

# Counting the costs

## of the *diabetic foot*

✎ Jan Apelqvist and Gunnel Ragnarson Tennvall

*Diabetes is a chronic condition that requires a life-long commitment of resources to the prevention and treatment of complications. The condition affects an increasing number of people all around the world, putting them at risk for foot ulcers and amputations. In addition to causing acute suffering, foot lesions in people with diabetes have substantial economic consequences: up to 20% of total expenditure on diabetes might be attributable to the diabetic foot. Jan Apelqvist and Gunnel Ragnarson Tennvall report on the economic impact of diabetes foot damage and examine the cost-effectiveness of prevention and the recommended multidisciplinary response to the condition.*



### Direct costs

However, no data are included in these figures regarding follow-up treatment and consequences for people after undergoing an amputation. Only the estimated direct medical cost of the treatment of diabetes foot complications were contemplated. These direct costs are related to inpatient or outpatient care, the use of resources such as surgery, clinical investigations, antibacterial drugs and other medication, dressing material, the treatment of damaged skin (topical treatment), and orthopaedic appliances. Diabetic foot-related costs may rise due to the need for home care and social-service support for people with a disability, transportation to and from a clinic, and home care (by a nurse) to dress wounds.

### Indirect costs

Foot ulcers also have considerable indirect costs. These are defined as the value of lost productivity when people are unable to work or when they die prematurely as a result of the damage to their feet or associated complications. The loss of quality of life should also be calculated into the cost of the diabetic foot.

### Where are the costs?

The cost of diabetes foot damage is influenced by a number of factors,<sup>1</sup> including:

- interventions to prevent foot ulcers
- strategies to heal these ulcers and shorten the time required for healing
- management to prevent amputations in people who have developed ulcers

- care required by people with diabetes with a disability following an amputation.

In 2001, diabetes-related foot ulcers and amputations were estimated to cost US health-care payers 11 billion USD.<sup>2</sup> Corresponding data from the UK estimated the total annual cost of diabetes-related foot complications at 456 million USD.<sup>3</sup>

### Some important foot notes

- 85% of diabetes-related amputations are preceded by a foot ulcer
- 50% to 70% of all lower-extremity amputations are related to diabetes
- 3% to 8% of people with diabetes have a foot ulcer
- The recurrence rate of new ulcers through five-year follow-up is 50% to 70%
- It takes on average 11 to 14 weeks for a diabetes foot ulcer to heal
- There is a 15% amputation rate in people with a diabetic foot ulcer



### Management and treatment

In studies involving people with diabetes foot ulcers who did not require amputation, the treatment costs ranged from 1000 USD to 17 500 USD (in 1998 prices).<sup>4</sup> When discussing the cost of treating diabetes foot ulcers, it is important to clarify the proportions of the overall cost that are incurred in the different aspects of therapy. In a study that followed the treatment until healing of people with diabetes foot ulcers, inpatient care and topical treatment of wounds were in the short term the most expensive item of total cost – whether the person’s damaged feet were successfully healed, remaining intact, or after amputation.<sup>5</sup> The cost of antimicrobial drugs, outpatient visits and orthopaedic appliances were low in relation to total cost.

#### Lower-extremity amputation

In data published between 1994

and 2000, the estimated cost of an amputation was between 16 500 USD and 66 200 USD (in 1998 prices).<sup>4</sup> The cost to society of amputations was high due to the need for prolonged hospitalization, rehabilitation and home care, and social services for the people with a resulting disability. More than 70% of the economic cost of the diabetic foot is incurred after amputation.

#### Long-term perspective

In evaluating the use of resources in the management of diabetes foot ulcers, a long-term analysis should be made. This should take into account the risk of renewed ulceration and amputation, as well as the use of resources resulting from the complications and disability that were provoked by previous ulcers.

A study in Sweden followed people with diabetes and a previous foot ulcer. This concluded that the highest costs

were for inpatient care, social-service support and home care, especially for people with a previous major amputation (above the ankle). The approximate costs (in 1990 prices) during three years from healing were:

- 16 500 USD for people whose wounds were healed without severely impaired circulation (ischemia)
- 27 000 USD for those with ischemia
- 44 000 USD for people who had to undergo a minor amputation
- 63 000 USD for those who had to undergo a major amputation.<sup>6</sup>

### The cost-effectiveness of prevention

In a model-based cost-utility analysis, it was suggested that if intensive prevention could reduce foot ulcers and amputations by 25%, this would be cost-effective or cost-saving in all people with diabetes – except in those with no specific risk factor other than

diabetes itself.<sup>7</sup> The study was based on a model simulation comparing current prevention of foot ulcers in people with diabetes and other risk factors with optimal prevention – including therapeutic health education, foot care, and appropriate footwear involving management by a multidisciplinary team.

The results of this study indicate that the provision of adequate preventive care to all people who are at risk or high risk of developing diabetes foot ulcers would be highly cost-effective. These include people in the following subgroups:

- people with sensory nerve damage (neuropathy) only
- those with sensory neuropathy and disorders in the blood vessels that supply the legs and feet (peripheral vascular disease) and/or a foot deformity
- people with previous foot ulcers or a previous amputation.

However, it was found that in people who have no risk factor other than diabetes itself, additional preventive measures to avoid foot ulcers or amputation would not be cost-effective.

**Investment in intensive preventive care would be cost-effective or even cost-saving.**

These findings were confirmed in two other European studies, which assert that management of the diabetic foot according to current guidelines for intensive multidisciplinary preventive care would result in improved rates of

survival and a reduction in the number of diabetes foot complications.<sup>8,9</sup> In addition, if reductions in the incidence of ulcers and amputation of 25% to 40% were achieved, this would be cost-effective or even cost-saving compared to current standard care.

### Conclusion

Research into the cost of diabetes foot ulcers and amputations indicate a huge drain on economic resources for both society and individuals. We should conclude from these studies that in any evaluation of the cost of diabetes foot damage, it would be wrong to focus solely on the unit cost for wound-dressing, single products or management procedures. We should take a broader view, encompassing the total use of resources as well as the influence of the health-care system and factors such as reimbursement to the individual. Quality of life should be factored in together with the final clinical outcome and the different management strategies under consideration.

Initiatives to identify the people with diabetes who are at risk of developing foot ulcers and take appropriate preventive measures would be cost-effective or even cost-saving. Investing resources in these would lead to a reduction in the number of people with ulcers or requiring amputation, and thereby reduce the total cost to society of the diabetic foot. The reduction of these costs and improvements in diabetes management and quality of life of people with diabetes require investment in both prevention and the multidisciplinary management of foot ulcers.

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