

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

Neil Baker, Colin Kenny

Costs associated with diabetic foot complications place an enormous 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 associated with 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 show that there are 3.2 million people living with diabetes in the UK. These data confirm a sharp increase year-on-year, with 6% of the UK population now diagnosed with the condition (Diabetes UK, 2014). It has been speculated that diabetes-related complications will also increase rapidly, reaching about 20–30% above 2000 levels by 2045 (Bagust et al, 2002).

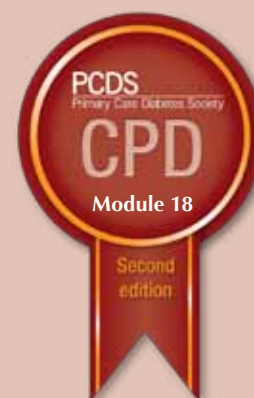
Diabetes UK has recently launched a campaign to prevent “foot attacks”. Underpinning this campaign is the information that in excess of 6000 leg, foot or toe amputations are still being carried out each year on people with diabetes in England, 80% of which are reported to be preventable (Young, 2014). Approximately 50% of all foot amputations are performed in people with diabetes and these can incur very high healthcare costs. The cost of diabetic foot care in 2010–2011 was estimated at £580 million, almost 0.6% of NHS expenditure in England (Kerr et al, 2014). It is estimated that about 50% of this sum is spent on ulceration in primary

and community settings. A considerable portion of this cost is incurred through inpatient ulcer care, which is estimated at £219 million, and that of amputation care, at £55 million.

Recently, the Scottish Diabetes Foot Action Group introduced a national inpatient foot care campaign called “CPR for diabetic feet”. This 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, not only were earlier foot indicators replaced with a requirement to cover the need for a foot examination to be made, but a mandate was added that patients be risk stratified according to the clinical findings. This remains the case in the 2014–15 QOF diabetes indicators and this indicator is now DM012 (see *Box 1*).

With the high cost burden associated with diabetic foot disease, it had been hoped that there would



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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. Understand referral pathways and describe when, where and who 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

Authors

Neil Baker is a Principal Diabetes Specialist and Research Podiatrist, Ipswich Hospital NHS Trust, Ipswich. Colin Kenny is a GP, Dromore, County Down.

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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 in previous ulcer) or 4) ulcerated foot within the preceding 12 months.”

NICE 2010 menu ID: NM13

be an indicator to encourage the referral of people found to be at risk of this condition (e.g. Gadsby and Chadwick, 2011). Instead, NICE (2014) has proposed a “bundled” QOF indicator in diabetes for the 2015–16 contract for England, which would see practices completing a series of eight annual checks before they are awarded points.

NICE guidance for diabetic foot disease is set to be updated in 2015, along with other diabetes-related guidance. A National Diabetes Foot Care Audit for England (<http://www.hscic.gov.uk/footcare>) was announced in July 2014. It may discover if nationally recommended foot care service structures and appropriate treatments, such as those described in NICE guidelines on peripheral vascular disease (NICE, 2012) and inpatient diabetic foot care (NICE, 2011), are in place and achieving desired outcomes. This audit mirrors a similar one conducted in Scotland in 2013 (Information Services Division Scotland, 2013).

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 should focus on the presence of peripheral neuropathy, peripheral artery disease, previous ulceration and abnormal foot anatomy, all of which may predict individuals at high risk of developing foot ulcers (Abbott et al, 2002). There are some data to suggest that many older people with diabetes are unable to perform this daily task owing to poor eyesight and reduced mobility, making it difficult to inspect their feet (Thomson and Masson, 1992). An overarching principle is that regular contact between professionals and patients is important (Edmonds et al, 1996).

Evidence shows that with the provision of an integrated foot care pathway, with trained staff

in foot protection services in the community and speedy access to multidisciplinary teams (MDTs) for the diabetic foot, amputations can be reduced by up to 62% (Krishnan et al, 2008). Podiatrists deliver the bulk of diabetic foot care in the UK and are key members of any MDT. There now exists a *Podiatry Competency Framework for Integrated Diabetic Foot Care* (TRIEPodD-UK, 2012), which hopefully will enable competency benchmarking and service improvements.

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 teaching individuals how to examine their own feet.
- Identification of more general medical problems, such as the presence of peripheral arterial disease (PAD), which would indicate more general vascular pathology.

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 in the way of robust UK data supporting this approach; however, two systematic reviews have examined risk stratification for foot ulceration. Both stated that, owing 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). More recently, investigators in Scotland reported a falling incidence of amputation, perhaps reflecting a well-integrated healthcare system (Kennon et al, 2012).

An ideal 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 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 one's feet, and poor vision, as well as attitudes, beliefs and knowledge relating to foot health.

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.

Physically examining feet in people with diabetes gives them a clear message that feet are important and it is very important to explain what is being done and why. This should be reinforced at each subsequent visit by asking individuals to understand why their feet are being examined 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 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. Most of these are related to 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. 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 horsehairs. 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 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 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

Page points

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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.

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.

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.



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.

- 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

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 (Sharma et al, 2014), which simply involves 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.

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 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. It is vibration sense that 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 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 diabetic peripheral neuropathy (DPN) is a factor of very high risk for ulceration, increasing risk by up to 77 times (Murray et al, 1996). The presence of blood-stained callus and DPN is highly predictive of ulceration, with it being 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 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). 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 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

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). All infections must be treated very swiftly and this is an important task within primary care. Regular review of the individual's response to antimicrobial therapy is crucial; as a

guide, any infection that shows no signs of resolving within 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 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% 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 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

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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 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

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

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

Any individual with open or previous ulceration, PAD or a history of cardiovascular disease may significantly benefit from anti-platelets 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.

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 the two 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 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.

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 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, 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 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.*

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.

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. 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 thought to be linked to 50–75% of non-traumatic amputations (Vinik et al, 2000), and so preventing ulceration is critical. It is the inability to feel stimuli that is associated with ulcer risk and is of great 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 sensation and stabbing pains. This can be very difficult for individuals to accept: “How can I have lost feeling but have so much pain?”

Painful neuropathy may be divided into an acute and a 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 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, HIV, herpes or alcoholism.


Management of neuropathic pain is complex 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).

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



Name: _____ Date: _____




Please answer the following questions, thinking about your feet and lower legs.

① Do you have discomfort or pain in your feet or lower legs?
 YES (Complete questions 2–5)
 NO (Finished) 

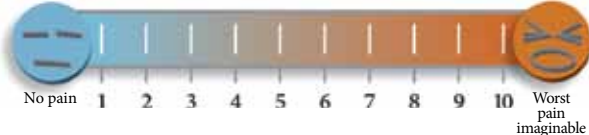
② Can the pain or discomfort be described by any of the following?
 YES
 NO

 Electric shocks, shooting
 Hot or burning
 Prickling, tingling, pins and needles
 Pain at light touch

③ Do you experience this discomfort in one or both feet?
 BOTH FEET  ONE FOOT 

④ At what time of day is the discomfort in your feet worst?
 NIGHT  DAY  SAME/NO PATTERN 

⑤ Mark how bad the discomfort in your feet is on this scale.


 No pain 1 2 3 4 5 6 7 8 9 10 Worst pain imaginable

HEALTHCARE PROFESSIONAL USE ONLY
 Healthcare professional's name: _____
 Action: _____

Figure 2. A screening tool for diabetic peripheral 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 or physical or visual impairment	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	Previous ulceration or amputation OR Loss of sensation (e.g. inability to feel 10-g monofilament) OR Signs/symptoms of PAD (e.g. absent pedal pulses) AND Callus/skin changes OR Foot deformity
WITH No previous ulcer	WITH No previous ulcer	

PAD=peripheral arterial disease.

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 foot self-care; and 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; 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).**

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) describe 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, though, that they are any less useful or reliable, and they are worthwhile examining.

Conclusion

Diabetic foot disease can incur high human and healthcare costs. Screening and risk stratification for foot ulcer risk in people with diabetes is an important QOF clinical indicator and fairly 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. ■

- Abbott CA et al (2002) *Diabet Med* **19**: 377–84
- Arad Y et al (2011) *Diabetes Care* **34**: 1041–6
- Bagust A et al (2002) *Diabet Med* **19**(Suppl 4): 1–5
- Baker NR et al (2005a) *The Diabetic Foot Journal* **8**: 28–37
- Baker NR et al (2005b) *The Diabetic Foot Journal* **8**: 58–70
- Baker N, Rayman G (2008) *The Diabetic Foot Journal* **11**: 179–82
- Birke JA, Rolfsen RJ (1998) *Diabetes Care* **21**: 23–5
- Booth J, Young MJ (2000) *Diabetes Care* **23**: 984–8
- Boulton AJ, Malik RA (1998) *Med Clin North Am* **82**: 909–29
- British Medical Association (2014) *QOF guidance 2014–2015 according to nation*. BMA, London. Available at: <http://bit.ly/1b4U1gK> (accessed 27.11.14)
- Chaturvedi N (2006) The epidemiology of amputations and the influence of ethnicity. In: Boulton A, Cavanagh P, Rayman G (eds). *The Foot in Diabetes* (4th edition). Wiley & Sons Ltd, Chichester
- Daousi C et al (2004) *Diabet Med* **21**: 976–82
- Davies M et al (2006) *Diabetes Care* **29**: 1518–22
- Diabetes UK (2014) *Number of people diagnosed with diabetes reaches 3.2 million*. Diabetes UK, London. Available at: <http://bit.ly/1fEIDJC> (accessed 27.11.14)
- Edmonds ME et al (1996) *Diabet Med* **13**(Suppl 1): S61–4
- Gadsby R, Chadwick P (2011) *The Diabetic Foot Journal* **14**: 54–8
- Harkless LB, Dennis KJ (1987) *Clin Podiatr Med Surg* **4**: 331–9
- Information Services Division Scotland (2013) *Inpatient statistics*. NHS National Services Scotland, Edinburgh
- International Working Group on the Diabetic Foot (2011) *International Consensus*. International Working Group on the Diabetic Foot, Brussels. Available at: <http://bit.ly/pjTtBy> (accessed 27.11.14)
- Kennon B et al (2012) *Diabetes Care* **35**: 2588–90
- Kerr M, Rayman G, Jeffcoate WJ (2014) *Diabet Med* **31**: 1498–504
- Krishnan S et al (2008) *Diabetes Care* **31**: 99–101
- Kumar S et al (1994) *Diabet Med* **11**: 480–4
- Leese GP et al (2006) *Int J Clin Pract* **60**: 541–5
- LeMaster JW, Reiber GE (2006) Epidemiology and economic impact of foot ulcers. In: Boulton A, Cavanagh P, Rayman G (eds). *The Foot in Diabetes* (4th edition). Wiley & Sons Ltd, Chichester
- Loden M (1996) Urea-containing moisturizers influence barrier properties of normal skin. *Arch Dermatol Res* **288**: 103–7
- Malik R et al (2011a) Addressing the burden of diabetic peripheral neuropathic pain: improving detection in primary care. *The Diabetic Foot Journal* **13**(Suppl): 1–8
- Malik R et al (2011b) *A Tool for the Initial Assessment of Foot Pain Among People With Diabetes*. Eli Lilly and Company, Basingstoke. Tool available at: <https://www.lillypro.co.uk> (accessed 27.11.14)
- Mayfield JA, Sugarman JR (2000) *J Fam Pract* **49**(Suppl 11): S17–29
- Miettinen H et al (1999) *Skin Pharmacol Appl Skin Physiol* **12**: 344–51
- Miranda-Palma B et al (2005) *Diabetes Res Clin Pract* **70**: 8–12
- Monteiro-Soares M et al (2011) *Diabetologia* **54**: 1190–9
- Muntner P et al (2005) *Diabetes Care* **28**: 1981–7
- Murray HJ et al (1996) *Diabet Med* **13**: 979–82
- NICE (2004) *Type 2 Diabetes – Prevention and Management of Foot Problems* (CG10). NICE, London. Available at: <http://www.nice.org.uk/guidance/cg10> (accessed 27.11.14)
- NICE (2011) *Diabetic foot problems: Inpatient management of diabetic foot problems* (CG119). NICE, London. Available at: <http://www.nice.org.uk/guidance/cg119> (accessed 27.11.14)
- NICE (2012) *Lower limb peripheral arterial disease: diagnosis and management* (CG147). NICE, London. Available at: <http://www.nice.org.uk/guidance/cg147> (accessed 27.11.14)

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, 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 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.

- NICE (2013) *Neuropathic pain – pharmacological management: The pharmacological management of neuropathic pain in adults in non-specialist settings* (CG173). NICE, London. Available at: <http://www.nice.org.uk/guidance/cg173> (accessed 27.11.14)
- NICE (2014) *NICE announces new QOF menu for improving care in general practice*. NICE, London. Available at: <http://bit.ly/1zLUV8e> (accessed 27.11.14)
- Norgren L et al (2007) *Int Angiol* **26**: 81–157
- Pecoraro RE et al (1990) *Diabetes Care* **13**: 513–21
- Perkins BA et al (2001) *Diabetes Care* **24**: 250–6
- Rosen RC et al (1985) *Cutis* **35**: 339–41
- Selvin E et al (2004) *Ann Intern Med* **141**: 421–31
- Sharma S et al (2014) *Diabet Med* **31**: 1100–3
- Stang D, Leese GP (2014) *The Diabetic Foot Journal* **17**: 16–8
- Thomson FJ, Masson EA (1992) *Age Ageing* **21**: 333–7
- TRIEPodD-UK (2012) *Podiatry competency framework for integrated diabetic foot care*. SB Communications Group, London
- Vinik AI et al (2000) *Diabetologia* **43**: 957–73
- Young B (2014) Preventing a “foot attack”. *Diabetes & Primary Care* **16**: 62
- Young MJ et al (2008) *Diabetes Care* **31**: 2143–7

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 new 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. How frequently should a 10-g monofilament be replaced? Select ONE option only.

A. After every use
B. After being used 10 times
C. Weekly
D. Monthly
E. Six monthly

2. A healthcare professional intends to test a person's foot sensation and opens a new packet of 10-g monofilaments.

Which one of the following is the MOST appropriate NEXT step? Select ONE option only.

A. Apply the monofilament to the person's less affected foot
B. Apply the monofilament to the person's forearm
C. Buckle the monofilament a few times
D. Explain to the person that he or she needs to say when the monofilament cannot be felt
E. Warm the monofilament before use

3. A 49-year-old woman with diabetic peripheral neuropathy has developed a blood-stained callus after wearing new, ill-fitting shoes over the past 3 weeks.

After removal of the callus, up to what percentage of people in this situation will have ulceration present? Select ONE option only.

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

4. A 63-year-old woman with diabetic peripheral neuropathy has very dry skin on her feet, particularly around both heels.

Which of the following is the MOST appropriate daily topical treatment to recommend? Select ONE option only.

A. Diprobase® cream
B. E45 cream
C. Epaderm™ ointment
D. Elocon® ointment
E. Flexitol® balm

5. A 37-year-old with type 1 diabetes has had satisfactory recent foot checks with a "low-risk" grading. However, she has noticed two fungal-looking toenails and subsequent nail clippings confirm *Trichophyton rubrum*.

Which of the following is the MOST appropriate management option? Select ONE option only.

A. Amorolfine nail lacquer
B. Clotrimazole cream
C. Itraconazole tablets
D. Terbinafine tablets
E. No treatment necessary

6. A 58-year-old man grades his diabetic neuropathy pain as "the worst pain imaginable".

According to national guidance, which of the following is the MOST appropriate first-line medication and starting dose? Select ONE option only.

A. Amitriptyline 10 mg
B. Amitriptyline 25 mg
C. Duloxetine 60 mg
D. Duloxetine 120 mg
E. Tramadol 50 mg
F. Tramadol 100 mg

7. What 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

8. Which of the following situations automatically stratifies a person with diabetes as having "high-risk" feet? Select ONE option only.

A. Absence of one dorsalis pedis pulse but no foot deformity
B. Being registered blind
C. Inability to reach one's own feet
D. Normal foot pulses but inability to feel a 10-g monofilament
E. Presence of callus and a history of previous foot ulceration

9. Which ONE of the following specialist referrals for a person with diabetes can be regarded as "routine" rather than "clinically urgent"? Select ONE option only.

A. Active foot ulcer
B. Acute Charcot neuroarthropathy
C. Foot deformity requiring shoe fitting
D. Painful diabetic neuropathy
E. Toe infection not resolving after 5 days of antibiotics

10. Which of the LETTERED AREAS is the LEAST appropriate site to test with a 10-g monofilament when screening for altered foot sensation?

Select ONE option only.

