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Cost of treating stroke in an Irish teaching hospital

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Abstract:

Background In contrast to CHD and cancer, the burden of stroke lies with long term disability as opposed to death and it is the most common cause of neurological disability in the western world. Consequently such patients frequently require longer acute hospital stays followed by lengthy periods of rehabilitation where such services are available, long term nursing care or indefinite dependency on community care. Inevitably stroke is a major economic burden on healthcare systems. It has been estimated that approximately 6% of total healthcare resources are consumed in the management of this condition a figure which is expected to grow with an increasing elderly population.

Aim Due to the high level of disability caused by stroke, patients often require longer and therefore costly periods of acute hospital stay**.** The aim of this study is to determine the cost of treating an acute episode of ischaemic stroke in an Irish teaching hospital.

Methods The costing evaluation was from the hospital admission perspective and the strategy used was a microcosting detailed collection of resources used on patients admitted to St. James's hospital between January 1999 and March 2000.

Results The average cost of a hospital admission for the treatment of an episode of acute ischaemic stroke was €6,722. The average cost per day was calculated at €263. Approximately 83% of hospital costs were associated with ward costs whereas medications accounted for just 1% of total costs. The projected cost for the treatment of stroke in euros using the consumer price index for October 2002 would be €7,686.

Conclusion The availability of Irish cost data is essential for the assessment of the cost effectiveness of therapeutic interventions for the treatment of stroke in our healthcare system

Introduction

Stroke is the third most common cause of death, after coronary heart disease (CHD) and cancer, in Europe and the USA, and is responsible for one in ten of all deaths. As a cause of death worldwide, stroke is second only to CHD[1].

Approximately 25% of men and 20% of women can expect to suffer a cerebrovascular event if they reach the age of 85 years[2].The incidence of stroke is similar to that of acute coronary events however mortality due to stroke is less. [3, 4]. In contrast to CHD and cancer, the burden of stroke lies with long term disability as opposed to death and it is the most common cause of neurological disability in the western world [5]. Consequently such patients frequently require longer acute hospital stays followed by lengthy periods of rehabilitation where such services are available, long term nursing care or indefinite dependency on community care.

Inevitably stroke is a major economic burden on health care systems. In the UK it is estimated that approximately 6% of the annual total health care budget and social services expenditure, is attributable to the management of this condition[6]. This figure accounts for almost double the cost of treating CHD. While it has been reported that the overall mortality rate for stroke has decreased over the past few decades this is mainly due to a decrease in case-fatality as opposed to a decrease in the overall incidence[7]. With an increasing elderly population it is predicted that stroke will account for 6.2% of the total burden of illness in 2020[8].Therefore without more effective management strategies for stroke victims, the cost of this disease will continue to escalate.

In Ireland, in 1999, there were approximately 9,235 patients discharged from our public hospitals with a principal diagnosis of stroke. This figure reaches 12,600 for all

diagnoses of stroke. The principal aim of this study was to identify the cost of treating patients admitted to an Irish teaching hospital with a primary diagnosis of ischaemic stroke. These costs can in turn be used to identify cost-effective measures in reducing the health care burden of this disease and provide valuable costing data for health economic evaluation.

Methods

Quantification of resource used

From a total of 348 patients admitted to St James's Hospital between January 1999 and January 2000 with a primary diagnosis of stroke (ICD-9-CM Code 430-437) 30 were randomly selected based on availability at the time the study was carried out, using the Hospital In-Patient Enquiry system (H.I.P.E.). A database was constructed to capture the required information and a detailed analysis of the medical records was carried out for each of the patients selected. Details of demography, referral source, previous medical history, risk factors, medications on admission, medical cover, length of stay in each ward, consultation referrals, number and type of diagnostic procedures, number of treatment procedures and quantity and class of medication received while in hospital were documented for each of the individual patients.The average length of stay and the average age of the patients in the study were compared at different stages of the study with those of the total number of patients admitted with a primary diagnosis of stroke (n=348) to eliminate any bios in the selection criteria.

Assignment of unit costs

The costing evaluation carried out in this study was from the hospital perspective and the method used was a micro-costing approach with complete collection of resources used. The therapeutic classification and drug acquisition costs were derived from the December 1999 edition of the *Irish Monthly Index of Medical Specialities* (MIMS). The costs associated with medications not listed in the MIMS were obtained from the hospital pharmacy.

The Finance department of the hospital provided the unit costs which were used to value each item of resource used. These costs were provided in 1998 figures and inflated to 1999 costs using a 4% inflation index for salary related costs as advised by the finance department in SJH**.** The ward costs included the sum of the cost of medical and paramedical teams, nursing and allied staff, blood products, medical and surgical and other consumables. Physician and Pharmacy costs were calculated as a product of the salary (inclusive of PRSI) paid to the staff allocated to the relevant wards and the proportion of the overall bed occupancy for the cohort of patients treated on these wards. Other consultation fees, such as Psychiatry, Neurology, Care of the Elderly, Physiotherapy, Speech therapy, Occupational therapy, Medical social worker, Dietician were based on an hourly rate calculated from average base salary, inclusive of PRSI.

Costs associated with overheads (including administration and hotel costs) were based on bed occupancy per ward for the cohort of patients and square footage of each ward as a proportion of the total area of the hospital. The procedure costs were obtained from the relevant hospital directorates and included material costs and labour time.

Laboratory investigation costs were obtained from the various departments within the Central Pathology Directorate and are consistent with costs charged to external consumers. Any test performed outside the hospital was costed at the charge to SJH.

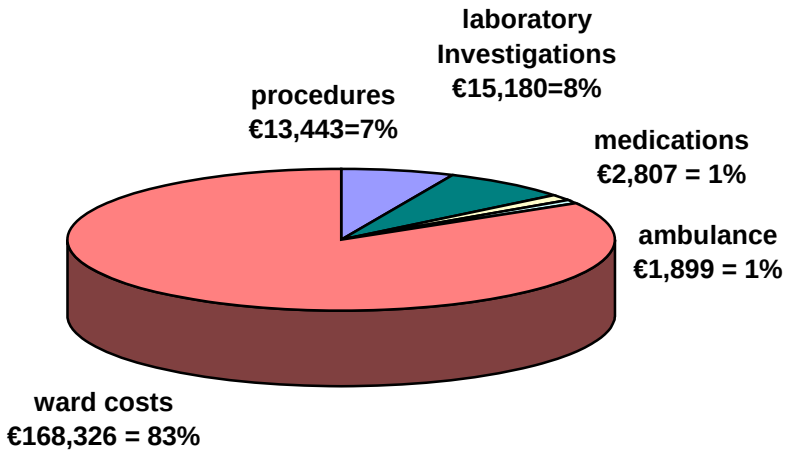
Results

The mean age of the 30 patients (16 female) was 70 years. The median age was 76 years (66 – 82). The median age for all of the patients in the original cohort n=348 was 79 years (71 – 84). Eight of the patients were smokers and a further eight patients were ex-smokers. Four of the patients had a documented history of diabetes mellitus. The likely underlying cause for the cerebrovascular events (CVA) included hypertension (40%) atrial fibrillation (20%), ischaemic heart disease (8.3%) and diabetes mellitus (13%).For 22 of the patients it was their first presentation to hospital with symptoms of stroke. For the remaining 8 patients (27%) it represented readmission for extension of a previous CVA. The average length of stay of the 348 patients admitted to St. James's Hospital that year with a primary diagnosis of stroke was 22.4 days. The median LOS was 12 (6 – 23). This figure was calculated from the HIPE database. The average length of stay in the hospital for the 30 patients in the study which was calculated from the patient's case notes was 25.5 days (4 -164). The median LOS was 14.5 days (9 – 21.5)

Some 23% of the patients were discharged to a nursing home or district hospital for long-term care. A further 6 (20%) of the patients died during their acute hospital stay. The remaining 57% were discharged home. The total cost of hospitalisation for the 30 patients admitted with a stroke was €201,655. The average cost of treating each patient was €6,722 (range €643 - €28,139). The average cost per day was calculated at €263. The overall costing was subdivided into ward costs, procedures, laboratory

costs, hospital medications and ambulance costs (Figure 1.1). Ward cost (including staff and administration costs, blood products and other consumables) was the area of greatest expenditure, accounting for 83% of all costs in treating stroke patients.

Figure 1.1:Total cost of treating patients (n=30) admitted to St. James's Hospital with a primary diagnosis of CVA (average = €6,722)



Cost of medications

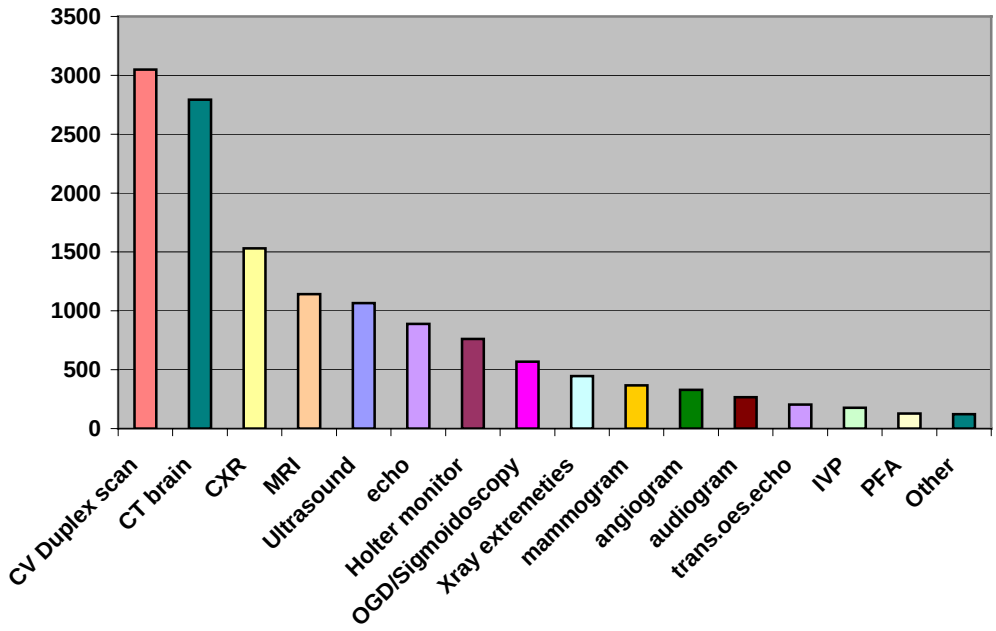
The total cost of medications was €2,807 accounting for only 1% of the total cost of treating stroke.The highest area of expenditure was on antibiotics, administered to 40% of the patients at €562.66 (20% of the total cost of medications). Gastric drugs which consisted predominantly of H2 receptor antagonists and laxatives, accounted for a further €295.86 (11% of the medication costs) and were prescribed for 50% of the patient cohort. Bronchodilators accounted for €213.56 (8% of the drug costs) administered to 27% of the patients. Some 43% of the patients received either benzodiazepines or anxiolytics/antidepressants at a cost of €192 (7% of the medication costs). Lipid lowering agents were prescribed for 20% of the patient cohort at a cost of €110.96 (4% of the medication costs). Some 47% of the patients

received the anticoagulants warfarin or heparin costing €169. A total of 70% of the patients were prescribed either aspirin or clopidogrel at a cost of €21.02 (1% of the drug costs).

Cost of Procedures

The total cost of procedures was €13,443 accounting for 7% of the total cost of treating stroke.Distribution of the total procedure costs are illustrated in Figure 1.2. The highest area of expenditure was on cerebrovascular duplex scans (€3,048) in 67% of the patients which accounted for 22% of the total cost of procedures. Twenty six of the patients (87%) had a CT brain scan performed with or without contrast accounting for (€2,794), a further 20% of procedures costs. All patients had one or more chest x-rays performed which amounted to €1,530 (11% of the procedure costs). Three of the patients had an MRI scan which accounted for 8% of the procedure costs (€1,143). Some 67% of the patients had an ultrasound performed accounting for 8% of the costs and a further 6% of the cost was attributable to twenty patients who had echocardiography.Twenty patients had 24 hour blood pressure monitoring carried out accounting for €762 or 6% of the cost of procedures. Fourteen patients had X-rays of their extremities which accounted for a total of €445 and three of the patients had a gastroscopy or sigmoidoscopy performed accounting for 3% of the procedure costs. The remainder of costs, (11%) arose from investigative procedures such as mammograms, angiograms, audiogram, trans oesophageal echo, intravenous pyelogram and pulmonary function tests. Distribution of procedure costs are illustrated in Figure 1.2

Figure 1.2: Distribution of procedure costs (Total = €13,443) for patients admitted with stroke



Discussion

While mortality rates due to stroke seem to have stabilised [7], the total incidence of stroke is expected to increase considerably over the next two decades due in part to the increase in the elderly population [2, 8, 9]. Approximately 25% of men and 20% of women will suffer a stroke by the age of 85 years[2]. It has been estimated that about one third of all stroke victims are dependent after one year. Due to the high level of disability caused by stroke, patients often require longer periods of acute hospital stay followed by lengthy periods if not long-term care in district or community nursing homes. The mean age of the patients in this study was 70 years and the average length of stay was 25.6 days. This average length of stay is fourth highest in Europe for the acute management of stroke. The UK (35.4days), Austria (31.6 days) and Hungary (26.6 days) rank higher than Ireland in this regard[10].

Stroke is expected to become a major healthcare burden. In the UK, for example it accounts for approximately 6% of the total National Health Service and Social Services expenditure[6]. This economic healthcare burden is almost twice the cost of coronary heart disease. With an increase in the elderly population we can only anticipate further demands on the healthcare budget in the management of patients with this condition over the coming years. Stroke often culminates in dementia, epilepsy, depression and is a major cause of falls and fractures. It was identified from this study that the average cost of treating a patient admitted to hospital with a stroke in 1999 was (€6,722) with an average daily cost of (€263). The Diagnostic Related Group (D.R.G.) figure for that year was €4,480. In a study carried out by Grieve et al. in 1995 which compared the costs of acute stroke across Europe the official exchange rate and the purchasing power parity index (PPP) was used to compare the results of different countries [10]. By comparing the results of this study (converted to 1995 consumer price index figures in $) it was identified that Ireland (£4,374)($6,998) was second to Austria ($8,182) as having the highest acute costs for the treatment of stroke. It was closely followed by England ($6,600). Both Austria and England had the longest length of stay in Europe at 35.4 days and 31.6 days respectively. The lowest acute costs were in Latvia ($266) which had a mean length of stay of 13.4 days. Spain had the shortest length of stay at 8.8 days. It must be acknowledged however in drawing on comparisons of cost of treating stroke across Europe that the wide variations in length of stay may be explained by the type of facilities available to stroke victims in different countries. The mean length of stay tended to be shorter in countries such as France where patients were discharged to rehabilitation centres therefore the costs associated with the treatment of acute stroke were less in such countries compared to the UK Austrian and Irish centre where patients stay at the

acute hospital for rehabilitation and as in the Irish situation, to await vacancies in long term care institutions.

Approximately 83% (€168,326) of the total costs identified in the Irish study were attributable to ward costs, or €5,611 per admission. Investigative procedures accounted for 7% of the cost of treating stroke and over 50% of this cost was attributable to cerebro vascular duplex scans, chest x-rays and CT scans. Laboratory investigations accounted for a further 8% of the cost.

Drug treatment accounted for only 1% of the total cost in the management of stroke. Antibiotics administered to 40% of the patients accounted for 20% of the drug costs. Only a third of the patients were receiving the antiplatelet agents aspirin and clopidogrel on admission. This increased to 70% of the patients during their hospital stay accounting for a mere 1% of the medication costs. Statin therapy was initiated 23% of the patients while in hospital. None of the patients were on any class of lipid lowering agent on admission.
Some 47% of the patients received the anticoagulants warfarin and heparin while in hospital accounting for 6% of the medication costs. One patient had been taking antidepressant/benzodiazepine medications prior to admission. This increased to 43% of the patients during their hospital stay accounting for 7% of the medication costs.

The incidence of stroke in Ireland is around 375 per 100,000 of the population over 45 years according to the Irish Heart Foundation Council on Stroke. It is responsible for approximately 2,580 deaths per year and approximately 9,500 admissions to our public hospitals each year involving lengthy hospital stays and an even greater

economic healthcare burden in relation to rehabilitation costs, long-term care in district hospitals and nursing homes or home care. It is estimated that there are in the region of 30,000 people in this country at present with residual disability as a direct result of stroke. Crowe et al carried out a survey of 231 stroke patients discharged from three different hospitals in the south east Dublin area between 1997 and 1998 [11]. They found that six months after hospital discharge 84% of the patients were living, however 41% of these patients were dependant either in nursing homes or living in the community. The results of this report also showed that many of these patients had no rehabilitation after their initial period of hospitalisation. The results of the European study identified that approximately 21% of the patients were discharged from acute care to rehabilitation units. The results of the Irish study identified that 3% of the patients were transferred to a Stroke Unit situated in St. James's Hospital, for rehabilitation. A further 23% were discharged to a district hospital or nursing home and 74% of the patients were discharged home. An audit of the stroke unit in Tallaght Hospital[12] identified that such units reduce death rates from stroke from 19% to 9%. They also increase the number of patients being discharged home instead of requiring long term care from 55% to 68% without increasing length of stay therefore reducing overall costs of stroke management. The available evidence suggests that dedicated stroke units for the management of patients enhance clinical care in a cost effective way [12-14].

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