Chapter 16
The Role of the Multidisciplinary Team in the Management of Diabetic Foot Complications

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Introduction

Diabetic foot complications are a global problem with increasing incidence of diabetes secondary to an ageing and more obese population. The most common diabetes-specific reason for hospital admission in the UK is the diabetic foot ulcer. This complication amounted to over one million bed days in England in the year 2009/2010 and significant resources are spent caring for these patients [1]. In fact, it is thought that one in every £150 spent by the NHS is towards the care of diabetic feet [2]. Each year, patients with diabetes undergo more than 6,000 major amputations in the UK. The number of amputations is increasing, and if current rates continue, is expected to

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exceed 7,000 per year by 2015/2016 [3]. Major amputations are associated with a 50 % two-year mortality rate in patients with diabetes [4]. Although data has been resourced from the UK, there is a similar impact to the healthcare systems globally.

The gravity of this mortality statistic is strikingly evident, especially when compared to that of many of the most common malignancies. We know that we can reduce the rates of major amputation, and therefore both the associated morbidity and mortality, by forming and supporting structured and integrated diabetic foot care pathways, led by multidisciplinary teams (MDTs). The term "foot attack" is used to describe an injury to a foot, or feet, of someone with diabetes, that may rapidly require an amputation and may not be immediately recognised by the patient, carers or clinicians [2]. There is a complex interplay between the pathophysiological processes in diabetes that culminate in foot attacks and their complications [5]. Ischaemia (both macro- and microvascular), peripheral neuropathy, immunosuppression and structural joint changes collude to form a foot more likely to be subject to trauma, more likely to become infected and less likely to heal promptly. Figure 16.1 demonstrates a typical foot attack, and the natural history may lead to life-threatening results [6]. Swift recognition and management of the foot attack saves lives and limbs. This is a central aim of the MDT in diabetic foot care.

The management of a foot attack requires the knowledge and skills of a diverse range of specialities and disciplines to provide optimal care and long-term reduction of risk of recurrence. The effectiveness of the MDT in the care of the diabetic foot cannot be underestimated [5]. Serial studies have demonstrated the improved outcomes, decreased complications and the cost-effectiveness of the MDT [2, 6, 7].

How Should This Work?

The definition of the MDT is often understood as incorporating only the clinicians within secondary care with very specialist expertise. In fact, the team is much larger and diverse,

Figure 16.1 A typical foot attack

encompassing professionals from both primary and specialist care and also the patient throughout the course of their disease.

There are four key components to ensuring that the risk of developing foot complications in patients with diabetes is minimised. These are:

1. Patient education
2. The foot protection team
3. The multidisciplinary team
4. A foot care pathway

Patient Education

Patients and carers are key to recognising or alerting clinicians. Sometimes, it can be that the foot "is just not right." This recognition is a challenge in some patients with diabetes who have sight problems, which prevent direct vision of their feet and therefore prevent them from identifying the subtle change within the foot. Similarly, neuropathy may mask the pain that would ordinarily trigger initial recognition of a new ulcer and autonomic neuropathy will ensure that a foot will remain warm to touch even with a compromised blood supply. The engagement of patients and carers in daily checks of their feet allows an early trigger when the foot is different from normal. It is then vital that patients and carers understand where they can find help and how quickly this should occur. Diabetes UK has recently produced a free booklet named "Recognising the Foot Attack," which documents the signs to look out for and provides space to record the phone numbers of key contacts. Patient leaflets are available in many languages and are a way of encouraging conversations within a family or group.

All patients with diabetes should have a foot check as part of the annual diabetes surveillance.

This allows each patient to be triaged as normal, low risk, at risk or high risk of developing future diabetic foot complications [8]. It is important that this risk is explained clearly to patients and that they are then referred appropriately to the foot protection team.

The Foot Protection Team

The foot protection team (FPT) includes general practitioners, practice nurses, podiatrists, district nurses and diabetes specialist services. These are the core components of the triage system, which ensures patients are educated, risk-stratified and monitored to decrease the risk of progression to an acute foot attack. These are often located within com-

munity services but need to have rapid access and good communication with secondary care colleagues. Many members of the team may also have contracts to work within secondary care. This service should be seamless with that of the MDT in specialist care, allowing rapid and shared care pathways to occur both into and out of the services.

The absolute prevention of complications may not be possible, but their burden will be reduced by appropriate advice and early referral should they develop. All diabetic patients should be triaged and allocated a risk category (to be reviewed at least annually) [8]. Those assessed as being at risk or as low risk should be reviewed by the FPT as per agreed protocols. Each visit provides an opportunity to educate and re-educate the patient and their carers. This responsibility of the FPT for education extends to the education of fellow healthcare professionals, to adequately assess and stratify diabetic feet.

The FPT is essential to the management of selected cases in the community, i.e. patients who are high-risk or have active disease, who would otherwise require MDT management. Patients discharged back to nursing homes, care homes or with poor mobility or difficulty with transport may not be able to manage the regular secondary-care appointments required to monitor healing. The implementation of a shared-care protocol after discharge, with clear individual care planning, will reduce the risk of non-compliance and hospital re-admission. A successfully treated foot attack still places that individual as a high-risk patient and highlights the ongoing need for long-term management plans.

These patients may need specialist footwear and off-loading devices as well as fundamental advice with regard to emollients and simple lifestyle advice, to include not walking in bare feet! Each patient needs to be counselled in the context of their lifestyle: the sole breadwinner for a family may need to work on a building site wearing the offending steel toe–capped boots, rather than wearing an off-loading cast, to ensure that they can work every day. The role of the FPT as an educator and patient advocate is crucial in ensuring

patient compliance, which will reduce the risk of re-occurrence of diabetic foot complications.

Not every individual with diabetic foot disease can be looked after within secondary care and so a large support network in the community is essential is helping to manage these patients at home, and avoid un-necessary admissions.

The Multidisciplinary Team

Each hospital trust should have a named foot care MDT. It is difficult to delineate exactly whether this team needs to be "actual," where all members meet regularly, or "virtual," with an ability to put the right clinicians into the right environment at the right time for the individual patient. The team should include diabetologists, accident and emergency (A&E) consultants, vascular surgeons, orthopaedic and/or plastic surgeons, diagnostic and interventional radiologists, podiatrists/podiatric surgeons, microbiologist, tissue viability nurses (or nurses with knowledge and experience of wound dressing), diabetes specialist nurses, orthotists, physiotherapists, plaster technicians and rehabilitation specialists. The MDT should have access to the advice and skills of other professionals, including medical photography. Within the MDT, there should be a named clinical lead, who most frequently is a diabetologist by trade, but this will vary on the individual team and their availability.

In 2011, the National Diabetes Inpatient Audit (NaDIA) found that 75 hospital sites (40.5 %) did not have a multidisciplinary team comprising a diabetologist with expertise in lower limb complications, a surgeon with expertise in managing diabetic foot problems, a diabetes specialist nurse, a specialist podiatrist and a tissue viability nurse. There had been no improvement from the previous year [9].

Referral criteria and referral pathways should be documented clearly and made accessible for the FPT, primary care practitioners and other non-specialists throughout the catchment area. A dedicated telephone and/or fax referral service

should be available [10]. Referrals can be reviewed and directed onwards to the appropriate MDT discipline to be seen in the appropriate time period.

The sign-posting of the services of the multi-disciplinary team is of great significance, and the Diabetes UK patient information leaflets provide a space for this information to be documented. A&E staff must be aware of the needs of patients with diabetic foot complications and of the need for rapid intervention. The inclusion of the A&E consultant is crucial to ensuring patients are not referred appropriately to secondary care and then turned away by inexperienced front-line staff.

Commissioners should demand agreed service standards for the MDT, with an outcome framework implemented to reduce amputation rates and diabetic foot complications. This will reduce overall healthcare spending, as complex diabetic foot complications are increasingly high-cost. Early intervention in diabetic foot complications reduces the number of secondary care admissions and therefore bed occupancy, thereby reducing cost.

The Foot Care Pathway

This is essential in providing a framework for care that can be shared by all professionals, patients and carers. The framework needs to take into consideration that the diabetic foot or the foot attack may have many aetiologies as well as treatment pathways. The most important concept is that the patient is treated within the right skill-set and right time-frame for their needs.

Patients with a foot attack or active foot disease need to be assessed rapidly. The guidelines suggest a review within one working day of presentation. This is often interpreted as a referral within one working day. It is more practical that the degree of urgency of referral is discussed with a specialist within the FPT or MDT within 24–48 h. This will allow triaging of the foot ulcer in context of other risk factors and co-morbidities. This

service needs to be accessible 7 days a week. This may be difficult to deliver within existing foot care services without the involvement of A&E staff (in the MDT), who are already commissioned as a 24-h, 7-day service.

The causative factors in the development of a foot attack or ulceration may be pressure or trauma; however, this can be compounded by infection, ischaemia, neuropathy or any combination of these. The competencies of the specialists will enable safe care plans to be implemented. A full assessment of the feet on presentation to an MDT clinician should include the assessments as outlined in Table 16.1.

The patient may simply require offloading, as their footwear may have compromised the skin. The combination of education, new footwear, and the off-loading of pressure from the ulcerated site will allow the foot to heal. Even with significant neuropathy this approach will allow healing without intervention. This will require skills from podiatry, orthotics and may require biomechanical assessment to understand why the ulcer has occurred.

The presence of a foot deformity, callus or a previous fracture may increase forces exerted at particular pressure points (most commonly on the plantar aspect). The intervention of skilled podiatrists or plaster technicians will allow off-loading in custom or non-custom footwear. Onward referral to ortho-

Table 16.1 Essential assessments during the foot attack

1. Inspection for structural foot deformity
2. A comprehensive neurological assessment of the foot
3. A comprehensive vascular assessment including Doppler waveform analysis, ankle brachial, toe brachial pressure index calculation and/or radiological imaging of the lower limb vasculature
4. Foot x-ray or MRI of the foot
5. Examination of footwear
6. Assessment of sepsis

paedic or podiatric surgeon for structural correction will allow healing, reduce long-term risks and reduce complications.

Ulceration in a limb with compromised arterial inflow is a surgical emergency. It should be recognised and managed as such. It is essential that the vascular status of any limb suffering a foot attack is interrogated to assess the inflow to the foot. This may be classified as macrovascular or microvascular disease. Any suggestion of vascular compromise must prompt urgent specialist vascular assessment. Critical limb ischaemia in a patient with diabetes is indicated if the toe pressures are <50 mmHg or ABPI <0.7. A non-healing ulcer or an ulcer associated with rest pain would indicate a need for radiological or surgical revascularisation. This decision will be made in conjunction with the patient, carers and MDT, as this decision needs to restore quality of life whilst also being associated with a favourable risk: benefit ratio. An immobile patient requiring hoisting with limited quality of life may gain some benefit from a prolonged revascularisation attempt but may benefit more from an amputation. These decisions are complex and are best made within a well-governed MDT.

It is important to remember that symptomatic varicose veins or the significant swelling after deep venous thrombosis will also increase the risk of ulceration, often secondary to poorly-fitting footwear. These patients may need venous intervention or management with compression hosiery. These need to be fitted correctly, as mal-fitting compression hosiery can lead to further foot deformities.

The patient presenting with a Charcot joint is hard to diagnose without a high degree of suspicion. It is often confused with an infected foot or a deep vein thrombosis. It is absolutely essential that these patients are rapidly assessed with the MDT to allow stabilisation of the deteriorating mid- or forefoot. This may take several months and needs on-going education and advice from the specialist team.

The addition of infection to a diabetic foot or neuroischaemic foot compounds the problem. Urgent debridement and drainage of pus reduces the risk of gangrene and gas

gangrene within the plantar space and thereby reduces the risk of amputation. The surgical toilette needs to happen with 24–48 h, as any delay results in increasing tissue loss, reducing the likelihood of salvaging a viable foot.

A foot x-ray or MRI will allow differentiation of soft tissue infection or osteomyelitis. Broad-spectrum antibiotics within locally agreed antibiotic guidelines should be commenced promptly. Pus, tissue or bone samples will direct further antibiotic therapy with culture and sensitivities. These patients often need further debridement, which may be undertaken by a competent clinician from a variety of disciplines: podiatric, vascular, orthopaedic or general surgery. These patients need regular review of their wounds and microbiology results. The presence of osteomyelitis may be an indication for a minor or major amputation if associated with significant tissue loss. The level at which this amputation is planned should be determined via an MDT discussion (including physiotherapy and rehabilitation teams). This should be at a level that is best suited to the individual's long-term mobility, whilst balancing the need to debride non-viable tissues with a margin.

Osteomyelitis may also be treated with antibiotics and this regime will be planned with the advice of microbiology specialists. These may be given intravenously and this can be facilitated in the community with shared-care protocols via a PICC (peripherally inserted central catheter) line. This affords a degree of independence for a patient who could otherwise require admission for the duration of treatment (6–8 weeks in total). Significant debridement needs to be undertaken by a clinician with the competencies, knowledge of associated anatomical structures and understanding of post-operative lower limb function. It is essential that the coverage of the debrided area is considered and this may occur through primary or secondary closure. This may necessitate a discussion with plastic surgery services. The wider availability of skin and tissue substitutes has allowed early coverage of diabetic foot amputation sites and wounds and therefore earlier return to normality.

Table 16.2 ALS foot

Remember: ALS for the Foot
Aetiology: Understand the underlying aetiology of the Foot Attack and prevent further disease progression
Life Threat: Ensure survival of the individual and long term protection
Salvage of the limb: Ensure limb salvage with functionality
Foot: Prevent contralateral foot disease

Although care and management are focused around the presenting problem (i.e. the acute foot problem), the MDT acts in a holistic fashion, treating the whole individual, rather than just the affected extremity. The mnemonic "ALS Foot" prompts clinicians to consider each of the domains outlined in Table 16.2.

Patients need to be assessed holistically and educated that the "Foot Attack" should be considered as the equivalent of a Myocardial Infarction. Aggressive risk management should be implemented, not only to treat this event, but to modify risk factors to prevent further episodes. Patients discharged from MDT care should be made known to the FPT and should be given the correct advice with leaflets to prevent re-admission. It is essential that on-going audit of all outcomes is undertaken and adverse results regularly discussed within the team.

Key Points

- Evidence suggests that the integrated, structured diabetic foot care pathway requires a dedicated FPT and MDT to deliver a clinically and financially effective service.
- Seamless work between the FPT and MDT, between primary and secondary care, is essential to the success of the foot care pathway.

- MDTs facilitate the provision of prompt assessment and intervention by the required disciplines when patients present with foot attacks.
- The thorough assessment during a foot attack includes that of the foot itself (structural, neurological, vascular, radiological and footwear) and that of the individual (remembering ALS foot).
- Major amputations, and their associated morbidity and mortality, can be avoided by early recognition and treatment of diabetic foot problems, with the help of the FPT and the foot care MDT.

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