

The costs of skin breakdown and ulceration in the UK

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SUMMARY

Chronic wounds represent a significant burden in the UK – to patients and to the healthcare system. With proper diagnosis and treatment, much of this burden is avoidable. The purpose of this paper is to provide an estimate of the annual cost of chronic wounds to the NHS. There are around 200,000 individuals in the UK at any time with a chronic wound – many more new wounds develop annually. The cost to the NHS of caring for these patients is conservatively estimated at £2.3bn to £3.1bn per year (at 2005/06 prices) - around 3% of total estimated 2005/06 expenditure on health (£89.4bn).

Venous leg ulcer

Venous ulceration is most commonly caused by venous hypertension, which may lead to restricted blood flow and damage to the skin and other tissues. Venous ulceration is a chronic condition, and recurrence is common. There are between 70,000 and 190,000 individuals in the UK with an open ulcer at any time. More than 100,000 new ulcers develop annually. The cost to the NHS, mostly borne in primary care and the community nursing services, is at least £168m-£198m per year.

Pressure ulcer

A pressure ulcer is an area of damage to the skin and underlying tissue caused by unrelieved pressure, friction and/or shear forces. A severe ulcer is susceptible to infection and may be life-threatening. It is estimated that 1 in 5 hospital inpatients has a pressure ulcer – this represents at least 20,000 hospital patients at any time. Many more individuals with an ulcer are cared for at home or in residential & nursing homes, but there are no good studies estimating how many patients in homes have pressure ulcers. Around 400,000 people develop a new pressure ulcer annually in the UK. The cost to the NHS is high, primarily because of the need for prolonged hospital treatment in serious cases and the need to protect

patients at risk – the annual cost is in the range £1.8bn - £2.6bn.

Diabetic foot ulcer

Foot ulceration is a common complication of diabetes. Gradual loss of sensation makes the foot vulnerable to even minor trauma. Susceptibility to infection and peripheral vascular disease inhibit healing after injury and may lead to gangrene and amputation. The age-adjusted rate of lower limb amputation is estimated to be 15 times higher in individuals with diabetes than in the general population. In the UK it is conservatively estimated that there are around 64,000 people with active foot ulcers at any time and 2,600 amputations a year in patients with a foot ulcer. The cost to the NHS is about £300m per year.

Demographic trends

Forecast changes in the structure of the UK population mean that the costs of chronic wounds are likely to increase significantly in real terms in the next 20 years.

The prevalence of chronic wounds is significantly higher in the population aged over 65 than in the general population. In one UK prevalence study, 68% of patients with a leg ulcer were aged 65 or more.

Trends in the structure of the UK population are likely to lead to a significant increase in the number of chronic wounds. The population of the UK is forecast to increase between 2005 and 2025 by 3.4m (5.6%) - from 60.4m to 63.8m. In the same period the population aged 65 and older is forecast to increase by 3.5m (36%) - from 9.5m to 13.0m.

The prevalence of non insulin-dependent diabetes (type 2 diabetes) is also strongly correlated with age. One estimate suggests that the number of individuals in the UK with type 2 diabetes will increase between 2000 and 2010 by more than 1m (55%). The expected increase in the numbers with diabetes alone could increase the number of new

cases of foot ulceration by 25,000 a year.

Research priorities

Many chronic wounds are preventable. With appropriate diagnosis and treatment, most wounds can be healed within 24 weeks. However, local audits have identified ineffective clinical practice, including lack of proper diagnosis, inappropriate treatment and ulcers that last a long time.

Most of the costs of wound care are driven by the small proportion of patients with non-healing wounds whose wound becomes infected and who have specialist medical or surgical intervention in hospital. These costs can be reduced by ensuring that primary care doctors, community nurses and hospital staff are properly trained in wound diagnosis and treatment. Understanding how to achieve this is a key research priority.

INTRODUCTION

This estimate of the annual cost of chronic wounds in the UK highlights the personal burden of chronic wounds, and the annual financial and resource impact on the National Health Service (NHS). The true burden is significant but poorly understood.

Cost estimates are derived from the literature and reflect the direct costs attributable to the presence of a chronic wound (leg ulcer, foot ulcer or pressure ulcer). Direct costs reflect the value of goods and services used in the diagnosis or treatment of patients. The main components of direct cost are dressings and other materials, medical and nursing time and hospital resources. Costs incurred by patients or their carers are not included.

The significant indirect costs, such as productivity losses attributable to chronic wound-related morbidity, disability and premature mortality are not included. Estimates based on the literature are adjusted to a consistent (2005/06) price base using national GDP deflators for public healthcare spending.¹

The impact of chronic wounds on patient functioning and quality of life are illustrated but are not quantified and are not included in the overall cost estimate.

The method used to determine the estimates differs depending on the source studies. A prevalence-based approach starts with an estimate of the number of patients receiving treatment at a particular time point and combines this with estimates of the attributable costs incurred by patients over a specific period. Attributable costs are costs due solely to the presence of a chronic wound and exclude costs associated with co-morbid conditions. An incidence-based approach takes the number of *new* patients presenting annually and combines this with estimates of the attributable cost per patient per year. Incidence-based estimates may underestimate the costs for patients whose condition extends over more than one year, because these patients will not be detected as new cases. This will be particularly significant because these patients are likely to consume the greatest resources. Both approaches are sensitive to the assumption that prevalence and incidence rates remain constant over time.

VENOUS LEG ULCERS

The nature of the problem

Venous ulceration is most commonly caused by venous hypertension resulting from valvular incompetence in the superficial, deep or perforating veins. Sustained venous hypertension causes swelling, restricted blood flow and damage to the skin and other tissues. Typical symptoms of venous disease include aching in the affected limb, itching, swelling and eczema. When a venous leg ulcer is present it may cause significant pain, exudate (fluid weeping from the wound) and odour. The risk of ulcers increases with age, probably because of poor mobility and changes in the skin which make it more susceptible to damage. Lack of mobility may be made worse by poor calf muscle pump function which helps maintain venous return.

Sustained compression with bandages has been shown to be effective because it reverses venous hypertension.² In carefully controlled trials, most patients heal within 24 weeks.³ In practice, many ulcers fail to heal over long periods because diagnosis and subsequent treatment choice are inadequate. The rate of ulcer recurrence is high, even when preventive strategies are used.

Chronic leg ulceration has a major impact on patients, including significant perceived pain from the ulcer and problems associated with exudate

management, including odour.^{4,5,6} Studies using various tools have indicated substantial reductions in health-related quality of life (HRQoL) compared with the general population, particularly in the domains of mobility and pain.^{7,8} The evidence suggests that at least part of the effects on mobility is a consequence of ulceration restricting activity and social functioning.⁹ While generic tools only indicate overall bodily pain, a substantial proportion of the pain experienced by these patients is related to the ulceration. Follow-up studies have demonstrated that healing the ulcer leads to substantial improvements in overall bodily pain and general mobility.¹⁰ Qualitative and quantitative studies have shown that the impact on patients' psychological health is substantial and that healing the ulcer leads to less depression, anxiety and hostility.^{9,11}

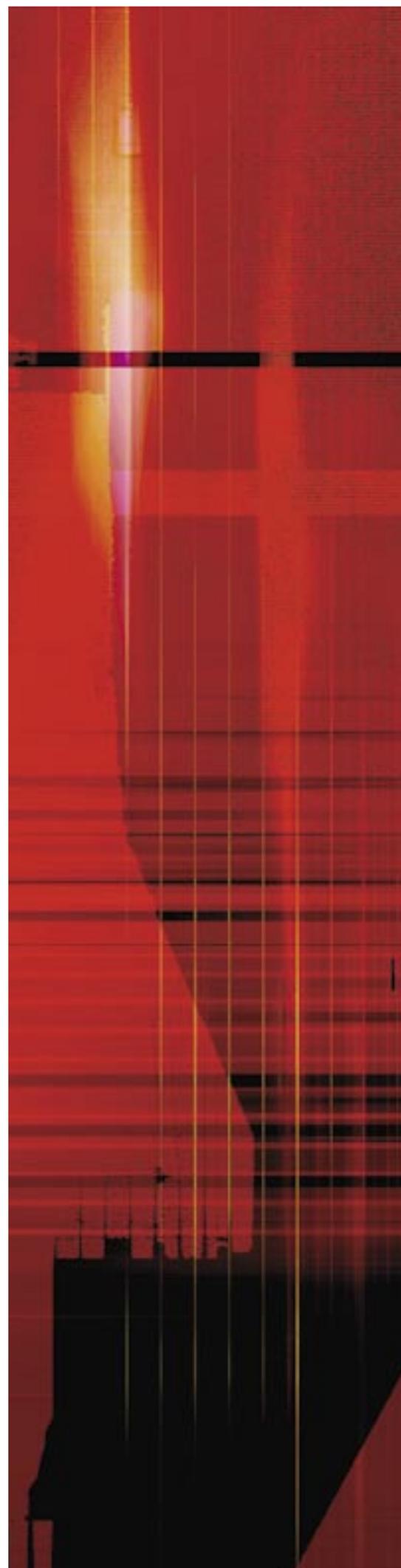
Between 60% and 80% of leg ulcers have a venous component.¹² Population prevalence rates generally fall in the range 1.2 – 3.2 per 1000,¹³ which means that there are between 70,000 and 190,000 individuals in the UK with an open venous leg ulcer at any one time. Prevalence rates increase markedly with age. A recent UK study examined the prevalence of venous ulceration in a local population of 252,000.¹⁴ Crude prevalence was 0.3/1000 in men and 0.5/1000 in women. In those aged over 85, rates were 8.29/1000 for men and 8.06/1000 for women. In this study, 55% of patients had had their current ulcer for longer than a year. These prevalence estimates are lower than those of other studies and may reflect the benefits of an intensive system of care that had been in operation for eight years prior to the evaluation.

Costs to the healthcare system

The best estimate of the cost of treating a patient with a venous leg ulcer in the UK is an estimate of the cost of an episode per patient. For this reason our estimate of the national cost is incidence-based.

The annual incidence of lower limb ulceration in Newcastle in 1991 was reported as 3.5 per 1000 population aged over 45 years.¹⁵ Approximately 80% of these ulcers were venous in origin and this gives an incidence of venous ulceration of 2.8/1000 in this population. The UK population aged over 45 at mid-2005 was approximately 24.47m¹⁶ and this suggests around 68,500 new cases of ulceration annually.

A more recent study using the General Practice Research Database (GPRD) found the incidence of venous ulcers in people over age 65 in the UK to be 0.76 (95% CI 0.71-0.83) per 100 person-years for



men and 1.42 (95% CI 1.35-1.48) per 100 person-years for women.¹⁷ Applying these rates to the relevant mid-2005 UK populations suggests around 30,900 men and 77,700 women present annually with a new case of venous ulceration (108,600 in total (See Table 1).

The GPRD estimate is used here, mainly because it is more recent and also because it covers the whole of the UK rather than a single district. This estimate is likely to underestimate the true extent of ulceration because it does not include the under 65s.

A recent study estimated the annual costs of treating venous leg ulcers in Sweden and the UK using an economic model. The model combined prospectively collected patient data, expert opinion and published literature.¹⁸ UK cost estimates reflect the perspective of the NHS and are reported in 2002 Euros at a rate of €1 = £0.638. Annual (mean) costs per patient depended on the size and duration of ulcer and ranged from €814 (£519) for an ulcer <10 cm² less than 6 months old, to €1,994 (£1,272) for an ulcer ≥10 cm² of 6 months duration or more. Updating to 2005/06 prices, the annual cost per patient ranged from £592-£1,123.

We have previously estimated annual costs per patient on the basis of healing rates and resource use.¹⁹ Costs included nurse time, dressings and bandages and were assessed from the point of view of the NHS at 2000 prices. Mean annual cost per patient was €1,205 (£800) for patients treated in a leg ulcer clinic and €2,135 (£1,423) for patients treated by district nurses in the community. Updating to 2005/06 prices, mean costs per patient were £990 for community leg ulcer clinics and £1,755 for district nurse care.

Data on resource use and healing from a randomised trial comparing two types of compression bandaging has provided a recent, comprehensive estimate of the healthcare costs of venous ulceration.²⁰ Four different types of resources were included in the estimation of costs:

- number of nurse visits
- number of doctor visits
- number of hospital visits and
- number of bandages used

Costs were measured from the perspective of the UK NHS at 2001 prices.

Mean annual costs per patient were £1,298 (95% CI £1,188-£1,472) for patients treated with four-layer bandage (4LB) and £1,526 (95% CI £1,374-£1,717) for patients treated with short-stretch bandage (SSB). These costs have been updated to 2005/06 prices using national GDP deflators. Updated costs are £1,549 (£1,418-£1,757) for treatment with 4LB and £1,822 (£1,640-£2,049) for treatment with SSB.

Estimates of the total NHS cost of venous leg ulceration are shown in Table 1. The total cost in 2005/06 was likely to be between £168m and £198m. These estimates are calculated by combining the number of new cases of venous ulceration annually with the expected annual cost per patient. Both components are subject to a high degree of uncertainty, and the overall cost is likely to be an underestimate:

- Incidence figures only apply to those over 65 known to the healthcare system. The incidence of leg ulceration in the total population will certainly be higher

and the number of cases which never present to health services is unknown. Also, patients with chronic ulceration for more than one year will not appear as incident cases.

- The central cost estimate is taken from a carefully controlled clinical trial in which all patients received good treatment and regular monitoring. In practice, not all patients are adequately diagnosed and appropriately treated. For these patients, costs may be considerably higher than the estimates here.

PRESSURE ULCERS

The nature of the problem

A pressure ulcer is an area of damage to the skin and underlying tissue caused by pressure, shear and/or friction forces which restrict blood flow, leading to tissue damage and cell death. A severe ulcer may involve damage through the skin, extending into muscle, tendon and bone. This type of ulcer is at risk of infection which may be life-threatening.

Pressure ulcers are secondary to other disabling or restrictive conditions and deficits in quality of life are related both to the pressure ulcer and the primary condition. While there is substantial evidence for the impact of leg ulcers on patients, the evidence on pressure ulcers is less clear. As with leg ulceration, exudate and its consequences are a major issue for patients, particularly odour and leakage on to bedclothes.²¹ Pain is also important, with patients describing their pain as excruciating, but often the painkillers that are prescribed are inadequate.^{22,23} Many patients have a negative body image, with a sense that their bodies are no longer whole. Patients feel they are losing their independence and dignity.²⁴ Patients also feel hopeless

Table 1: Estimated annual cost to the NHS of caring for patients with a venous leg ulcer – 2005/06 prices

Annual incidence	New cases in the UK annually	Annual NHS cost (UK population)	
		Annual cost per patient	2005/06 prices
Males 0.76/100 (95% CI 0.71-0.83) ¹⁷	30,886 (28,800-33,700)		2005/06 prices
Females 1.42/100 (95% CI 1.35-1.48) ¹⁷	77,700 (73,800-80,900)		2005/06 prices
Total	108,600 (102,600-114,600)	4LB = £1549²⁰ (£1418-£1757) SSB = £1822²⁰ (£1640-£2049)	4 LB = £168.2m (£145.5m-£201.4m) SSB = £197.9m (£168.3m-£234.8m)

due to the uncertainty of when, or whether, the ulcer will heal.

A recent study reported prevalence of pressure ulcers of 20% in acute hospital inpatients in the UK, Belgium and Sweden. This suggests around 22,000-23,000 hospital inpatients in the UK have a pressure ulcer at any one time.²⁵ Most were superficial (68.3% grade 1 and 2) but a significant number were grade 3 (18.5%) or 4 (13.2%). A grade 3 ulcer involves full-thickness skin loss which may extend down to the underlying fascia. A grade 4 ulcer shows extensive destruction, tissue death or damage to muscle, bone or supporting structures. Little is known about the prevalence of pressure damage in long-term care or home care in the UK.

Costs to the healthcare system

Estimates of the incidence of pressure ulcers in acute care range from 1.5% - 11.0%²⁶ depending on a number of factors such as patient age, diagnosis and specialty of admission. In the UK, incidence in acute care has been reported at 4%.²⁷ Estimates based solely on acute settings are likely to underestimate the true cost of pressure damage because many ulcers develop among patients cared for in nursing or residential homes, in their own home by the district nursing service or by GPs in primary care. Moreover, there is evidence that the incidence of grade 1 pressure ulcers may be underestimated.²⁸

An analysis of US hospital utilisation found in 2003 there were 455,000 hospital stays during which pressure ulcers were noted as a principal or secondary diagnosis. Patients aged 65 years and older accounted for 72.3% of these hospital stays.²⁹

A recent study estimated the annual incidence of pressure ulcers, bed days lost and the economic value (cost) of these bed days at Australian public

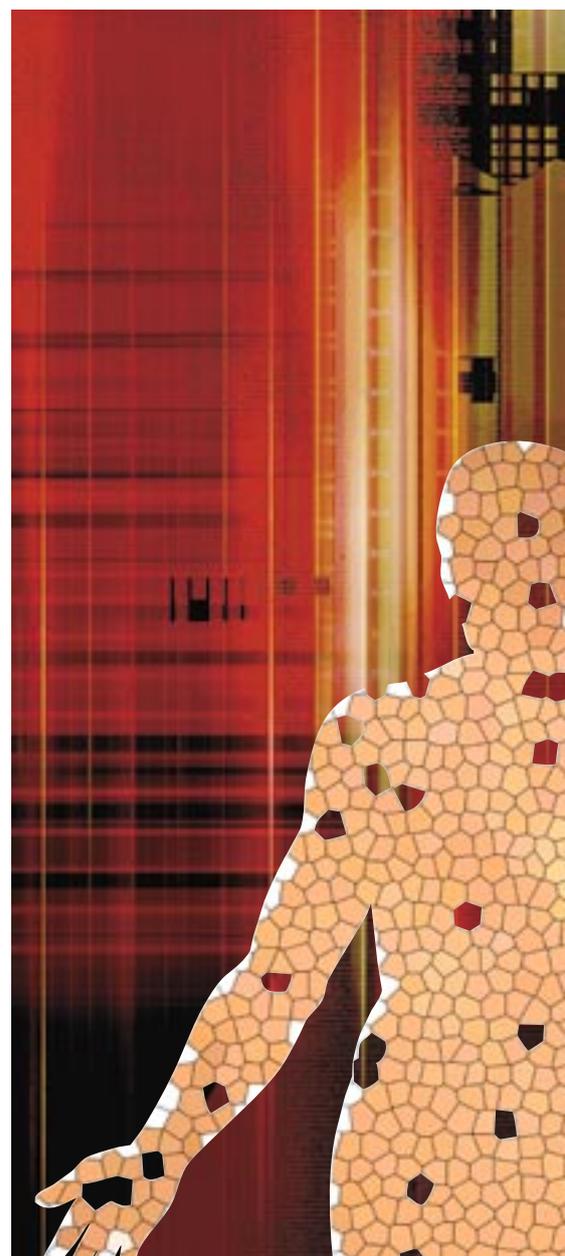
hospitals in 2001-02.³⁰ Estimates were derived by modelling. The annual number of hospital discharges was combined with pressure ulcer incidence rates and the expected additional length of stay attributable to a pressure ulcer. The independent effect of pressure ulcers on length of stay was assumed to be 4.31 days (95% CI 1.85-6.78).

The model predicts a median total of 95,695 cases of pressure ulcer among inpatients in Australian public hospitals. Median bed days lost was 398,432 and the estimated annual cost of pressure ulcers to the public hospital system was AU\$285m (£117m). The overall incidence of pressure ulcers in the population of hospital patients included in the modelling was 4.66%.

The figure of AU\$285m (£117m) is an underestimate of the true cost because the hospital population covered in the modelling represented only 52% of total discharges in 2002-02. In addition, costs to other sectors within the healthcare system (such as community, residential and primary care services) were not included.

The most comprehensive estimate of the cost of pressure ulcers in the UK was calculated from costing protocols of care reflecting good clinical practice.³¹ Resources included dressings and other materials, nursing and medical time and hospital bed days required to treat ulcer patients. These included risk assessment, turning and pressure relieving equipment. Expected costs per patient episode (at 2000/01 prices) were estimated for ulcers of different grades and combined with estimates of annual pressure ulcer incidence.

In the UK the incidence of pressure ulcers has been reported at 4% among hospital inpatients in acute medical and surgical specialties.²⁷ In 1999/2000 there were 7.95 million inpatient admissions



in the UK (excluding mental illness, learning disability and admissions related to pregnancy and childbirth). At an incidence rate of 4%, the number of new pressure ulcers developing in hospital patients amounted to 320,000 in that year.

Studies in the UK, US and Canada have reported pressure ulcer incidence among residents in nursing and residential homes in the range 12%-13% annually.³¹ In 2000 there were approximately 390,000 places in residential and nursing homes in England. Assuming 80% occupancy, this suggests a population at risk in long-term care of around 300,000. At an incidence rate of 12%-13% there are likely to be 36,000-39,000 new ulcers annually in this population.

A study of grade 2+ pressure ulcers in General Practice found an overall incidence of 0.58 per 100 person-years in patients aged over 65 visiting their GP.³² This gives a conservative estimate of 55,000 patients with pressure ulcers

Fig 1

Common co-morbidities in pressure ulcers²⁹

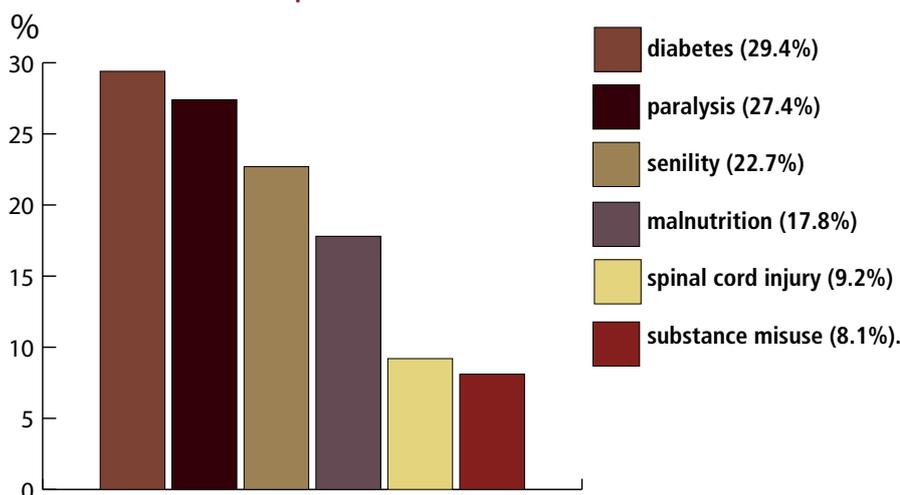


Table 2: Estimated annual cost to the NHS of caring for patients with a pressure ulcer – 2005/06 prices

Ulcer grade	New cases in the UK annually	Annual NHS cost	
		1999/2000 prices	2005/06 prices
Grade 1	130,000 - 160,000	£124m - £185m	
Grade 2	150,000 - 190,000	£606m - £905m	
Grade 3	50,000 - 60,000	£315m - £471m	
Grade 4	40,000 - 50,000	£288m - £579m	
Total	370,000-460,000	£1,430m £2,140m	£1,760m-£2,640m
cost per patient		£3,500-£5,200	£4,300-£6,400

developed under the care of a GP. Taken overall, around 410,000 people are likely to have developed a new pressure ulcer in the UK in 2000, 1 in 150 of the general population and 1 in 23 of the population aged over 65. Total cost to the NHS was estimated in that year at £1.4bn-£2.1bn (£3,500-£5,200 per patient). This amounts to £1.76bn-£2.64bn at 2005/06 prices.

FOOT ULCERS IN PATIENTS WITH DIABETES

The nature of the problem

Patients with diabetes are prone to the development of foot ulcers because of the nature of their disease. The development of peripheral neuropathy and the resulting loss of sensation render the foot susceptible to even minor trauma. Repetitive stress, increased susceptibility to infection and a higher probability of peripheral vascular disease all serve to impair healing once injury has occurred. A combination of peripheral neuropathy, infection and compromised vascular supply may result in gangrene and amputation. The age-adjusted rate of lower limb amputation is estimated to be 15 times higher in individuals with diabetes than in the general population.³³ Foot complications in patients with diabetes is the most common cause of non-traumatic lower-limb amputation.

Quality of life issues for patients with a diabetic foot ulcer relate to the underlying condition, but also to the serious consequences of infection and amputation. There is little information on patients' experiences. Much of the literature revolves around clinicians' statements on the impact of foot ulceration on patients.³⁴ While there is an assumption that patients who undergo amputation will have a worse quality of life, some research has

indicated that mobile amputees have better quality of life than those with current foot ulcers.³⁵ Those with ulcers may have higher levels of depression and a negative attitude towards their feet. Other studies have shown that patients with stable foot ulcers are affected physically and socially.³⁶ The condition may limit the roles they play in life, their physical functioning and health³⁷ and they may experience pain.³⁸ However, quality of life may be improved by appropriate care, including management within a specialist foot clinic.³⁹

Costs to the healthcare system

Analysis of Medicare claims data in the US from 1995 and 1996 showed that Medicare expenditures were on average 3 times higher for patients with diabetes and a lower extremity ulcer than for Medicare patients in general (\$15,309 vs \$5,226).⁴⁰

A more recent US study analysed medical and pharmacy claims from a large insurer covering 2.7 million insured residents in a number of US States.⁴¹ Total ulcer-attributable claims were \$13,179 for episodes which lasted a mean of 87.3 (+/- 82.8) days.

A UK cost of illness study used a prevalence-based approach, augmented with an incidence model for acute events (such as amputation) to estimate annual NHS costs of treatment for patients with diabetic peripheral neuropathy (DPN).⁴² Most of this cost (more than 90%) was attributable to patients with neuropathic foot ulceration.

Weekly costs to the NHS were estimated for a number of ulcer-related health states: neuropathic foot ulcer (no deep infection, with cellulitis, with osteomyelitis) and amputation. Amputation costs were estimated per episode, rather than on a weekly basis.

According to this study, the prevalence

of diagnosed diabetes in the UK is 2.3% (approximately 1.4 million people).

In this population, the prevalence of neuropathic foot ulceration is 4.55% (6% with foot ulceration, of which 75.8% are neuropathic). This gives an estimate of 63,700 individuals with an active foot ulcer. There were an estimated 2,599 amputations in 2001 in patients with a foot ulcer (4.1%). Total direct costs to the NHS for patients with DPN were £252m (£114m-£516m) at 2001 prices (£3,900 per patient per year) - £300m at 2005/06 prices.

The UK estimate is sensitive to the assumed prevalence of diabetes in the population. The model is based on diagnosed cases, giving a rate of

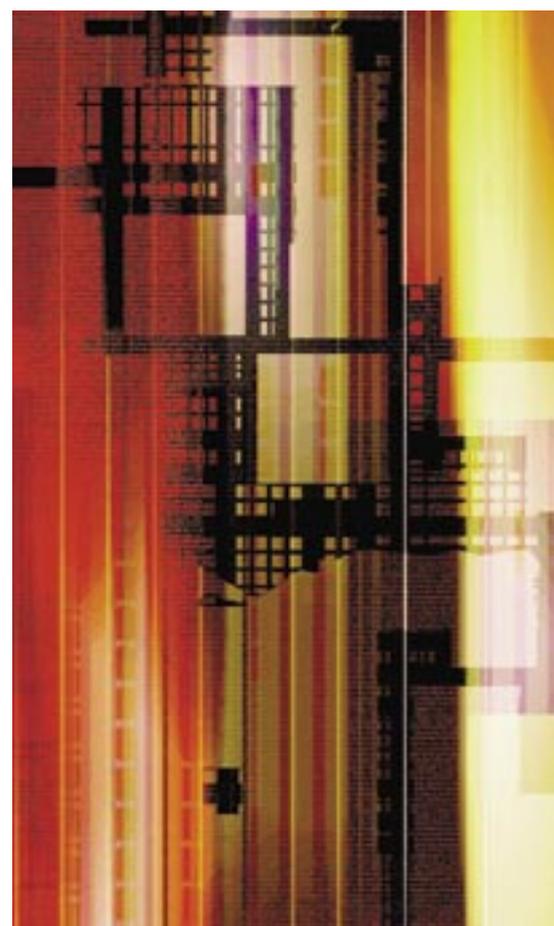


Table 3: Estimated annual cost to the NHS of caring for patients with diabetes and a foot ulcer – 2005/06 prices

	Prevalence	Annual NHS cost	
		2001 prices	2005/06 prices
Neuropathic foot ulcer¹			
No infection	59,800	£181.9m	
Cellulites	1,250	£9.2m	
Osteomyelitis	2,650	£36.3m	
Lower limb amputation²			
Toe	1,391	£4.8m	
Foot	208	£1.6m	
Leg	1,000	£11.0m	
Other costs of DPN		£6.8m	
Total UK cost		£251.5m	£300.0m
Cost per patient		£3,900	£4,653

1. Point prevalence
2. Number of new cases per year

2.3%. Other estimates have put the prevalence of diabetes in the UK as high as 5.3%.⁴³ Undiagnosed cases are just as likely to develop ulceration as those whose diabetes is diagnosed. If the true population prevalence of diabetes is 5.3% (implying 3.18m diabetics in the UK), the prevalence of foot ulceration could be as high as 144,700 (4.55% of 3.18m). Annual costs to the NHS would then be more than £600m (at 2005/06 prices) rather than £300m.

On the other hand, the prevalence of ulceration in the population of patients with diabetes is higher in this study (4.55%) than was found in a recent large population-based study of three districts in the UK.⁴⁴ In this study, 1.4% of type 2 diabetic patients had active foot ulcers. If this is representative of the UK population, the estimated prevalence of patients with active ulceration would be reduced from 63,700 (at 4.55% of 1.4m) to 19,600 (1.4% of 1.4m) or 44,500 (1.4% of 3.18m).

THE IMPACT OF DEMOGRAPHIC TRENDS

The prevalence of (active) chronic wounds is strongly related to age, and forecast trends in the structure of the UK population are likely to lead to a significant increase in the number of patients with a chronic wound and to a corresponding increase in the costs of care.

The population of the UK is forecast to increase between 2005 and 2025 by 3.4m (5.6%) - from 60.4m to 63.8m. In the same period the population aged 65 and above is forecast to increase by 3.5m

(36%) - from 9.5m to 13.0m

In one prevalence study in a local community in Scotland, 68% of patients with a leg ulcer were aged 65 or above.⁴⁵ The prevalence of leg ulceration ranged from 10/1000 in the adult population to 36/1000 in the population aged over 65. In a similar study in Australia covering a population of 238,000, 90 % of patients with a venous leg ulcer were aged over 60 and the median age of these patients was 75 years.⁴⁶

A recent UK study found annual incidence of venous ulcers in the population over 65 of 0.76 (0.71-0.83) per 100 person-years for men and 1.42 (1.35-1.48) per 100 person-years for women.¹⁷ At mid-2005 populations, this amounted to around 108,000 individuals with a new venous ulcer annually. By 2025, this number could have risen to 148,000.

The prevalence of non insulin-dependent diabetes (type 2 diabetes) is also strongly correlated with age. Estimated age-specific prevalence rates of type 2 diabetes for the UK range from 5.2% (male) and 2.5% (female) at age 50-54, to 14.3% (male) and 8.2% (female) at age 60-64. One estimate suggests that the number of individuals in the UK with type 2 diabetes will increase between 2000 and 2010 by more than 1m (55%). The annual incidence of foot ulceration in patients with diabetes is 1%-4% (mean 2.5%). The expected increase in the numbers with diabetes alone could increase the number of new cases of foot ulceration by 25,000 a year.

CONCLUSION

We estimate that the annual direct cost

to the NHS of caring for patients with chronic wounds is in the range £2.3bn - £3.1bn (at 2005/06 prices), around 3% of total estimated 2005/06 outturn expenditure on health (£89.4bn).¹ This cost could increase in real terms by at least a third in the next 20 years, solely as a result of ageing of the UK population.

Much skin breakdown, including pressure ulcers and foot ulcers in patients with diabetes, is preventable. With appropriate diagnosis and treatment, most wounds can be healed within 24 weeks. However, a number of local audits have found ineffective clinical practice, including lack of proper diagnosis, inappropriate treatment and the continuing presence of ulcers that do not heal.

A review of wound treatment in a primary care setting in Copenhagen⁴⁷ found that only 51% of patients with a chronic wound had had a significant diagnostic examination, 40% of patients with expected venous leg ulcers had not been treated with compression and 34% of patients with a foot ulcer were not investigated for diabetes. These conclusions are reflected in many other international studies.^{48, 49}

Inadequate diagnosis and treatment are likely to lead to long ulcer duration and raised risks of infection and other complications. In the mid-Western Health Board in Ireland, only half of patients with a leg ulcer had the cause of their ulceration properly investigated.⁵⁰ The median duration of ulceration at the point of audit was 8 months - 27% of patients had continuous ulceration for 2 years or more. In a Canadian audit,⁴⁹ the

median duration of leg ulceration was 6 months (mean duration = 15 months). A third (33%) had an ulcer for more than a year and 19% had an ulcer for more than 2 years. Similar findings are reported in other studies.^{48,51}

Most of the costs of wound care are driven by the relatively small proportion of patients with non-healing wounds whose wound becomes infected and who receive specialist medical or surgical intervention in hospital. These costs can be reduced by ensuring that primary care doctors, community nurses and hospital staff are properly trained in wound diagnosis and treatment. Understanding how best this can be achieved is a key research priority.

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