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Cost of treating acute myocardial infarction in an Irish teaching hospital.

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Abstract:
Recent figures indicate that there are approximately 6,500 patients admitted to hospital following acute myocardial infarction (AMI) in Ireland each year.[1] As hospital admission is frequently the most expensive component of healthcare we determined the costs associated with treatment of AMI in a teaching hospital. The costing evaluation was from the hospital perspective and the strategy used was a micro-costing detailed collection of resources used. The average cost of hospital admission for the treatment of AMI was £3,976. The average cost per day was calculated at £501. Approximately 50% of hospital costs were associated with ward costs. Procedures accounted for 35% of costs whereas medications contributed just 7% of total costs.

Introduction:
In OECD (Organisation for Economic Co-operation and Development) countries, treatment of cardiovascular disease generally consumes about 10 - 15% of total healthcare budgets.[2] Individual costs for the treatment and care of people who suffer cardiovascular events in Ireland are not readily available. In an attempt to determine the hospital costs of treating patients who suffer an AMI, a cost of care study was conducted for 100 patients who were admitted to an Irish teaching hospital (St. James's Hospital, Dublin) following such an episode.

Method:

1) Measurement of resources used:
One hundred patients with a primary diagnosis of AMI between September 1998 and March 1999, were randomly selected using the Hospital In-Patient Enquiry database. This patient cohort represented approximately two thirds of all patients admitted to St. James's hospital with an AMI during this period. A review of medical charts was conducted for each patient and a database constructed to encapsulate all resources used. Details of demography, risk factors, referral source, medical cover, length of stay in each ward, therapeutic and diagnostic procedures performed, number of treatment procedures performed and quantity of medication received in hospital were collected for each patient.

2) Assignment of unit costs or prices
The costing evaluation in this study was from the hospital perspective and the strategy used was a micro-costing approach. Therapeutic classification and drug acquisition costs were derived from the February 1999 edition of the Irish Monthly Index of Medical Specialities (MIMS). The hospital finance department provided bed day costs which included costs on nursing and allied staff, blood products, and consumables. Medical costs for physicians and pharmacists were calculated as a product of the salary paid to the staff covering the relevant wards (plus PRSI) and the proportion of overall bed occupancy of the wards attributable to the cohort of patients. Overhead costs (including administration and hotel costs) were assigned based on bed occupancy per ward and square footage of each ward as a proportion of total area of the hospital. Other consultation costs such as speech therapy, physiotherapy, medical social worker and dietician were based on an hourly rate calculated from average base salary, inclusive of PRSI. The procedure costs were collected from the relevant hospital directorates. Investigation costs were obtained from the laboratories and are consistent with costs charged to external consumers.

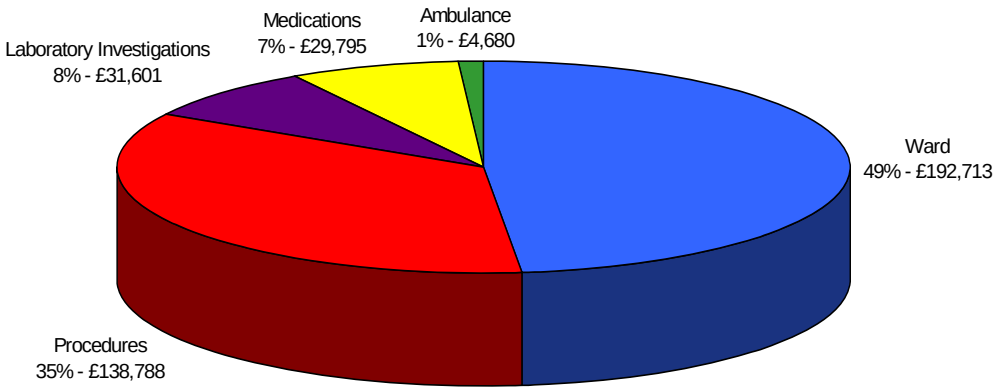

Figure 1: Distribution of total hospital costs for the treatment of patients with acute myocardial infarction (average £3,976 per patient) in an Irish teaching hospital

Results:

The average age of the one hundred patients in this study (64 male, 34 female) was 65 years (range 37 to 90 years). Eighty-two patients were discharged following an average length of stay of 7.9 days (median 7.0 days) in hospital while eighteen patients died following admission. The total cost of care for this cohort was £397,577(Fig. 1).

Ward costs were the most expensive component of treating a patient admitted to hospital with an AMI (49% of total costs). The Intensive Care Unit was the most expensive ward but had little influence on overall costs as only 6 patient days were spent there. Eighty-three patients were admitted to the coronary care unit with an average stay of 3.5 days (range one to ten days). This accounted for 65% of total ward related costs. Our cohort of patients spent almost half their time in a general cardiac ward though this only accounted for 27% of ward costs. The period spent in the CCU was almost three times more expensive than the general cardiac ward.

Procedures cost £138, 788 (35% of total cost) and Coronary Artery Bypass Grafting (CABG) cost well in excess of any other surgical intervention performed in this study, totalling 31% of all procedure costs, despite the fact that only 4 patients had this operation. If the costs related to the CABGs were excluded, the overall average cost of treating a patient with an AMI would be £3,528. Thirteen patients received percutaneous transluminal coronary angioplasty (PTCA) plus stenting whilst twenty one patients received PTCA without stenting representing 23% and 19% of the procedure costs respectively.

Biochemistry profiles accounted for 70% of laboratory investigation costs and haematology 28%. As might be expected, cardiac enzymes (465 tests), coagulation screens (403 tests) and renal profiles (514 tests) represented 29%, 27% and 16% of total laboratory costs respectively for this cohort of patients. However, only 54 patients (two thirds of surviving patients) had a lipid profile during their hospital stay

(4% of investigation costs), possibly because this test is unreliable unless performed early during the course of an AMI.

From the pharmacoeconomic standpoint medications administered to the patients whilst in hospital cost £29,795 (7% of total). Some 86% of this cost relates to cardiovascular drugs with a further 4% for analgesics and 3.3% for anti-infective medications.

Discussion:

This study demonstrates that the average cost of treating an AMI in an Irish teaching hospital is approximately £3,976 (range £683 to £16,337). This average cost is less than those associated with hospitalisation of a similar cohort of patients in a French hospital in 1999 (£5,566)[3] but similar to that of a Belgium hospital in 1998 (£3,675).[4]

The cost of treating AMI patients has increased significantly over the last few years with increased utilisation of expensive interventions in the form of surgical procedures and medications. A previous study in the Irish setting (Mater hospital) between 1992 and 1994 demonstrated that the average hospital cost of treating a patient with an AMI was £2,333 (59% of our total costs).[5] Similarly a study in Spain in 1995 costed the hospital treatment of AMI patients at £2,445 (61% of our total costs).[6] Hospital stay remains the most expensive component when treating a patient following the onset of an AMI despite the fact that the mean length of stay for these patients has decreased somewhat in recent years. In future it is possible that the length of stay may be reduced even further. In some hospitals, economic pressures have contributed to AMI patients being discharged as soon as 72 hours following thrombolysis provided that there were no complications during this time. A study using data from 22,361 patients from the Global Utilisation of Streptokinase and TPA for Occluded Coronary Arteries (GUSTO-1) trial examined the cost effectiveness of such early discharge and concluded that in relation to other medical interventions, extending hospitalisation beyond 72 hours after thrombolysis for patients with uncomplicated myocardial infarction was not cost effective. [7-9] Procedure costs (including CABG) accounted for 24% of total costs in the earlier Irish study[5] but had increased to 35% of total cost in our study. In 1996, the cost of performing CABG, PTCA and coronary angiography in Irish public hospitals alone was in the region of £14.65 million.[10]

Medications received during hospital admission accounted for 7% of total costs. Although thrombolytic and antiplatelet therapy (ie. streptokinase, TPA and abciximab) accounted for 61% of medication costs, it is important to acknowledge that appropriate use of the less expensive medications is also essential in improving overall patient morbidity and mortality. This was highlighted in a recent US study of 30 day mortality in 149,177 patients following AMI, which concluded that admission to a hospital ranked high on the list of “America’s Best Hospitals” [11] was associated with a lower 30 day mortality. A substantial portion of the survival advantage seemed to be associated with the higher rates of use of aspirin and beta blockers in these hospitals.[12] In our study, 99% of patient received aspirin and 70% were treated with beta blockers as compared with figures of 91.5% and 63.8% respectively for patients admitted to the top-ranked US hospitals. However, aspirin and the beta-blockers only accounted for 0.1% and 0.4% of hospital drug expenditure, respectively.

Thirty eight percent of the patients in our study received ACE inhibitor therapy post AMI. Between 1992 and 1995 eight randomised controlled clinical trials of ACE inhibitors following myocardial infarction were reported. [13-20] The trials confirmed the beneficial effects on morbidity and mortality. From the pharmacoeconomic standpoint regardless of treatment strategies i.e. treatment of all patients with objective evidence of left ventricular failure or clinical signs of heart failure, economic analysis indicates that ACE inhibitors are cost effective in treating patients post AMI. Analysis by McMurray et al (1997) suggests the cost effectiveness of ACE therapy post AMI is within the range £1,752 to £3,110 per life year gained which is well within accepted limits of cost effectiveness. Available evidence suggests that ACE inhibitor therapy is under-utilised following AMI.[21]

Statin therapy also reduces the risk of coronary artery disease in a cost effective manner particularly in the area of secondary prevention. Statin therapy was administered to 28% of patients leaving hospital, which accounted for 18.5% of total medication cost. This frequency of administration is in line with other European centres where statin prescription on discharge has slowly increased from 7% to 35% between 1994 and 1998.[22] However, there may still be under-prescribing of lipid lowering therapy if European treatment guidelines (total cholesterol < 5.0 mmol/l and low density lipoprotein cholesterol < 3.0 mmol/l[23]) are to be followed. In this study a further 23 patients could have been prescribed a statin based on their lipid levels while a further 28 patients did not have a lipid profile performed while in hospital. Therefore potentially 83% of this cohort of patients could have received a statin when leaving hospital. In the UK, it has been estimated that the cost implications of statin therapy in secondary prevention of CHD could consume approximately 15% of the drug budget.[24] If that were the case in the Irish context, then the total GMS expenditure on statin medication alone would be in the region of £100 million per annum.

Conclusion:

With the increasing demand to demonstrate the cost effectiveness of new technologies, including medications, the provision of cost data is essential. There is a scarcity of such data in Ireland. The results of a detailed costing study such as this will be of relevance in helping to cost some of the recommendations following the recent publication of the cardiovascular health strategy.[10] Mindful of the increasing role of interventions such as PTCA plus stenting, it is likely that the cost of treating AMI will continue to increase. The cost data provided here will be of importance when determining the cost effectiveness of interventions for the treatment of AMI.

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