The occurrence of foot ulcers in people with diabetes is increasing globally. Armstrong et al (2017) noted that one in three people with diabetes will develop a foot ulcer in their lifetime. In older people with diabetes, foot ulcers can have significant negative long-term effects in terms of quality of life, morbidity and mortality. Appropriate care is crucial to prevent the development of foot ulcers and to manage them if they develop despite adequate preventive measures. Multidisciplinary team working and robust care pathways are essential. This article outlines the role of nurses in supporting older people with diabetes to maintain optimal foot health, ensuring that they undergo an annual foot assessment, assessing them for foot ulcers and referring them promptly to specialist care when required to avoid amputation.

Abstract

Foot ulcers in a person with diabetes mellitus can be life-changing and threaten the viability of their lower limb. As many as one in three people with diabetes develop a foot ulcer in their lifetime. These foot ulcers are prone to fast-spreading infection and often precede lower-limb amputation. In older people with diabetes, foot ulcers can have significant negative long-term effects in terms of quality of life, morbidity and mortality. Appropriate care is crucial to prevent the development of foot ulcers and to manage them if they develop despite adequate preventive measures. Multidisciplinary team working and robust care pathways are essential. This article outlines the role of nurses in supporting older people with diabetes to maintain optimal foot health, ensuring that they undergo an annual foot assessment, assessing them for foot ulcers and referring them promptly to specialist care when required to avoid amputation.

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Keywords

Community, community care, clinical, clinical review, diabetes, diabetic foot ulcers, healthy ageing, nursing care, older people, professional

THE OCCURRENCE of foot ulcers in people with diabetes is increasing globally with Armstrong et al (2017) noting that one in three people with diabetes will develop a foot ulcer in their lifetime, while the National Institute for Health and Care Excellence (NICE) (2019) cited a more conservative estimate of 10%. In older people with diabetes, foot ulcers can have significant negative long-term effects in terms of quality of life, morbidity and mortality (Vainieri et al 2022). Armstrong et al (2007) noted that people with lower extremity complications of diabetes have five-year mortality rates that are similar or worse than many people with common types of cancer.

The cost for the NHS in England of healthcare for ulceration and amputation in people with foot complications associated with diabetes was estimated to be between £837 million and £962 million in 2014-15—this is, between 0.8% and 0.9% of the NHS budget for England. More than 90% of that expenditure was related to ulceration and 60% was spent in care in community, outpatient and primary care settings (Kerr et al 2019).

A diabetes foot ulcer can be defined as a localised injury to the skin and/or underlying tissue below the ankle in a person with diabetes (NICE 2019). Foot ulcers in a person with diabetes can be life-changing and threaten the viability of their lower limb. Although people with diabetes make up about 5% of the adult population in England and Wales, they account for between 40% and 70% of admissions for amputations and renal replacement therapy—deteriorating kidney function being another potential complication of diabetes (NHS Digital 2019).

People with diabetes are about 23 times more likely to have a toe, foot or leg amputated than those without the condition (Kerr 2017).

In a systematic review on the effects of foot
ulceration and amputation on mortality in people with diabetes, Jupiter et al (2016) found that major lower-limb amputation tends to result in early death in people with diabetes, especially men aged in their mid-sixties with type 2 diabetes. Diabetes is the most common cause of non-traumatic lower limb amputation, with diabetes foot ulcers preceding more than 80% of amputations performed in people with diabetes (Pecoraro et al 1990, NICE 2019).

This article summarises the causes of diabetes foot ulcers and describes how to prevent and manage them in older people with diabetes.

Causes of foot ulcers in people with diabetes

Foot ulcers in diabetes usually develop due to neuropathy, ischaemia or a combination of neuropathy and ischaemia referred to as neuro-ischaemia. All healthcare professionals including nurses have a responsibility to understand such factors, since this will support them to promote foot health and educate patients about self-care of their feet (Chan et al 2012, Miikkola et al 2019).

Neuropathy

Neuropathy is the overall term for all types of nerve damage, and peripheral sensory neuropathy refers specifically to nerve damage affecting the sensory nerves in the body’s peripheral areas – usually the hands and feet but also the arms and legs. Peripheral sensory neuropathy is particularly common in diabetes and is the cause of many foot issues because people can no longer feel their feet and therefore injure them without realising (Diabetes UK 2023a).

In the UK, almost one in ten people aged 55 years or over are affected by peripheral sensory neuropathy (NHS 2022). The main symptoms include (NHS 2022):

» Numbness and tingling in the feet or hands.
» Burning, ‘stabbing’ or shooting pain in the affected areas.
» Loss of balance and/or coordination.
» Muscle weakness, especially in the feet. An older person with diabetes and peripheral sensory neuropathy is therefore at increased risk of tripping or falling and of injuring their feet without realising.

Ischaemia

Ischaemia occurs when there is a decrease in blood supply to the tissues, leading to a decrease in oxygen and nutrients to the affected area, which may eventually become necrotic. Areas most commonly affected by ischaemia are the heart, brain, intestines and fingers and toes (NHS 2023). This lack of blood supply may occur suddenly because of a blood clot (thrombosis) or embolism (blockage of a vessel frequently caused by a blood clot), or because of a gradual build-up of fatty deposits (atheroma) comprising cholesterol and other waste substances in the walls of the arteries. Atheroma narrows the arteries and restricts blood flow in a process called atherosclerosis. In people with diabetes, ischaemia often affects the feet, where atheroma causes the development of peripheral arterial disease (PAD), which results in a lack of blood supply. Ischaemia is a serious condition and can result in tissue damage and potentially the loss of the affected limb (NHS 2023).

Neuro-ischaemia

The neuro-ischaemic foot is characterised by varying degrees of ischaemia together with neuropathy. This can lead to ulceration, commonly at the margins of the foot or tips of the toes (often at sites of pressure from poorly fitting footwear), or beneath toenails if these have become overly thickened (Edmonds and Foster 2006). Such ulcers are prone to bacterial infection, which along with reduced arterial perfusion in the neuro-ischaemic foot, are important contributing factors in tissue necrosis (Edmonds 2016).

Additionally, individuals with Charcot foot deformity (neuropathy-related disease of the foot’s bones, joints and soft tissue) and ischaemia were noted in studies to be significantly older and have a greater mean duration of diabetes. They presented with more concomitant comorbidities such as ischaemic heart disease and end-stage renal disease compared with patients with neuropathy alone (Meloni et al 2022).

Diabetes management in older people

More than four and a half million people in the UK have diabetes, of which around 1.5 million are aged over 65 years (Diabetes UK 2019, 2022). Older people with diabetes are a distinct yet heterogeneous group, with individual biomedical, psychological and social attributes that differ from those of younger adults (Kalra and Sharma 2018). Older people with diabetes are more likely to experience difficulties with self-care and develop diabetes-related complications such as foot issues because many live with multiple morbidities (Diabetes UK 2022). A multidisciplinary team approach to diabetes management in older people is therefore of the utmost importance. Wherever possible, this approach should include members of the wider multidisciplinary team such as dietitians to provide advice and guidance on diet and nutrition, and physiotherapists to promote...
balance and mobility and prevent falls, as well as the person with diabetes and their family and/or carers (Kalra and Sharma 2018).

**Promoting foot health in older people with diabetes**

To reduce the risk of foot ulcers, the nursing care of the older person with diabetes needs to include education to increase their awareness of the importance of optimal foot care, including self-care (Diabetes UK 2015). This health promotion activity is fundamental if the older person is to maintain their activity levels and health and well-being.

**Washing and foot care**

The older person and their family and carers should be encouraged to check the older person’s feet every day and immediately report any changes to a healthcare professional. Older people and their family and carers should also be encouraged to (WebMD 2023):

- Wash their feet daily but not soak them for a long time.
- Use mild soap and warm water to wash their feet rather than harsh soap and hot water.
- Pat the skin dry rather than rubbing it and ensure the feet are thoroughly dry.
- Use an emollient to moisturise the feet daily.

**Toenail care**

According to Diabetes UK (2023b), the belief that people with diabetes should not cut their own toenails to avoid damaging their feet is misguided. In fact, cutting the toenails safely is crucial to prevent nail and foot issues, aid mobility and reduce the risk of trips and falls (Camden and Islington NHS Foundation Trust 2023). The general advice for older people with diabetes is that their toenails should be trimmed often with a pair of nail clippers and the corners of the nail filed with an emery board (Diabetes UK 2023a).

In terms of toenail care, nurses can advise older people to (WebMD 2023):

- Trim their toenails after washing or bathing when the nails have softened.
- Trim the toenails straight across – but not too short.
- Avoid cutting into the sides of the nails or the cuticles.
- Use a nail brush to clean under the toenails, not anything sharp such as the points of scissors.

Factors such as a loss of sensation due to peripheral sensory neuropathy and suboptimal eyesight, mobility and/or cognition may affect the person’s ability to undertake toenail care – or to undertake it safely – and this needs to be taken into consideration. If it is challenging for the older person to care for their toenails, if their toenails are thickened or painful, or if the person cannot safely see, reach or cut them without assistance, nurses may need to ask the person’s GP for advice and refer them to a foot care practitioner or podiatrist.

**Footwear and environment**

To reduce the risk of falls and the development of foot ulcers through trauma, it is important to consider the person’s lifestyle, footwear, furniture and home environment (Kalra and Sharma 2018). Feet issues such as untrimmed toenails, bunions, hard skin (callus) or pain can alter the way the person walks, which can in turn affect their balance. Foot pain and/or untrimmed toenails may mean that the person wears ill-fitting shoes or slippers, which further increases the risk of falls. Older people should be encouraged to wear well-fitting shoes or slippers with laces or a Velcro fastening, low heels and non-slip soles (Camden and Islington NHS Foundation Trust 2023).

**Annual foot assessment**

All people with diabetes aged over 12 years should have an annual foot assessment to check their risk of developing foot complications associated with diabetes (NICE 2019). Before undertaking an annual foot assessment, the competent healthcare professional – often a podiatrist or practice nurse – should first take a comprehensive patient history, including the duration of diabetes, medicines being taken for diabetes and for other health issues, and blood glucose levels. The annual foot assessment should then be undertaken following the procedure detailed in Box 1 (Diabetes UK 2016, 2017).

**Key points**

- In older people with diabetes, foot ulcers can have significant negative effects in terms of morbidity and mortality
- An infected foot ulcer can deteriorate rapidly and require the need for amputation
- The annual foot assessment that people with diabetes undergo from the age of 12 years must include a foot ulcer risk assessment
- Preventing diabetes foot ulcers involves informing patients of the risks, assessing their feet and giving them foot care advice
- People with an active foot ulcer or spreading infection must be referred to a specialist foot protection team within one working day of presentation

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**Box 1. Annual foot assessment procedure for people with diabetes**

- Ensure the patient is barefoot during the assessment; if necessary, assist them to remove their shoes and socks and/or hosiery
- Assess the whole foot including the heel, sole, toenails and in between the toes to check for corns and calluses as well as any changes in shape, cracked or dry skin and discolouration
- Test the patient’s feet for numbness or altered feeling with a tuning fork (Young 2009) or by hand using the Ipswich Touch Test (Rayman et al 2011). This test involves the healthcare professional lightly touching the tips of the patient’s first, third and fifth toes and the dorsum of the hallux, then asking the patient whether they can feel the touch
- Check the circulation in the feet by testing the patient’s foot temperature and pulses by hand
- Check the patient’s shoes to ensure they are not causing any issues
- Ask the patient the following questions:
  - Have they ever had a foot ulcer?
  - Have they subsequently noticed any cuts or blisters that they did not feel at the time?
  - Have they experienced any pain in the legs and feet during the day or at night and if so, what eases that pain?
  - Do they check their feet daily?
  - What has their blood glucose level been recently and have they taken any measures to control it?

(Diabetes UK 2016, 2017)
Foot ulcer risk assessment

Foot ulcers can occur at any time in the life of a person with diabetes, so their annual foot assessment – and any foot examination they undergo – must include a foot ulcer risk assessment. The foot ulcer risk assessment may be undertaken by any competent healthcare professional such as a district nurse or practice nurse (The University of Edinburgh 2021).

If necessary, a care plan will be developed following the assessment. Multidisciplinary working and robust care pathways are crucial to ensure that patients receive appropriate and timely interventions following a risk assessment (Robbie et al 2020, British Geriatrics Society 2021). If a person is deemed to be at high risk of developing a foot ulcer, they must be referred to a specialist foot protection team – either the foot protection service in the community or the multidisciplinary foot team in hospital – in accordance with local guidelines.

Table 1 describes levels of risk of developing a foot ulcer, the corresponding risk factors and the actions to take.

Prevention advice

Diabetes UK (2017) advises that following the annual foot assessment, patients should be informed of their risk level for developing a foot ulcer (Table 1) and given prevention advice. Patients should be advised to (Diabetes UK 2017):

1. Check their feet daily.
2. Be aware of any loss of sensation in their feet, which increases the risk of unnoticed injury.
3. Look for any skin discolouration or change in temperature, which may indicate injury or infection.
4. Look for any change in the shape of their feet, which may indicate swelling or deformity.
5. Avoid corn-removing plasters or blades because of the risk of damaging healthy skin.
6. Understand how to care for their toenails, including safe cutting and filing.
7. Wear shoes that fit properly and ask for advice about fit and style if needed.
8. Maintain optimal blood glucose control.
9. Attend their annual foot assessment.

All patients with diabetes should receive verbal and written education about the risk of foot ulcers as well as emergency contact numbers. Beyond providing health education materials, nurses should also be competent in diabetic foot examinations so that they can give appropriate and meaningful foot care advice. If they are in any doubt whether a patient is at risk of developing a foot ulcer, they must immediately refer the patient to a specialist foot care centre (Diabetes UK 2017).

<table>
<thead>
<tr>
<th>Level of risk of diabetes foot ulcer</th>
<th>Risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active diabetes foot ulcer</td>
<td>Uceration, spreading infection, critical limb ischaemia (severe peripheral arterial disease (PAD)), gangrene, suspicion of acute Charcot foot (neuropathy-related disease of the foot’s bones, joints and soft tissue), unexplained hot, swollen foot with a change in colour, with or without pain</td>
</tr>
<tr>
<td>High risk of diabetes foot ulcer</td>
<td>Previous foot ulcer, previous amputation, patient taking renal replacement therapy, neuropathy in combination with callus and/or foot deformity, lower-limb PAD in combination with callus and/or foot deformity, neuropathy and lower-limb PAD together (neuro-ischaea)</td>
</tr>
<tr>
<td>Moderate risk of diabetes foot ulcer</td>
<td>Foot deformity, neuropathy, lower-limb PAD</td>
</tr>
<tr>
<td>Low risk of diabetes foot ulcer</td>
<td>No risk factors except callus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Refer patient to the foot protection service (FPS) (usually in the community) or the multidisciplinary foot team (usually in hospital) for triage within one working day of presentation</td>
</tr>
<tr>
<td>2. Assess patient’s feet and lower limbs, then agree on a tailored treatment plan</td>
</tr>
<tr>
<td>3. Provide verbal and written patient education and emergency contact numbers</td>
</tr>
<tr>
<td>4. Refer for specialist intervention by a healthcare professional such as a podiatrist, specialist nurse or GP, as necessary</td>
</tr>
<tr>
<td>5. Liaise with other healthcare professionals, for example GPs, as necessary</td>
</tr>
</tbody>
</table>

(Diabetes UK 2017, National Institute for Health and Care Excellence 2019)
Managing foot ulcers in older people with diabetes

Foot infection
Infection is a common consequence of any wound in a person with diabetes. In people with diabetes and neuropathy, infection often develops following an injury such as cutting the feet on a sharp surface or from a skin condition such as eczema. Foot infection in a person with diabetes is defined as the presence of at least two of the following factors (NICE 2019):

- Local swelling or induration.
- Erythema.
- Local tenderness or pain.
- Local warmth.
- Purulent discharge.

An infected foot ulcer can deteriorate swiftly, as shown by the images in Figure 1 (Edmonds et al 2020a). Recognising foot infection using the factors listed above is therefore essential.

If infection is present, urgent referral and management are crucial, the aim being to avoid amputation. People with an active diabetes foot ulcer or spreading infection should be referred to the foot protection service (FPS) (usually in the community) or the multidisciplinary foot team (usually in hospital) within one working day of presentation, as outlined in Table 1 (Diabetes UK 2017, NICE 2019).

As with any ulcer, nurses will need to undertake wound care including cleansing and selecting and applying a dressing, but these interventions are outside the remit of this article. More information on the wound care of diabetes foot ulcers can be found, for example, in Chadwick (2021).

Offloading
Offloading, or the relief of the mechanical load from the foot, is recommended as part of the standard treatment of diabetes foot ulcers (NICE 2019, Chadwick et al 2022). While offloading alone does not heal the ulcer, it promotes healing because the foot’s soft tissue is no longer being damaged by pressure from body weight, walking or ill-fitting footwear. Offloading devices include heel casts, inflatable leg troughs and air mattresses. They can be used by community and care services where indicated and according to local guidelines (Munro et al 2021).

Decisions regarding the use of offloading devices and interventions should be made by an appropriately trained healthcare professional such as an advanced clinical practitioner or a GP or following referral to a specialist podiatrist or orthotist. Pressure-relieving mattresses can be requested via the local formulary. Bespoke offloading devices can be made by a podiatrist in primary or secondary care or by a plaster technician in secondary care. Figure 2 shows a selection of bespoke, removable offloading devices.

![Figure 1. Rapid progression of infection in the neuropathic foot and the ischaemic foot](https://example.com/foot-infection-fig1)

- A person with diabetes with an intact foot on Monday
- A break in the skin on Tuesday
- Infection of the foot on Wednesday
- Gangrene on Thursday
- Foot amputation required on Friday

(Edmonds and Foster 2014)

![Figure 2. Examples of bespoke, removable offloading devices](https://example.com/offloading-devices-fig2)

- Heel casts, loose
- Heel cast in place
- Slipper cast
- Removable total contact cast
Foot care at the end of life

It is important to acknowledge that, at the end of life, the goals of diabetes management may change from optimising the patient’s blood glucose levels to managing symptoms and preserving dignity and quality of life (Kalra and Sharma 2018). Because the person will be increasingly prone to injury and pressure damage, it is imperative that nurses implement offloading measures to protect the person’s feet, as described above, to avoid the development of pressure ulcers and diabetes-related ulcers, especially if the person becomes immobile or bedbound.

**ACT NOW! checklist**

The author of this article is a member of the Insights for Diabetes Excellence, Access and Learning (iDEAL) group, a multidisciplinary team of clinicians with an interest in improving outcomes for people with diabetes in the UK. In 2020, the group published a position statement on diabetes and foot care assessment and referral (Edmonds et al 2020b). That statement provided front-line clinicians who may have been unfamiliar with diabetes and foot care, or who may have been working virtually, with practical information about foot assessment and referral. It was especially relevant at a time when remote consultations were increasingly used in part due to the restrictions prompted by the coronavirus disease 2019 (COVID-19) pandemic (Stafford 2020). The iDEAL position statement includes the ACT NOW! checklist (Figure 3), which can be used by any healthcare professional and by people with diabetes and/or their family and carers when assessing a foot issue to ensure rapid referral to appropriate services (Edmonds et al 2020b, Phillips et al 2020).

**Figure 3. ACT NOW! checklist**

Tool for all NHS primary and secondary care services to promote prompt and rapid referral to the multidisciplinary foot care team (Edmonds et al 2020b). Refer the person/people with diabetes if they present with any of the following to their foot/feet:

<table>
<thead>
<tr>
<th>ASSESSMENT OF FOOT</th>
<th>Tick if present</th>
<th>Digital photo taken to include with referral</th>
<th>Date referred</th>
<th>Document referral to specialist multidisciplinary foot care team</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - ACCIDENT?</td>
<td></td>
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<tr>
<td>Recent or history of an accident or trauma?</td>
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<tr>
<td>C - CHANGE?</td>
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<tr>
<td>Is there any new swelling, redness or change of shape of the foot?</td>
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<tr>
<td>T - TEMPERATURE?</td>
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</tr>
<tr>
<td>If there is a change in temperature present? Could this be an infection or possible Charcot?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N - NEW PAIN?</td>
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<tr>
<td>Is there pain present? Is it localised or generalised throughout the foot?</td>
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<tr>
<td>O - OOZING?</td>
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<tr>
<td>What colour is any exudate? Is there an odour?</td>
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<tr>
<td>W - WOUND?</td>
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</tr>
<tr>
<td>Can you document the size, type and position of the wound in the foot affected?</td>
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</tbody>
</table>

(Edmonds et al 2020b)
Conclusion
Foot ulcers can have serious consequences for older people with diabetes including reduced quality of life, amputation and early death. Optimal prevention and management are crucial. Nurses can support older people with diabetes to maintain optimal foot health by educating them about foot care and ensuring that they undergo an annual foot assessment. Delays in treating a diabetes foot ulcer must be avoided, and the nurse’s role includes identifying older people with diabetes who need urgent referral for diabetes foot complications. If they suspect or diagnose a diabetes foot ulcer, nurses need to refer patients to the local foot protection team, either an FPS in the community or a multidisciplinary foot team in hospital. A multidisciplinary approach to diabetes management involving GPs, dietitians, physiotherapists and social workers will assist in preventing the development of, and reducing hospital admissions for, diabetes foot ulcers.

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