Critical Leg Ischaemia in New Zealand
Economic Cost of Amputation versus Intravenous Iloprost

Helen M. Scott\(^1\) and W. Guy Scott\(^2\)

\(^1\) W. Guy Scott and Associates Ltd, Wellington, New Zealand
\(^2\) Wellington Polytechnic, Wellington, New Zealand

Summary

The purpose of this study was to establish the incidence of surgical amputation for critical leg ischaemia in New Zealand, and estimate the hospital, prostheses and indirect costs of this intervention. The cost of amputations was then compared with the cost of treating such patients with iloprost.

The study was retrospective. Individual patient records relating to 1991 for both public and private hospitals were analysed. Unit costs relevant to 1991 were applied to the volume data of patients and procedures to derive total costs. Costs were estimated on an incremental basis taking a societal perspective.

Conservative estimates were obtained for hospital costs, prostheses and for production loss (loss of output or productivity). Total cost was $NZ15.9 million (hospital and prosthetic cost $NZ13.1 million, production loss $NZ2.8 million). The total quantified cost per amputation was $NZ23,038 (hospital and prosthetic cost $NZ19,020, production loss $NZ4,017). 32% of patients requiring amputations were in the working age group. The theoretical avoidance of amputation by treatment with iloprost resulted in net savings of hospital and prosthetic costs of between $NZ6,660 and $NZ8,720 per patient.

Amputation for critical leg ischaemia is costly and has a high mortality, but for iloprost treatment to be cost effective in a New Zealand hospital setting, patients must be targeted and a success rate of at least 55% achieved in avoidance of amputation and reduction of pain while at rest.

Critical leg ischaemia is ischaemia that endangers the leg or part of a leg. Patients with diabetes are 5 times more likely to develop critical leg ischaemia than nondiabetic patients.\(^1\)

Existing data on the prevalence of critical leg ischaemia have been based on all leg amputation procedures undertaken or on all referrals to limb-fitting centres. The European Working Group on Critical Leg Ischaemia\(^1\) assumed that virtually all leg amputations were undertaken for ischaemia and that 25% of patients with critical leg ischaemia would eventually require an amputation. Referrals to limb fitting centres gave an estimate of amputations on the assumption that half of the patients requiring amputation would be referred for a limb fitting. The available information from Western Europe and the US indicates that the prevalence of peripheral arterial disease is 5% in males over 50 years old, but fewer than 10% of these will develop critical leg ischaemia.\(^2\) Incidence rates, similarly based on studies in Western Europe and the US, have been estimated to range between 500 and 1000 new cases per million population per year.\(^1\)

For patients with critical leg ischaemia who present with rest pain (i.e. incurring pain while at rest) and/or ischaemic ulcers, the first choice of treatment is revascularisation by surgical bypass or percutaneous angioplasty. However, almost 40%
of such patients are not suitable for reconstructive surgery because of the distribution of arterial disease, other medical or anaesthetic considerations, or because previous revascularisation was unsuccessful. The last resort is amputation which is regarded as a high risk procedure.

This study sought to establish the incidence and costs to New Zealand society of critical leg ischaemia patients who had lower limb amputations and to use these costs to evaluate the cost or benefit of treating selected numbers of such patients with iloprost. Thus, both pharmacoeconomic and cost-of-illness aspects were assessed.

Iloprost is a prostacyclin analogue with an elimination half-life of 30 minutes. Natural prostacyclin has a half-life of 2 to 3 minutes. The analogue inhibits platelet aggregation and induces vasodilation, providing a nonsurgical treatment option for patients with critical leg ischaemia in cases when revascularisation is not possible, or has failed, and the next option would be amputation.

Information on both the economic cost and clinical efficacy of treatment options are essential for cost-effective decision-making relating to individual patients and to hospital management. Accurate clinical and costing data are the starting point for policy analysis and formulation.

**Methods**

A retrospective study incorporating incremental analysis was used to estimate costs for critical leg ischaemia patients who had amputations. Incremental analysis is concerned with the measurement of costs that would change as the result of a decision made (in this paper the decision to amputate a limb or to use drug treatment).

Since the objectives of the study were to provide data that would allow drug vs surgical treatment options to be evaluated in economic terms, it was necessary to estimate only those costs and benefits that would differ between these treatments. Costs and benefits that were identical would cancel each other when differences in costs and benefits between treatment options were calculated. It was assumed that the costs up to the point of amputation would be identical for both treatment options studied.

Diagnosis Related Groups (DRGs) is a classification scheme relating the type of patients that a hospital treats (case mix) to the costs incurred by the hospital in their treatment. That is, DRGs are groupings of diagnoses according to their clinical similarities and treatment costs. International Classification of Diseases (ICD) is a classification system (published by the World Health Organization) of diseases, each with a unique code number. Patients who underwent vascular reconstructive surgery followed by amputation were included in the analysis, but costs were evaluated for the amputation only. Individual 1991 patient records (unit record data) relating to (DRG) codes 113 (amputation for circulatory system disorders except upper limb and toe) and 285 (amputation of lower limb for endocrine, nutritional and metabolic disorders), and ICD procedure code 841 (amputation of lower limb) were obtained for all New Zealand public and private hospitals. These data related to all hospital admissions, the details of which are recorded at the time of discharge or death. Any patient readmitted for the same condition within the period studied was recorded as a separate admission. Data were analysed with respect to age and gender groupings.

Records with the following ICD codes were excluded from the analysis: all accident codes, all codes relating to malignant and benign neoplasms likely to result in surgery to the limbs (ICD codes 170 to 173, 198, 201, 202, 205, 221, 237, 238), late effects of injuries to the limbs (ICD codes 905, 906), unspecified disorders of the joint (ICD 719), other disorders of the bone and cartilage (ICD 733), and congenital anomalies of limbs and musculoskeletal deformities (ICD 754 to 757).

Two alternative methods were used to isolate patients undergoing leg amputations. The first method selected records by ICD procedure code (the ICD procedure code method) and the second method selected records by DRG code (the DRG method). The 2 methods were used as a cross check on data sorted. ICD procedure code 841 (amputation of the lower limb) was costed using DRG code