Insight
Health Economics

DIABETIC FOOT CARE IN ENGLAND: AN ECONOMIC STUDY

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JANUARY 2017

Contents

Acknowledgements

We would like to thank the following individuals and organisations for their help with this paper:

Emma Barron, Head of Health Intelligence (Diabetes), Public Health England
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Nikki Joule, Policy Manager, Diabetes UK
Wing May Kong, Consultant Physician Endocrinology and Diabetes, London North West Healthcare NHS Trust
Graham Leese, Consultant and Professor in Diabetes and Endocrinology, Ninewells Hospital and Medical School, Dundee
Gerry Rayman, Consultant in Diabetes, Ipswich Hospital NHS Trust
Mark Sutton-Smith, London Northwest Healthcare NHS Trust
Gaytree Todd, Specialist Podiatrist in Diabetes, London Northwest Healthcare NHS Trust
Bridget Turner, Director of Policy and Care Improvement, Diabetes UK
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Executive Summary

Ulceration and amputation exact a heavy toll on the lives of many thousands of people with diabetes every year. They also cost the NHS hundreds of millions of pounds annually. In this paper, we produce estimates of the numbers of people with diabetes experiencing ulcers or amputations in England each year, and of the cost of their care. We also examine the quality of current care for the diabetic foot, and the potential for improved care both to improve and lengthen lives, and to reduce NHS costs. We look at services around the country where improvements in the quality of diabetic foot care have been followed by reductions in ulceration and amputation rates, and savings to the NHS.

There are around 7,000 lower limb amputations in people with diabetes in England each year, and the likelihood that someone with diabetes will have a leg, foot or toe amputation is around 23 times that of a person without diabetes. We estimate that 2-2.5% of the diabetes population has an ulcer in any given week, around 60,000-75,000 people in England.

Both amputation and ulceration are associated with high mortality. Research suggests that only around 50% of patients survive for two years after major amputation in diabetes; a similar survival rate to that for colon cancer and very much lower than survival for breast cancer or prostate cancer. Five-year survival rates of less than 60% are reported in those who have experienced ulceration.

Quality of life both for those with current ulcers and for people who have undergone major amputation is lower than for patients with other long-term conditions such as chronic obstructive pulmonary disease or renal disease requiring haemodialysis.

For many people with diabetes, ulceration is an ongoing problem. Studies suggest that around a quarter of patients who become ulcer-free have developed new ulcers within 3 months.

We estimate that the NHS in England spent £972m. - £1.13bn on healthcare related to foot ulceration and amputation in diabetes in 2014-15; equivalent to 0.72-0.83% of the entire NHS budget. Around two thirds of this expenditure was on care in primary, community and outpatient settings for ulceration.

Available data suggest that care for the diabetic foot could be improved in many areas. The 2015 National Diabetes Foot Care Audit found that many patients experienced long waits for specialist foot care. Almost a third of patients covered in the audit presented themselves to specialist services without a referral. Of the rest, almost two fifths were not seen by the foot care service until at least two weeks after the first healthcare contact for their ulcer. This is in spite of National Institute for Health and Care Excellence (NICE) guidance which recommends that people with diabetes with an active foot problem should be referred to a multidisciplinary foot care service or foot protection service within one working day and triaged within one further working day.

NICE also recommends that all adults with diabetes should have their risk of developing a foot problem assessed if they are admitted to hospital, and that those with diabetic foot problems should be referred to a multidisciplinary foot care team within 24 hours of the initial foot examination.

According to the National Diabetes Inpatient Audit, in 2015 almost two thirds of inpatients with diabetes included in the audit had no documentation in their case notes of a foot risk assessment at any point during their hospital stay. Of those with active foot disease, 40.5% were not seen by a member of a multidisciplinary foot care team within 24 hours of admission Almost a third of hospital sites that provided information did not have a multidisciplinary foot care team.

Delays in access to specialist care are associated with increased ulcer severity, slower healing, increased risk of amputation and higher NHS costs. The potential for improved services to deliver better outcomes and cost savings will vary from place to place, depending on baseline standards of care, and on the type of improvement undertaken. We present in this paper illustrative data on outcomes and costs from three service improvements.

> In Ipswich Hospital NHS Trust, an inpatient improvement programme was associated with a reduction of two thirds in the ulceration rate in inpatients with diabetes, averting an

estimated 19 ulcers a year. The estimated annual saving from averted bed days was £214,000, more than 20 times the cost of the improvement programme.

In Somerset, the major amputation rate fell by 43% after the introduction of a county-wide integrated diabetes foot pathway, averting an estimated 19 amputations a year. Inpatient days for diabetic foot disease fell by 23%. The estimated annual saving was £926,000, almost 6 times the cost of the service improvement.

In Brent, a multidisciplinary specialist foot care team was established in 2004. Brent CCG now has the lowest diabetes amputation rate in England. The major amputation rate in Brent is 71% below the England rate, and 55% below the rate for demographically similar CCGs. The number of days in hospital for diabetic foot disease is 26% below the England level and 22% below the level for comparator CCGs. As there are no robust local data on outcomes before 2004, we used current data from 10 demographically similar CCGs as a proxy, to estimate the impact of the MDFT. Savings from averted amputations and bed-days, relative to the mean for the 10 most similar CCGs, are estimated at £474,000, almost 5 times the cost of the service improvement.

The Scale of the Problem

People with diabetes are around 23 times as likely to have a leg, foot or toe amputation as those without diabetes.[1] Approximately 8 out of every 10,000 people with diabetes undergo major lower extremity amputation (above ankle) each year, and 18 out of 10,000 have minor amputation (below ankle).

Amputations can lead to long-term changes in patients' mobility, living conditions, and relationships; they can substantially reduce quality of life. People with diabetes who have had amputations are also at risk of premature death. For major amputation, in particular, the prognosis is poor; the limb on the other side is at risk, and research suggests that only around 50% of patients survive for two years after major amputation in diabetes.[2] The one-year mortality rate has been estimated at 32.7% after major amputation and 18.3% after minor amputation in people with diabetes.[3] Five-year cumulative mortality for patients with diabetes undergoing a first major amputation has been estimated at 68% to 78.7%.[4,5]

In many cases, amputation occurs as a result of foot ulceration and infection. People with diabetes have high rates of peripheral artery disease (PAD) and neuropathy (nerve damage). Both these conditions can lead to foot ulcers. In PAD the large blood vessels supplying the lower limbs become narrowed and blood flow to the legs and feet is reduced. The skin becomes thinner and this can lead to ulceration, and also reduces the likelihood that ulcers heal. Neuropathy causes loss of sensation, which increases the risk of undetected injury and skin ulceration. However, neuropathy can also reduce blood flow to the foot – partly by increasing calcification in the walls of medium to smaller arteries and partly by interfering with the normal distribution of blood in response to local need. All foot ulcers are susceptible to infection and this can spread rapidly causing extensive tissue destruction.

It is estimated that 5-7% of people with diabetes have had a foot ulcer at some time, and that 2% experience at least one new foot ulcer in a year.[6,7,8,9] There are currently no national data on foot ulcer incidence and prevalence in diabetes in England. In Scotland the SCI-DC Network extracts diabetes-related data from GP practices and specialist diabetes clinics. The 2015 data extract showed that 2.0% of the diabetes population had active foot ulceration (point prevalence).[10] An earlier data extract, in 2010, showed a point prevalence of 2.5%.[11] However, it is known that ulcers are poorly recorded in GP records, so these figures may be underestimates. It is not known whether the rate has reduced since 2010, or whether recording practices have changed.

If it is assumed that ulceration rates in England are similar to those in Scotland, we can estimate that at least 60,671 – 75,838 people with diabetes in England have foot ulcers at any given time. These figures are based on the two Scottish point prevalence estimates and the diagnosed diabetes population in England in 2015-16, (3,033,529 people aged 17 and over) as measured in the Quality and Outcomes Framework (QOF).[12] However, it is believed that there are also many people with undiagnosed diabetes. It is thought that total diabetes prevalence may be around 20% higher than the figure derived from QOF registers.[13]

For many people with diabetes, ulceration is an ongoing problem. Only two thirds of diabetic foot ulcers eventually heal without surgery.[14,15,16] Patients who have had a foot ulcer are at increased risk of further ulceration. Studies suggest that around a quarter of patients who become ulcer-free have developed new ulcers within 3 months, and 34-41% within 12 months.[15,17,18,19,20]

Some foot ulcers are painful, and treatment often requires that a considerable amount of time be spent on clinic visits, hospitalisation and frequent changes of wound dressings. This can impinge on many aspects of patients' family and working lives.

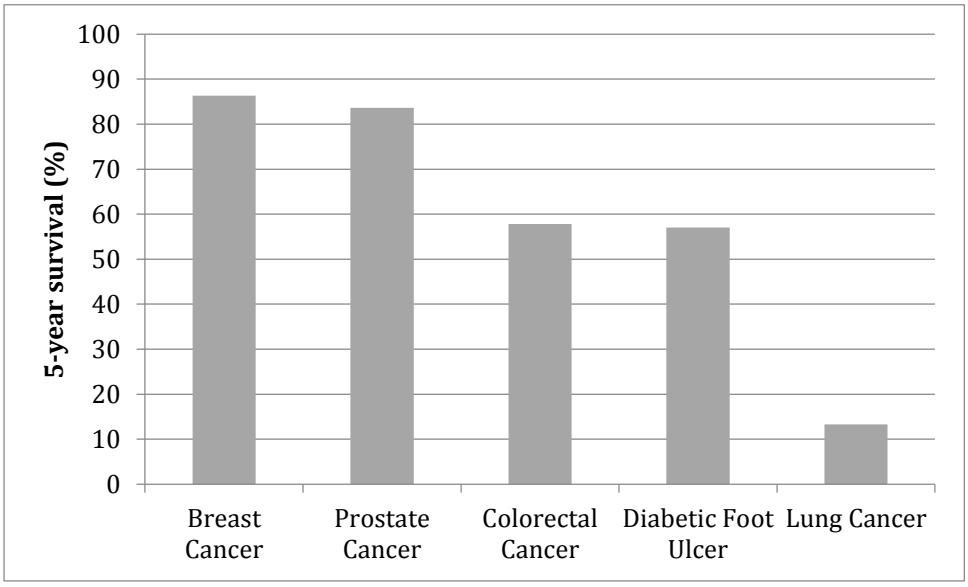
Diabetic foot ulcers are also associated with high levels of mortality. A 5-year mortality rate of 44% was observed in a study of patients presenting with new ulcers at a Liverpool foot clinic.[21] International studies report mortality rates of 42% after 5 years in patients who have experienced primary ulcer healing and 51.7% after average follow-up of 6.5 years.[15,22,23,24]

The 5-year mortality rate observed in the Liverpool study is similar to that for patients with colon cancer and very much higher than mortality rates for patients with breast cancer and prostate cancer.

Figure 1 shows net age-adjusted 5-year survival rates for the four most common cancers, taken from Office for National Statistics (ONS) data,[25] and estimated net survival for diabetic foot ulcers, based on data from the Liverpool study. Net survival is the ratio of the observed survival and the survival that would have been expected if the patients had only experienced the background mortality seen in the general population. (In order to produce an illustrative net survival estimate, the Liverpool survival figure has been adjusted to allow for expected survival in the general population aged 65–74 years. Using this adjustment it is estimated that 5-year net survival for patients with diabetic foot ulcer is around 57%).

It is important to note, however, that many people with diabetic foot ulcers will also have other conditions such as ischaemic heart disease, which increase mortality risk. In addition, diabetes is associated with increased risk of a wide range of life-threatening comorbidities and acute adverse events such as hypertension, stroke and renal failure. Given the complex inter-relationships between these complications and comorbidities of diabetes, it is very challenging to estimate the discrete impact of individual complications on mortality: no studies have been identified that estimate the discrete impact of ulceration.

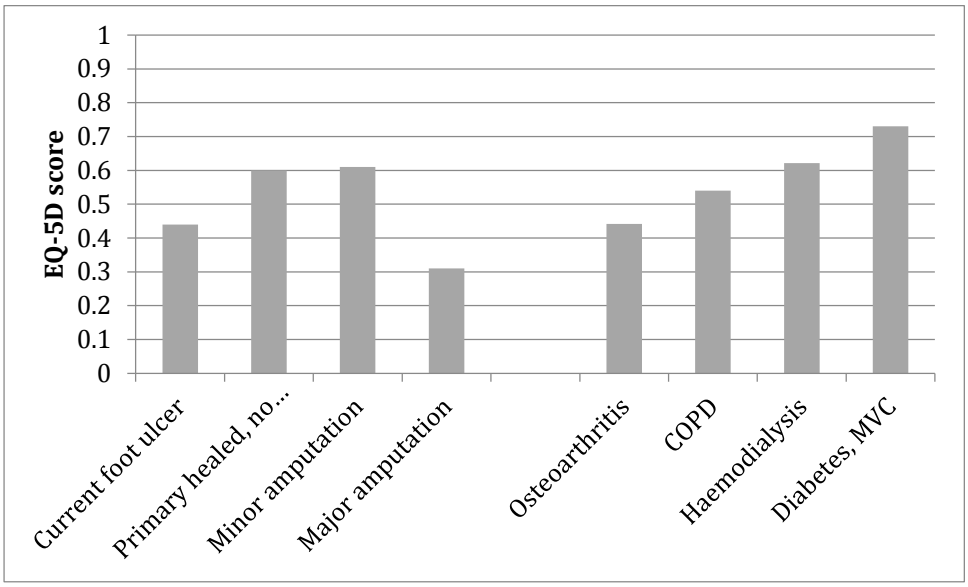
Figure 1. Five-year net survival rates for the four most common cancers (Source: ONS) and estimated 5-year net survival rate for patients with diabetic foot ulcer (Estimate derived from: Moulik et al.[21])



Health-related quality of life is often measured using generic metrics that allow comparison with other clinical conditions. In England, the National Institute for Health and Care Excellence (NICE) has specified that EQ-5D is the preferred measure for cost-effectiveness analysis.[26] EQ-5D scores are derived from patient questionnaires covering five domains: mobility, pain/discomfort, anxiety/depression, ability to care for oneself, and ability to perform usual tasks. Scores are recorded on a metric in which 0 represents death and 1 represents perfect health. EQ-5D can be used in conjunction with survival data to estimate quality-adjusted life years (QALYs).

Using the EQ-5D instrument, a Swedish study recorded scores for patients treated by a MDT between 1995 and 1998.[27] The scores recorded for current ulcers and for major amputation are lower than those recorded in other studies for people with diabetes and macrovascular complications,[28] or with other long-term conditions such as chronic obstructive pulmonary disease[29] or end-stage renal disease requiring haemodialysis[30] (Figure 2).

Figure 2 EQ-5D (quality of life) scores for people with ulcer and amputation in diabetes and for other conditions (Sources: Ragnarson Tennvall et al.[27] Brazier et al.[29] UKPDS[28] Wasserfallen et al.[30])



MVC: Macrovascular complications

The burden of diabetic foot disease is likely to increase; the incidence of type 2 diabetes is rising and contributory factors to foot disease, such as neuropathy and peripheral artery disease, are present in more than 10% of people at the time of diagnosis of type 2 diabetes.[31]

Quality of Foot Assessment and Care

In recent years, there have been several national initiatives aimed at improving the care of people with, or at risk of, diabetic foot disease in England. In 2015, NICE published comprehensive guidelines for the prevention and management of foot problems in diabetes (NG19).[32] A National Minimum Skills Framework sets out the clinical skills required for the delivery of high-quality foot care services for people with diabetes.[33] Diabetes UK has run a *Putting Feet First* campaign aimed at raising awareness of the diabetic foot and reducing the number of preventable amputations.

It is not possible systematically to assess the quality of care against the principles set out in these guidelines, as national datasets do not measure all the activities set out in these documents. There are however data on foot screening, on amputation rates, and on aspects of inpatient care. In addition, the National Diabetes Foot Care Audit provides information on the provision of NICE-recommended structures of care, and on clinical outcomes for people experiencing ulceration. The available evidence on the quality of foot care will be summarised here. The most recent data will be used from each source.

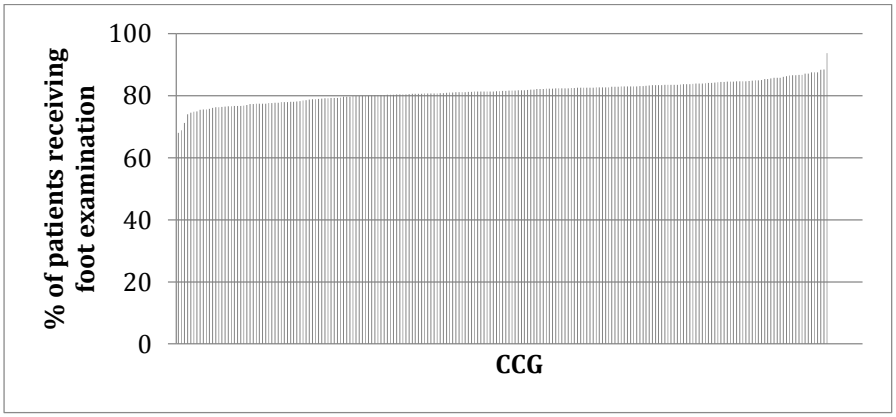
The Quality and Outcomes Framework for General Practice (QOF) provides financial incentives for regular foot examination in patients with diabetes (Box 1).

Box 1: QOF indicator for the diabetic foot, England 2015-16

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

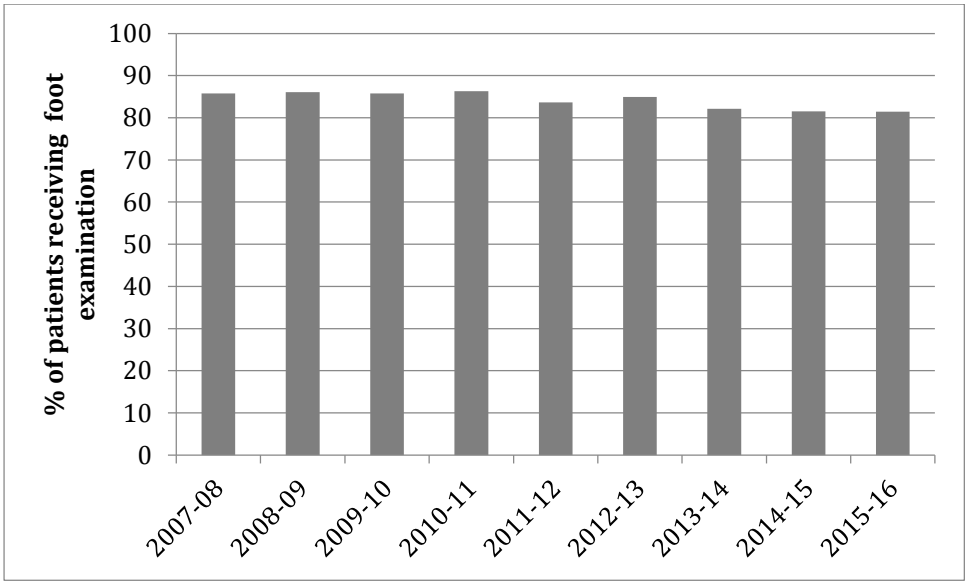
In 2015-16, GPs recorded that 81.45% of people with diagnosed diabetes had a foot examination. However, there is substantial variation in foot examination rates across Clinical Commissioning Groups (CCGs), with the percentage of people receiving examinations ranging from 68.09% in Bradford Districts CCG to 93.77% in City and Hackney CCG (Figure 3). There is also variation in rates by diabetes type and age. According to the National Diabetes Audit, in 2014-15, 86.7% of those with Type 2 diabetes in England had a foot examination, but only 72.4% of people with Type 1 diabetes. Younger people were much less likely than older people to have their feet checked; of people under 40, 59.9% of those with Type 1 diabetes had a foot examination and 73.6% of those with Type 2 diabetes.[34]

Figure 3. The percentage of people with diabetes with a record of a foot examination within the preceding 12 months, by CCG, England 2015-16 (Source: QOF[12])



The QOF has included an indicator relating to routine foot review in diabetes for several years, although the requirements for the review have changed over time. QOF data indicate that the percentage of patients having a review has consistently been between 80% and 90% over the past 9 years (Figure 4). Until 2011-12, the QOF indicator did not require risk stratification. Between 2007-08 and 2010-11, the average number of patients having a foot review was 85.99%. In the 5 years since the introduction of risk stratification, the average percentage of patients having a foot review has been 82.73%.

Figure 4. Percentage of patients with diabetes receiving routine foot review, England, 2007–16 (Source: QOF[12])



According to Public Health England data, each year 8.09 in every 10,000 adults with diabetes in England undergo major amputation, and 18.13 undergo minor amputation.[35] The annual major amputation rate varies 10-fold across CCGs, from 2.01 per 10,000 adults with diabetes in Harrow to 21 in Blackpool (Figure 5). The minor amputation rate also varies 10-fold, from 3.75 in Brent to 38.84 in Scarborough and Ryedale (Figure 6).

Figure 5. Annual major lower extremity amputation rate per 10,000 adults with diabetes, 2012-15, by CCG (Source: PHE[35])

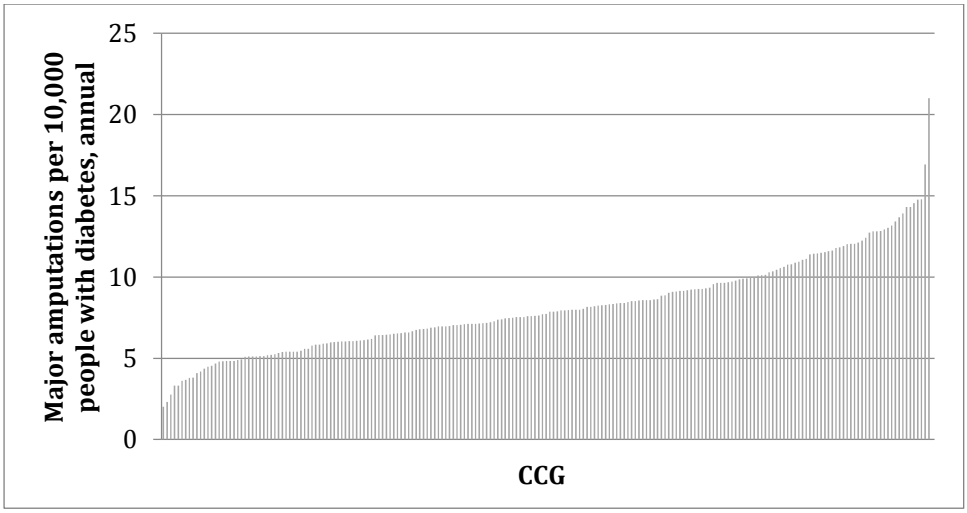
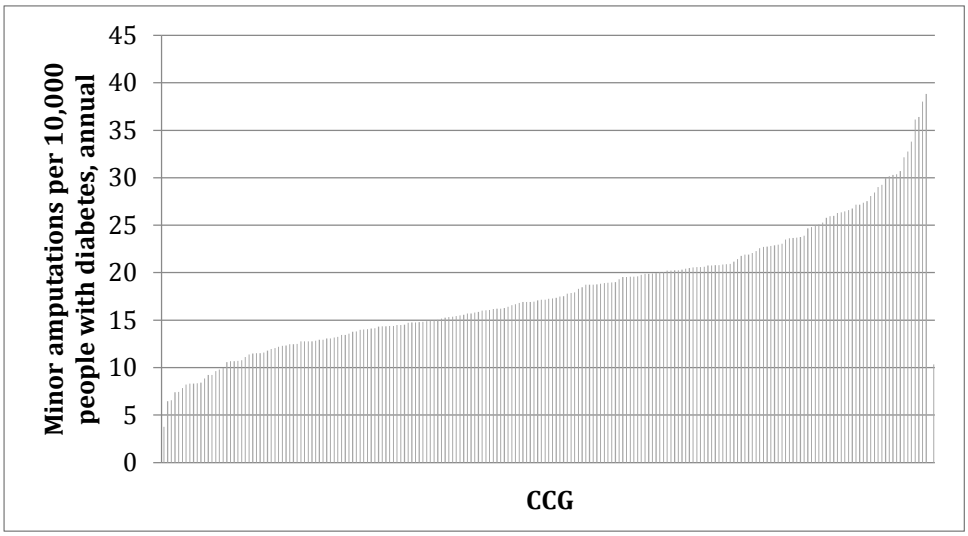


Figure 6. Annual minor lower extremity amputation rate per 10,000 adults with diabetes, 2012-15, by CCG (Source: PHE[35])

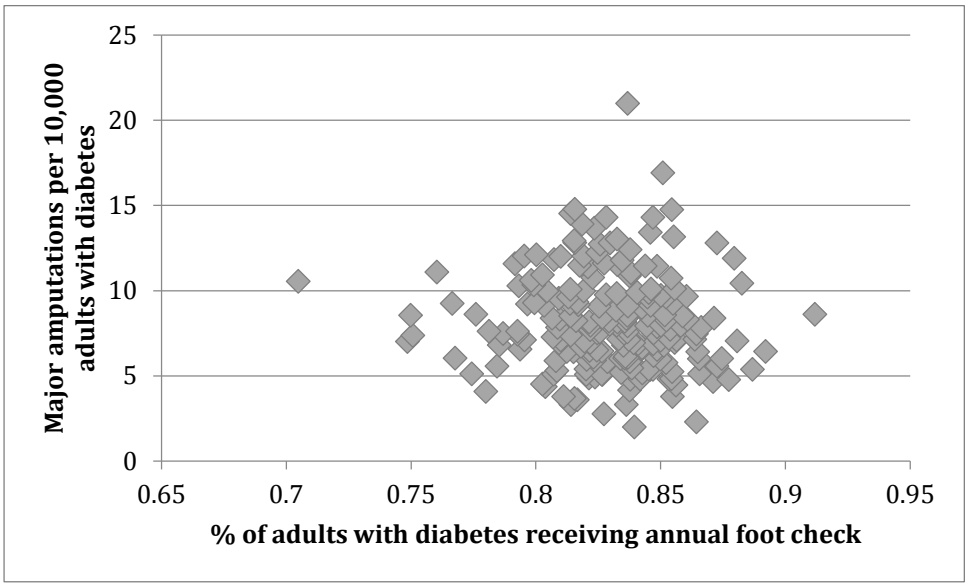


Amputation figures require careful interpretation. They can be affected by many factors, including quality of primary care, delays in presentation or referral to specialist services, availability and quality of specialist resources, population demographics and prevailing medical opinion.[36] A high incidence of amputation does not necessarily reflect adversely on the quality of specialist services.

It has sometimes been argued that the optimal use of minor amputation will lead to prevention of major amputation, and that an inverse relationship should be observed between the two types (the 'Hi-Lo' ratio).[37] However, there is no evidence for such a relationship in England: areas with a high incidence of minor amputations tend also to have a high incidence of major amputations.[1] Care is also needed in comparing amputation rates at local level owing to variability between providers in the quality of coding.

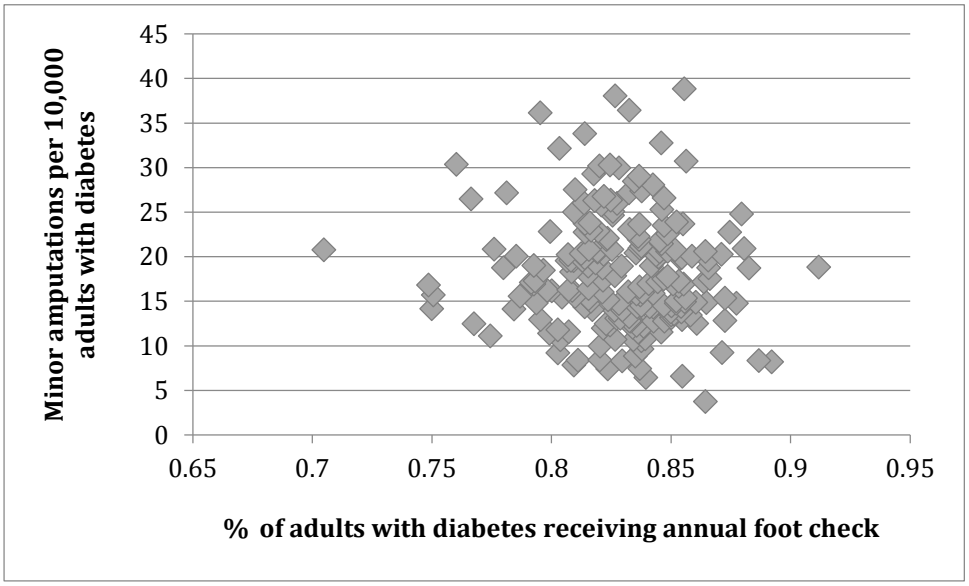
Figures 7 and 8 show the percentage of patients receiving a routine foot review and the incidence of major and minor amputation, respectively, by CCG. It can readily be seen that there is little or no correlation between foot review performance and amputation incidence. A number of factors could account for this. For example, there may be a 'lead time' between effective early identification of risk and reduction in amputations. But there may also be deficiencies in the quality of the foot examination, and/or a failure to refer high-risk patients to appropriate follow-on services. The QOF indicator does not measure whether appropriate action is taken in the light of foot examination results, and routine datasets do not capture the results of foot examinations, or subsequent referral patterns. Foot examinations are crucial, but are unlikely to deliver improved outcomes unless followed by appropriate referral and care.

Figure 7. Percentage of adults with diabetes having foot checks, and annual major amputations per 10,000 adults with diabetes, by CCG, 2012-15 (Source, PHE,[35] QOF[12])*



*In 2012-13 the foot check indicator used was DM10: The percentage of patients with diabetes with a record of neuropathy testing in the preceding 15 months

Figure 8. Percentage of adults with diabetes having foot checks, and annual minor amputations per 10,000 adults with diabetes, by CCG, 2012-15 (Source, PHE,[35] QOF[12])*



*In 2012-13 the foot check indicator used was DM10: The percentage of patients with diabetes with a record of neuropathy testing in the preceding 15 months

The National Diabetes Foot Care Audit (NDFA) in 2015 asked commissioners of care in England and Wales whether the following NICE-recommended structures of care were in place in their areas:

- A training scheme ensuring healthcare professionals have the necessary competence to undertake routine foot examinations during annual diabetes reviews.
- An established referral pathway for patients identified as higher risk during annual foot

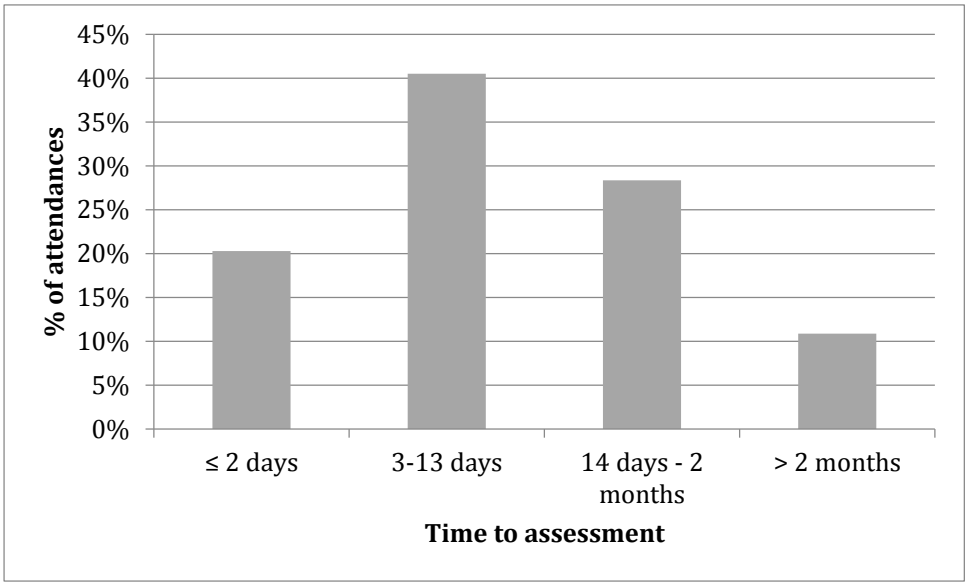
examination into a designated foot protection service.

- An established referral pathway for patients with new, deteriorating or recurrent foot disease to expert assessment within, when necessary, 24 hours.[39]

They found that almost 40% of participating organisations were unable to give a definitive response (yes or no) to one or more of these questions. Of those that did provide a response, 57.1% said that they provided training for routine diabetic foot examinations, 77.4% said there was an established referral pathway for higher-risk patients, and 54.1% said there was a pathway for assessment within 24 hours.

The NDFA also examined, for the first 5015 patients (5025 ulcers) entered in the audit, the interval between first presentation to a health professional and first assessment by the multi-disciplinary foot team. Current NICE guidance recommends that people with diabetes with an active foot problem should be referred to the multidisciplinary foot care service or foot protection service within one working day and triaged within one further working day. The audit found that almost a third (29.07%) of patients presented themselves to specialist services without a referral. Of the remainder, only one in five was seen within the NICE- recommended time frame of 2 days. If self-presenting patients are excluded, almost two fifths of patients (39.2 per cent) were not seen by the foot care service until at least two weeks after the first healthcare contact for their ulcer (Figure 9).

Figure 9 Interval between first presentation to a health professional and first assessment by multi-disciplinary foot team, England and Wales, excluding self-presenters, 2014-2015 (Source: NDFA[39])



The NDFA also found that patients who waited longer to be seen tended to have more severe ulcers and longer ulcer duration than those who were seen quickly. Ulcer severity was measured using the SINBAD (Site, Ischaemia, Neuropathy, Bacterial Infection and Depth) score, with a score of 3 or more considered severe.[40] Among patients who were self-presenting, 33.9% of ulcers were severe, while 59.7% were severe in those who waited more than 2 months for specialist care (Figure 10). Of self-presenting patients, 56.3% were ulcer-free at 12 weeks, compared with 34.3% of patients who waited more than 2 months (Figure 11).

Figure 10. Ulcer severity by time to first assessment by multi-disciplinary foot team, England and Wales, 2014-2015 (Source: NDFA[39])

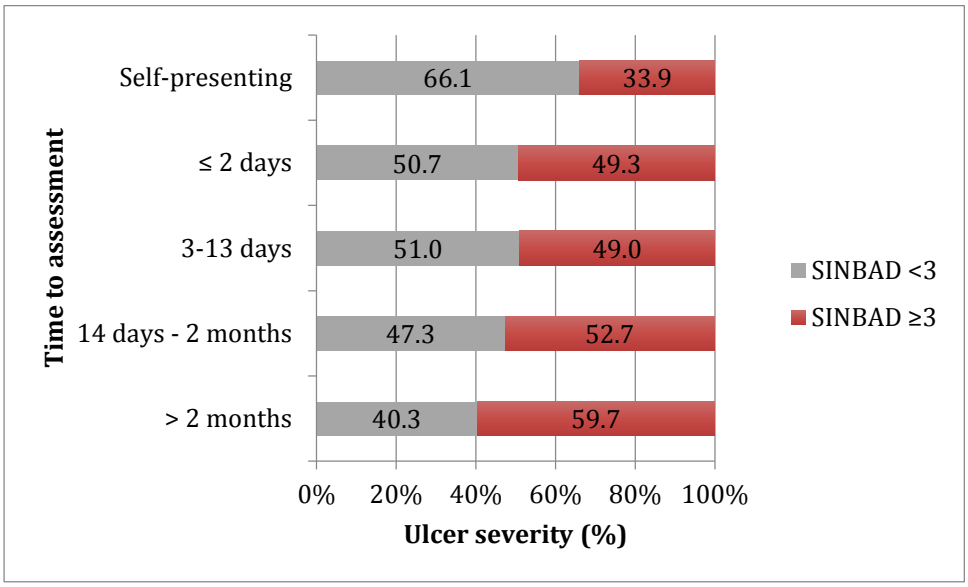
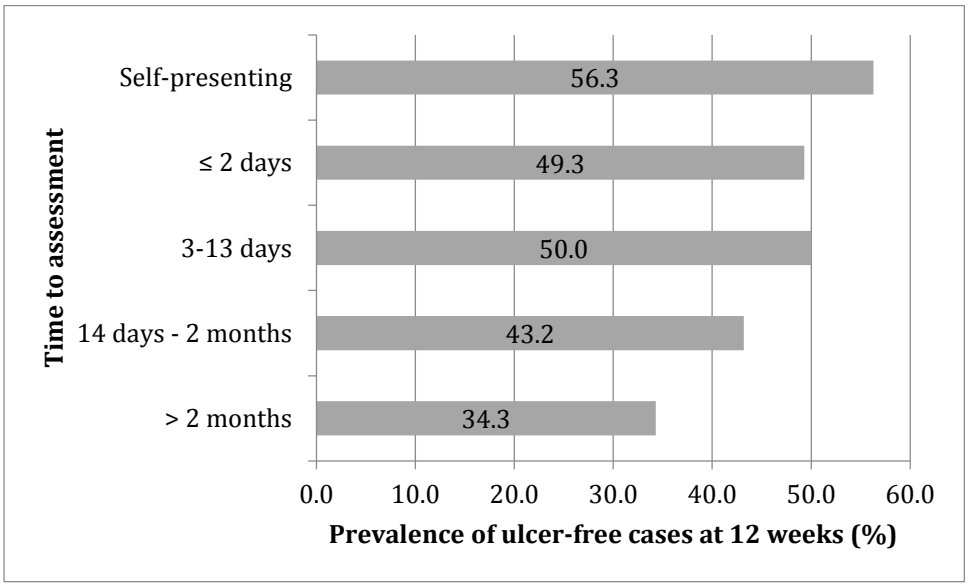


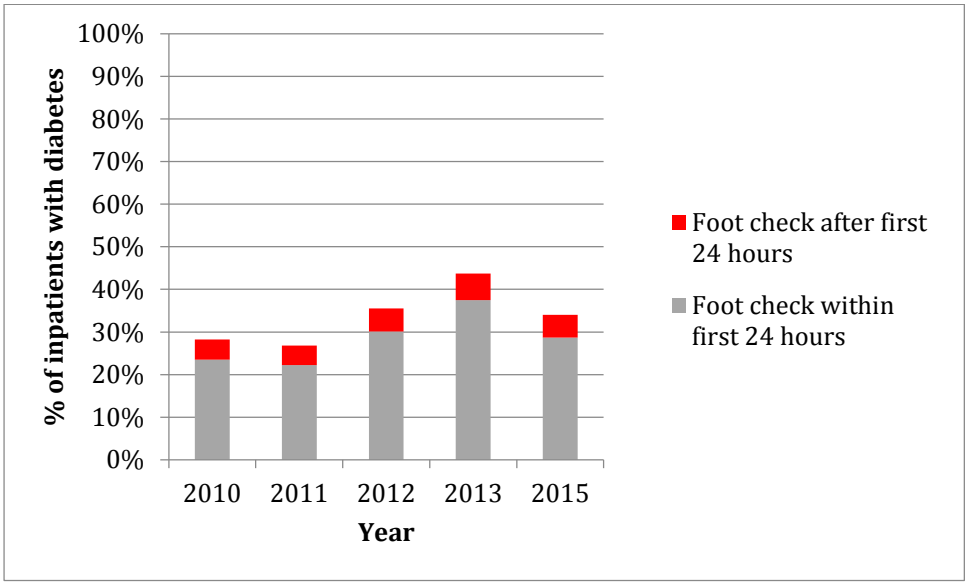
Figure 11. Ulcer free cases at 12 weeks, by time to first assessment by multi-disciplinary foot team, England and Wales, 2014-2015 (Source: NDFA[39])



The National Diabetes Inpatient Audit (NaDIA) provides a snapshot of foot care for inpatients with diabetes.[41] NICE guideline NG19 recommends that, for all adults with diabetes, the risk of developing a foot problem should be assessed on hospital admission. All hospitals should have a multidisciplinary foot care service. Inpatients with diabetic foot problems should be referred to a multidisciplinary foot care service within 24 hours of the initial foot examination.[32]

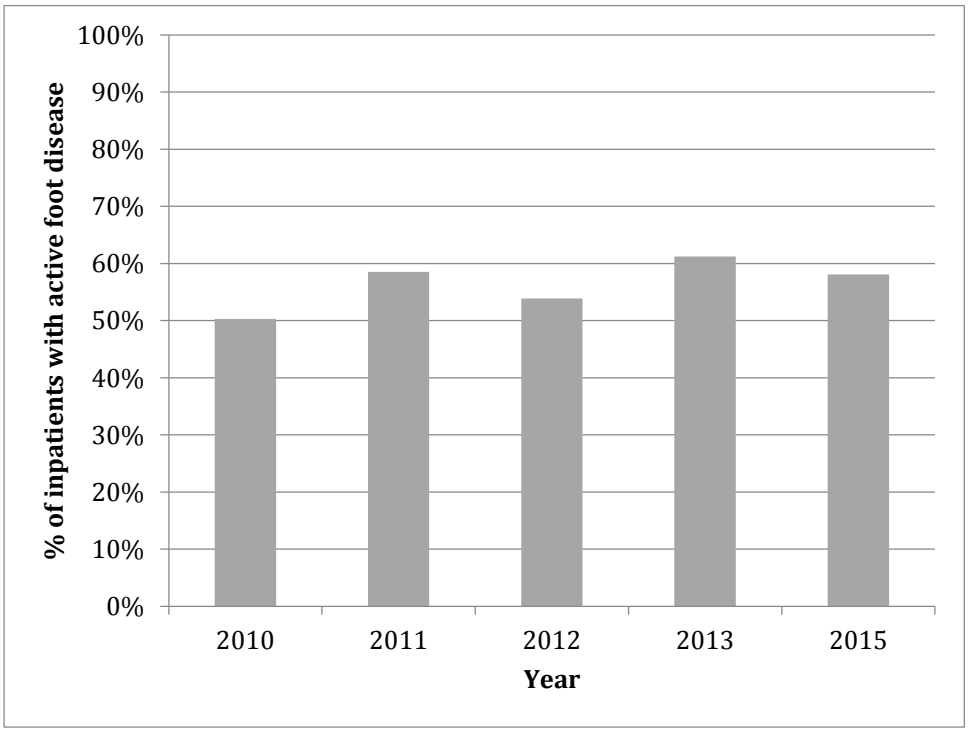
According to NaDIA, in 2015 only 28.7% of inpatients with diabetes included in the audit had documentation in their case notes of a foot risk assessment within 24 hours of admission. A further 5.4% of inpatients had a documented examination of their feet later in their hospital stay. The proportion of patients having foot checks was lower in 2015 than in the previous two audits (Figure 12).

Figure 12. Percentage of inpatients with diabetes having a diabetic foot risk assessment, England, 2010-2015 (Source NaDIA[41])



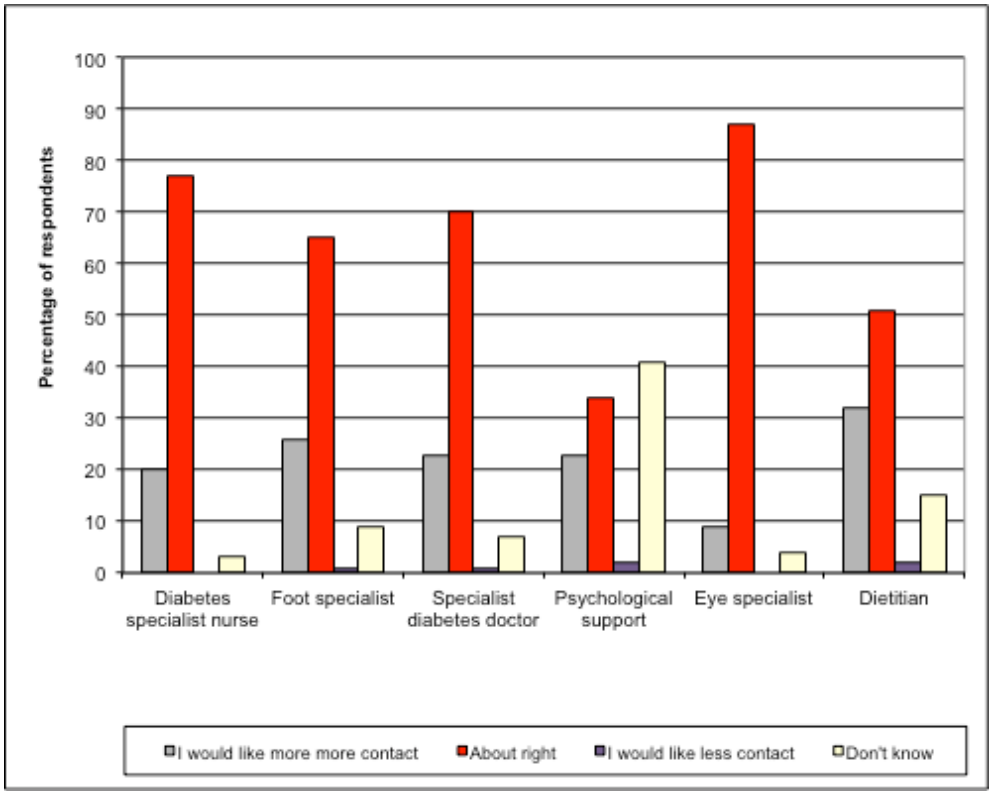
The inpatient audit also indicates that 8.90% of inpatients with diabetes had active foot disease when admitted to hospital. Of those with active foot disease, 59.5% were seen by a member of a MDFT within 24 hours of admission (Figure 13). Of the sites which provided information about hospital characteristics, 30.8% did not have an MDFT.[42]

Figure 13 Percentage of inpatients with diabetes and active foot disease seen by MDFT member within 24 hours of admission, England, 2010-2015 (Source NaDIA[41])



Another insight into the quality of foot care comes from the Diabetes UK patient survey.[43] In the 2009 survey, 26% of people with diabetes said they would like more access to a foot specialist (as shown in Figure 14), and 14% identified faster access to foot screening as the thing that would most improve the quality of their diabetes care.

Figure 14. Diabetes UK patient survey results, 2009



The Cost of Ulceration and Amputation

This section sets out estimates of current NHS spending on diabetes-related foot problems in England. Costs are estimated in the following categories:

- primary, community and outpatient care for ulceration,
- inpatient care for ulceration and amputation
- post-amputation care.

Hospital Episode Statistics for England, national tariffs[44] and NHS Reference Costs[45] were used to estimate inpatient activity and costs. NHS Reference costs were also used to estimate outpatient costs. In other areas, where national data are not available, activity was estimated from study evidence and data from individual hospitals. Staff unit costs were taken from the Personal Social Services Research Unit,[46], and the cost of medications from the NHS Electronic Drug Tariff[47] and the British National Formulary.[48] All costs are expressed in 2014-15 values. Where unit costs were sourced from earlier years, inflation adjustments were made using the Hospital and Community Health Services Pay and Prices Index.[46] Data sources and assumptions are summarised in Appendix 1.

Cost of Primary, Community and Outpatient Care for Ulceration

National datasets do not provide details of foot ulcer incidence, nor of resource use for patients with diabetic foot ulcers in primary, community or outpatient settings.

A number of studies have suggested that resource use in ulceration is affected by factors such as bacterial infection and the presence of peripheral artery disease.[49,50] Costs were therefore estimated for two patient groups, designated as Group A and Group B.

Group A was defined as patients who have ulcers with no infection or relatively mild infection, and do not have conditions such as peripheral artery disease or osteomyelitis. This was taken to be equivalent to a SINBAD score of ≤2. Those in Group B have ulceration with a SINBAD score of ≥3.

The mean weekly cost of ulcer care for patients in Group A was estimated using data from a randomized controlled trial of dressing preparations.[17] That study provided cost data for dressings management and professional time (apart from hospital admissions), and details of prescribing and off-loading methods. Patients with ulcers extending to the tendon, periosteum or bone, or with osteomyelitis at the time of recruitment, were excluded.

Weekly costs for patients in Group B were estimated from data supplied by The North West London Hospitals NHS Trust (LNWH). LNWH provided data on resource-use for all patients presenting with diabetes and ulcers with SINBAD score ≥3 between 1st April 2014 and 31st March 2015. All patients were followed to healing or for 12 months, whichever came first. Patient-level data were collected on clinic attendances, prescribing, imaging, consumables, orthotics, casts, domiciliary rehabilitation, and NHS transport. District nurse visits for dressing changes were estimated from data on a patient sub-group.

There is uncertainty regarding the proportion of people with relatively severe foot disease. The 2015 National Diabetes Foot Care Audit reported that 46.23% of incident ulcers were severe (SINBAD score of ≥ 3). These findings are in line with study evidence; the proportion of patients with SINBAD score of ≥ 3 was estimated at 41.4% in a specialist outpatient service in England, and the proportion with peripheral artery disease at 42.7%.[51, 49]

Based on the NDFA findings, we assume that 54% of those with ulcers fall into Group A, and 46% into Group B. However, this may be an underestimate of severe ulceration; NDFA also reported that relatively severe ulcers tended to take longer to heal, so the prevalence of severe ulcers is likely to be higher than the incidence.

To estimate aggregate annual NHS spending, it was assumed that 2-2.5% of people with diagnosed diabetes have active foot ulcers in any given week, based on data from the Scottish diabetes audit. Patient numbers were estimated by applying these point prevalence estimates to the number of patients on the QOF diabetes register data for England in 2014-15.[10,12]

Group A

The average weekly cost of dressings and professional time for people in Group A is estimated at £47. It should be noted, however, that in the study from which these estimates are derived, nearly 70% of dressing changes were performed by non-professionals such as family members or friends. No costs are counted for these dressing changes. The mean weekly cost per patient of medications and i.v. administration is estimated at £20. The mean weekly cost of off-loading devices is estimated at £11. The mean weekly cost of all primary, community and outpatient care for people in this group is estimated at £77.

Group B

Data from LNWH indicate that, over a 12-month period, mean treatment duration for those with ulcers with a SINBAD score of ≥3 was 23 weeks. The mean weekly cost of dressings and professional time was £207. The mean weekly cost of medications (including staff time for intravenous or intramuscular administration) was £129. The mean weekly cost of off-loading devices was estimated at £8, and imaging at £9. The mean weekly cost of all primary, community and outpatient care for people in this group is estimated at £359. Further details are provided in Appendix 2.

The total annual cost of primary, community and outpatient care for ulceration is estimated at £629m. - £786m. (Table 1)

Table 1 Estimated cost of primary and community care for ulceration, England 2014-15

	Patients in any given week	Weekly cost per patient	Annual cost
Group A			
SINBAD score ≤2	31,332-39,165	£77.33	£125,986,376 - £157,482,969
Group B			
SINBAD score ≥3	26,939,-33,673	£359.20	£503,174,978 - £628,968,723
Total	58,271- 72,838		£629,161,354 - £786,451,692

Cost of inpatient care for ulceration and amputation

Hospital Episode Statistics data for 2014-15 were searched to identify admissions with a diabetes diagnosis code (International Classification of Diseases-10 codes E10–14) and diagnosis or procedure codes related to foot disease or amputation anywhere on the patient record. Full details of codes used are given in Appendix 3. Each inpatient admission is assigned for payment to a Healthcare Resource Group (HRG). An HRG is a grouping of clinically similar treatments that are also similar in cost. National tariffs are set for most inpatient HRGs. These tariffs are derived from national costing exercises (NHS Reference Costs) conducted each year to estimate the mean cost of admissions grouped to each HRG. It should be noted, however, that the cost of individual admissions may differ from the mean cost and from the tariff. Records with invalid HRG fields were excluded.

Clinical advisers identified the HRGs considered likely to identify admissions specific to ulceration (in cases where the admission also included a foot ulcer-specific diagnosis or procedure code). For admissions grouped to these HRGs, and for all amputation admissions, the cost of the admission was estimated using national tariffs.[44] Further details of HRGs are provided in Appendix 3. Diabetic foot disease is frequently recorded, however, in admissions assigned to HRGs related to other areas of care, reflecting the fact that many foot problems occur in people who are admitted to hospital primarily for treatment unrelated to the foot. For these admissions, costs were estimated only for excess length of stay, relative to patients with diabetes who did not have foot disease. Elective day case admissions were excluded from this analysis, and no costs were counted for such admissions.

Extended generalized linear model regression analysis was used to estimate the impact of foot disease on length of stay in these admissions. Finished admissions for people with diabetes in Hospital Episodes Statistics data for 2014-15 were analysed. Admissions coded to ulceration- or amputation-specific HRGs were excluded from the analysis, as costs are estimated separately for these admissions.

Covariates used in the regression analysis were foot disease, patient age, gender, index of multiple deprivation score, ethnicity, admission method (elective or emergency) and specialty type (surgical or non-surgical).

The unit cost of an inpatient day for a person with diabetic foot disease was estimated at £376, based on the weighted mean cost of an inpatient day in HRGs KB03A-B (Diabetes with Lower Limb Complications) in NHS Reference Costs.[45]

Hospital Episodes Statistics data record 96,492 inpatient admissions with diabetes and either foot ulcer or amputation codes in 2014-15, 6.3% of all admissions with a diabetes diagnosis code. Of these, 7.031 included amputation codes, 376 related to procedures on amputation stumps and the remainder (89,085) included ulceration codes without amputation. The tariff price of admissions involving non-traumatic amputation or procedures on amputation stumps in people with diabetes was £43.80m. Of admissions with diabetes and foot disease without amputation, 42.98% (38,290) were grouped to HRGs related to foot care. The tariff price of these foot disease admissions was £125.48m.

Of the 50,795 admissions with diabetes and ulceration grouped to HRGs unrelated to foot care, 2,652 were elective day cases. No costs were included for these, as it was not considered likely that ulceration had a substantial impact on the cost of care in these cases. The mean (SD) length of stay for admissions with ulcers grouped to non-ulcer-specific HRGs was 16.58 (16.54-16.62) days, compared with 7.46 (7.45-7.46) days in diabetes admissions without ulceration. Regression analysis suggests that ulceration was associated with a length of stay 8.26 days longer (95% CI 6.70-9.84) than that for diabetes admissions without ulceration. The cost of excess bed days for patients with foot disease in admissions grouped to non-foot-care HRGs, is estimated at £152.97m. The total cost of inpatient care is estimated at £322.25m. (Table 2 and Appendix 3).

Table 2 Estimated cost of inpatient care for ulceration and amputation, England 2014-15

		Admissions	Annual cost
Major amputations		3,016	£24,772,523
Minor amputations		4,015	£16,910,258
Procedures on stumps		376	£2,114,851
Foot ulcers	Grouped to ulcer-specific HRGs	38,290	£125,479,594
	Grouped to other HRGs	50,795*	£152,972,792
Total		96,492	£322,250,018

*Costs are counted for 48,143 admissions

Cost of post-amputation care

Costs were estimated for prosthetic care, physiotherapy and wheelchair provision after amputation. The University of Salford United National Institute for Prosthetics and Orthotics Development (UNIPOD) provides annual data on referrals to prosthetic services after amputation in the UK, and states the cause of amputation.[52] The National Diabetes Audit[34] provides annual data on amputation rates in people identified as having diabetes. The most recent UNIPOD data relate to 2011-12. Comparison of the UNIPOD data for that year, for those for whom diabetes was given as the cause of amputation, with National Diabetes Audit data on major amputations suggests that ~29% of people who underwent major amputation in diabetes in England were referred to prosthetic services. We used the 2011-12 proportion as an estimate of the proportion in later years. No costs were estimated for prostheses for the remaining 71% of people undergoing major amputation in diabetes, or for those undergoing minor amputation. Unit costs for prosthesis provision and associated care were provided by the Royal National Orthopaedic Hospital NHS Trust.

The Royal National Orthopaedic Hospital NHS Trust (RNOH) provided details of the mean number of physiotherapy sessions provided after major and minor amputation. It was assumed that NHS transport is provided for 50% of physiotherapy sessions and that wheelchairs are provided for 50% of patients who undergo amputation. Unit costs for physiotherapy, wheelchairs and transport were taken from NHS Reference costs.[45]

RNOH estimated in 2010 that the mean annual cost of prosthesis provision and care was £2,802 per patient treated. It has not been possible to obtain revised costs, so we have used this figure, updated for inflation (£2,968 in 2014-15 prices). Based on the number of amputations in diabetes recorded in HES, annual expenditure on prosthesis services for people who have had diabetes-related amputations is estimated at £11.00m. RNOH estimated that people receive on average (mean) 30 physiotherapy sessions in the year after major amputation, and 10 after minor amputation. Expenditure on physiotherapy, including NHS transport, is estimated at £6.30m. The cost of wheelchair provision is estimated at £3.51m. Further details are provided in Appendix 3.

Total expenditure on healthcare related to foot ulceration and amputation in diabetes in 2014-15 in England is estimated at £972m. - £1.130bn. (Table 3). This is equivalent to 0.72-0.83% of the NHS budget for England in 2014-15.[53]

Table 3 Total estimated expenditure on diabetic foot disease, England, 2014-15

	Estimated annual cost
Primary, community and outpatient care, ulceration	£629,161,354 - £786,451,692
Inpatient care, amputation	£43,797,632
Inpatient care, ulceration	£278,452,386
Post-amputation care	£20,813,777
Total	£972,225,149 - £1,129,515,487

The Impact of Multidisciplinary Foot Care

A number of studies have indicated that it is possible to identify people with diabetes who are at risk of ulceration,[54,55] that targeted preventive services can improve outcomes, [56,57,58] and that early access to multi-disciplinary specialist care for patients with ulcers can reduce ulcer duration, improve healing rates, reduce amputations and increase survival rates.[59,60,61,62]

The marginal cost of introducing improved services for diabetic foot care is likely to vary substantially from place to place, depending on baseline provision (which will play a part in determining how much new resource is needed) and also on the service model chosen. MDTs and other diabetic foot care services are configured differently in different parts of the country. The potential for savings from improved care will also vary, depending on baseline standards of care and other factors.

In this section, we present illustrative costs, savings and QALY gains from the introduction of specialist multidisciplinary care, based on initiatives at Ipswich Hospital NHS Trust, Somerset CCG, and Brent CCG. Staff costs are taken from PSSRU 2015.[46] Savings are estimated using bed day costs derived from NHS Reference Costs,[45], and NHS tariffs.[44]

QALY gains are estimated for amputations averted over a 5-year perspective for a 1-year cohort of patients. It is assumed that those who avert amputation experience ulcer healing. EQ-5D scores derived from a Swedish study have been used.[27] It has been assumed that 5-year mortality after ulceration is 44%,[21] and that 2 year mortality after major amputation is 50%.[2] A re-ulceration rate of 3.5% a month is assumed, derived from study data.[15] This is applied both to those whose ulcers have healed without amputation, and to those who have undergone amputation. QALYs are valued at £25,000 (the mid-point of the cost effectiveness range generally used by NICE). QALYs and costs are discounted at 3.5% per year. Further details of assumptions and sources are given in Appendix 4.

Ipswich Hospital NHS Trust

Intervention: In 2010 Ipswich Hospital NHS Trust launched an improvement programme aimed at promoting foot checks in diabetes inpatients and reducing ulcers. Promotional videos were produced, featuring patient stories and instructions for the Touch the Toes test. These were shown in all wards by a podiatrist and a diabetes specialist nurse. Monthly random audits were instituted, to check on the percentage of inpatients with diabetes having foot checks, and ward-level results were published on the hospital intranet. Data on foot ulcer prevalence were collected for all patients from 2008 to 2013.

Clinical Impact: In 2008-10, before the new service was introduced, the prevalence of foot ulcer in admissions in inpatients with diabetes (i.e. patients who had a foot ulcer at any point during their hospital stay) was 0.74%, and in 2010-13 it was 0.27%, a reduction of almost two thirds (Table 4). Regression analysis indicates that the odds ratio for ulceration in diabetes in 2010-13, relative to that for 2008-10, was 0.38 (95% CI 0.24-0.60) adjusting for age, sex, diabetes status, comorbidities and specialty. Based on this finding it is estimated that in 2010-13 there were 19 fewer ulcers in inpatients with diabetes each year than there would have been if the rate had stayed at the 2008-10 level.

Cost Impact: The annual costs of the improvement programme are estimated at £8,060. There were non-recurring set-up costs of £4,924 (Appendix 5). Regression analysis suggests that, in people with diabetes, foot ulceration was associated with a 4.67-fold increase in length of stay (3.67-5.94), adjusting for age, sex, comorbidities and specialty. Based on this result, it is estimated that 19 fewer ulcers per year are associated with 571 fewer bed days. The annual saving from these averted bed days is estimated at £214,548, more than 22 times the annual cost of the service improvement (Table 5). (The cost of a diabetes bed day is estimated at £376, based on the weighted mean cost of an inpatient day in HRGs KB03A-B (Diabetes with Lower Limb Complications) in NHS Reference Costs.[45]) It is estimated that 19 averted ulcers are also associated with savings of £30,979 from averted ulcer care in primary, community and outpatient settings after discharge. Further details of costing methods are provided in Appendix 5.

(Public Health England data indicate that major amputation rates in Suffolk also fell during this period, both in absolute terms and relative to the England rate. Details are given in Appendix 5, but

no QALYs or cost savings are counted here for averted amputations as there were other quality improvement initiatives, in addition to the inpatient programme, which are likely to have contributed to this improvement).

Table 4 Admissions, ulcers and length of stay, Ipswich Hospital NHS Trust, 2008-10 and 2010-13

	2008-10		2010-13	
	Diabetes	No diabetes	Diabetes	No diabetes
Admissions	7,060	64,710	12,232	101,225
Ulcer/all admissions	0.74%	0.21%	0.27%	0.15%
Mean LOS with ulcer	38.54	36.98	39.00	33.71
Mean LOS without ulcer	8.74	5.63	8.35	5.68

Table 5 Estimated annual impact of intervention on ulcers, bed days, and costs, Ipswich Hospital NHS Trust

	2010-13 Actual	Expected based on 2008-10 rate	Difference	Cost impact
Foot ulcers in diabetes	11	30	-19	
Bed days in ulcer admissions	1,287.00	1,857.61	-571	-£214,548
Post-discharge ulcer care				-£30,979
Cost of improved service				£9,702*
Net cost impact				-£235,826

* Includes set-up costs, which have been averaged over three years.

Somerset CCG and partners

Intervention: In 2011, Taunton and Somerset NHS Foundation Trust, Yeovil District Hospital NHS Foundation Trust, Somerset CCG, Somerset Partnership NHS (community) Foundation Trust, and local GPs established a county-wide integrated diabetes foot pathway. Emergency clinics were established in eight locations, offering appointments within 24 hours for people with active foot disease, and direct referral to the hospital MDT where necessary. Community podiatrists received specialist training and became members of the foot MDT, with regular rotation into the hospital-based diabetic foot services. Patient notes were shared electronically. Training was provided for practice nurses and GPs. The aim was to ensure rapid access to specialist care, robust follow-up and the elimination of inefficiencies arising from poor communication.

In 2013 Musgrove Park Hospital introduced the Ipswich Touch Test for all inpatients with diabetes, with a clear referral pathway and a monthly compliance audit.

Clinical Impact: Somerset historically has had high levels of amputation and of hospital admission for diabetic foot problems. In part, these are accounted for by demographic factors, including an ageing population. However, levels in Somerset have been high even relative to demographically similar areas.

According to Public Health England diabetes foot care activity profile data, there were 1.61 major amputations per 1,000 adults with diabetes in Somerset PCT in 2008-11, 59% above the England rate, and 46% above the rate for demographically similar PCTs (Table 6).[35]

In 2012-15 the major amputation rate in Somerset CCG (which is coterminous with the former Somerset PCT) was 0.92, 13% above the England rate, and 12% below the rate for similar CCGs.[†] Minor amputations increased from 3.18 per 1,000 adults with diabetes in 2008-11 to 3.22 in 2012-15. It is estimated that there were 20 fewer major amputations per year in 2012-15, and one additional minor amputation per year, than there would have been if the rates had stayed at the 2008-11 level.

The number of days in hospital for diabetic foot disease was 45% above the England level in 2008-11, and 19% above the England level in 2012-15. Further details are given in Appendix 6.

Table 6 Annual major and minor amputations and days in hospital for diabetic foot disease per 1,000 adults with diabetes, 2008-11 and 2012-15

	Major amputations		Minor amputations		Days in hospital for diabetic foot disease	
	2008-11	2012-15	2008-11	2012-15	2008-11	2012-15
Somerset	1.61	0.92	3.18	3.22	248.30	191.05
England	1.01	0.81	1.66	1.81	171.30	161.05
Comparator organisations	1.10	1.04	1.87	2.31	179.20	167.43

Cost and QALY impact: The estimated cost of the improved foot care service in Somerset is £147,879 a year in 2014-15 prices, plus one-off set-up costs of £30,450 (which are here averaged over 3 years). Details of staff inputs and other costs are given in Appendix 6. Savings from averted amputations are estimated at £314,424 per year, almost twice the cost of the service improvement. (This is the net effect of 20 fewer major amputations and one additional minor amputation). If savings from the reduction in bed days are also included, the annual gross saving rises to £926,016, almost six times the cost of the service improvement (Table 7). The numbers of QALYs gained per year from the reduction in amputations is estimated at 62.59. Valuing each QALY at £25,000 (the midpoint of the range generally used by NICE), the monetized value of these QALYS is £1.56 million.

Table 7 Annual major amputations, minor amputations and bed days per 1,000 adults with diabetes, Somerset, 2012-15, compared with expected levels if rate had remained at the 2008-11 level, and associated annual cost impacts

	Actual	Expected based on 2008-11 rate	Difference		Unit cost	Cost impact
Major amputations	26	46	-20	Acute care	£10,668	-£210,510.64
				Post-discharge care	£5,519	-£108,918
Minor amputations	91	90	1	Acute care	£3,956	£3,964
				Post-discharge care	£1,038	£1,040.27

[†] The comparator is not constant as 2008-11 data are not available at CCG-level. 2009-12 data are shown in Appendix 6. These include some data from the period after the introduction of the new service, but do provide a constant comparator for the 2012-15 data.

Days in hospital for diabetic foot disease	5,427	7,053	-1,626		£376	-£611,592
Gross cost impact of averted activity						-£926,016
Cost of improved service						£157,927*
Net cost impact						-£768,089

* Includes set-up costs, which have been averaged over three years.

Brent CCG and North West London Hospitals NHS Trust

Intervention: In 2004, Brent CCG (then known as Brent Teaching PCT) and The North West London Hospitals NHS Trust established a multidisciplinary specialist foot care team (MDT). The MDT operates two consultant-led clinics a week and an emergency service five days a week. There are close links with community podiatry services, which can refer patients directly to the specialist service. Patients with recurring ulcers can self-refer to the service. The MDT also works closely with intermediate care services, which operate a Short Term Assessment, Rehabilitation and Reablement Service (STARRS), providing home care to avert admissions and support rapid discharge.

Clinical Impact: Brent CCG has the lowest diabetes amputation rate in England. According to Public Health England diabetes foot care activity profile data, there were 0.23 major amputations per 1,000 adults with diabetes in Brent in 2012-15, 71% below the England rate, and 55% below the rate for demographically similar CCGs (Table 8). There were 0.38 minor amputations per 1,000, 79% below the England rate, and 71% below the rate for similar CCGs.[35]

The number of days in hospital for diabetic foot disease was 26% below the England level and 22% below the level for comparator CCGs. Robust comparator data are not available for the period before 2004, when the Brent service was introduced. We have therefore used the data from similar CCGs as a proxy, to estimate the impact of the Brent MDT. Further details are given in Appendix 7.

Table 8 Annual major and minor amputations and days in hospital for diabetic foot disease per 1,000 adults with diabetes, 2012-15

	Major amputations	Minor amputations	Days in hospital for diabetic foot disease
Brent	0.23	0.38	119.44
England	0.81	1.81	161.05
Comparator CCGs	0.52	1.31	152.34

Cost and QALY impact: The estimated marginal cost of the improved foot care service in Brent is £97,687 a year in 2014-15 prices. Details of staff inputs and other costs are given in Appendix 7. Savings from averted amputations are estimated at £188,626 per year, 1.9 times the cost of the service. If savings from averted bed days are also included, the annual gross saving rises to £474,396 (Table 9). The numbers of QALYs gained per year from averted amputations is estimated at 15.65.

Valuing each QALY at £25,000 (the midpoint of the range generally used by NICE), the monetized value of these QALYS is £391,000.

Table 9 Annual major amputations, minor amputations and bed days per 1,000 adults with diabetes, Brent, 2012-15, compared with expected levels if rate was as for comparator CCGs, and associated annual cost impacts

	2012-15 actual	Expected based on comparator CCG rate	Difference		Unit cost	Cost impact
Major amputations	5	10	-5	Acute care	£10,668	-£52,948.32
				Post-discharge care	£5,519	-£27,394.33
Minor amputations	9	30	-22	Acute care	£3,956	-£85,778.30
				Post-discharge care	£1,038	-£22,505.49
Days in hospital for diabetic foot disease	2,759	3,519	-760		£376	-£285,769.10
Gross cost impact of averted activity						-£474,396
Cost of improved service						£97,687
Net cost impact						-£376,709

Discussion

Diabetic foot disease reduces the quality of life of tens of thousands of people in England every year, and is associated with high levels of mortality. In addition to this human toll, there is a substantial financial cost to the NHS; our analysis suggests that at least £1 in every £140 of NHS expenditure in England is spent on care for the diabetic foot.

We estimate that around two thirds of expenditure on diabetic foot care is in primary, community or outpatient settings, and is for ulcer rather than amputation care. For care delivered in primary and community settings there are no national datasets recording the diagnoses or procedures on which money is spent, and in most areas of the country detailed local datasets of this kind do not exist either. For this reason, commissioners and budget-holders are generally unaware of the cost of caring for diabetic foot ulcers. We believe that understanding the cost of current models of care is an important first step toward building the case for improved services.

Clinical evidence and audit data suggest that there is a great deal of scope for improvement in the quality and outcomes of diabetic foot care in England. On the one hand, there is a large body of evidence indicating that targeted preventive services can identify those at risk of ulceration and improve outcomes, and that early access to multidisciplinary specialist care for patients with ulcers can reduce ulcer duration, improve healing rates, reduce amputations and increase survival rates. On the other hand, the National Diabetes Foot Care Audit indicates that many patients in England experience long delays between first presentation to a healthcare professional with a foot problem, and assessment by a MDT or foot protection team. In many areas, appropriate services do not exist. Even where services do exist, it is likely that some patients are not referred to them as soon as they present with a problem. Almost two thirds of inpatients with diabetes have no documentation in their case notes of a foot risk assessment during their hospital stay. Almost a third of hospital sites do not have a multidisciplinary foot care team. In many areas of the country there are no clear pathways for referral of patients to appropriate specialist services.

We present in this paper cost, benefit and saving estimates from three services, which suggest that early access to specialist care and foot checks for inpatients with diabetes are associated not only with improved outcomes, but also with financial savings for the NHS that substantially exceed the cost of the service. The case studies presented in this paper suggest that such improvements and savings can be achieved rapidly and sustained over long periods. The foot care initiatives in Ipswich and Somerset were associated with improved outcomes and cost savings in the first three years, while low amputation and bed day rates for diabetic foot problems have been maintained over many years in Brent.

Reducing ulcer duration is key to improving quality of life for patients and reducing NHS costs. We estimate that at least 60,671 – 75,838 people with diabetes in England have foot ulcers at any given time (2-2.5% of the diagnosed diabetes population), and that the mean weekly cost of caring for each patient is £208. Some ulcers never heal, so quality of life is permanently reduced, and these costs to the NHS are ongoing. The more severe the ulcer, the more difficult it is to achieve healing, and the more costly the care. The NDFA reported that patients who waited longer to be seen had, on average, more severe ulcers and longer ulcer duration than those who were seen quickly. We estimate that reducing the prevalence of people with diabetic foot ulcers by one third would save the NHS £210m.-£262m. a year. If the proportion of people with severe ulcers was also reduced the savings would be greater.

As in all areas of health care, decisions regarding the introduction of improved prevention and care services for foot problems in diabetes will need to be informed by local data on costs, savings and outcomes. The potential for quality of life gains and financial savings will vary depending on how services are currently delivered, baseline standards of care, and the configuration of proposed new services.

Close collaboration between primary, community and acute care providers will be needed if better outcomes for people with diabetes and cost savings for the NHS are to be delivered. In order to

ensure rapid referral to specialist care, it is necessary not only that an appropriate specialist service exists in each area, but also that non-specialist staff understand the diabetic foot, and that clear referral protocols are in place.

The savings from improved care are likely to accrue both to commissioners and acute providers. The excess costs of extended lengths of stay are borne by acute providers, while the costs of amputations and extended ulcer duration are mainly paid by commissioners. It will be important for commissioners and providers of care to consider the distribution of costs and savings arising from improved care, in order to ensure that improved services are appropriately incentivised. It will be important to audit new services using patient outcome and satisfaction measures, along with clinical and economic metrics, to ensure that gains in quality and productivity are achieved.

In 2010-11, we estimated the annual cost of diabetic foot care in England at £580.5 million, equivalent to almost 0.6% of the NHS budget in that year. [63] The costs presented here for 2014-15 are considerably higher than the 2010-11 estimates, even after adjustment for inflation and increased diabetes prevalence. However, it is important to note that the two studies used different methodologies to estimate costs. In particular, we have had access to much more detailed data on primary, community and outpatient care for severe ulcers in 2014-15 than in 2010-11. The costs estimated for this group and setting account for the bulk of the increase relative to the 2010-11 estimates. In the light of these methodological changes, we do not believe it is possible to draw conclusions from our study about changes in resource use since the earlier paper.

Diabetes prevalence is increasing; the number of adults with diabetes recorded in QOF in England rose by 30% between 2009 and 2015. The Association of Public Health Observatories Diabetes Prevalence model suggests that there are, in addition, substantial numbers with undiagnosed diabetes, and predicts that the numbers will increase by a further 20% between 2015 and 2025.[13] As a result of the increase in prevalence, the absolute number of diabetes-related amputations in England increased by 16% between 2009-12 and 2012-15, even as rates per 10,000 people with diabetes were reduced.[35] Unless there is a significant increase in the quality and efficiency of diabetes foot care, it is likely that the cost of ulceration and amputation care for people with diabetes will rise substantially, both in absolute terms and as a proportion of total NHS spending.

Given the high cost of diabetes foot care, and the continuing increase in diabetes prevalence, it is likely that the provision of higher quality cost effective foot care for people with diabetes, and early intervention to avoid complications, are likely to play an important part in attempts to improve the overall quality and productivity of the NHS in the coming years.

Appendix 1

Table A1.1 Summary of sources and assumptions used in cost estimation

		Resource use type	Resource use source	Unit costs source	Notes/assumptions
Primary and Community Care					
	Group A	Dressings management	Jeffcoate et al.[17]	Jeffcoate et al.[17]	
		Medications		BNF[48]	
		Off-loading		Casted devices and removable off-loading devices: Piaggesi et al.[64] Bespoke shoes and insoles: Salford Royal NHS Foundation Trust	Assumed that, of those receiving shoes and/or insoles, 80% receive insoles only and 20% receive bespoke shoes.
	Group B	MDT consultations, nurse-led clinics, high-risk podiatry clinics, imaging	The North West London Hospitals NHS Trust	NHS Reference Costs[45]	
		Medications		NHS Electronic Drug Tariff[47]	
		NHS Transport		NHS Reference Costs 2010-11 (as transport costs were not provided in 2014-15),[45] inflation-adjusted.[46]	

		District nurse home visits (dressings management) and STARRS		PSSRU[46]	
		Orthotics and dressings		The North West London Hospitals NHS Trust	
Inpatient Care		Foot ulcer or amputation-specific admissions	Hospital Episode Statistics 2014-15	National Tariffs[44]	
		Excess bed days in other admissions		Regression analysis to estimate excess bed days, unit cost estimated from NHS reference costs[46]	
Post-amputation care		Physiotherapy	Royal National Orthopaedic Hospital	NHS Reference Costs	Based on estimate that patients receive 30 sessions on average after major amputation, and 10 sessions after minor amputation
		Prosthetic provision and care	Royal National Orthopaedic Hospital	Royal National Orthopaedic Hospital	University of Salford United National Institute for Prosthetics and Orthotics Development (UNIPOD)[52] indicates that in 2011-12 in England, 924 patients with diabetes received prostheses after amputation, equivalent to 29% of major amputations recorded in NDA[34] for that year. It was assumed that the same proportion of those undergoing major amputation in 2014-15 received prostheses. Lifetime cost based on mean treatment time of 4 years, 3 months for people with diabetes undergoing major amputation and receiving prostheses (RNOH).

	Wheelchairs		NHS Reference Costs[45]	Based on assumption that 50% of patients undergoing major or minor amputation receive wheelchairs
	NHS Transport		NHS Reference Costs 2010-11 (as transport costs were not provided in 2014-15),[45] inflation-adjusted.[46]	Based on assumption that NHS transport provided for 50% of physiotherapy attendances

Appendix 2

Table A2.1 Mean weekly resource use and costs for those with severe ulcers (SINBAD score ≥3). Source: LNWH

	Nurse-led clinic	Doctor-led clinic (MDT)	Podiatry clinic	NHS transport	STARRs (domiciliary rehabilitation) visits	District nurse visits for dressing changes
Mean weekly resource use	0.06	0.24	1.02	0.44	0.09	1.28
Mean weekly cost	£8.23	£45.91	£119.50	£5.77	£2.70	£24.65
	Orthotics	Medications	Imaging	Dressings		
Mean weekly cost	£8.19	£129.38	£9.33	£5.53		

Appendix 3

Table A3.1 Codes for Identification of Inpatient Admissions related to Ulceration or Amputation in Diabetes

	Diagnosis code (ICD-10)	Procedure code (OPCS- 4)	Other ICD-10 code required	Other OPCS- 4 code required
Amputation				
Major amputation	At least one of E10, E11, E12, E13, E14	At least one of X09, X10		
Minor amputation	At least one of E10, E11, E12, E13, E14	X11		
Procedures on amputation stumps	At least one of E10, E11, E12, E13, E14	X12		
Ulceration				
Ulcer of the lower limb	At least one of E10, E11, E12, E13, E14		L97	
Decubitus ulcer	At least one of E10, E11, E12, E13, E14		L89	
Cellulitis	At least one of E10, E11, E12, E13, E14		At least one of L03.0, L03.1	
Osteomyelitis	At least one of E10, E11, E12, E13, E14		M86	
Gangrene	At least one of E10, E11, E12, E13, E14		R02	
Atherosclerosis	At least one of E10, E11, E12, E13, E14		I70.2 AND at least one of L97, L89, L03.0, L03.1, R02	

Bacteraemia/ Septicaemia/ Septic shock/ Sepsis syndrome	At least one of E10, E11, E12, E13, E14		At least one of A40, A41, A49.9 AND at least one of L97, L89, L03.0, L03.1, R02	
Debridement of a foot/Leg wound	At least one of E10, E11, E12, E13, E14	S57.1		At least one of Z50.4, Z50.5, Z50.6
Diabetes mellitus with peripheral circulatory complications	At least one of E10.5, E11.5, E12.5, E13.5.E14.5			

Table A3.2 Major amputation admissions and tariff expenditure, 2014-15, by HRG, England

HRG	HRG description	Admissions	Expenditure
QZ11B	Amputations without Major CC	1,259	£11,979,226
QZ12Z	Foot Procedures for Diabetes or Arterial Disease, and Procedures to Amputation Stumps	545	£2,304,935
QZ11A	Amputations with Major CC	374	£5,440,952
QZ15B	Therapeutic Endovascular Procedures with Intermediate CC	193	£847,860
QZ02A	Lower Limb Arterial Surgery with CC	166	£1,431,585
RC14Z	IR Procedures - Vascular - Major	54	£227,988
QZ15A	Therapeutic Endovascular Procedures with Major CC	52	£513,919
QZ03Z	Bypasses to Tibial Arteries	42	£448,638
HB31Z	Major Foot Procedures for Non-Trauma	36	£173,286
HB32A	Intermediate Foot Procedures for Non-Trauma category 2 19 years and over	35	£103,250
QZ16B	Diagnostic Vascular Radiology and Other Transluminal Diagnostic Procedures with Intermediate CC	27	£82,683
HB21A	Major Knee Procedures for Non-Trauma category 2 with Major CC	24	£182,880
JC03A	Major Skin Procedures category 1 with Major CC	23	£125,725
HD25A	Infections of Bones or Joints with Major CC	20	£85,912
HB35B	Minor Foot Procedures for Non-Trauma category 1 with CC	15	£18,300
HB21C	Major Knee Procedures for Non-Trauma category 2 without CC	13	£73,346
JD01A	Major Skin Disorders category 2 with Major CC	11	£48,068
HB34D	Minor Foot Procedures for Non-Trauma category 2 19 years and over with CC	9	£16,704
QZ16A	Diagnostic Vascular Radiology and Other Transluminal Diagnostic Procedures with Major CC	8	£66,144
HB21B	Major Knee Procedures for Non-Trauma category 2 with CC	8	£50,656
QZ01A	Aortic or Abdominal Surgery with CC	7	£57,418

JC01A	Major Multiple Skin Procedures with Major CC	6	£54,000
KB03A	Diabetes with Lower Limb Complications with Major CC	6	£25,524
HB33D	Intermediate Foot Procedures for Non-Trauma category 1 19 years and over with CC	6	£15,084
FZ66A	Very Major Small Intestine Procedures 19 years and over with CC	4	£30,624
QZ17B	Non-Surgical Peripheral Vascular Disease with Intermediate CC	4	£11,308
FZ09A	Proximal Colon Procedures with Major CC	3	£25,956
FZ11A	Large Intestine - Major Procedures with Major CC	3	£20,872
QZ04Z	Extracranial or Upper Limb Arterial Surgery	3	£16,101
JC04A	Intermediate Skin Procedures category 2 with Major CC	3	£9,684
LB12Z	Bladder Intermediate Open Procedure	3	£9,539
KB03B	Diabetes with Lower Limb Complications without Major CC	3	£6,156
HR04B	Reconstruction Procedures Category 3 with CC	2	£21,332
HR04C	Reconstruction Procedures Category 3 without CC	2	£19,640
FZ08A	Complex Large Intestine Procedures with Major CC	2	£18,861
EA12Z	Implantation of Cardioverter - Defibrillator only	2	£11,601
LA08A	Chronic Kidney Disease with length of stay 2 days or more with Major CC	2	£8,072
HD24A	Non-Inflammatory Bone or Joint Disorders with Major CC	2	£7,246
LB47Z	Penis Major Open Procedures	2	£6,338
JD03A	Intermediate Skin Disorders category 2 with Major CC	2	£6,112
QZ15C	Therapeutic Endovascular Procedures without CC	2	£6,008
QZ05A	Miscellaneous Vascular Procedures with CC	2	£5,274
JD04A	Intermediate Skin Disorders category 1 with Major CC	2	£5,186
Other		30	£152,530
Total		3,017	£24,772,523

CC: complications and comorbidities

Table A3.3 Minor amputation admissions and tariff expenditure, 2014-15, by HRG, England

HRG	HRG description	Admissions	Expenditure
QZ12Z	Foot Procedures for Diabetes or Arterial Disease, and Procedures to Amputation Stumps	2,297	£9,085,843
QZ15B	Therapeutic Endovascular Procedures with Intermediate CC	348	£1,533,458
JC03A	Major Skin Procedures category 1 with Major CC	211	£1,165,457
HB34D	Minor Foot Procedures for Non-Trauma category 2 19 years and over with CC	161	£298,816
QZ02A	Lower Limb Arterial Surgery with CC	155	£1,308,645
RC14Z	IR Procedures - Vascular - Major	129	£554,613
HB34E	Minor Foot Procedures for Non-Trauma category 2 19 years and over without CC	118	£141,246
HB35B	Minor Foot Procedures for Non-Trauma category 1 with CC	67	£81,740
HD25A	Infections of Bones or Joints with Major CC	60	£296,184
QZ16B	Diagnostic Vascular Radiology and Other Transluminal Diagnostic Procedures with Intermediate CC	59	£217,851
HB33D	Intermediate Foot Procedures for Non-Trauma category 1 19 years and over with CC	53	£133,242
JC01A	Major Multiple Skin Procedures with Major CC	51	£481,008
QZ03Z	Bypasses to Tibial Arteries	46	£489,130
QZ15A	Therapeutic Endovascular Procedures with Major CC	37	£366,424
HB32A	Intermediate Foot Procedures for Non-Trauma category 2 19 years and over	31	£91,450
HB33E	Intermediate Foot Procedures for Non-Trauma category 1 19 years and over without CC	27	£45,576
JC03B	Major Skin Procedures category 1 with Intermediate CC	15	£42,891
KB03B	Diabetes with Lower Limb Complications without Major CC	14	£32,008
KB03A	Diabetes with Lower Limb Complications with Major CC	12	£51,048
JD01A	Major Skin Disorders category 2 with Major CC	10	£43,636

QZ17B	Non-Surgical Peripheral Vascular Disease with Intermediate CC	9	£25,443
QZ11B	Amputations without Major CC	8	£71,712
JC15Z	Skin Therapies level 3	7	£3,752
QZ16A	Diagnostic Vascular Radiology and Other Transluminal Diagnostic Procedures with Major CC	6	£49,608
QZ05A	Miscellaneous Vascular Procedures with CC	6	£15,822
JC02A	Major Skin Procedures category 2 with Major CC	4	£29,981
FZ12D	General Abdominal - Very Major or Major Procedures 19 years and over with Major CC	3	£17,616
HB31Z	Major Foot Procedures for Non-Trauma	3	£13,050
HB35C	Minor Foot Procedures for Non-Trauma category 1 without CC	3	£2,469
HB99Z	Other Procedures for Non-Trauma	3	£867
QZ11A	Amputations with Major CC	2	£29,096
QZ01A	Aortic or Abdominal Surgery with CC	2	£15,813
WA03V	Septicaemia with Major CC	2	£7,458
HB22B	Major Knee Procedures for Non-Trauma category 1 with CC	2	£6,726
JC04A	Intermediate Skin Procedures category 2 with Major CC	2	£6,456
EA05Z	Pace 2 - Dual Chamber	2	£6,416
JD03A	Intermediate Skin Disorders category 2 with Major CC	2	£6,112
QZ15C	Therapeutic Endovascular Procedures without CC	2	£6,008
JD04A	Intermediate Skin Disorders category 1 with Major CC	2	£5,194
GB02B	Endoscopic/Radiology category 3 with Intermediate CC	2	£4,792
HB23B	Intermediate Knee Procedures for Non-Trauma with CC	2	£4,594
JC04B	Intermediate Skin Procedures category 2 with Intermediate CC	2	£3,654
QZ13A	Vascular Access for Renal Replacement Therapy with CC	2	£2,928
QZ10A	Primary Unilateral Varicose Vein Procedures with CC (includes Ulceration)	2	£2,046
Other		34	£112,379
Total		4,015	£16,910,258

CC: complications and comorbidities

Table A3.4 Foot-ulcer-related HRGs, admissions for people with diabetes, and tariff expenditure, England 2014-15

HRG	HRG description	Admissions	Expenditure
JD03A/B/C	Intermediate skin disorders	12,556	£30,795,645
JD01A/B/C	Major skin disorders category 2	4,123	£17,107,825
KB03A/B	Diabetes with lower limb complications	3,612	£10,703,346
QZ15A/B/C	Therapeutic endovascular procedures	2,261	£9,339,763
JC03A/B/C	Major skin procedures category 1	1,781	£9,157,177
WA03V/X	Septicaemia	1,852	£6,738,074
HD25A/B/C	Infections of bones or joints	1,351	£6,338,361
QZ02A/B	Lower limb arterial surgery	675	£5,394,406
WA22V/X	Other specified admissions and counselling	1,479	£5,267,018
JC01A/B	Major multiple skin procedures	490	£4,086,155
QZ17A/B	Non-surgical peripheral vascular disease	1,394	£3,868,874
JD04A/B	Minor skin disorders category 3	1,082	£2,390,555
WA18V/X	Admission for unexplained symptoms	781	£2,155,521
QZ16A/B/C	Diagnostic vascular radiology and other transluminal procedures	599	£1,824,452
QZ03Z	Bypasses to tibial arteries	123	£1,243,173
HB21A/B	Major knee procedures for non trauma category 2	126	£960,120
HD21A/B	Soft tissue disorders	474	£943,552
HD24A/B	Non-inflammatory bone or joint disorders	311	£921,779
HD26A	Musculoskeletal signs and symptoms with major CC	259	£790,366
HD23A/B	Inflammatory spine, joint or connective tissue disorders	254	£738,739
JC04A/B	Intermediate skin procedures	182	£510,172
HB35B	Minor foot procedures for non-trauma category 1 with CC	306	£373,320
HB24B	Minor knee procedures for non trauma category 2 with CC	235	£368,950

WA09W	Other non-viral infection with CC	124	£359,108
HA22B	Major knee procedures category 1 for trauma with CC	49	£283,465
JC02A/B	Major skin procedures category 2	37	£265,733
HB23B	Intermediate knee procedures for non trauma with CC	90	£206,730
JC15Z	Skin therapies level 3	309	£178,299
HA21B	Major knee procedures category 2 for trauma with CC	22	£153,010
WA19W	Abnormal findings without diagnosis with CC	118	£148,038
JD02A/B	Major skin disorders category 1	38	£140,429
JD05A/B	Minor skin disorders category 2	62	£115,056
HA31B	Major foot procedures for trauma with CC	26	£113,880
HB31Z	Major foot procedures for non-trauma	23	£106,848
HA92Z	Knee trauma diagnosis without procedure	99	£104,877
QZ12Z	Foot procedures for diabetes or arterial disease, and procedures to amputation stumps	19	£104,215
HA23B	Intermediate knee procedures category 2 for trauma with CC	21	£94,563
JC05A/B/C	Minor skin procedures category 3	104	£91,421
HB22B	Major knee procedures for non trauma category 1 with CC	27	£90,801
HA33Z	Intermediate foot procedures for trauma category 1	43	£86,129
HA93Z	Foot trauma diagnosis without procedure	107	£73,343
HA32Z	Intermediate foot procedures for trauma category 2	24	£71,928
WA06W	Other viral illness with CC	51	£64,518
JC06A/B	Minor skin procedures category 2	53	£55,578
JD06A	Minor skin disorders category 1 with CC	36	£51,656

PA17A/B	Intermediate infections (age ≤18)	34	£46,116
HA26B	Minor knee procedures category 1 for trauma with CC	23	£33,695
HA34Z	Minor foot procedures for trauma category 2	17	£33,388
AB05Z	Intermediate pain procedures	19	£31,707
HB91Z	Other non trauma diagnosis without procedure	40	£31,080
AB03Z	Complex pain procedures	26	£30,562
JC16Z	Skin therapies level 4	40	£30,476
HA25B	Minor knee procedures category 2 for trauma with CC	11	£29,766
WA04S/T	Acute febrile illness length of stay 4 days or less	23	£25,995
JC17Z	Skin therapies level 5	28	£23,944
WA20W	Examination, follow up and special screening with CC	35	£23,409
HA35Z	Minor foot procedures for trauma category 1	12	£22,200
HB99Z	Other procedures for non-trauma	69	£19,941
WA21W	Other procedures and health care problems with CC	11	£17,997
HA24Z	Intermediate knee procedures category 1 for trauma	6	£17,946
JC27Z	Nursing procedures & dressings 1	34	£16,962
HA96Z	Multiple trauma diagnoses without procedure	10	£14,750
AB04Z	Major pain procedures	22	£14,742
JC07Z	Minor skin procedures category 1	13	£12,465
JC14Z	Skin therapies level 2	19	£10,784
AB06Z	Minor pain procedures	5	£7,404
QZ19Z	Blood vessel injury with no significant procedure	2	£3,730
PA35A	Skin disorders with CC (age ≤18)	3	£3,567
Total		38,290	£125,479,594

CC: complications and comorbidities

This list of HRGs was drawn up by a panel of clinical experts for the Yorkshire and Humber Public Health Observatory (YHPHO). In the view of the panel, foot ulcer care was likely to be the sole or dominant cost driver in admissions grouped to these HRGs if the patient record included a diabetes

diagnosis code and a foot-ulcer related diagnosis or procedure code. For the present analysis the original list has been adjusted slightly. HRGs QZ11A and QZ11B (Amputation with/without complications and comorbidities) were removed from the list as lower-extremity amputation admissions are considered separately. Six HRGs were added to the list, as the grouping algorithms for these HRGs were identical to those for HRGs already on the list, except in regard to (non-diabetes) complications and comorbidities.

The HRGs added are:
HD25C (Infections of Bones or Joint without CC)
JC05C (Minor Skin Procedures Category 3 without CC)
QZ02B (Lower Limb Arterial Surgery without CC)
QZ15C (Therapeutic Endovascular Procedures without CC)
QZ16C (Diagnostic Vascular Radiology and other transluminal Procedures without CC)
WA22X (Other specified admissions and counselling with Intermediate CC)
Together, these six HRGs accounted for 0.95% of admissions and 0.82% of expenditure in Table A3.2

For some HRGs on the list, there were no admissions with diabetes and foot ulcer in 2014-15. These HRGs are AB02Z, HB25A/B, HB32Z, HB33B, HB34B, HD31A/B, HD32A, HD35A, HD36A, NZ09Z, PA37Z.

Table A3.5 Estimated lifetime cost of post-amputation care for a one-year cohort of patients*

Intervention	Lifetime cost per patient receiving intervention	Patients	Total cost
Prosthesis provision and care	£12,614.32	872	£10,999,179
Wheelchair assessment, provision, review and maintenance	£1,000	3,516	£3,514,656
Physiotherapy (major amputation)	£1,252	3,016	£3,775,389
Physiotherapy (minor amputation)	£417	4,015	£1,675,308
Transport	£121	7,031	£849,246
Total			£20,813,777

*** Lifetime costs for a one-year cohort are taken as a proxy for one year costs for all post-amputation incident and prevalent patients**

Appendix 4

Table A4.1 Unit costs, utilities and transition probabilities used in economic analysis of impact of MDT

		Method	Source
	Unit cost	Method	Source
Major amputation (acute care)	£10,668	Weighted average tariff paid for major amputations in diabetes grouped to amputation HRGs (QZ11A-B)	NHS PbR tariff 2014-15[44]
Major amputation (post-discharge care)- lifetime cost	£5,519	Cost of prosthesis care plus physiotherapy, transport and wheelchairs per patient undergoing amputation	National Orthopaedic Hospital, NHS Reference Costs[45]
Ulceration (acute care)	£376 per bed day	Weighted average cost of bed day in HRGs KB03C,D,E (Diabetes with lower limb complications)	NHS Reference Costs 2014-15[45]
Ulceration - primary and community care annual	£218 per week	Weighted average cost of primary and community care for ulceration. Assuming 54% of ulcers are SINBAD ≥3, 46% are SINBAD ≤2.	Jeffcoate et al.[17] for SINBAD ≤2 costs, North West London Hospitals for SINBAD ≥3 costs, NDFA for distribution of ulcers by SINBAD score.[39]
Minor amputation (acute care)	£3,956	Weighted average tariff paid for minor amputation admissions in diabetes grouped to HRG QZ12Z (Foot Procedures for Diabetes or Arterial Disease, and Procedures to Amputation Stumps)	NHS PbR tariff 2014-15[44]
Minor amputation (post-discharge care), lifetime cost	£1,038	Physiotherapy, transport and wheelchairs per patient undergoing amputation	National Orthopaedic Hospital, NHS Reference Costs[45]
Utility			
Post major amputation	0.31	EQ-5D	Ragnarson Tennvall et al.[27]
Post minor amputation	0.61		
Ulceration	0.44		
Ulcer-free	0.6		
Transition probabilities (annual)			

Death after ulceration	0.11	Derived from 5-year risk	Moulik et al.[21]
Death after major amputation	0.29	Derived from 2-year risk	Waugh[2]
Death after minor amputation	0.11	Assumed equal to probability after ulceration	

Appendix 5

Table A5.1 Estimated cost of service improvement, Ipswich Hospital NHS Trust

	Resource type	Unit cost (per hour)	Cost
Non-recurring (set-up) costs			
Video production			£200
Printing			£500
Training	Band 7 podiatrist 6 hours	£52	£312
	Band 6 DSN 6 hours	£44	£264
	Ward staff - band 5 nurses 84 hours	£36	£3,024
	Ward staff - band 7 nurses 12 hours	£52	£624
Total set-up costs			£4,924
Recurring annual costs			
Monthly audit	Band 6 DSN 72 hours	£44	£3,168
Foot checks	Band 5 nurse - 2 minutes per patient, approximately 4,077 patients per year	£36	£4,892
Total recurring costs			£8,060

Savings from averted post-discharge ulcer care were estimated by assuming that mean ulcer duration is 12 weeks, that 54% of ulcers have SINBAD score of ≤2 and 46% have SINBAD score of ≥3, and that the mean cost of a week of care is £77 for ulcers with SINBAD score of ≤2 and £359 for ulcers with SINBAD score of ≥3. Since excess length of stay is estimated at 31 days, post-discharge treatment duration was estimated at 12 weeks minus 31 days.

According to Public Health England diabetes foot care activity profile data, there were 1.16 major amputations annually per 1,000 adults with diabetes in Suffolk PCT in 2007-10, 7% above the England rate of 1.08. In 2010-13 there were 0.83 major amputations per 1,000 adults with diabetes in Suffolk PCT, 5% below the England rate of 0.88.[35] It is estimated that there were 7 fewer major amputations per year in 2010-13 than there would have been if the rate had remained at the 2007-10 level.

(For 2010-13, profile data were published at CCG rather than PCT-level. Suffolk PCT was split into two CCGs; Ipswich and East Suffolk, and West Suffolk. Data for Ipswich and East Suffolk are more relevant in considering the impact of an improvement programme at Ipswich Hospital NHS Trust. However, in order to provide a comparator for 2008-10 data, we have combined data for the two successor CCGs. In 2010-13, there were 0.72 major amputations per 1,000 adults with diabetes in Ipswich and East Suffolk CCG, 18% below the England rate).

Appendix 6

Table A6.1 Estimated recurring costs of service improvement, Somerset

Recurring costs	WTE	Annual unit cost for 1 WTE (salary and salary oncosts)	Annual cost
1. Staff posts created			
Band 7 podiatrist	0.44	£48,137	£21,180
Band 7 podiatrist	0.8	£48,137	£38,510
Band 6 podiatrist	0.45	£38,610	£17,375
Band 5 podiatrist promoted to band 6	2.55	£9,951	£25,375
Total			£102,439
2. Taunton MDT patient-facing inputs	Hours pa	Cost per hour	Cost pa
Vascular surgeon	42	£106	£4,452
Diabetologist	48	£105	£5,040
Orthopaedic surgeon	42	£106	£4,452
Band 7 podiatrist	42	£81	£0
Band 7 orthotist	48	£81	£3,888
			£17,832
3. Taunton MDT non-patient facing inputs	Hours pa	Cost per hour	Cost pa
Vascular surgeon	9	£106	£954
Diabetologist	114	£105	£11,970
Orthopaedic surgeon	9	£106	£954
Band 7 podiatrist	9	£52	£0
Band 7 orthotist	0	£52	£0
Band 6/7 nurse	9	£50	£446
			£14,324
4 Yeovil patient-facing inputs			
Vascular surgeon	18	£106	£1,908
Diabetologist	60	£105	£6,300
Orthopaedic surgeon	36	£106	£3,816
Band 7 podiatrist	60	£81	£0
			£12,024
Training			£1,260
Total recurring costs			£147,879

Table A6.2 Estimated non-recurring costs of service improvement, Somerset

Non-recurring costs	
Building of specialist podiatry room	£18,161
Podiatrist training	£12,289
Total	£30,450

Table A6.3 Annual major amputations per 1,000 people with diabetes, 2012-15, England, Somerset, and comparator CCGs. (Source: PHE[35])

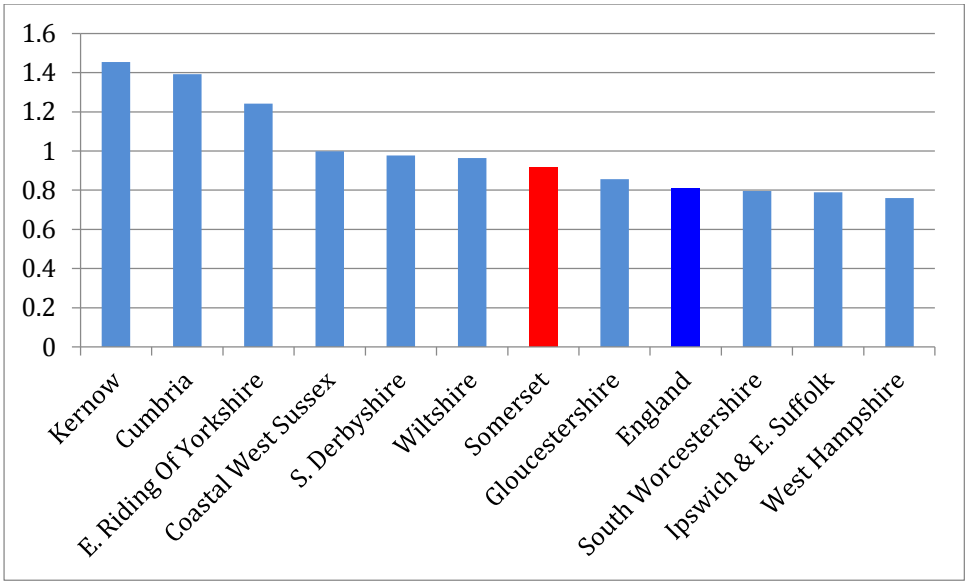


Table A6.4 Annual minor amputations per 1,000 people with diabetes, 2012-15, England, Somerset, and comparator CCGs. (Source: PHE[35])

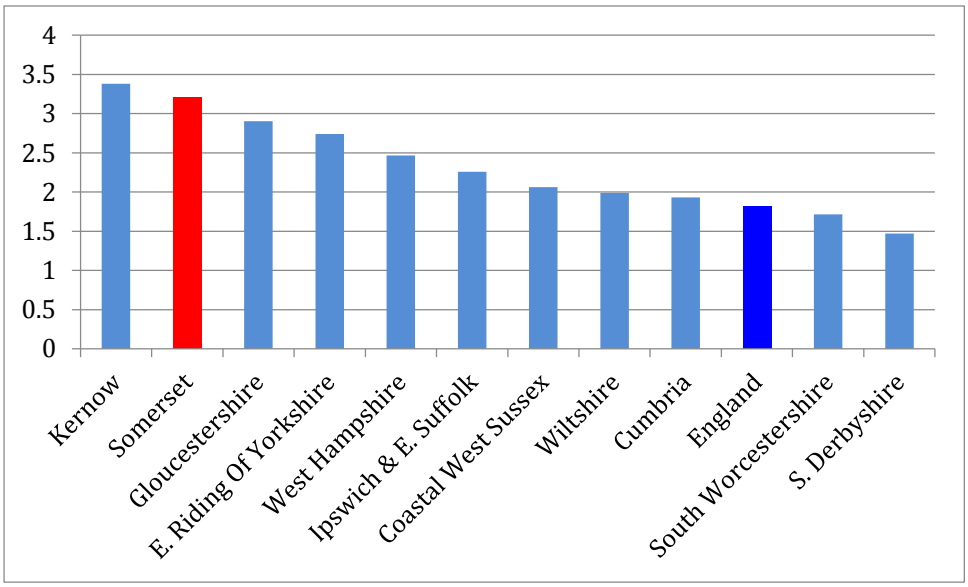
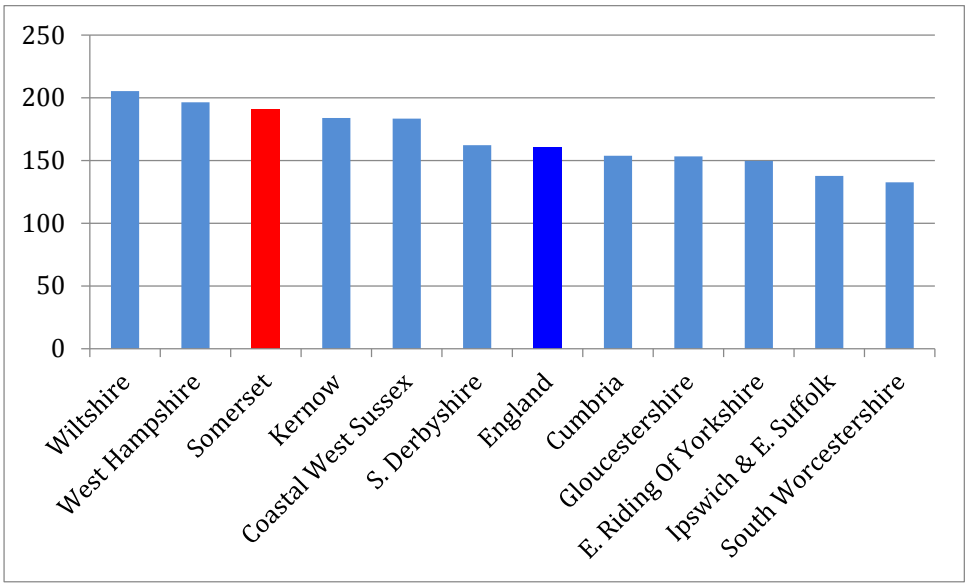


Table A6.5 Annual nights in hospital for diabetic foot disease per 1,000 people with diabetes, 2012-15, England, Somerset, and comparator CCGs. (Source: PHE[35])



Appendix 7

Table A7.1 Marginal recurring costs, specialist diabetes foot care, Brent

	Grade	WTE	Unit cost	
Consultant endocrinologist		0.4	£133,449	£53,380
Podiatrist	7	0.4	£57,147	£22,859
DSN	6	0.05	£47,365	£2,368
Consultant radiologist		0.05	£133,449	£6,672
Consultant vascular surgeon		0.05	£135,698	£6,785
Plaster technician	3	0.05	£27,194	£1,360
Total MDT				£93,424
STARRS				£4,263
Total - MDT and STARRS				£97,687

Table A7.2 Annual major amputations per 1,000 people with diabetes, 2012-15, Brent, England and comparator CCGs. (Source: PHE[35])

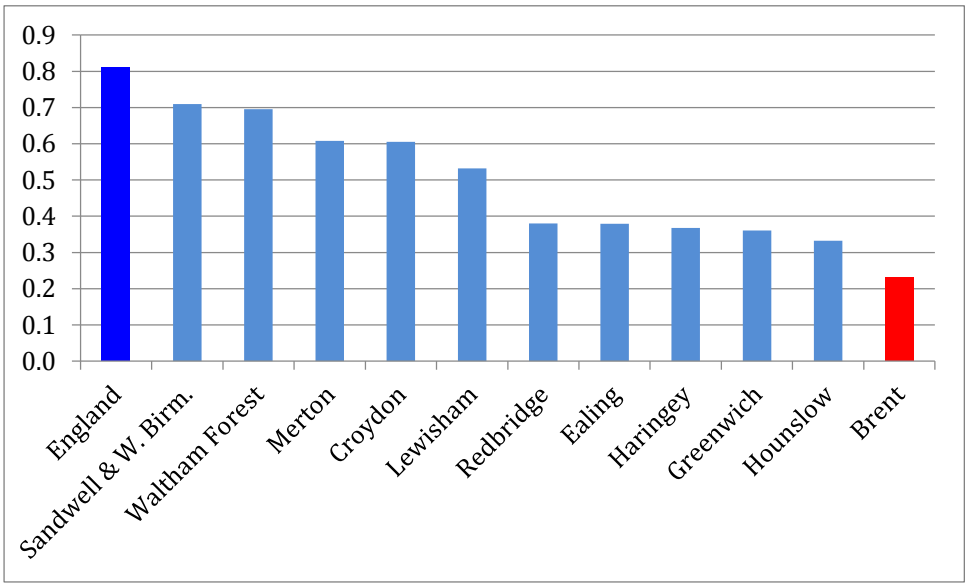


Table A7.3 Annual minor amputations per 1,000 people with diabetes, 2012-15, Brent, England and comparator CCGs. (Source: PHE[35])

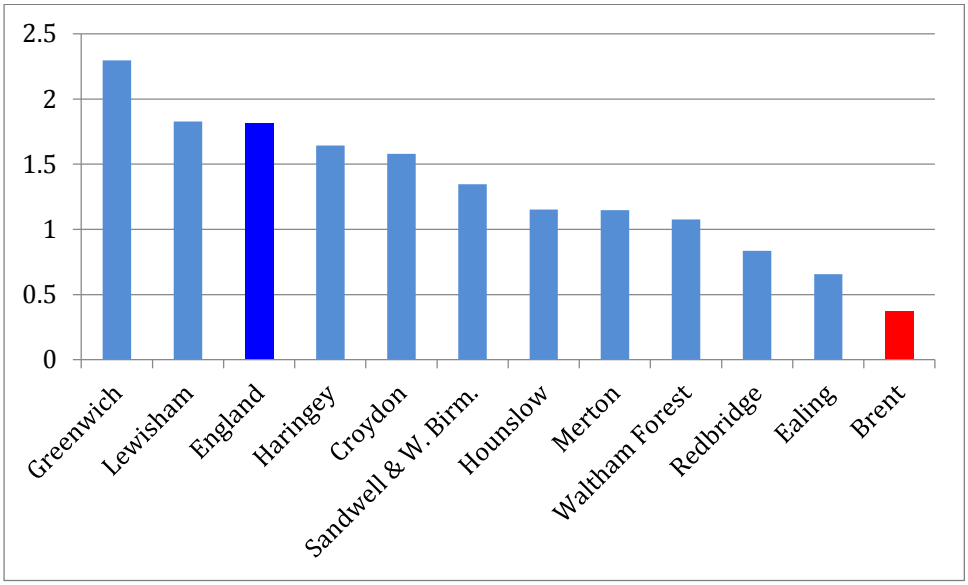
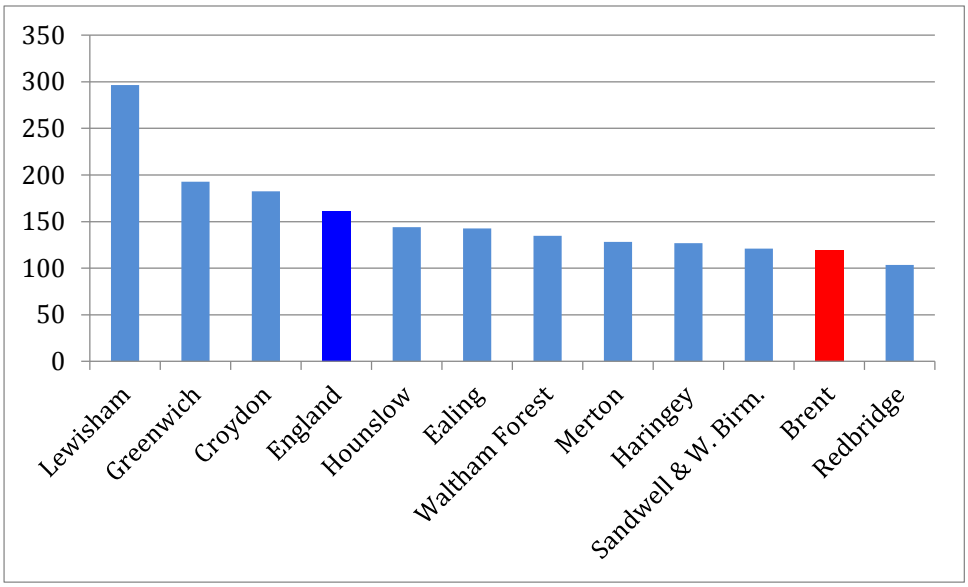


Table A7.4 Annual nights in hospital for diabetic foot disease per 1,000 people with diabetes, 2012-15, Brent, England and comparator CCGs. (Source: PHE[35])



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