

The cost utility of a multi-disciplinary foot protection clinic (MDFPC) in an Irish hospital setting

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Abstract

Background Foot ulceration which may result in lower limb amputation is one of the most feared complications among patients with diabetes and the prevention of both ulceration and amputation is a major challenge facing the health service. Many studies have proposed dedicated diabetic foot teams as the future of diabetic foot care.

Aims We aimed to quantify the cost benefit and sustainability of a multi-disciplinary foot protection clinic (MDFPC) in an Irish university hospital setting.

Methods A dedicated bi-weekly consultant-led MDFPC including Vascular Surgery, Endocrinology, Orthopaedic Surgery, Podiatry, Orthotics and Tissue Viability was established in June 2008.

Results Between 2006 and 2010, a total of 221 lower limb procedures (major/minor amputations and debridement) were performed. The number of major amputations decreased from 12 during the control period (2 years before the clinic) to 7 in the study period (2 years after the clinic). After costing all activity associated with the clinic, there was an overall saving of €114,063 per year associated with the introduction of the MDFPC.

Conclusion This is the first study in an Irish context, and one of few international studies, to demonstrate that an

aggressive-coordinated approach to diabetic foot care is both cost effective and clinically efficient in reducing the burden of foot-related complications in a diabetic population.

Keywords Cost · Foot protection clinic · Diabetes

Introduction

Diabetes is a growing problem and foot complications in those with diabetes place a significant social, psychological and economic strain on patients and the health service [1, 2]. The lifetime incidence of foot ulceration in diabetics has been estimated as high as 25 % [3], and up to 85 % of diabetic lower extremity amputations are preceded by ulceration and diabetic foot infection [4].

Many studies have advocated dedicated diabetic foot teams as the mainstay of diabetic foot care [5, 6] with patient education, risk factor modification and an aggressive preventative approach reported to reduce the amputation rate by more than 50 % [7]. Nowadays, it is generally accepted that a multi-disciplinary approach reduces amputation rates but recent evidence also suggests that the costs for implementing diabetic foot teams may be offset over the long-term by improved access to care and reductions in foot complications and in amputation rates [8].

Despite evidence supporting the benefits of dedicated foot teams, they are not yet standard in all hospitals in Ireland or elsewhere. The cost of managing diabetic foot complications is difficult to quantify and at present there is paucity of Irish data in the literature regarding the diabetic foot, complications or management. In 2004, in an Irish hospital setting, Smith et al. [1] concluded that ‘the management of diabetic foot complications placed a significant

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economic impact on the Irish healthcare budget'. However, the cost-benefit impact of the introduction of such a dedicated foot protection clinic remains unproven, in an Irish context. We aimed to quantify the cost benefit and sustainability of a multi-disciplinary foot protection clinic in an Irish university hospital setting.

Methods

A dedicated bi-weekly consultant-led multidisciplinary disciplinary (Vascular Surgery, Endocrinology, Orthopaedic Surgery, Podiatry, Orthotics, Tissue Viability) foot protection clinic (MDFPC) in collaboration with Ability Matters (Blanchardstown, Dublin 15) was established in an Irish university hospital in June 2008 as part of an integrated foot protection service. The hospital is a 457 adult bed university teaching hospital and has a catchment area in the west Dublin/Kildare region with an approximate population of 450,000 (including an adjacent General Hospital for which our hospital is the sole referral centre).

All diabetic patients at high risk of foot ulceration (neuropathy or absent pulses with deformity) [9], with active ulceration or previous minor amputations were referred to the clinic for structured assessment (skin and soft tissue, sensation, perfusion and structural deformity). Patients are streamlined into two main categories, those for preventative management and those for intervention (Fig. 1).

In patients considered to be at high risk of developing ulceration, intervention is focused on the prevention of ulceration and diabetic foot complications. Glycaemic

control and cardiovascular risk factors are optimised by the endocrinology service. Patients are treated with best medical management, educated regarding personal foot care and hygiene and advised regarding smoking cessation and lifestyle. Patients are then supplied with semi-bespoke footwear and casted cushioned insoles as required.

Patients with active ulceration are treated more aggressively. They have more frequent clinic visits, including debridement of calluses, infected and necrotic tissue, assessment with a view to early admission from clinic for high dose intravenous antibiotics and further intervention for revascularisation such as angioplasty in order to expedite wound healing in those with associated arterial disease.

Data regarding clinic visits, admissions for lower limb procedures, length of stay and number of readmissions were collated over a 2-year period prior to clinic establishment (control period) and the subsequent 2 years (study period) from the MDFPC databases. Ability Matters supplied information regarding invoicing of footwear and amputee prostheses.

Surgical procedures (amputations and debridements) were coded and costed via the HIPE system. The running costs of the clinic included staffing costs and invoiced footwear. Staffing costs in the clinic were calculated using the approximate HSE salary scales.

Results

During the 2-year study period, 313 referrals were seen at the MDFPC. This represents 2.4 % of those registered with the diabetic services ($n = 12,950$) in our own and the adjacent referral hospital. Two hundred and twenty-one lower limb procedures (major/minor amputations and debridement) were carried out over the 4-year period (2006–2010) on 108 diabetic patients (63 males, 45 females) under the vascular service. The number of major (above knee-AKA and below knee-BKA) amputations decreased from 12 (8 males, 4 females) during the control period to 7 (4 males, 3 females) in the study period. The ratio of AKA:BKA reduced from 2 to 0.75. The number of in theatre debridements decreased from 100 to 93.

Patients with evidence of vascular disease also underwent angioplasty and/or bypass surgery as clinically indicated during both time periods. There was an increase in the number of angioplasties performed in this cohort from 26 in the control period to 34 in the study period, while the number of attempted bypass procedures decreased from 4 to 3.

The total number of admissions with a diabetic foot complication as the presenting complaint over the 4-year period was 251 (131 in the control period vs. 120 in the study period). Of the 108 patients who underwent an amputation or debridement, 55 (50.9 %) required a further

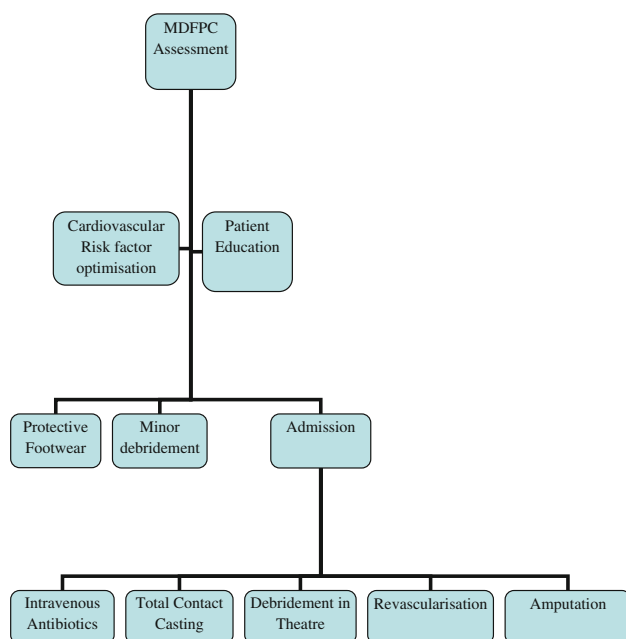


Fig. 1 MDFPC assessment process

Table 1 Cost breakdown—control period vs. study period

	Control period		Study period	
	<i>N</i>	Cost (€)	<i>N</i>	Cost (€)
AKA in hospital cost	8	340,196	3	116,286
AKA prosthesis	8	44,000	3	16,500
BKA in hospital cost	4	100,220	4	258,924
BKA prosthesis	4	15,200	4	15,200
Minor amputation in hospital cost	100	1,966,150	93	1,697,669
Staff	N/A	N/A	(Consultant, SpR, 3 nurses, 2 administrators)	69,120
Footwear	N/A	N/A		63,942
Total		2,465,766		2,237,641

readmission to hospital (median number of readmissions 2) during the 4-year period. This did not take into account any admissions to the hospital for any illness unrelated to their diabetic foot.

The establishment of the MDFPC coincided with a reduction in the median length of stay for each admission with a diabetic foot complication as the presenting complaint from 15 days (range 4–194) in the control period to 12 days (range 1–258) in the study period. The number of bed days used reduced by 13 % from 2,842 bed days (0.85 % of all available bed days used) in the control period to 2,485 bed days (0.74 % of all available bed days used) in the study period.

Since June 2008, the total cost for footwear, total contact casts and other orthotics supplied to patients came to €63,942 (monthly range €540–8,405).

Staffing of the clinic was calculated on the basis of one consultant (€100/h), one SpR (€50/h), three nurses (€50/h) and two clinical administrators (€30/h) for 8 h a month equating to €34,560 a year. An orthotist employed by Ability Matters also attended the clinic but these costs were covered by Ability Matters and are effectively included in the costs of the footwear. A podiatrist attended on a part-time basis within the sessions already allocated for footcare within the diabetic service as there was no additional funding to pay for podiatry session.

There has also been a savings in respect of the total number of amputee prostheses ordered ($n = 12$ vs. 7). The number of BKA was unchanged ($n = 4$). However, five fewer above knee prostheses ($n = 8$ vs. 3) were ordered saving €27,500. These were costed at €5,500 per above knee prosthesis and €3,800 per below knee excluding rehabilitation costs.

From the HIPE database, which adjusts each admission for case mix, in hospital costs of AKA decreased from €340,196 in the study period to €116,286 in the control period. The in hospital cost of BKA increased from €100,220 to €258,924. A significant difference was noticed for the BKA inpatient cost despite the same number of

patients due to an extensively prolonged hospital stay for two of the patients in the study group. One patient declined revision of a non-healing below knee amputation and required prolonged conservative treatment while another had poor social circumstances delaying discharge. The hospital cost associated with minor amputations and debridements decreased from €1,966,150 to €1,697,669. This equates to a total reduction in hospital costs of €333,687 from the study period to the control period (>€150,000 per year) (Table 1).

Discussion

Foot-related complications in patients with diabetes consistently represent a significant cost to the health service due to higher rates of hospitalisation and the costs of antibiotics, amputations, revascularisation and other surgery. The introduction of an integrated foot protection service has been associated with a decreased number of amputations, reduced average length of stay and has proven to be cost effective in its first 2 years since establishment. Specifically, the decrease in the number of amputations was primarily seen in AKA, which ultimately renders most patients more functionally dependant. The clinic has proven to be of benefit both in economic terms and also from a patient perspective.

Our data collection was a retrospective case control study carried out in a single institution which already has Vascular Surgery, Endocrinology, Orthopaedic Surgery and Podiatry clinics. The orthotic service was not previously available in the hospital and was established specifically as part of the clinic. The presumed advantage of the MDFPC is a joint endeavour which brings a multi-speciality focus solely on the complex nature of the diabetic foot. While our overall amputation rate is low, the audit is still ongoing to analyse whether the initial benefits are sustained overtime.

One major cost category which we were unable to evaluate was the social implications of amputation. However, any further costs assigned to amputation would further enhance the cost benefit of the clinic. Studies have shown that the majority of amputees have low walking skills and the walking distance is limited. Amputees are often dependent in respect of their activities of daily living presumably due to their limited mobility [10]. Approximately 50 % of amputees are rendered functionally dependent which, in turn, places a strain on the family, carers and community [11]. Loss of independence delays or prevents return to work, increases rehabilitation requirements and the burden on personal carers, the need for home modifications and dependence on the state for long-term care costs. In addition, a major limb amputation carries a 2-year survival rate of 50 % and a dismal 5-year survival rate of 29 % post-amputation [12–14].

There is limited national and international data proving the cost benefit of dedicated diabetic foot teams. However, there appears to be a general consensus supporting ‘the importance of a multidisciplinary team approach to the care of diabetic feet’ as highlighted in a joint statement from the Society of Vascular Surgery and the American Podiatric Medicine Association in 2010 [15]. In 2008, a US study showed that the implementation of a team approach to diabetic foot care resulted in a 20 % decrease in long-term amputation rates, similar to that seen in our study. They also suggested that the costs for implementing diabetic foot teams can be offset by reductions in foot complications including amputation [7], as we can confirm from our analysis.

The only published Irish data on the cost of the diabetic foot found that in 2004, the average length of stay with foot ulceration was 20.3 days. The authors of the study advocated the introduction of a multidisciplinary team approach to reduce this economic burden [1]. The introduction of the MDFPC in our institution shows a favourable reduction in both length of stay (from 15 to 12 days) and bed utilisation. Our data demonstrate the wisdom of the proposal, of Smith et al., and has quantified the financial benefit of doing so.

As the prevalence of diabetes and obesity increases, the challenge of diabetic foot complications will place further demand on resources. An emphasis on patient education, primary prevention, prompt early referral and rapid assessment of appropriate patients in specialist centres is crucial. Optimisation of cardiovascular risk factors and lifestyle advice can be achieved through national education campaigns aimed at a young population. In 2009, the NHS in collaboration with Diabetes UK introduced a campaign ‘Putting Feet First’ aimed at increasing awareness of diabetic foot disease in order to avoid amputations. ‘Putting Feet First’ promotes an integrated care pathway for healthcare professionals for the early management of

patients with early signs of an ulcer [16]. Patients with diabetes were also supplied with an information card regarding the diabetic foot. A similar campaign could be introduced in Ireland and help reduce the risk of amputation. Our MDFPC has been a success and has been associated with reduced patient and economic strain.

Recently, in Ireland, a clinical program for community screening and risk stratification for diabetic foot complications has been proposed which includes the creation of 16 podiatrist posts within the HSE [17]. Our data indicate that a crucial part of realising the benefits of screening for foot complications in people with diabetes is access to a specialist multi-disciplinary clinic for the treatment of ulceration and specific measures to reduce ulcer risk in these high risk patients. This would be crucial to the success of the programme.

We will continue to audit the clinic to demonstrate that the benefits we have seen to date are sustained over a longer period. Finally, we propose that analysis of outcomes (in hospital course, mobility and independence) should be implemented as quality indicators for the national programme.

Conclusion

Investment in clinical services to prioritise diabetic foot care such as a dedicated multi-disciplinary foot protection clinic has been associated with a 42 % decrease in the number of major amputations, a decreased average length of stay by 2 days and a 13 % decrease in the number of bed days used per year. The clinic has proven to be of cost benefit resulting in €114,063 savings per year. The cost benefit is likely to increase with the long-term benefits of reduced amputations and resulting dependency. In the face of a growing prevalence of diabetes, development of preventative and early intervention services is both prudent and cost effective. This is the first study in an Irish context, and one of few international studies, to demonstrate that an aggressive coordinated approach to diabetic foot care is both cost effective and clinically efficient in reducing the burden of foot-related complications in a diabetic population.

Conflict of interest None.

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