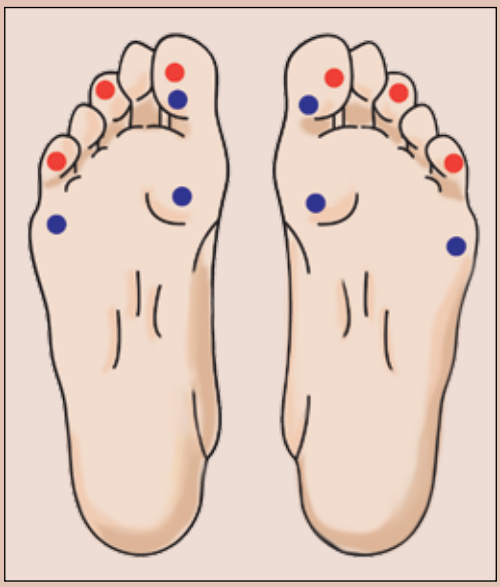

Figure 1. Testing sites using a 10 g monofilament. Blue dots = testing sites recommended by the International Working Group on the Diabetic Foot (2011); red dots = testing sites recommended by the author.

Page points

1. Physically examining feet in people with diabetes gives them a clear message that feet are important and it is imperative to explain what you are doing and why.
2. 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.
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.

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1. 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 force.
2. A simple working definition of deformity is the inability for a foot to be adequately accommodated in a high-street shoe.
3. The presence of callus over weight-bearing areas of the foot in the presence of diabetic peripheral neuropathy is a very high risk factor for ulceration, increasing risk by up to 77 times.
4. The presence of dry skin may also increase ulcer risk as it is unable to absorb frictional and shear forces that occur during gait.

Testing the heel or arch does not add any 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.

Monofilaments should be allowed to rest after 10 applications, renewed regularly (the author suggests every 6 months as a rough guide), 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, for example the forearm, so that they can experience the sensation of the monofilament.
- Ask the person to close their eyes and to say "yes" every time they feel the monofilament.
- 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 their ability to detect the light pressure of the monofilament.
- Re-check any sites that do not invoke a response.

Monofilament technique

- The monofilament must be placed at 90 degrees to the skin surface.
- It is applied, held and released in a controlled manner.
- It should be applied, held and released over 1–2 seconds for each test.
- 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.

Vibration perception

How to use a tuning fork

Hold the tuning fork by gripping the flat ridged area at the base of the tuning fork 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 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 they 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 are closed during this procedure. Do not ask "can you feel anything?" as they may feel pressure, cold or vibration. It is vibration sense you are testing for.

Deformity

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. A simple working definition of deformity is the inability for a foot to be adequately accommodated in a high-street shoe. The importance of this is that an individual with neuropathy will not be able to detect the trauma for 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 diabetic peripheral neuropathy (DPN) is a very high risk factor for ulceration, increasing risk by up to 77 times (Murray et al, 1996). The presence of bloodstained callus and DPN is highly predictive of ulceration being present in up to 80% of cases following 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 is very common in people with DPN because of reduced or absent sweating due to autonomic dysfunction or due to PAD.

The daily use of urea- or glycerine-based moisturisers helps to overcome this (Loden, 1996; Miettinen et al, 1999; Baker and Rayman, 2008). Dry skin around the heels is particularly problematic and frequently leads to fissures and possible ulceration and infection.

Good nail care in people with DPN and especially 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 sore in the nail bed.

Blisters

Blisters are caused by frictional forces 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 covered firmly with a thin gauze dressing and monitored. Most blisters should resolve with basic woundcare 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

Infections must be identified and addressed swiftly, taking a microbiological sample, antibiotics and ideally daily reviews for the first 3 days to determine a positive response to treatment. All infections must be treated very swiftly and this is an important role within primary care. Regular review of the individual's response to antimicrobial therapy is paramount and as a guide, any infection that shows no signs of resolving with 3–5 days 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 if the specialist foot clinic is not available, such as at weekends or bank holidays.

A recently published 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 imperative 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. Screening for the presence of significant arterial disease can be confusing and difficult. In people with diabetes, for every 1% 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 is the most likely cause of diabetes-related lower extremity amputations in the developed world (Chaturvedi, 2006). It also frequently co-exists in approximately 45% of 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 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 for 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, pink and is 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

Page points

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Page points

1. Diabetic peripheral neuropathy (DPN) is reportedly the most common (approximately 50%) and familiar complication that affects the feet of people with diabetes.
2. DPN is a reduction or total inability to determine certain stimuli such as light touch, vibration, hot or cold, and pain, for example a sharp sensation.
3. The inability to feel protective pain sensations and retract is so reduced in DPN or absent that injuries such as burns, cuts, blisters and shoe rubs often go unnoticed until they have deteriorated to ulceration or become infected.

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

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 in the lower leg or the foot or both.
- A loss of substance to the plantar surface of the foot.
- Pale, sunset red, deep red or purple colouration to the skin.

Do not to forget to ask if the individual suffers from intermittent claudication or rest pain. If they do, then determine how far they can walk before claudication, the recovery time and level of claudication (foot, calf, thigh or buttock).

Any individual with open or previous ulceration, PAD or history of cardiovascular disease may significantly benefit from anti-platelets and statin therapy (Young et al, 2008). A working group for NICE is currently working on national guidance for PAD, due to be published in 2012.

Table 1. Different features of peripheral arterial disease symptoms and painful 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

Peripheral sensory neuropathy

DPN is reportedly the most common (approximately 50%) and familiar complication that affects the feet of people with diabetes (Kumar et al, 1994). To clarify the differences between DPN and PAD, *Table 1* compares the symptoms of both conditions. Prevalence of neuropathy has been shown to increase with diabetes duration (Kumar et al, 1994). There are a variety of manifestations of diabetic neuropathy but most pertinent to the diabetic foot is DPN.

DPN is a reduction 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 is often described as having a glove and stocking distribution pattern, 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 inability to feel protective pain sensations and retract is so reduced or absent that injuries such as burns, cuts, blisters and shoe rubs often go unnoticed until they have deteriorated to ulceration or become infected. It is this loss of pain sensation that has been clearly implicated as a major causal factor in foot ulcer development with up to 85% of amputations preceded by foot ulceration (Pecoraro et al, 1990). Significantly, DPN is implicated in 50–75% of nontraumatic amputations (Vinik et al, 2000), so preventing ulceration is critical. It is the inability to feel stimuli that is associated with ulcer risk and is of paramount importance. Identifying this 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). Paradoxically, it can coexist as painless and painful neuropathy, which is the existence of both sensory loss and some of the symptoms of painful neuropathy. Generally in this situation the painful symptoms are those of burning, electric shock type and stabbing pains. This can be very difficult for patients to accept: "How can I have lost feeling but have so much pain!".

Painful neuropathy may be divided into acute or chronic form. 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 a condition that is considered to be under-reported as individuals are likely to only complain of moderate to severe symptoms. Additionally, it could also be that healthcare professionals may not ask patients if they are experiencing any symptoms. This condition is difficult to diagnose and treat. A simple screening tool has been developed to help healthcare professionals screen for DPN (Malik et al, 2011a). This tool is a very simple and quick questionnaire that can be completed by patients in a few minutes and was designed for use in primary care (*Figure 2*).

Symptoms of painful neuropathy are varied but commonly described as burning, shooting, electric shocks, stabbing pains, or intense pins and needles. Additionally other forms include hypersensitivity to light touch or 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, HIV, herpes or alcoholism.

Management of neuropathic pain is complex and NICE (2010) recommends duloxetine first-line at 60 mg per day with upward titration to the maximum tolerated dose of no higher

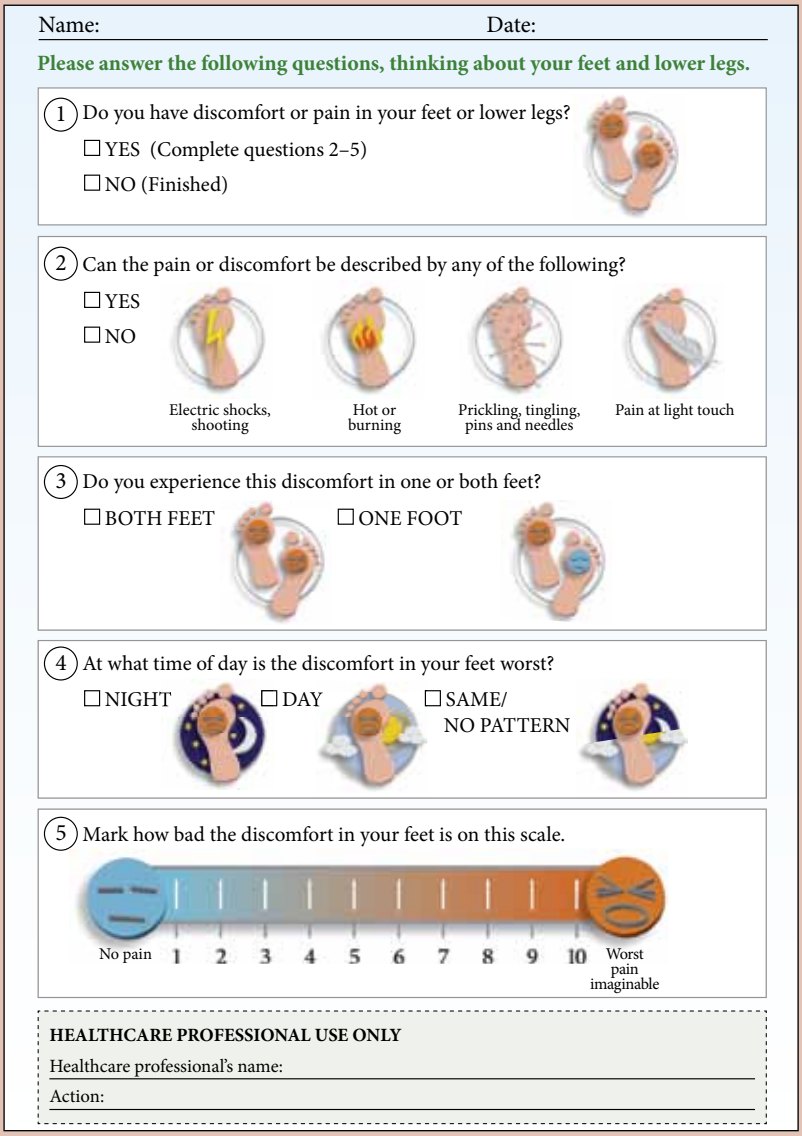

Figure 2. A screening tool for diabetic peripheral neuropathy (Malik et al, 2011b)

Table 2. Risk stratification (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 defomity, physical or visual impairment. 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 (no history of previous foot ulcer).	Previous ulceration or amputation OR absent pulses AND unable to feel 10 g monofilament OR one of the above with callus or deformity.

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 MDT clinic (NICE, 2004).

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/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

than 120 mg. If duloxetine is contraindicated, oral amitriptyline should be offered at a dose of 10 mg per day with gradual titration to an effective dose or the person's maximum tolerated dose (no higher than 75 mg per day). Consider referral to a specialist pain service (NICE, 2010).

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*.

Suggested care plan

Those 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. *Tables 3* and *4* summarise care pathways and appropriate referrals for various diabetic foot conditions. The plan below is based upon the model from Leese et al (2006).

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

Once a person 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.

The International Consensus guidelines (International Working Group on the Diabetic Foot, 2011) and NICE (2004) also describes risk-scoring systems that have very similar criteria for each level of risk, however these are not validated by clinical research. This does not mean they are any less useful or reliable and are worthwhile examining.

Conclusion

Screening and risk stratification for foot ulcer risk in people with diabetes is fairly easy to undertake without the need for extensive training. This is provided that clear guidance is given and there is an integrated care pathway with established education and good communication between primary and secondary care. There is of course a need for clinical governance and ongoing updating of knowledge and skills. This CPD module should be a resource to help facilitate effective diabetic foot screening. ■

"Those 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."

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Box 2. Case report.

Narrative

A 64-year-old man with insulin-treated type 2 diabetes presents with a cyanosis at 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 9.6% (81 mmol/mol).

Discussion

What are the most likely causes of this presentation and what action should be taken?

- 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 cellulitus/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 at least should be taken. It is always important to look between the toes.
- Assuming that infection is the most likely cause, antibiotics should be commenced immediately and should be broad-spectrum and high dose. Therapy should be for a minimum of 2 weeks. Daily observations are recommended to determine any deterioration.
- Consideration should be given for an urgent specialist referral as this picture is very indicative of "septic vasculitus" 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, or clotting disorders should be considered. If an aneurysm is detected, intervention should be determined by the vascular surgeons and interventional radiologists.

CPD module

Online CPD activity

Visit www.diabetesandprimarycare.co.uk/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. 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 learned in practice.

1. In the presence of peripheral neuropathy, what risk factor is associated with the greatest risk of ulceration? Select ONE option only.
A. Deformity.
B. Poor fitting footwear.
C. Callus.
D. Hyperglycaemia.
E. Poor hygiene.

2. To whom and when should a person with diabetes who has unresolving infection in their foot normally be referred? Select ONE option only.
A. Multidisciplinary foot care team within 2 weeks.
B. Multidisciplinary foot care team on the same day.
C. Vascular surgeon within 4 weeks.
D. Diabetologist within 24 hours.
E. Multidisciplinary foot care team at the next clinic.

3. Which of the following necessitates specialist referral? Select ONE option only.
A. Loss of sensation.
B. Loss of one palpable pulse in both feet.
C. Mild foot infection.
D. New foot ulceration.
E. Mild blister.

4. Which adults with diabetes need to seen by a podiatrist? Select ONE option only.
A. All people with diabetes.
B. Any person with diabetes and callus but intact sensation.
C. Any person with diabetes and long nails with foot ulcer risk factors.
D. Any person with diabetes with loss of sensation.
E. Any person with diabetes and a fungal nail infection.

5. Which of the following does not describe diabetic peripheral neuropathy? Select ONE option only.
A. A reduction or total inability to determine certain stimuli.
B. Distal and symmetrical pattern.
C. Pins and needle sensation.
D. Numbness.
E. Significant reduction in blood flow and tissue vitality.

6. Following foot screening, when should a referral to a vascular surgeon be made? Select ONE option only.
A. If only one pulse is felt in both feet.
B. If intermittent claudication is described alone.
C. If intermittent claudication is described with an open foot wound.
D. If the foot looks dusky red and is cool to the touch.
E. All of the above.

7. When considering the use of the 10 g monofilament to detect diabetic neuropathy, which of the following factors is NOT important? Select ONE option only.
A. The monofilament must be placed at 90 degrees to the skin surface.
B. It should be applied, held and released over 1–2 seconds for each test.
C. When applied and held the monofilament should buckle at about 1 cm from the horizontal.
D. Record their ability to detect the light pressure of the monofilament.
E. Apply the monofilament to the plantar aspect of the first, third and fifth toes.

8. A 65-year-old man with type 2 diabetes, hypertension and proliferative retinopathy attends your practice for his annual diabetes review. He has a BMI of 30 kg/m^2 and smokes 15 cigarettes per day. His foot screening shows he is able to detect a 10 g monofilament and only has a palpable dorsalis pedis on the right and a post tibial in his left foot. During the screening process he says that he can only manage to walk 50 yards before the cramp in his legs make him stop and rest. What is the next course of action? Select ONE option only.
A. No risk.
B. Low risk.
C. Moderate risk.
D. High risk.
E. Ulcerated.

9. A 23-year-old man with type 1 diabetes attends for an annual diabetes review. He is single, works in a car assembly line, attends a gym 3–4 times per week, has a BMI of 20 kg/m^2 and does not smoke. His foot screening reveals intact sensation to a 10 g monofilament and easily palpable foot pulses. He has no evidence of any diabetes complications but does have some soggy, white skin between several of his toes. Which of the following options is the appropriate course of action? Select ONE option only.
A. Take no action it as it is not significant enough.
B. Give advice on using an antifungal preparation and foot hygiene and review in 1 year.
C. Prescribe an antifungal preparation, give advice on foot hygiene and review promptly.
D. Review his condition at the next annual review.
E. Refer him to the podiatry team.

10. A 58-year-old woman with type 2 diabetes says that she is concerned about her feet as she has some discomfort in them especially at night. She describes this as intense pins and needles but with some sudden burning sensations. You examine her feet and find that she is unable to feel a 10 g monofilament and she has some moderate callus over her first metatarsal head and "bunions". Her pedal pulses are present and easily felt. What is the most likely cause of her "odd" foot sensations? Select ONE option only.
A. Peripheral arterial disease.
B. An allergy.
C. Painful diabetic neuropathy.
D. Metatarsalgia.
E. A foot ulcer.