

Reducing amputations in the UK: a key to unlock the door

Fionuala Creagh, Ellis Cerrone, Rosie McDonnell,
Dinesh Selvarajah, Rajiv Gandhi

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Article points

1. Despite the focus on foot complications in recent years, amputation rates nationally have remained fairly static.
2. Foot care pathways are complex systems and cross-organisational structures and delays — often due to failings at the interfaces — are leading to unnecessary amputations.
3. A structured approach to service improvement, focusing on the patient journey, can yield major reductions in amputations over a short period of time.

Key words

- Diabetes
- Lower limb amputation
- Service improvement

Authors

Author details can be found on the last page of this article.

This article details a comprehensive service improvement conducted by Sheffield Diabetes Foot Service with the aims of reducing amputation rates and improving quality of care. The identification of problems, strategies employed to tackle them and outcomes of interventions are discussed within this article.

Amputation is one of the most feared complications of diabetes and has an enormous impact on people with diabetes' lives, including loss of occupation and status, disfigurement, reduced mobility and depression. In addition, prognosis is bleak, with mortality rates of 50% at 2 years (Kerr, 2012) after amputation. A recent study has shown that there is a 10-fold variation in the incidence of major amputation as a consequence of diabetic foot disease (Holman et al, 2012). Despite heightened awareness about the problem, amputation rates in England have remained fairly static in recent years (National Cardiovascular Health Network, 2014). Therefore, finding innovative ways to improve foot care services in order to reduce diabetes-related amputation rates is a priority.

Despite on paper fulfilling all the recommendations proposed by *Putting Feet First* (Diabetes UK, 2012), *Putting Feet First National Minimum Skills Framework* (Diabetes UK, 2011) and the National Institute for Health and Care Excellence's diabetic foot care guidelines (NICE, 2004) — including an integrated care pathway and a multidisciplinary foot team — Sheffield had one of the highest amputation rates in the country between 2007–10 (4.4 amputations per 1000 people with diabetes; national average of 2.7 amputations per 1000 people with diabetes).

The aim of the authors' service improvement project was to better to understand the reasons behind Sheffield's high diabetes-related amputation rate, and devise and introduce

interventions to lower this number. A further aim was to improve the overall patient experience within the service.

Understanding the problem

The first stage of this process was to gain a better understanding of the key factors that were leading to this high amputation rate. The explanation that high amputation rates are the result of the absence of integrated foot care pathways and multidisciplinary foot teams did not apply.

The first step was to construct a detailed map of the entire patient journey. A detailed root-cause analysis of every amputation (minor and major) over a 12-month period was then undertaken to identify those elements of the pathway that were dysfunctional.

Root-cause analysis of all amputations ($n=140$) identified at least 20% as potentially avoidable. Key factors were delayed referral from primary care, delays in obtaining investigations and suboptimal management of antibiotic therapy (McDonnell et al, 2014).

Detailed mapping of the care pathway demonstrated a high level of complexity that was often difficult for both healthcare professionals and patients to navigate. A further study showed that 61% of general practices in Sheffield did not have any members of staff that had attended any form of training on how to screen for diabetic foot complications. In addition, between 2008 and 2012, there had been an 80% rise in our foot clinic activity, without the equivalent rise in resource, and

this was resulting in significant levels of both patient and staff dissatisfaction (McDonnell et al, 2014).

Intervention

Problems potentially contributing to the area's high diabetes-related amputation rate were identified across both primary and secondary care. Thus, no single intervention was likely to result in reducing the amputation rate, or the secondary objectives of reducing delays and improving patient experience.

Various strategies were employed to engage with relevant stakeholders and put in place changes to our service. These strategies are described in the 'Ensuring effective teamwork and shared goals' section and the key interventions are shown in *Table 1*.

Outcomes

In 2008–9, there were 23,690 people >17 years old with diagnosed diabetes in Sheffield, representing 4.2% of the total population. This rose to 27,895 people in 2012–13, representing 6% of the population. Over this period, there was also a rise in the activity within the multidisciplinary foot team by 80%.

As a result of the interventions we have put into place, there has been a major reduction in the number of amputations carried out in people with diabetes (National Cardiovascular Health Intelligence Network, 2014), which has fallen by around one-third from 4.4 to 2.7 amputations per 1000 people with diabetes (2007–10 versus 2010–13 as shown in *Figure 1a*. Major amputations over this period also fell from 1.75 to 0.9 amputations per 1,000 people with diabetes (*Figure 1b*).

Other surrogate markers of the quality of care, such as the number of days in hospital for diabetic foot problems fell from 265.4 to 170.9 days per 1000 people with diabetes. It has meant that, despite the rising prevalence of diabetes and the increasing numbers of patients attending the diabetes foot clinic, 18 fewer people with diabetes are losing a limb in Sheffield every year (45% reduction). In terms of the direct costs of the surgery alone, this represents an annual saving of >£300,000.

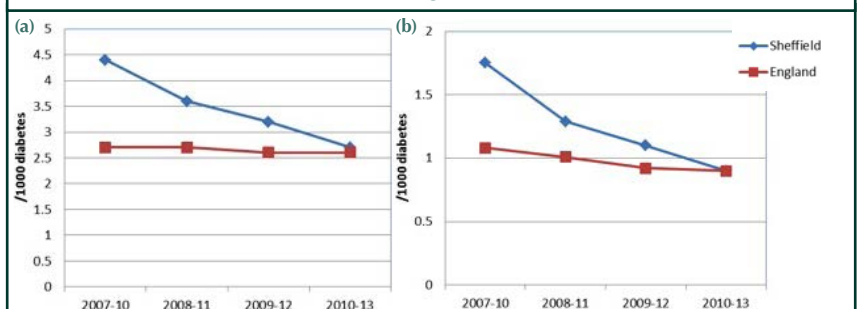
Table 1. Interventions undertaken in Sheffield to reduce diabetes-related amputation rates.

1. Introduction of a diabetes foot hotline, carried by a consultant diabetologist, to provide immediate advice to any community healthcare professional and enable fast-track to the multidisciplinary foot clinic.
2. Simplification of the footcare pathway and a single point of referral for all foot-related referrals.
3. Improved access to training for primary care screeners, including the development of a community-based diabetes podiatrist whose role was to target GP practices with training needs, as well as to manage vulnerable patients with foot problems who had difficulty accessing the multidisciplinary clinic.
4. Improved education of patients, including the development of specific leaflets that included important contact telephone numbers, enabling them to access specialist services without the need for referral by their GP.
5. Redesign of multidisciplinary foot clinics using service improvement tools, specifically process mapping and Plan, Do, Study, Act (PDSA) cycles.
6. Closer liaison with microbiology, including detailed protocols for surgical and wound swab specimens and consultant microbiologist presence in multidisciplinary meetings, with the aim of ensuring more appropriate antibiotic prescribing.
7. Daily automated email to inpatient diabetes foot team of any admission of a known foot clinic patient.
8. Development of a simple inpatient foot-screening tool.

As many of the service improvements were only put in place towards the latter part this period, we anticipate that the full benefit has yet to be realised (NICE, 2012).

There have also been many qualitative benefits. Innovative practices such as the provision of a consultant-held foot hotline (which receives between 10–20 calls per week) has been universally popular with healthcare professionals in the community and a large amount of positive feedback has been received. It has facilitated more prompt referrals from

Figure 1. Total amputation rates per 1000 patients with diabetes between 2007–13 Sheffield and England for (a) total and (b) major amputations (National Cardiovascular Health Intelligence Network, 2014).



primary care and more rapid handling of referrals by secondary care, together reducing delays. In addition, every contact through the hotline is an opportunity for education and intervention/treatment can commence even before the patient has been seen by the multidisciplinary foot team. The restructuring of the diabetes foot clinics has led to the ability to review patients with a foot care emergency throughout the whole week. Patient feedback has also been significantly positive, with a recent survey showing over 90% satisfaction with the service provided. Staff morale has also improved dramatically.

Not all interventions were universally successful. Despite the introduction of a simple inpatient foot screening tool and an extensive programme of ward-based education, recorded levels of foot examination remain poor; our levels in the National Diabetes Inpatient Audit have not improved significantly and are similar to the national average (NHS Information Centre, 2014). However, there is some anecdotal evidence that the project has heightened awareness of diabetes foot problems and referrals to the inpatient podiatry service have increased. Despite improving access and targeting of individual GP practices, the take-up of training on foot screening remains patchy.

Ensuring effective teamwork and shared goals

The care of people with diabetic foot disease involves a large number of healthcare personnel across both primary and secondary care. A complex and challenging redesign such as this is only possible due to the engagement of all the key stakeholders. In order to ensure “buy-in” from all of these groups, we developed a steering committee that had representatives from primary care (medical and nursing), the PCT/CCG, podiatry, vascular surgery, diabetes nursing, administrative staff and patient representatives. Other key stakeholders (e.g. microbiology, radiology, orthotics, etc) were also invited as required. Many meetings had external facilitators, with expertise in skills such as service mapping. Other meetings, particularly involving the secondary care aspects of the

pathway, were facilitated by the deputy medical director and patient safety lead for the Trust; this ensured that the changes we were engaging in had the support of senior management.

Another key element of the successful delivery of the project was to give clinicians time to step off the treadmill of day-to-day responsibilities, to enable them to conduct the analyses and lead the drive for change.

A major benefit of this collaboration was how it translated into day-to-day clinical practice. We have been able to create a truly integrated pathway and broken down traditional barriers between services as a result of the relationships that have been developed. It has also enabled more effective multidisciplinary working. The success of the programme also depended on the passion and dedication of everyone within the team and the absence of traditional hierarchies, which meant that all members of the team had an equal voice.

Summary

Around 6000 people with diabetes undergo an amputation every year in England (Health and Social Care Information Centre, 2013). It is one of the most feared complications of diabetes and has an enormous impact on the lives of those affected. In addition, mortality following amputation is higher than for many cancers (Armstrong et al, 2007). We also know that there is a 10-fold variation in amputation rates across the country (Holman et al, 2012). It is for these reasons that both the health service and organisations such as Diabetes UK have made the reduction of amputation rates a key priority, with campaigns such as Putting Feet First (Diabetes UK, 2012). Key to this strategy is to ensure that all areas have an integrated foot care pathway and access to a multidisciplinary foot team.

Our experience would suggest that the reasons behind variations in amputation rates are complex. Despite having all of these services in place, our amputation rates were among the highest in the country; it is not enough to have the appropriate structures in place.

As a result of this project, a better understanding of which parts of the pathway

add value to patient care, and which are just unnecessary complexities, has been gained. Delays in the patient journey are leading to avoidable amputations. These delays are often due not to weaknesses in individual departments but to failings at the interfaces, where different parts of the service interact. It is only by analysing the entire pathway and focussing on the patient journey that we have come up with novel solutions. This approach is far more effective than focussing on individual departments or functions.

A number of different initiatives targeting the interface between key parts of the pathway were implemented. Innovative practices such as the development of a foot hotline and a simplified foot care pathway, which is now the cornerstone of the training we provide to primary care healthcare professionals, have enabled the care we deliver to flow more seamlessly. Also key to the success of the project was using proven service improvement tools and ensuring that all key stakeholders were involved in the development of the strategy, which created an environment conducive to engendering improvement.

As a result of the interventions put in place, there has been almost a halving of amputation rates in Sheffield (both major and minor), over a period when the prevalence of diabetes has risen substantially and the national amputation rate has remained static.

However, many challenges remain. Screening for diabetic foot problems in the primary care setting, and knowing how to deal with foot care emergencies, remains the first line of defence in preventing amputation. Yet, unlike with diabetic eye screening, there is no requirement for any form of mandatory training for primary care staff who undertake this procedure. Until this issue is addressed, it is likely that the level of training will remain patchy and there will continue to be delays in patients being referred

to the specialist team. There also continue to be issues around improving inpatient care and ensuring that all patients with diabetes get a regular foot check.

Many of the key problems identified here are likely to resonate in other areas of the UK. Developing appropriate solutions is not always straightforward. Other Trusts may be able to adapt the tools and strategies developed in Sheffield and in so doing drive down their diabetes-related amputation rates. ■

Authors

Fionuala Creagh is a Consultant Diabetologist, Academic Department of Diabetes, Endocrinology and Metabolism, Sheffield Teaching Hospitals NHS Trust. Ellis Cerrone is a Medical Student, University of Sheffield. Rosie McDonnell is a Medical Student, University of Sheffield. Dinesh Selvarajah is a Senior Lecturer in Diabetes, Academic Department of Diabetes, Endocrinology and Metabolism, Sheffield Teaching Hospitals NHS Trust. Rajiv Gandhi is a Consultant Diabetologist, Academic Department of Diabetes, Endocrinology and Metabolism, Sheffield Teaching Hospitals NHS Trust.

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