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The economic impact of improved orthotic services provision

A review of some of the financial and economic benefits of a better functioning system for the provision of orthotic services

Report for the **British Healthcare Trades Association (BHTA)**

Final report

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Authorship and acknowledgements

This report has been produced by Cebr, an independent economics and business research consultancy established in 1993. The study was led by Oliver Hogan, Cebr Managing Economist, who is also the author of the report.

This study has been commissioned by the British Healthcare Trades Association (BHTA) and has utilised some data provided by them. However, the report does not necessarily reflect the views of the BHTA or its members.

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1 Introduction and background

This is a review of the potential benefits of an orthotics service that is better integrated throughout the patient pathway.

Independent impact assessment of a better functioning system for orthotics services provision

This study was conducted by Centre for Economics and Business Research Ltd (Cebr), an independent economics research consultancy founded in 1992. In addition to regular forecasts of global economic trends, Cebr has been at the forefront of analysis into the wider economic impact of policy proposals for over fifteen years. Among the studies carried out in this area are assessments of the impact of the ban on point-of-sale tobacco displays and on cigarette sales from vending machines, and the Government's review of alcohol taxation and pricing.

The review has been commissioned by the British Healthcare Trades Association (BHTA). Nevertheless, the views expressed herein are those of the authors alone and are based upon independent research by them.

In this section, we describe the nature of orthotics services and the policy context surrounding the study on which this report is based.

1.1 Orthotics services

Orthotics is a section within the medical field concerned with the design, manufacture and application of orthoses, orthopaedic devices which support or correct the function of a limb or the torso. Orthoses are used to restrict movement in a given direction, to assist movement more generally, to reduce weight-bearing forces for particular mobility purposes, to assist rehabilitation from fractures following the removal of a cast or to otherwise correct the shape and/or function of the body to provide easier movement capability and/or reduce pain.

Patients benefiting from orthoses have usually sustained some sort of physical impairment arising from such things as a stroke, a spinal chord injury or congenital abnormalities such

as spina bifida or cerebral palsy. Orthoses help to preserve people's functional abilities, their independence and quality of life.

Orthotics provides treatment options for a wide range of conditions and Orthotists work closely with many clinical specialties

Orthotists are the designated experts involved in the assessment, evaluation, design, fabrication, fitting, supply, review, maintenance and ongoing review of orthotic services for patients. They see patients from within days of birth (for example, for the treatment of developmental Dysplasia of the hip) until the latter years of life (when they are called upon to help maintain mobility and reduce pain).

Orthotists work with many clinical specialties, including:

- *Neuromuscular teams*: for example the stroke team, preventing deformity, increasing the range of motion, increasing mobility and improving the quality of life. Other examples include the treatment of congenital disorders such as spina bifida and cerebral palsy (contracture prevention).
- *Musculoskeletal teams*: reducing pain, improving function and protecting joints, for example, orthopaedic pre- and post-operative joint support, joint rehabilitation following sports injuries.
- *Rheumatology teams*: pain relief from custom bracing and footwear for sufferers of Rheumatoid Arthritis and Osteoarthritis.
- *Diabetic teams*: prevention of ulceration, healing and protecting the at risk limb.
- *Paediatric team*: assisting in the physical development of children.
- *Spinal team*: reducing deformity (e.g. scoliosis), providing support protecting function.
- *Trauma team*: protection of joints and immobilisation and post-operative bracing.
- *Elderly Medicine*: increasing independence, preventing falls, maintaining mobility, reducing pain, reducing hospital admissions and time spent on the ward.

The correct supply and fitting of orthotic devices can be a major factor in the effective management of patients' conditions and in the prevention of future problems.

1.2 Policy context – The prevailing orthotics services delivery model

The "Orthotic Pathfinder" report* asserted that, for many years,

* See "Orthotic Pathfinder: A patient focused strategy and proven implementation plan to improve and expand access to orthotic care services and transform the quality of care delivered", Philip Boxer & Tom Flynn, Business Solutions, July 2004.

“NHS orthotic services have been a poor relation in healthcare delivery, hidden away in the secondary healthcare system and behind the ‘commercial wall’ that results from being a largely outsourced clinical service.”

This is despite the potential for significant health and quality of life benefits for patients, financial benefits for the NHS and economic benefits for the wider economy that could be derived from a comprehensive, integrated orthotics service that is provided consistently throughout the patient pathway.

There are several problems with and consequences of the current structure of the orthotics service

The problems with the current orthotics service delivery model were summarised in the same Orthotic Pathfinder report as the facts that:

- while orthotics is predominantly a primary care service for chronic conditions, it is usually located within acute trusts;
- orthotics does not contribute to acute care key performance indicators, which means it has become progressively more budget constrained over the years as a result;
- there has been little consideration of orthotic services by NHS commissioners and management in general.

The first has meant a pervasive lack of referral access to orthotic care by primary care clinicians, long referral pathways and long waiting times. The Orthotic Pathfinder evidence suggested that this, combined with budgetary constraints and limited GP awareness of what the orthotic service can provide, has resulted in underutilisation (or “underuse”) of the service. The main sufferers have been patients with diabetes and the elderly, many of whom, it is believed, have suffered partial or total losses of mobility because they have not received the orthotic care that they needed.

These problems are exacerbated by the fact that demand for the service is increasing in line with England’s ageing population and the complexity of the associated clinical conditions.

The consequences for the NHS are that people who lose mobility resulting from the lack of orthotic intervention often end up requiring more acute intervention for mobility problems (such as hip replacements) as well as for falls. Furthermore, the lack of referral access for podiatrists for appropriate footwear results in delayed referral and this could, if avoided, reduce the need for acute care, in-patient stays, drugs and amputations, as well as the need for podiatry, nursing and social support in the community. Many elderly patients who lose their mobility require expensive social care services, while scarce and valuable clinical resources, such as those provided by orthopaedic consultants are wasted.

Consequently, there are significant benefits to be harnessed by resolving these problems

Patients, particularly those who have suffered a stroke and the elderly, would, if in receipt of orthotic care, benefit from an improved quality of life by enabling them to maintain themselves as independently mobile citizens. This would have a major impact on falls,

which would reduce the demand for orthopaedic care. For acute trusts, many patients currently being referred to consultants would be treated in primary care, thereby freeing clinical resources for patients who truly need acute care.

The greatest financial impact is expected to derive from the reduced demands on social care, with the number of elderly patients requiring residential care through loss of mobility and related factors expected to be greatly reduced. Furthermore, better orthotic provision will mean people who ultimately do require residential care will remain independent and enjoy a greater quality of life for longer.

For Government, a better functioning orthotics system would further the objective of a co-ordinated health and social care approach. The 'health of the nation', particularly of the elderly, can be expected to benefit from the improved quality of delivered care. But there will also be major net annual savings to the Exchequer because, as primary care trusts expand the level of provision of orthotic care, they will reduce the number of patients referred for acute procedures.

Relative to the costs, the aggregated benefits are expected to be substantial. Specifically, the aforementioned Orthotic Pathfinder study reported a saving of £4 for the NHS for every £1 spent on improving orthotics service provision. The study on which this report is based constitutes an attempt to corroborate this result of the Orthotic Pathfinder study, but also to determine the wider economic benefits that can be expected to be derived from a better functioning orthotics system, benefits which centre largely on the productivity gains as a result of a more mobile and independent working age population.

1.3 Structure of this report

The remainder of this report is structured as follows:

- Section 2 provides further background on the current state of play in orthotic services provision and what has been assessed as needing to change. This provides the context for describing the methodology we endeavoured to adopt for the study, the difficulties encountered in implementing that methodology and the manner in which we had to adapt and narrow the focus of the methodology to suit the limited data that was available.
- Section 3 considers the administrative and process efficiencies that could be achieved by relocating orthotic services from their current position within the acute trusts to an outsourced primary care environment.
- Section 4 considers some of the financial savings for the NHS and for social care, as well as some of the wider economic benefits arising from avoided productivity losses, through the better use of orthotics in the treatment of diabetic foot complications.
- Section 5 considers some of the financial savings for the NHS and for social care through the better use of orthotics, specifically ankle-foot orthoses, in the treatment and

rehabilitation of stroke survivors. Neither we nor BHTA were able to find data that would allow us to quantify potential productivity loss avoidance for treatment of stroke.

- Section 6 considers plantar fasciitis, but is limited by the data to considering only some of the potential financial savings for the NHS of primary care access to orthotic services much earlier in the treatment pathway for this condition.

2 Background, data and methodology

In this section, we outline the challenges posed by the study, particularly in terms of the lack of relevant data and the implications of this shortage for the methodological approach that was required to be adopted.

The purpose of the study was to quantify the financial savings to the NHS, the social care cost savings and the economic benefits for the wider economy that could be derived from a comprehensive, integrated orthotics service that is provided consistently throughout the patient pathway.

2.1 The current state of play

There were an estimated 1.2 million patients of orthotic services in 2007 according to a Foundation for Assistive Technology report, patients who rely on their orthoses to be able to continue to work and live independently.* However, the “Hutton report” asserts that the reported 1.2 million users can only be used as a guide because the same report suggests that the total number of patients benefiting from such assistive technologies is actually unknown.†

Furthermore, if one believes the findings of the Orthotic Pathfinder evidence, there is also a substantial unmet demand, arising largely from the aforementioned lack of referral access to orthotic care by primary care clinicians. This unmet demand is expected to grow in line with England’s ageing population, the complexity of the associated clinical conditions and the continuing rise in obesity.

While the Hutton report notes that increases in the elderly population in the UK is gradual compared to other European countries, with increasing life expectancy, it is projected that the percentage of those aged 65 and over will be 23.2% by 2031. Currently, 19.5% of the total population of England is beyond the typical working age, that is, over 65 for males and over 60 for females.

The continuing rise in obesity is, according to Hutton, also cause for concern, with estimates suggesting that, by 2015, 36% of males in England and 28% of females being expected to be obese. By 2025, these levels are expected to reach 47% and 35% for males and females respectively. This increase in obesity is expected to substantially increase the risk of developing several chronic diseases, in particular, type 2 diabetes, stroke and coronary heart disease.

The Pathfinder study found that orthotic clinics generally tend to be located in acute trusts and housed in facilities that are in need of upgrade. In five of the six pathfinder sites, Orthotists were contracted from the private sector, with only one having an in-house service model.

* See Down, K., “Assistive Technology Workforce Development”, The Foundation for Assistive Technology, June 2007.

† See Hutton, J. and M. Hurry, “Orthotic Service in the NHS: Improving Service Provision”, York Health Economics Consortium, July 2009.

Orthotic services have, nonetheless, received a very low priority in the NHS, with a lack of funding or accountability due to the service not being incorporated in key performance targets. Hutton noted that there is currently no agreed mechanism for relating changes in funding to changes in demand for orthotic services.

Current procurement of the service is, as also noted by Hutton, too dependent on a 'commodity product procurement' model, whereas a locally commissioned service based on clinical outcome is required to secure improved patient care and real value to the NHS. More specifically, NHS procurement currently divides the supply of orthotic products from the provision of professional orthotic services which, Hutton notes, has been targeted for cost reductions without a full appreciation of the benefits of an integrated overall service structure.

The problems with this structure were outlined in Section 1 above and are not repeated here.

2.2 What needs to change?

The cornerstone of a new system of orthotics provision will be the delivery of orthotic care to patients promptly, in the right place, and by the right clinician with the right skills. The Orthotic Pathfinder report recommended that:

- Earmarked finance should be made available for five years, channelled through strategic health authorities, enabling primary care trusts to either take over the orthotic service from acute trusts, or to institute direct funding of the primary care element of their acute orthotic service (dual funding).
- A restructuring of longer term budgets is required to reflect the change in service provision and the reduced demand for mobility care in social services.
- Dedicated and appropriately skilled resources are required to support PCTs in implementing the commissioning-led processes needed for instituting dual funding, or transferring the services to sit under their control where appropriate.
- In improving service effectiveness in orthotic clinics, more effective links with acute trust consultants and other primary care clinicians should be built to increase patient access to the service.
- There should be a marked expansion in training of Orthotists to ensure sufficient levels of trained staff, particularly in the context of increasing number of female Orthotists, many of which will have career breaks for families etc.

However, the report notes that systemic changes of this kind "will not be prioritised by primary care trusts unless they sit within the larger context of strategic health authority plans for chronic services, of which orthotics is just one part". The Pathfinder report recommends ten key areas of change, but the experience of the study showed that these are difficult to implement without the restructuring longer term budgets.

The following benefits are, according to the Orthotic Pathfinder report, expected to flow from implementing the above recommendations and from instituting the key areas of change identified:

- *Improved access to care*: an estimated 24,000 additional chronic orthotic referrals per annum and an additional 300,000 chronic patients being under orthotic care within ten years.
- *Freed clinical consultant resources*: the treatment of many of today's acute trust referrals in primary care is expected to save 54,000 orthopaedic consultant appointments for patients who truly need acute care.
- *Reduction in the incidence of falls*: improved mobility provision and the reduction in falls are also expected to reduce the demand for orthopaedic care.
- *Reduced demand for social care services*: this is expected to yield a major net annual saving to the Exchequer of £40 million, which is expected to rise to £390 million in ten years.

These benefits were derived by extrapolating the findings from a detailed examination of the current workings of the orthotics service at six Pathfinder sites to the national level. However, these benefits were measured based only on meeting existing levels of demand through a better functioning, more integrated orthotics service and based on the reductions in the mobility problems of those who were observed to have been denied access to an orthotics service at the Pathfinder sites.

2.3 The benefits we aimed to measure in this study and the problems encountered

The detail and data provided in the Pathfinder report was insufficient to allow us to replicate its calculations or to fully understand the basis for the benefits quantified. The aim of the BHTA Orthotics Group in commissioning the present study was to attempt to corroborate the finding that a saving of £4 could be achieved by the NHS for every £1 spent on improving orthotic services. Our aim was also to quantify the wider economic benefits that can be expected to be derived from the improved orthotics service.

To achieve these aims, the methodology we endeavoured to adopt was to model the savings and benefits of treating the conditions that are amenable to orthotic care through a new hypothetical system that incorporates a better functioning orthotics system relative to a counterfactual of treating those conditions under the current system, which embodies the problems with the current orthotics service outlined above. By independently modelling the likely incidence of these conditions, we departed from the estimated 1.2 million patients currently receiving orthotic care and implicitly assumed that both the current existing and unmet demand would be met for the specific medical conditions considered.

The main difficulty with this approach was the fact that there is a very long list of medical conditions that are amenable to orthotic care and it became immediately apparent, not least due to the lack of data, that it would be difficult to model savings and benefits for all of

them. Following discussions with the BHTA Orthotics Group, we agreed to narrow the focus of the study to those conditions which the Group has observed currently place the greatest demands on the orthotics service. These were diabetic foot complications, stroke treatment and rehabilitation and cerebral palsy.

While we were able to find some data on diabetic foot complications and stroke, data on cerebral palsy was all but non-existent. Therefore, Cebr and the Group agreed that we would consider another condition on which we were able to find some (albeit still sparse) information. The condition that we chose instead of cerebral palsy was plantar fasciitis.

For the three conditions to be considered, the data we were able to find were far from being detailed enough to carry out a truly comprehensive quantification of savings and benefits associated with their treatment under a better functioning orthotics service relative to the current system. This is not least due to the fact that every patient is different, not only in terms of the severity and exact nature of the particular condition under consideration, but also in terms of the levels and nature of the treatment required, be it under the new hypothetical system or the current system.

Furthermore, the data that would allow us to quantify all the possible financial savings and economic benefits that are conceivably achievable under the better functioning orthotics service was simply not available.

Therefore, as well as considering only three out of the many possible conditions that are amenable to orthotic care, we have had to narrow our focus in a number of other respects, namely:

- assuming that the nature of any condition considered is common across the population of patients suffering that condition;
- assuming that the treatment pathway and associated costs are the same for all patients with the particular condition in question; and
- restricting our attention to the quantification, for each condition considered, of the particular categories of savings and benefits for which data was available, for example, there was no information on the productivity losses that result from loss of mobility or on the consequent economic inactivity of that proportion of the working age population affected by plantar fasciitis.

The necessity of making these simplifying assumptions (as well as those made in the remaining sections) is that our quantifications cannot be expected to be an accurate reflection of the true picture. For that reason, we have focused our attention on the ratios of costs under the new hypothetical system (incorporating better functioning orthotics) and the current system, rather than on the absolute savings calculated by subtracting the former from the latter.

These ratios must be seen for what they are, that is, indicative broad orders of magnitude of savings that can be expected to be achieved when addressing forecasted levels of incidence of conditions that are assumed to be common across all patient cohorts. While the absolute

numbers would inevitably change if these simplifying assumptions could be relaxed, we doubt that the ratios would change very much.

3 Administrative and process efficiency savings

This section considers the administrative and process efficiencies that could be achieved by relocating orthotic services from their current position within the acute trusts to an outsourced primary care environment.

The BHTA orthotics group believes that a better functioning system for orthotic services provision could, by relocating them to an outsourced primary care environment from their current location within acute trusts, save the NHS £40 million per annum, money that could be released to help meet the current unmet demand for orthotic services rather than being consumed on acute trust overheads.

3.1 Current NHS expenditure on orthotics

There are diverging views on the size of current expenditure on orthotics by the NHS. The Hutton report stated that, in 2005, expenditure (by the NHS) on orthoses was in the region of £85 million.* However, the same report noted that current (2009) expenditure was £100 million, which BHTA notes is inclusive of the cost of commissioning Orthotists. However, BHTA also notes that, taking account of the costs of accommodation of the service (within acute care facilities) and the administration of the procedure (over 1 million small-value transactions per annum) probably takes the true cost of provision to over £200 million.

The breakdown of this spend, based on PASA and other sources in the public domain, is shown in Table 1 below. The BHTA Orthotics Group undertook a sanity check, building on the same £85 million of known spend on orthotic products, but using their own knowledge and experience of how orthotic services are currently housed, delivered and administered and how Orthotists and orthoses are procured. The Orthotics Group's estimate comes out at about £2 million lower than those derived from sources in the public domain.

Table 1: Alternative estimates of current annual NHS expenditure on orthotic services, January 2011

ITEM OF SPEND	PASA and other public domain sources	BHTA Orthotics Group estimate
	NHS CURRENT ANNUAL EXPENDITURE (£ millions)	NHS CURRENT ANNUAL EXPENDITURE (£millions)
Orthotic products	85	85
Orthotic services	15	18
Administration	15	15
Facilities	10	11
NHS order process	30	27

* Based on PASA expenditure in 2004/05

	PASA and other public domain sources	BHTA Orthotics Group estimate
Purchasing costs	2	1
Trust overhead	50	47
Total	207	205

3.2 NHS expenditure under a new system for orthotics

By migrating orthotic services away from their current location within acute trusts, the BHTA Orthotics Group believes that this annual spend of £207 million could be reduced to £159 million. The breakdown of this reduced level of spend is shown in Table 2 below which, when compared with Table 1, shows the sources of these savings.

Table 2: BHTA

ITEM OF SPEND	BHTA Orthotics Group estimate NHS PROJECTED ANNUAL EXPENDITURE UNDER NEW SYSTEM (£ millions)
Orthotic products	85
Orthotic services	25
Administration	5
Facilities	8
NHS order process	10
Purchasing costs	1
Trust overhead recovery	25
Total	159

The principal source of the savings arise from reduced administration, reduced NHS order processing costs and reduced overheads associated with the service. Savings are also seen as being achievable in the areas of facilities and purchasing costs. However, spend on orthotic service provision would likely increase under a new system.

3.3 Deploying these resources to more productive uses

The £48 million savings projected by the Group is money that could be released to help meet the current unmet demand for orthotic services. The Group also pointed out that the vast majority of patients, once they enter the system, are patients for life so that, if things

continue in the manner in which they currently operate, the unmet demand will continue to grow.

4 Diabetes: financial & economic impacts of multi-disciplinary foot ulcer prevention & management teams

In this section we assess some of the potential financial savings for the NHS and for social care provision, as well as some of the wider economic impacts for the UK, arising from the introduction of multi-disciplinary teams for the prevention and management of diabetic foot complications.

For the purposes of this report, we have calculated some of the savings that the NHS can expect to achieve through a better functioning system for the prevention and management of diabetic foot complications. That system incorporates orthotic solutions, but also the involvement of podiatrists, vascular and orthopaedic surgeons, diabetologists, interventional radiologists and diabetes and tissue viability nurses. Where diabetes is concerned, therefore, the better functioning orthotics system that is the subject of this report is one amongst many elements of the multi-faceted sets of practitioners required to effectively treat patients with diabetic foot complications.

4.1 Financial savings for the NHS

Table 3 below illustrates our findings in terms of some of the financial savings the NHS could expect to achieve through the rollout of multi-disciplinary teams for the prevention and management of diabetic foot complications.

Table 3: NHS savings in the treatment of diabetes, 100% savings achieved after 3 years

NET FINANCIAL SAVINGS TO NHS	2011	2020	2020 ratio achieved by...
Savings under the new system (£m)	685	1,136	
Current system : New system cost ratio	1.7 : 1	2.0 : 1	2015

The financial savings for the NHS in any year consists of the *difference* between the total cost associated with treating diabetic foot complications through a national system of multi-disciplinary diabetic foot care teams and the total cost of treating them under the current system. For simplicity, we have ignored ulcers that are recurring from those suffered in the years preceding 2010.

The savings and ratios presented in Table 3 above assume that it takes 3 years for the new multi-disciplinary system (incorporating better functioning orthotics) to become fully functioning. This amounts to an assumption that one-third of the savings are realised in year 1, two-thirds are realised in year 2 and 100% are achieved in year 3.

The savings and ratios presented in Table 4 below assume that it takes 4 years for the new multi-disciplinary system to become fully functioning, so that 25% of the savings are

realised in year 1, 50% in year 2, 75% in year 3 and 100% in year 4. The table shows that while the magnitude of savings has changed in year 1 (2011), the ratio has remained broadly unchanged.

However, when there is assumed to be a 4-year lead time before the new system is fully-functioning, it takes until 2017 before the 2 : 1 ratio is achieved. This is achieved by 2015 when there is a 3-year lead time.

Table 4: NHS savings in the treatment of diabetes, 100% savings achieved after 4 years

NET FINANCIAL SAVINGS TO NHS	2011	2020	2020 ratio achieved by...
Savings under the new system (£m)	672	1,136	
Current system : New system cost ratio	1.7 : 1	2.0 : 1	2017

Our total cost model for the **current system** is based on average levels of cost for treating new and recurring ulcers and carrying out amputations, most of which are preceded by foot ulcers. The predictions of the quantities of ulcer treatments and diabetic amputations that drive the magnitude of total cost are based on the following assumptions:

- That, of the 3 million diabetes sufferers in England today,* which is expected to grow to 4 million by 2025, 40% have a high risk of developing a foot ulcer.†
- That 7.7% of all diabetes sufferers are likely to develop an ulcer in any one year.‡ This amounted to an implicit assumption that 19.1% of high risk patients developing an ulcer in any one year.
- That the recurrence rate is 28% after 12 months and 50% after 3 years.§

* See Rachel Berrington, "Implementing the 'Putting Feet First' campaign", Lead Diabetes Specialist Foot Nurse Team, University Hospitals of Leicester. This paper was supplied to Cebr by BHTA and is available at <http://www.diabetes.nhs.uk/document.php?o=959> for those with access to the NHS Diabetes website. The 3 million were reported to consist of 2.5 million who are aware of their condition and 0.5 million who are unaware that they suffer from diabetes.

† We have based this assumption on the empirical findings in relation to the Salford Foot Ulcer Prevention and Management Service presented in Marion Kerr, "High Impact Change: Building the economic case for improved foot care services", 28th September 2010. The finding of Ms Kerr that led to our assumption of 40% was that, out of the Salford service's 10,000 diabetic patients, 4,000 were considered to be medium- to high-risk of developing a foot ulcer. We note, however, that Ms Kerr's findings were noted as preliminary and awaiting validation. The monetary savings and ratios presented in Table 3 and Table 4 were produced, therefore, on the basis of a hypothetical world in which it was assumed that what was observed by Ms Kerr in Salford reflects the situation for the national population of diabetics.

‡ We likewise based this assumption on the empirical findings of Marion Kerr in relation to the Salford service. The finding of Ms Kerr that led to our assumption of 7.7% was that, in the last year before the Salford Foot Ulcer and Prevention and Management Service was introduced (1999), foot ulcer incidence was at this level. This 1999 incidence rate was assumed by Cebr to reflect incidence under the current system, which amounts to assuming that national incidence is reflective of incidence in Salford prior to the introduction of the new multi-disciplinary foot care team.

§ See Peter R. Cavanaugh et al, "Treatment for Diabetic Foot Ulcers", *Lancet*, **366**, 2005 and Boulton et al, "The Global Burden of Diabetic Foot Disease", *Lancet*, **366**, 2005.

- That the rate of amputation is 2.25% of the total diabetic population.* We assumed that 50% are toe amputations, 25% are foot amputations and 25% are leg amputations.

The average cost of treatment for a diabetic foot ulcer is assumed to be close to £5,400 under the current system, which is the cost calculated by Hutton (2009), uplifted for inflation since 2009, and which is assumed to apply equally to a new or a recurring ulcer. The average cost of an amputation is assumed to vary according to the limb being amputated. The average cost of a toe amputation is assumed to be about £3,600, a foot amputation £8,200 and leg amputation to cost £11,600, which are the costs published by Wounds UK (2008) uplifted for inflation. The BHTA Orthotics Group suspect that these costs reflect only the direct cost to the NHS of carrying out the amputation but exclude the range of ancillary pre- and post-operative costs associated with amputations.

Our total cost model for the **new multi-disciplinary system** is based on a scaling-up to the national level of the empirical evidence from the Salford foot ulcer prevention and management service, as reported in Kerr (2010). (See footnotes † and ‡ above.) The 'clinic' has 10,000 diabetic patients (all or mostly Type 2) and involves annual foot screening by podiatrists for all patients with risk stratification and greater frequencies of screening for medium- to high-risk patients, namely those suffering from sensory neuropathy or ischemia. The evidence suggests that:

- For 10,000 diabetics, a single podiatrist check per year costs a total of £114,000.
- For 4,000 medium- to-high-risk patients, an average of four podiatrist checks per year and the requisite orthotics products and services has a total cost of £350,000.
- For 647 patients with ulcers, the combined cost of (i) weekly half day clinics, podiatrist visits, district nurse visits, dressings, orthotic products and services, and medications and (ii) home intravenous therapy (5 bed equivalent) is £1,890,000.

However, the BHTA Orthotics Group considered £350,000 to be too low an amount to cover the costs of 4 podiatry checks per year for 4,000 patients as well as the requisite orthoses and services required as part of the preventative service. Consequently, we added a line item to the current (outlined above) and new system calculations to capture this additional cost, in the following manner:

- For the current system, we assumed that a total of 35,000 diabetic patients are seen by Orthotists at a cost of about £630 per annum each.† This gave an additional total cost associated with the orthotic element of the current system of £22.1 million, which is included in the total costs under the current service reported above.
- For the new system, we assumed that a greater number of patients are seen by Orthotists, this being the 35,000 uplifted by the rate by which the number of (new and

* See Paul Chadwick et al, "How can we improve the care of the diabetic foot?", Wounds UK, Vol. 4 No. 4, 2008.

† This cost is based on the £300 reported in Hutton (2009) for direct treatment costs, uplifted for inflation and doubled to reflect the fact the true cost of the aggregate orthotic service is probably twice the cost of the £100 million reported for orthotic products and services. See section 3 above.

recurring) ulcers treated per annum is assumed to fall under the multi-disciplinary system. This gave an additional total cost associated with the orthotic element of the new multi-disciplinary service of £26.2 million.

Continuing with the total cost model for the new hypothetical multi-disciplinary system, we combined the data above with assumptions, based again on the empirical findings of Kerr in relation to Salford, that:

- (a) 16.2% (647 out of 4,000) of medium- to high-risk patients have ulcers (which compares with an implied 19.1% ulceration rate for medium- to high-risk patients under the current system);
- (b) ulcer recurrence rates have fallen by almost 20%; and
- (c) amputations have fallen by nearly 65%.

The difference between the annual costs under the current system and annual costs under the multi-disciplinary team using this modelling approach gave the savings and ratios detailed in Table 3 and Table 4 above.

During the closing stages of the study, it was pointed out to us that the national-level ulcer incidence rates that we assumed based on the preliminary findings of Marion Kerr (see footnotes † and ‡) are 300% higher than is generally accepted by experts in the diabetic foot. We, therefore, re-modelled the savings and ratios presented in Table 3 and Table 4 above to assess the impact of the lower incidence rates that are implied by this assertion. This amounted to changing the following assumptions:

- That under the current system, instead of 7.7% of all diabetes sufferers being likely to develop an ulcer in any one year (which amounted to an implicit assumption that 19.1% of high risk patients develop an ulcer in any one year), 2.6% of all diabetes sufferers are likely to develop an ulcer in any one year (which, likewise, translated to an implicit assumption that 6.4% of high-risk patients develop an ulcer in any year).
- That under the new system, instead of 16.2% of medium- to high-risk patients being assumed to develop an ulcer, 5.4% of these patients are assumed develop an ulcer in any one year.

The results are presented in Table 5 and Table 6 below. These show a dramatic fall in the monetary values of the savings, but also a quite dramatic fall in the ratio of costs under the current system versus the new multi-disciplinary system. Specifically, the ratio has fallen from 1.7 : 1 in 2011 to 1.3 : 1 under the revised incidence assumptions and from 2 : 1 in 2020 to 1.5 : 1.

Table 5: NHS savings in the treatment of diabetes, lower assumed ulcer incidence, 100% savings achieved after 3 years

NET FINANCIAL SAVINGS TO NHS	2011	2020	2020 ratio achieved by...
Savings under the new system (£m)	141	286	
Current system : New system cost ratio	1.3 : 1	1.5 : 1	2013

Moving from a system in which there is a 3-year lead time before the new hypothetical multi-disciplinary team is fully functioning to one in which there is a 4-year lead time does little to alter the ratio of costs under the current system relative to the new system, despite reducing the amount of monetary savings achievable in the very early years.

Table 6: NHS savings in the treatment of diabetes, lower assumed ulcer and amputation incidence, 100% savings achieved after 4 years

NET FINANCIAL SAVINGS TO NHS	2011	2020	2020 ratio achieved by...
Savings under the new system (£m)	135	286	
Current system : New system cost ratio	1.3 : 1	1.5 : 1	2013

4.2 Financial savings for social care services

Table 7 below illustrates our findings in terms of some of the social care savings that could expect to be achieved through the rollout of multi-disciplinary teams for the prevention and management of diabetic complications.

Table 7: Social care savings in the treatment of diabetes, 100% savings achieved after 3 years

SOCIAL CARE SAVINGS	2011	2020
Savings under the new system (£m) (Corresponding with Table 3)	64	189
Savings under the new system (£m) (Corresponding with Table 5)	23	67
Current system : New system cost ratio (Corresponds with Tables 3 & 4 and Tables 5 & 6)	1.1 : 1	1.3 : 1

The magnitudes of the monetary savings are substantially lower when the incidence rates are assumed to be those used as the basis for the NHS financial savings presented in Table 5 above, which are substantially lower than those based on Cebr's assumptions (Table 3). However, moving between Cebr's higher incidence assumptions and the alternative lower incidence assumptions has no effect on the magnitude of the cost ratio between the new and current system. Neither does profiling the realisation of 100% of the savings over a 4 rather than a 3 year period.

The financial savings for social services in any year likewise consists of the *difference* between the total cost of treating all the new and recurring ulcers that are hypothesised to arise under the current system and the total cost of treating the number hypothesised to arise under the multi-disciplinary system.

The following assumptions were made:

- The average healing period for a diabetic ulcer is 12.5 weeks under the current system but 6 weeks under the alternative multi-disciplinary patient pathway.*
- The average healing period for a diabetic toe amputee is 127 days and for all other amputees is 366 days.†
- Elderly diabetic ulcer patients require residential care at a weekly cost of £856 per patient during the healing period, while working age patients require one hour's home care per day during the healing period at a cost of £105 per week.‡
- That the share of elderly diabetic ulcer sufferers is allocated according to the elderly share of the total population, which is expected to increase from about 19.6% in 2011 to 22% by 2031.§

* These data were sourced from the references in footnote § above.

† Data taken from Herbert et al (2006), "Predictors of return to work following traumatic work-related lower extremity amputation", in *Disability and Rehabilitation*, Vol. 28 Issue 10, 2006.

‡ See Frances Heywood and Lynn Turner, "Better outcomes, lower costs: Implications for health and social care budgets of investing in housing adaptations, improvements and equipment – a review of the evidence", Office for Disability Issues in conjunction with Bristol University, 2007.

§ Based on ONS demographics data.

4.3 Economic impact: reductions in lost productivity

Table 8: Avoided productivity losses in the treatment of diabetes, 100% savings achieved after 3 years

AVOIDED PRODUCTIVITY LOSSES	2011	2020
Savings under the new system (£m) (Corresponding with Table 3)	996	1,758
Savings under the new system (£m) (Corresponding with Table 5)	344	624
Current system : New system cost ratio (Corresponds with Tables 3 & 4 and Tables 5 & 6)	2.1 : 1	2.6 : 1

below illustrates our findings in terms of some of the productivity losses that could expect to be avoided through the rollout of multi-disciplinary teams for the prevention and management of diabetic complications.

Table 8: Avoided productivity losses in the treatment of diabetes, 100% savings achieved after 3 years

AVOIDED PRODUCTIVITY LOSSES	2011	2020
Savings under the new system (£m) (Corresponding with Table 3)	996	1,758
Savings under the new system (£m) (Corresponding with Table 5)	344	624
Current system : New system cost ratio (Corresponds with Tables 3 & 4 and Tables 5 & 6)	2.1 : 1	2.6 : 1

The magnitudes of the avoided monetary losses are, when the incidence rates are assumed to be those used as the basis for the NHS financial savings (presented in Table 5 above), substantially lower than those based on Cebr's assumptions (Table 3). However, as in the case of social care savings, moving between Cebr's higher incidence assumptions and the alternative lower incidence assumptions has little to no effect on the magnitude of the cost ratio between the new and current system. Neither does profiling the realisation of 100% of the savings over a 4 rather than a 3 year period.

The productivity gains (or, more accurately, the avoided productivity losses) in any year consist of the *difference* between the total productivity loss arising from treatment of diabetic foot complications under the current system and that lost when treating them under the multi-disciplinary system.

We assumed that these losses arise only from the treatment of working age diabetics. Using the ulcer and amputation healing periods outlined in subsection 4.2 above, we calculated total productivity losses based on current and Cebr forecasted levels of England's weekly GDP per capita.

5 Stroke: financial savings arising from the greater use of ankle-foot orthoses in the treatment of stroke patients

In this section we assess some of the potential financial savings for the NHS and for social care provision arising from the greater use of ankle-foot orthoses (AFOs) in the treatment of survivors of stroke.

We have calculated some of the savings that the NHS and social care services that could expect to be achieved through the greater use of AFOs in the treatment and rehabilitation of stroke survivors. The financial savings for the NHS are hypothesised to arise from reduced length of in-patient hospital stays arising from the enhanced mobility provided by a PRAFO that is fitted to the stroke survivor immediately upon admission to hospital and from the reduction in the number of falls and associated injuries suffered by stroke patients due to enhanced mobility provided by AFOs used in longer-term post-discharge rehabilitation. We did not have data that would allow us to hypothesise a reduction in contractures through the greater use of AFOs which, we understand, would be another major source of cost savings for the NHS in the treatment of stroke. Financial savings for social care arise from the reduced demands on social care services arising from the health benefits associated with the greater use of AFOs outlined above.

5.1 Financial savings for the NHS

Table 9 below illustrates our findings in terms of some of the financial savings the NHS could expect to achieve through the greater use of ankle-foot orthoses in the treatment and rehabilitation of stroke survivors.

Table 9: NHS savings in the treatment of stroke

NET FINANCIAL SAVINGS TO NHS	2011	2020
Savings under the new system (£m)	29	31
Current system : New system cost ratio	1.02 : 1	

The financial savings for the NHS in any year consists of the *difference* between the total cost associated with treating stroke patients through a hypothesised current system and that incurred in treating them through a hypothesised new system involving the greater use of AFOs. The cost model for both the hypothesised current and new systems consists of three components, namely:

- The cost of in-patient stays in stroke units for new stroke survivors;
- The cost associated with treating new and existing stroke survivors with AFOs; and

- The treatment of hip fractures that are hypothesised to arise from falls suffered by stroke survivors.

The driving assumptions for the costs associated with treating stroke patients under our hypothetical **current system** are as follows:

- That there are about 92 thousand new stroke survivors per annum in England, 252 thousand existing stroke survivors living in England and that about 50% of these are living with mobility problems.*
- That none of these patients are treated with a PRAFO upon hospital admission following a stroke, so that the average in-patient hospital stay per new stroke survivor is 34.4 days.†
- That 20% of new and existing stroke survivors use AFOs during rehabilitation following hospital discharge.‡
- That 50% of stroke patients regain the ability to walk.§
- That 75% of new stroke survivors experience a fall within 6 months, while 75% of the 50% of existing stroke patients who do not regain the ability to walk experience a fall in any year.**
- That 2% of new and existing stroke survivors who experience falls suffer a hip fracture.††
- The following unit cost assumptions:
 - A per patient per diem cost of £400 of an in-patient stay in a stroke unit.
 - A cost of £600 per AFO prescribed during rehabilitation following hospital discharge.‡‡
 - A cost of £30,000 imposed on the NHS by a hip fracture.

These assumptions produced a **total cost** associated with aspects of the treatment and rehabilitation of stroke survivors under our hypothetical **current system of £1.38 billion in 2011, which is projected to increase to £1.48 billion in 2020.**

* These data are extrapolated, based on ONS demographic data, from UK data provided in Sarah Tyson, "Ankle-foot orthoses (AFOs) for people with stroke", University of Salford. This paper was supplied to Cebr by BHTA.

† This data featured in Omer Saka et al, "Cost of stroke in the United Kingdom", *Age and Ageing*, **38**, 2009 and is based on data from the South London Stroke Register (SLSR).

‡ See footnote *.

§ See footnote *.

** See footnote *.

†† This is derived from Department of Health, *Falls and Fractures*, 2009.

‡‡ This is the annual cost including the orthotic services requirement in the first year. See footnote 15 for reference. Note that our calculations do not take into account ongoing treatment post the first year.

The alternative assumptions for the costs associated with treating stroke patients under our hypothetical **new system** are, where different, as follows:

- That 66% of new stroke survivors are treated with a PRAFO upon hospital admission following a stroke, which reduces the average in-patient hospital stay per new stroke survivor by 5% to 32.7 days.*
- That 43% of new and existing stroke survivors use AFOs during rehabilitation following hospital discharge arising from the better functioning orthotics service that is integrated into the patient pathway.†
- That a reduced proportion (65%) of new stroke survivors experience a fall within 6 months, while same proportion of the 50% of existing stroke patients who do not regain the ability to walk experience a fall in any year.‡ This, in turn, reduces the number of stroke survivors who suffer a hip fracture, which is still assumed to be 2%.

These assumptions produced a **total cost** associated with aspects of the treatment and rehabilitation of stroke survivors under our hypothetical **new system of £1.35 billion in 2011, which is projected to increase to £1.45 billion in 2020.**

The difference between the annual costs under the hypothetical current system and those under the hypothetical new system involving the greater use of AFOs gave the savings and ratio detailed in Table 9 above.

5.2 Financial savings for social care services

Table 7 below illustrates our findings in terms of some of the social care savings that could be expected to be achieved through the greater use of ankle-foot orthoses in the treatment and rehabilitation of stroke survivors.

* This is a BHTA Orthotics Group hypothetical assumption to facilitate the illustrative quantification exercise that this study has turned out to be. However, it can potentially be substantiated by findings in the medical field. For example, Rogerson & Tyson found that stroke patients achieved a 3.5% increase in walking speed with the combined use of an AFO and another walking aid relative to the use of a non-AFO walking aid only. The same authors found that 55% of patients reported better safety through the combined use of an AFO and a walking cane, as opposed to 50% when using a walking cane alone. See Sarah Tyson and Louise Rogerson, "Assistive walking devices in nonambulant patients undergoing rehabilitation after stroke: The effects on functional mobility, walking impairments and patients' opinion", *Archives of Physical Medicine and Rehabilitation*, Volume 90, March 2009.

† See footnote *.

‡ This reduced proportion of new and existing stroke survivors who suffer falls arising from the greater use of AFOs was made by the BHTA Orthotics Group for the purposes of facilitating the quantification. There is no empirical basis for this assumption as far as Cebr is aware.

Table 10: Social care savings in the treatment of stroke

SOCIAL CARE SAVINGS	2011	2020
Savings under the new system (£m)	8.2	8.8
Current system : New system cost ratio	1.3 : 1	

The financial savings for social services in any year consists of the *difference* between the total cost associated with treating stroke patients through a hypothesised current system and that incurred in treating them through a hypothesised new system involving the greater use of AFOs.

The following assumptions (which should be read in conjunction with the assumptions in subsection 5.1 above) were made:

- That 12.5% of all new and existing stroke survivors in England are in receipt of formal social care and that 12.5% of all new and existing stroke survivors who suffer falls in any one year also require formal social care. This, we hope, amounts to an implicit assumption that 87.5% of patients are cared for by friends and family.
- That, of those in receipt of formal social care, one-third receive nursing home care, one-third receive residential home care and one-third receive sheltered home care.
- That the average length of stay is 16.9 days in a nursing home, 8.5 days in a residential home and 8.1 days in a sheltered home and that the cost per week of stay in a nursing home is £622, £559 in a residential home and £255 in a sheltered home.*
- That the fall in the proportion of existing stroke survivors receiving formal care under the new system is directly proportional to the increase in the proportion of existing stroke survivors who receive post-discharge AFOs

This gave a **total cost under the hypothetical existing system of £35 million in 2011, rising to £37 million in 2020**. The **total cost under the new system is £26 million in 2011 and rising to £28 million by 2020**.

The difference between the annual costs under the hypothetical current system and those under the hypothetical new system involving the greater use of AFOs gave the savings and ratio detailed in Table 9 above.

5.3 Summary

This section has detailed our assessment of some of the potential financial savings for the NHS and for social care provision arising from the greater use of ankle-foot orthoses in the

* See reference in footnote †.

treatment and rehabilitation of stroke survivors. The numbers are purely hypothetical and, as in the case of diabetes above, must be accompanied by caveats that reflect the limiting assumptions imposed by the lack of data.

While the financial savings presented above cannot be expected to be an accurate reflection of the true picture, they do provide orders of magnitudes that could be expected to be achieved under these limiting assumptions above.

Table 11 below presents the aggregated findings in terms of financial savings to the NHS and to social care services through the greater use of AFOs in the treatment and rehabilitation of stroke survivors.

Table 11: NHS and social care financial savings in the treatment of diabetes

NHS & SOCIAL CARE SAVINGS FOR STROKE	2011	2020
Savings under the new system (£m)	35	37
Current system : New system cost ratio	1.02 : 1	

6 Plantar Fasciitis: financial savings for the NHS

Table 12 below suggests that, by 2020, the NHS could achieve annual savings in the region of £1.2 billion through more extensive treatment of Plantar Fasciitis patients through orthotics, increasing from £773 million in 2011.

Table 12: NHS financial savings in the treatment of plantar fasciitis

NHS SAVINGS	2011	2020
Savings under the new system (£m)	733	1,221
Current system : New system cost ratio	2.5 : 1	

The starting point for these projections is an assumption that this condition affects 15% of the obese population in England. The resulting number of patients developing the condition is, therefore, expected to grow significantly over the forecasting horizon in line with the expected increase in obesity levels, from 22% in 2010 to 36% in 2015 and 47% in 2025 amongst the male population and from 24% in 2010 to 28% in 2015 to 35% in 2025 amongst the female population.*

For this condition, we based the counterfactual scenario on all of these patients being treated through the current pathway, the cost of which we assumed from the Hutton report, uplifted for inflation since 2009. This was compared with all sufferers being treated through orthotics, for which we assumed a 73% success rate. The unsuccessful orthotic treatments were assumed to revert to the traditional pathway.

Total financial savings for the NHS were, therefore, calculated as the difference between:

- the cost of treating all Plantar Fasciitis sufferers through the current pathway; and
- the cost of treating all sufferers through the orthotic pathway and of treating the 23% recipients for whom orthotic treatment was unsuccessful through the current more expensive pathway.

The difference between the annual costs under these hypothetical current and new systems of treating plantar fasciitis gave the savings and ratio detailed in Table 12 above.

There was insufficient data to enable us to quantify potential financial savings for social care or avoided productivity losses arising from early orthotic treatment of this sometimes debilitating condition.

* These assumptions were taken from Audit Commission, "Audit Commission, Fully Equipped – The provision of disability equipment services to older or disabled people by the NHS and social services in England and Wales", 2000.