The Economic Burden of Femoral Neck Fractures in Jamaica

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ABSTRACT

Osteoporotic femoral neck fractures are increasing as the population ages. There is a significant cost to care for patients with such fractures. We prospectively analysed the in-hospital cost of managing 85 patients admitted to the University Hospital of the West Indies (UHWI) with such fractures. The majority of patients were females, 78.8%, and the mean age of the cohort was 83.7 years. There was a significant difference in the mean preoperative delay and length of stay between those patients treated publicly as compared to those treated privately, 9.6 vs 3.1 days and 18.9 vs 8.8 days, respectively. The mean acute cost of those treated publicly was 39% of the cost of those treated privately, J$110 878.80 vs J$284 287.61. The economic cost per year to the country for the acute management of femoral neck fractures was calculated at J$46 264 528.76 which is 0.32% of the 2005−2006 budgetary allocation for health. This cost was significantly associated with the length of hospital stay and the number of complications developed.

Keywords: Cost, developing countries, femoral neck fractures

Carga Económica de las Fracturas del Cuello del Fémur en Jamaica

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RESUMEN

Las fracturas osteoporóticas del cuello femoral van en aumento a medida de que la población envejece. Hay un costo significativo asociado con el cuidado de los pacientes con tales fracturas. Analizamos prospectivamente el costo de hospitalización de 85 pacientes ingresados en el Hospital Universitario de West Indies (HUWI) con tales fracturas. La mayoría de los pacientes eran hembras (78,8%) y la edad promedio de la cohorte fue 83.7 años. Hubo una diferencia significativa en la demora preoperatoria promedio, y la duración de la estancia entre los pacientes tratados en instalaciones públicas, en comparación con aquellos tratados en privado, 9.6 vs 3.1 días, y 18.9 vs 8.8 días, respectivamente. El costo promedio agudo con respecto a los pacientes tratados en instalaciones públicas representó el 39% del costo de los tratados en privado, a saber, 110 878.80 jmd frente a 284 287.61 jmd. El costo económico anual que para el país representaba el tratamiento agudo de las fracturas del cuello del fémur, fue estimado en 46 264 528.76 0, lo que representa el 30% de la asignación presupuestaria de 2005−2006 para la salud. Este costo se encontraba significativamente asociado con la duración de la estancia hospitalaria y el número de complicaciones producidas.

Palabras claves: Costo, países en desarrollo, fracturas del cuello del fémur

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INTRODUCTION

As the world population ages, the cost of treating osteoporotic hip fractures is proving to be an increasing challenge to health services worldwide (1−6). The worldwide direct and indirect annual costs of hip fracture in 1990 were estimated at US$34.8 billion, and are expected to increase substantially over the next fifty years (2). Apart from the cost

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of acute care in hospital, there is also the cost of convalescence, rehabilitation, home care and reoperations. Rehabilitation after hip fracture can be lengthy and costly (1, 7). It may take as long as a year to get patients with femoral neck fractures back on their feet walking independently (8). Increasing age (9) and living in an institution at the time of injury are strong predictors of increased cost (10).

Osteoporotic hip fractures are often associated with the presence of multiple co-morbidities. These may delay surgery, prolong hospital stay and increase mortality (11). The best outcome in this group of elderly patients is seen in those who have surgery within 48 hours of admission (12). Furthermore, it has been shown that spending more resources for performing hip surgery within 48 hours is more cost effective than delaying surgery past the 72-hour period (12). Patients who develop medical complications postoperatively have a significantly longer mean length of stay, increased associated cost and mortality (13, 14). Centenarians have been shown to have longer preoperative delays and also overall length of stay (9).

There are several studies from developed countries which have looked at the cost of managing hip fractures (1−5, 10, 15−17). There are, however, very few studies from developing countries that address this issue (18, 19). To the best of our knowledge, this is the first such study from the Caribbean which has looked at the acute cost of treating osteoporotic femoral neck fractures. The primary aim of this study therefore was to document the acute cost of managing hip fractures in Jamaica and to look at the factors which contribute to this cost. The secondary aim was to provide information on the economic burden of this entity to clinicians, health policy-makers and health administrators alike.

SUBJECTS AND METHOD

This was a prospective study between February 1, 2004 and January 31, 2006. All patients aged sixty-five years and older who were admitted to the University Hospital of the West Indies (UHWI), which is the main teaching hospital in Jamaica, with a diagnosis of a fracture of the neck of the femur were invited to participate in the study. Patients with pathological fractures as a result of tumours were excluded. Informed consent was obtained either from the patient or from their relatives if they were unable to give consent. Ethical approval for the study was obtained from the University Hospital of the West Indies/University of the West Indies/Faculty of Medical Sciences Ethics Committee.

Information on patient's age, gender, type of fracture, the presence of co-morbidities, the preoperative delay, the length of stay and the postoperative complications developed were recorded. The itemized bills as charged by the hospital upon discharge were obtained. Items were categorized as follows: hospitalization cost which included room and board and disposables; surgical cost *ie* use of operating theatre and recovery room, cost of implants, surgical and anaesthetic costs; laboratory costs; radiographic costs; physical therapy; and pharmaceutical costs. Where cost data were missing from the itemized bills, usually with radiographic, pharmaceutical or physiotherapy costs, approximations were made of the cost with reference to other patients who had similar diagnoses, lengths of stay, co-morbidities and complications.

As the cost for service at the hospital represents a highly subsidized cost, patients who were treated on the private side of the hospital were included in the study as they formed the basis on which the true cost of treating femoral neck fractures was calculated, since these patients were billed at full cost for all services. The extent of subsidy was obtained by looking at the difference in cost between those treated publicly as compared to those treated privately.

The number of patients per year with osteoporotic femoral neck fractures within the age group and period under review was obtained from the Ministry of Health. It was assumed that 93.4% of patients had surgical fixation of their fractures based on the 6.6% who did not have surgery at the UHWI.

Data were analysed by the Statistical Package for Social Sciences version 12.0 (SPSS Inc, Chicago, IL, USA), using simple frequencies, the Chi-squared test for analysis of categorical variables and the Students' *t*-test along with the Mann-Whitney U test for analysis of continuous variables. Linear regression analysis was done to look at the factor or factors that were predictive of increased hospital cost. Significance was set at < 0.05.

Assuming the mean cost of those treated privately as the true cost, the total cost to the country was obtained by multiplying this mean total cost by the average number of cases seen per year throughout the country for the period under study. All costs were calculated in Jamaican dollars and converted to US dollars. The exchange rate used for the Jamaican dollar was $65.245 to US$1 which was the rate of exchange on January 31, 2006, the date on which the study ended. The value of the Jamaican dollar did not vary significantly from the figure used throughout the period under review.

RESULTS

There were ninety-one patients who were admitted during the study period. Six patients (6.6%) did not have surgery at the UHWI as they were deemed either too high risk for surgery (4/6) or were transferred to another institution for surgery (2/6). These six were excluded from the analysis. Of the eighty-five patients who had surgery, ten were treated privately. Complete costing figures were available for 72/75 (96%) of those treated publicly and 8/10 (80%) treated privately.

The mean age of our patients was 83.7 ± 8.01 years; that for males was 80.6 ± 9.18 years as compared to 84.5 ± 7.5 years for females which was not a significant difference. Other patient characteristics, type of fractures and co-morbidities are listed in Table 1. Only 27.4% of patients had

Table 1: Profile of patients with neck of femur fracture

Characteristics	Number /85	Percentage (%)
Gender:		
Females	67	78.8
Males	18	21.2
Types of fractures: Extracapsular	47	55.3
Intracapsular	38	44.7
Co-morbidities:		
Hypertension	42	49.4
Diabetes	21	24.7
Cardiovascular accidents	8	9.4
Ischaemic heart disease	11	12.9
Alzheimer's	13	15.3
Seizures	1	1.2
Previous myocardial infarction	1	1.2

no co-morbidities. Fifty-six per cent had no or only one co-morbidity, whereas 44.1% had two to four co-morbidities. Approximately half of our patients were hypertensive and a quarter had diabetes. There was no significant difference between the gender and the number of co-morbidities.

Table 2 shows the mean preoperative delay and length of stay based on whether a patient was treated publicly or

Table 2: Comparison of mean preoperative delay and length of stay in days

	Public	SD	Private	SD	*p*-value
Preoperative delay	9.6	7.1	3.1	3.4	0.001
Length of stay	18.9	11.5	8.8	6.5	0.001

privately. There was a significant difference between the two groups in both preoperative delay and length of stay. There was, however, no significant difference in either preoperative delay or length of stay based on gender.

Of the patients who had surgery, 55/85 (64.70%) had no complications, 23/85 (27.1%) had one complication and 7/85 (8.23%) had two or more complications. The types of com-plications are as indicated in Table 3. Of 35 complications, 20 were infection related, accounting for 57% of all complications. The effect of complications, in particular infective complications, is shown in the Figure where there was a significant increase in cost for treating patients with infective complications.

Table 5 shows the mean cost of the billed items and the percentage contribution of each to the overall cost with their associated significance. Total mean cost at the public side of the hospital was \$110 878.80 ± \$52 483.62, whereas that for the private section was \$284 287.61 ± \$28 676.59. There were significant differences between the public and private groups in costs associated with hospitalization, surgery and

Table 3: Complications following surgery for femoral neck fractures

Characteristics	Number /85	(%)
Pneumonia	6	7.1
Wound infection	6	7.1
Confusion	6	7.1
Urinary tract infection	3	3.5
Decubitus ulcer	3	3.5
Cerebrovascular accident	3	3.5
Fixation failure	2	2.4
Deep wound infection	2	2.4
Dislocation	2	2.4
Upper gastrointestinal bleed	1	1.2
Femoral fracture	1	1.2
Total complications	**35**	

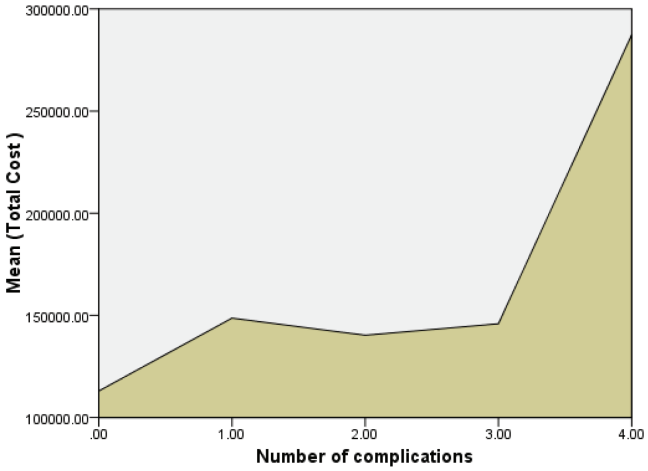

Figure: The effect of complications on cost in Jamaican dollars.

Table 5: Mean acute cost of treating femoral neck fractures in Jamaican dollars

Billed item	Private	% of cost	Public	% of cost	*p*-value
Surgical cost	175 266.27	61.7	60 303.80	54.39	< 0.000
Hospitalisation	70 965.05	25.0	29 618.53	26.71	< 0.000
Pharmacy	16 155.32	5.7	12 511.05	11.28	< 0.731
Laboratory	12 725.20	4.5	5339.44	4.81	< 0.001
Physiotherapy	4239.00	1.5	3318.75	2.99	< 0.46
Radiology	3755.03	1.3	2954.17	2.66	< 0.56
Total	**284 287.61**		**110 878.80**		

laboratory fees but not for pharmacy, physiotherapy or radiology costs. Combined surgical and hospitalization costs accounted for 80−86% of total costs. The cost of private care was 2.6 times that of public care. Public care was therefore subsidized by 64% at the UHWI. There was no significant difference between the costs of managing intra- or extracapsular fractures.

Table 6: Comparison of acute cost of treating neck of femur fracture

Publication	Country	Year of study	No of patients	Age	Stay days	Cost in USD
Lawrence *et al*	UK	2003	100	83	23	23 878
Haetjens *et al*	Belgium	2000	159	78.7	29	9534
Lee *et al*	Singapore	2001	80	79	16	5783
Azhar *et al*	Ireland	2005	143	82	11	18 131
Clark *et al*	Mexico	2006	218	78.9		4365
Tanriover *et al*	Turkey	2003−6	50	74.2	7	5983
Our series	Jamaica	2004−6	85	84	18	5583

Increased cost was most significantly affected by the number of co-morbidities, preoperative delay, length of stay and the number of complications developed, especially infective complications. Linear regression analysis, however, showed that the strongest predictor of total cost was the number of complications developed ($p < 0.003$). Gender was not a factor in determining cost or length of stay. The single patient who had a total hip replacement was treated publicly and incurred a cost of $174 848.30 which was above the total mean cost for public patients.

During the period of study, there was an average of 127 femoral neck fractures per year in the country. Assuming 6.6% or eight patients had no surgery for various reasons, there would have been 119 who would have had surgical management of their femoral neck fractures. The figure of $284 287.61 for acute private care represents an average stay of 8.8 days. Meanwhile, the mean length of stay was 18.9 days on the public ward. This would therefore add an additional ten days' cost to hospitalization, pharmacy, laboratory and physical therapy services of approximately $80 000.00. The overall acute cost would therefore be $364 287.61 or US$5583.38 per person. The economic cost per year to the country for those patients having surgery would therefore amount to J$43 350 225.59 or US$664 422.19.

Jamaica's budgetary allocation for health during the period 2005−2006 was approximately 4.1% or $14 281 000 000.00 (20). This did not change appreciably from the previous year. The acute cost for treating femoral neck fractures therefore would be 0.32% of the budgetary allocation for health.

DISCUSSION

Fractures of the neck of the femur occur primarily in the elderly. As the world's population ages, more cases of femoral neck fractures will be encountered. Jamaica will be no exception as the ten years between 1991 and 2001 saw an increase in the population over age sixty-five years, with the age group over eighty-five years showing an annual increase of 3.49% (21).

As healthcare cost in the public sector is highly subsidized and in some cases free, one has to look at the cost incurred in treating patients privately in order to arrive at a true cost for treating this entity. The real acute cost of treating a patient with a femoral neck fracture privately was therefore US$5583.38. The greatest portion of the total cost resulted from costs associated with surgery and hospitalization. Together, they accounted for over 80% of total cost. It is well recognized that these two costs account for the major part of the acute cost associated with femoral neck fracture treatment (4). This total cost compares with that for similar treatments in Mexico, Singapore and Turkey (18, 19, 22), but well below that incurred in Europe or the United States of America [USA] (4, 10, 15) [Table 5]. This is perhaps explained by the fact that Mexico, Turkey, Singapore and Jamaica are all developing countries. As shown in Table 5, the cost to developed countries is approximately 5.5 times that of Jamaica's cost. This reflects the higher healthcare costs generally in those countries. In the case of the USA, figures quoted do not always include the surgical costs, which is a significant portion of overall cost (15).

There was no significant difference in the cost of radiology, pharmacy or physiotherapy services. In the case of radiology, this was most evident, as irrespective of where you were treated, publicly or privately, only two radiographs were needed, one preoperatively and another postoperatively and, unless a complication supervened, no other cost would be incurred. For physiotherapy services, there was a shorter preoperative and postoperative stay with private care as compared to public care and, therefore, less sessions of therapy would be given for the shorter hospital stay private patient than their longer stay public counterpart. This was despite a differential in billing practices. A similar explanation could be offered for the lack of significance in the cost of drugs used. Patients spent more time on the public ward, developed more complications and so, despite a lower cost for drugs, the longer duration of stay and increased usage approximated that on the private side.

The significant preoperative delay in those patients on the public wards is explained in part by the fact that elective orthopaedics and trauma compete for the same valuable operating time. The lack of a dedicated geriatric service to care for the medical needs of these patients further exa-

cerbates the delay. The larger volume of patients seen publicly, with a significant trauma bias also contributes to this delay. The delay on the private side is just outside international standards where surgery is usually performed within 48 hours. It is well known that the best outcomes following neck of femur fracture come from early surgery and rehabilitation along with the presence of a geriatrician to look after the medical needs of the frail elderly (23). Older patients tend to have an increased preoperative delay and longer hospital stay (9).

The increased length of stay in an acute care setting even after surgery is as a result of the lack of adequate rehabilitation facilities to which patients can be discharged. Patients therefore have to attain a certain level of competence in mobilization before they are discharged home, as a significant number of them are unable to afford home or outpatient therapy. Patients treated privately, on the other hand, are able to afford home visits by physical therapists and so their homes function as a convalescent facility, hence their earlier discharge, thus shortening their hospital stay.

Patients who develop medical complications following a hip fracture have a significantly longer mean length of stay and higher associated cost as demonstrated. A longer preoperative delay is associated with increased morbidity and, in particular, infective complications, thus increasing cost and further compounding the length of stay. Patients with infective complications incurred significantly greater costs as their hospital stay was usually prolonged with increased usage of antibiotics, often requiring more investigations, both laboratory and radiographic, physical therapy services and often requiring repeat surgery.

The single patient who had a total hip replacement incurred a higher mean cost that those who had either a hemiarthroplasty or internal fixation of their femoral neck fractures. She had no complications and no reoperations, thus supporting the finding that when the total costs for internal fixation and total hip replacement after a neck of femur fracture were compared, it was found that there was no significant difference between the two groups when reoperations over a two-year period were included (24).

As only 19.8% of the population is covered by health insurance in Jamaica (20), the majority of the cost of treating femoral neck fractures has to be borne by the individual. Individuals will therefore have to shoulder the responsibility of their own healthcare. As our population ages, we will inevitably have more patients with osteoporosis and therefore at risk for osteoporotic fractures of the hips. Healthcare cost will rise in tandem with this ageing population. Some obvious strategies to reduce cost would be shorter preoperative delay, frequent dedicated trauma lists in hospitals, the establishment of geriatric medical services and a rehabilitation facility for the convalescence of these patients. Decreasing overall length of stay would have the effect of decreasing complications and hence costs, as the majority of costly complications are related to prolonged immobilization.

This is the first paper which looks at the cost of treating femoral neck fractures in Jamaica and as far as could be ascertained, the English-speaking Caribbean. It is of value both in the public and private health sectors, where policymakers will have for the first time a costing for a disease entity which is set to increase over the next decades. Additionally, in the public sector, where the government has established free healthcare, it will afford them the opportunity of seeing what the true cost of just one entity is as it makes budgetary allocations and policies. This study will also provide useful data for the purpose of comparison of cost across countries as these data are lacking from developing countries. It will also serve as a basis for comparison of cost over time.

The number of patients involved in this study represents 30% of all cases seen in the island. The majority of patients treated in other public institutions would incur an even lower cost than that which pertains at the UHWI as they are more heavily subsidized or incur no cost at all. Other studies have obtained cost figures from insurance companies; however, as so few of our patients have health insurance coverage, this would not be a feasible source from which to obtain information. The number of privately treated patients accounted for only 12%, a relatively small proportion on which to make the calculations; however, that was all that was available. The assumption that 93.4% of patients would have surgery may be higher than what pertains at other institutions where some patients are treated non-operatively with prolonged traction with its attendant increased complications. Some approximations in cost had to be made where cost figures were missing. This might have thrown out some figures, however, these were in the areas of least cost and where analysis showed no significant differences between those patients treated publicly and privately.

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