Economic burden and the effects of early versus delayed hospitalization on the treatment cost of patients with acute fragility hip fractures under the UPM-PGH Orthogeriatric Multidisciplinary Fracture Management Model and Fracture Liaison Service

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Abstract

Objectives: Fragility hip fractures present not only as a significant cause of morbidity and mortality to the elderly population but also as an important source of financial burden due to staggering costs for treatment. This study is designed to determine the effects of timing of hospitalization to the treatment costs of patients with acute fragility hip fractures.

Methods: In this retrospective cohort study, the patient database of the University of the Philippines Manila-Philippine General Hospital Orthogeriatric Multidisciplinary Fracture Management Model and Fracture Liaison Service was reviewed to investigate the effects of timing of hospitalization to the treatment cost of patients with acute fragility hip fractures admitted in a tertiary government hospital. The economic burden of this group of patients was also computed.

Results: A total of 118 patients were enrolled in the study with 54 patients in the early hospitalization (EH) group (≤ 3 days from injury) and 64 in the delayed hospitalization (DH) group (4–28 days). Median treatment cost is less among the EH group than those who were in the DH group (P = 0.0362). The computed economic burden of patients with acute fragility hip fractures is PhP 1,094,048,363.00 (USD 22,595,007.79) per year in the Philippines.

Conclusions: Fragility hip fractures impose significant financial impact; and therefore, recommend early hospitalization to lessen treatment cost. Future studies should also be undertaken to investigate other interventions that may help alleviate this burden.

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1. Introduction

Fragility hip fractures present not only as a significant cause of morbidity and mortality to the elderly population but also as an important source of financial burden due to the staggering costs of hospitalization, medications, and implants, and productivity losses. With the growing aging population across the globe and the concomitant increase in the incidence of osteoporosis, there is an increasing interest in the field of fragility hip fractures and its economic burden to various countries [1].

In the Philippine setting, the cost of treating fragility hip fractures includes purchasing the implant, medications, and other miscellaneous needs. In-hospitalization also entails loss of income to the patients and their respective caregiver(s). Majority of our indigent patients also need to avail of financial aid through social services to cover for the expenses incurred in the treatment of fragility hip fractures. However, this aid may still be insufficient; as such, patients and their families would still require to shell out money from their pockets. In a tertiary government hospital, it is important to investigate factors that contribute to the treatment costs of fragility hip fractures, look for avenues to support its treatment interventions, and allocate these funds appropriately.

The University of the Philippines-Philippine General Hospital (UP-PGH) is a tertiary government hospital operated and managed by the University of the Philippines Manila, the health sciences center of the premiere state university. As a state-funded institution, UP-PGH is designated as the National University hospital,
which caters mostly to marginalized patients needing specialty and subspecialty care.

In 2017, the University of the Philippines Manila-Philippine General Hospital (UPM-PGH) Department of Orthopedics, in partnership with the Department of Anesthesiology, Department of Family and Community Medicine, Department of Internal Medicine, and Department of Rehabilitation Medicine launched the UPM-PGH Orthopedic Multidisciplinary Fracture Management Model and Fracture Liaison Service (UPMOMMA-FLS). This multidisciplinary team approach to the management of acute fragility hip fractures was implemented to reduce not only the time to surgery and duration of hospital stay but also in-patient morbidity and mortality of patients with acute fragility hip fractures. The Fracture Liaison Service (FLS) was then created to address the management of osteopenia or osteoporosis and to prevent secondary fractures.

An unpublished report on the adaptation of the UPMOMMA-FLS found that this multidisciplinary approach resulted in a shorter pre-operative interval and duration of hospital stay [2]. However, the study was not able to measure its effects on the costs of treating acute fragility hip fractures. Upon further analysis of the patient database of the UPMOMMA-FLS, the average days-to-hospitalization interval (ie, date of injury to date of hospital admission) of patients with acute fragility hip fractures was 5.3 days. From date of admission, it would take another 5.5 days before surgical intervention, making time-to-surgery, or the interval between date of injury and date of surgery at 10.3 days, which is five times the golden period of 48 h, as recommended by the American College of Surgeons [3].

As in the case of many low-to middle-income countries, the problem starts with delayed hospitalization. Pouramin et al. [4] identified that 39% of patients with fractures had delays in seeking care to hospitals and concluded that pre-hospital care should be recognized to improve access to healthcare institutions. For a population with poor awareness on osteoporosis and its associated morbidities [1], coupled with barriers to access to health care [4], there can be delays in the hospitalization of patients with fragility hip fractures, which can result in secondary illnesses (eg, deconditioning, pneumonia, pressure ulcers, etc) brought about by prolonged immobilization [5].

Therefore, this paper aims to measure the economic burden of acute fragility hip fractures and identify its determinants. This study also intends to investigate if early hospitalization (<3 days from injury) of patients with suspected fragility hip fractures would lead to a decrease in the treatments costs as compared to those who are hospitalized late (>4–28 days from injury). In a study investigating the impact of timing of surgery and outcomes of elderly patient with acute hip fractures, Klestil et al [6] found that those operated on within 24–72 h had a reduced risk of mortality.

It is hypothesized that early hospitalization would facilitate initial work up of the patient and result in earlier surgical intervention. This would also allow the healthcare team to address early, if not prevent, any potential complication that may arise as a consequence of the injury, and, in turn, decrease the total cost of treatment and improve the quality of life of patients with fragility hip fractures.

2. Methods

2.1. Objectives

This study is a retrospective cohort study designed to determine the effects of timing of hospitalization to the treatment costs of patients with acute fragility hip fractures under the UPMOMMA-FLS. Two cohorts were made based on their days-to-hospitalization (DTH) interval. Patients who were hospitalized within 3 days from the time of injury were assigned to the early hospitalization (EH) group while those who were admitted 4–28 days after were assigned to the delayed hospitalization (DH) group. Presently, there are no studies defining early and delayed hospitalization. Hence, a cut-off of 3 days was set by the principal investigator as a baseline value to define the timeline of hospitalization.

Furthermore, the economic burden of patients with acute fragility hip fractures is computed from the variables extracted from the patient database.

The secondary objectives of this study were as follows:

1) To identify the significant contributors to the treatment costs of patients with fragility hip fractures; and
2) To determine the relationship between timing of hospitalization and the different components of the treatment cost.

2.2. Subject selection and formation of cohorts

The patient database of the UPMOMMA-FLS from the period of October 2017 to February 2020 was reviewed. All patients with acute fragility hip fractures who underwent surgical intervention were included in this study. Patients with fragility fractures elsewhere in the body, pathologic fractures, refused or did not undergo surgical intervention for any reason, and insufficient data were excluded in the study.

Demographic and clinical data of each patient were obtained. Patients were then assigned to their respective groups based on their DTH interval. This study was approved by the UPMREB (University of the Philippine Manila Research Ethics Board) as Code Number 2020-473-01.

2.3. Treatment cost

Treatment cost was calculated based on the definitions set by Drummond et al. [7] which is composed of health sector costs, other sector costs, patient/family costs, and productivity losses. The sum of the 4 components was computed to determine the treatment cost for each patient.

2.3.1. Health sector (HS) cost

This included medications, diagnostic and laboratory fees, use of facilities, cost of surgery, and physicians’ charity rate fees. This was obtained from the Department of Health (DOH)-Malasakit Center, which provides a total bill for each patient upon clearance prior to discharge.

2.3.2. Other sector (OS) cost

This is the amount shouldered or contributed by third parties to the treatment cost of each patient, specifically to cover for the implant cost. Example of which are guarantee letters from the Philippine Charity Sweepstakes Office (PCSO), Department of Social Work and Development (DSWD), and offices of public officials. This was collected from the transaction record available at the Department of Orthopedics and respective implant companies.

2.3.3. Patient/family (PF) cost

This covers out-of-pocket expenses incurred either directly or indirectly to provide healthcare for the patient during hospitalization period. Examples of the former were medications that have to be brought outside of the hospital. The latter was in the value of food brought by the watcher while staying with the patient or the transportation allowance allocated to attend to the patient. This
2.4. Economic burden

Economic burden of acute fragility hip fracture was computed using the formula below (as consulted with a faculty from the Department of Clinical Epidemiology - University of the Philippines Manila):

Economic burden = Incidence rate X population at risk X (average treatment cost + lost productivity per case)

The formula takes into account the macroeconomic impact of the disease in terms of government and family health expenditures, direct and indirect productivity losses due to the loss of livelihood of the patient and caregiver, and aid from private sectors [8].

2.5. Statistical analysis

Descriptive statistics such as frequencies and percentages were obtained for sex, diagnosis, and type of implant used. Means and standard deviations were obtained for age, interval of injury to hospitalization and duration of stay while median and interquartile range was used for treatment cost and its components, namely, Health Sector Cost, Other Sector Cost, Out-of-Pocket Cost and Productivity Losses. Furthermore, Mann-Whitney U Test was used to determine if there is difference in the median cost among early hospitalized and delayed hospitalized group. A P-value of ≤ 0.05 was considered statistically significant.

3. Results

3.1. Patient profile

A total of 118 patients were enrolled in the study with 54 patients in the EH group and 64 in the DH group. No significant differences were observed between the 2 cohorts in terms of sex (P = 0.2296) and age (P = 0.1052). Majority of the enrolled patients for the 2 groups were female with 88.85% in the EH group and 81.25% in the DH group. Mean interval of injury to hospitalization is 1.30 ± 1.24 days among the EH group and 12.52 ± 6.20 days among the DH group. On the other hand, EH group had a mean duration of stay of 13.61 ± 6.13 while the DH group was admitted for 13.56 ± 7.37 days. Transcervical femoral neck fracture was the most frequent diagnosis in both groups. Table 1 shows the patient profile per cohort.

3.2. Health sector cost

The average HS cost of all patients is PhP 65,260.89 (USD 1349.08) with 27.67% of the amount being covered by PhilHealth. Mean HS cost for the EH group is PhP 58,273.25 (USD 1204.63) while the mean HS cost for the DH group is PhP 70,938.35 (USD 1466.45). Medication cost comprised most of the HS cost with PhP 20,551.01 (USD 426.70) and PhP 29,104.77 (USD 604.31) for the EH and DH group, respectively.

3.3. Other sector cost

The average OS cost of all patients is PhP 27,820.86 (USD 575.12), which covers 59.82% of the implant cost per patient. Mean OS cost for the EH group is PhP 20,187.50 (USD 417.32) while the mean OS cost for the DH group is PhP 34,023.00 (USD 703.33).

In the EH group, 16 (29.63%) used proximal femoral nail as implant and 20 (31.25%) used partial hip arthroplasty in the DH group. The average implant cost for the EH group is PhP 38,104.43 (USD 787.70) and PhP 47,040.94 (USD 972.44) for the DH group. Implant distribution is seen in Table 2.

3.4. Patient/family cost

The average out-of-pocket expenses for all patients is PhP 36,333.55 (USD 751.09). It was also noted that patients spend an average of PhP 18,686.21 (USD 385.68) or 40.18% of the implant cost. With respect to each cohort, patients cover 67.10% of the implant cost for the EH group while 52.83% for the DH group. Aside from the implant cost, patients also shell out for food, medications and transportation with median cost of PhP 13,790.00 (USD 285.07) for the EH group and PhP 13,000.00 (USD 268.74) for the DH group.

3.5. Productivity losses

The mean PL for all patients is PhP 8592.00 (USD 179.19). The average PL for the EH group is PhP 8695.27 (USD 181.34) and PhP 8508.09 (USD 177.44) for the DH group.

3.6. Treatment cost and its components

Overall, the mean treatment cost is PhP 138,007.31 (USD 2852.91). Hospital sector cost contributes to majority (47.29%) of the treatment cost, followed by PF cost at 26.33%. The average treatment cost for the EH group is PhP 126,349.02 (USD 2635.04) and PhP 147,749.44 (USD 3054.31) for the DH group. Hospital sector cost contributes to majority of the treatment cost with 46.12% and 48.1% for the EH and DH group, respectively. Out-of-pocket expenses cover 31.01% for the EH group and 23.06% for the DH group. Table 3 shows the percent contribution of each component with the respective treatment cost of each group.

3.7. Comparison of total treatment cost and its components per cohort

Comparing the treatment cost and its components, there was significant difference in the median treatment cost (P = 0.0362) and other sector cost (P = 0.0220) between those who were early hospitalized and delayed hospitalized. Moreover, median treatment cost and median other sector cost is less among early hospitalized group than those who were in the delayed hospitalized group. Table 4 shows the comparison of costs among the 2 groups.

3.8. Economic burden

Data from 34 patients attended to in the year 2019 was used to compute for the economic burden of patients with acute fragility hip fractures. With the incidence rate of hip fractures in the Philippines at 93/100,000 per year [1] and the population at risk for hip fracture is at 8,013,059 [9], the computed economic burden of patients with acute fragility hip fractures is PhP 1,094,048,363.00 or USD 22,595,007.79.
4. Discussion

A recent global study on the cost of treating fragility hip fractures in the acute hospital setting showed a pooled estimate of USD 10,075. Furthermore, the same study cited a 1-year cost of USD 43,669, with inpatient care as the major source of expenses [10]. This is consistent with the study of Nurmi et al [11], which stated that approximately 25% of the total 1-year cost of treating fragility hip fractures are used in the acute hospitalization. Moreover, Braithwaite et al [12] documented a lifetime attributable cost of hip fractures at USD 81,300 and an estimated 1-year cost for all hip fractures of more than USD 2 billion.

In a systematic review by Mohd-Tahir and Li [13], they found out that the median treatment cost of hip fractures in the Asian region is USD 2943.74 with a range of USD 774 to USD 14,198.90. They also documented a wide range of proportion of treatment cost to gross domestic product (GDP) per capita from 3.58% to 57.05%, with almost half of the countries included utilizing more than one-third of their respective GDP/capita. With a projected increase in the number of hip fractures to 2.56 million in 2050 among Asian countries, the direct medical cost of treatment is estimated to surge to USD 15 billion [14].

Locally, the International Osteoporosis Foundation estimated direct hospital costs of hip fracture in the Philippines in 2013 to be USD 2200 or PhP 94,611 [1]. However, this data is also solely based on the national health insurance system and is exclusive of unreported cases and those not enrolled in the program.

The findings of this study supports existing literature on the significant economic burden of patients with hip fractures. In a developing country reliant on out-of-pocket expenses to avail healthcare, this injury aggravates the current financial status of patients. As illustrated in this study, patients shoulder an average of 40% (range: 0—100%) of the implant cost on top of the daily direct and indirect expenses even if admitted to a tertiary government hospital.
hospital. Out-of-pocket expenses alone was already equivalent to 25% of the country’s GDP/capita.

This study also exhibited the amount contributed by third parties to provide health services to patients with acute fragility hip fractures. As implants are not currently covered by the national health insurance program, patients seek help to charitable institutions or individuals to avail these essential products. Sixty percent of the total implant cost is covered by this sector. This emphasized the need for a more inclusive insurance system to safeguard patients from exhausting their financial resources.

Another important finding of this study is the relationship between timing of hospitalization and overall treatment cost. Early hospitalization resulted in a mean difference of PhP 22,000.00 (USD 455) on the average treatment cost. Patients who were hospitalized early had lesser medication cost, owing to limited or no use of unnecessary antibiotics. These patient also had less diagnostic cost, with laboratory work-up limited only to pre-operative clearance. This indirectly inferred that patients who were hospitalized late developed complications needing prolonged course of antibiotics and frequent diagnostic monitoring.

There was also an increased trend towards hip arthroplasty in the delayed hospitalization group. Given the comparable fracture patterns in both groups, it is suggested that an unfortunate consequence of late presentation of hip fractures is the difficulty in reducing the fracture. This caused surgeons to opt for joint replacement procedures, which is a more expensive treatment option. This also explained the difference in the other sector and total treatment cost between the 2 cohorts.

Several studies have also investigated factors that led to a decrease in the cost of treating fragility hip fractures—one of which is the timing of surgery from date of injury. As surgery is the treatment of choice for fragility hip fractures, it is proposed that this be carried out as soon as clearance for the procedure is obtained [5]. In a study done in Brazil, it was found that early surgical intervention led to a lower cost as compared to those to who were operated on at a much later date [15]. While the study set the distinction of early surgery to within 4 days from injury, which is still subpar as compared to the standard of within 48 h in modernized Western countries, it still showed better results. Judd and Christianson [16] compared 2 cohorts of geriatric patients with fragility hip fractures and found out that surgical treatment within 6 h from the time of admission, resulted in an average cost savings of USD 15,400 per patient. As most studies investigated only the relationship of timing of surgery to treatment costs, this study tackled the consequences of delay in hospitalization to the cost of treatment of acute fragility hip fractures. This opens the discussion to investigate these variables and look for interventions to lessen this burden.

In comparison with the findings of Mithal et al [1], the computed treatment cost of this study provided a more accurate amount of the treatment cost of patients with acute fragility hip fractures during hospitalization. Nonetheless, the present study only included data from a single tertiary government hospital. There is also a lack of a national unified hip fracture registry at the time of the completion of this study. Furthermore, data used in the incidence of hip fractures was based on the national health insurance program and did not include unenrolled individuals and unreported cases of hip fractures, which can underestimate our reported figures. This presents an opportunity to invite other hospitals to create a database of patients with hip fractures and improve the existing pathways to better clinical and economic outcome.

Moreover, as our data only investigated treatment cost during the hospitalization period, it is suggested that future research look into the recuperative and rehabilitative phase expenses to conclude a more inclusive figure. Another limitation of this study is the retrospective manner of looking into the out-of-pocket expenses. Although guidelines were set to standardized this component, it was still subject to recall bias. Furthermore, out-of-pocket expenses is subject to many factors such as food preference during admission, geographical distance from the hospital with farther place of origin requiring higher budget for transportation, and availability of medications for a given period. This may explain the difference in the patient/family cost between the 2 cohorts. In addition, a number of patients were not reachable through their registered contact details in the patient database. A prospective and real-time study design would have provided more accurate data.

At present, the current health system in the Philippines is still far from the ideal setting of carrying out an intervention within the golden period. For a population with poor awareness on osteoporosis and its associated morbidities [1], there can be delays in the hospitalization of patients with fragility hip fractures, which can result in secondary illnesses (e.g., pneumonia, pressure ulcers, etc) brought about by prolonged immobilization [5] and would result to a higher cost of care. This study showed that an early intervention, in the form of prompt hospitalization, resulted in less overall treatment cost.

The UPMOMMA-FLS was established to improve clinical outcomes of patients with acute fragility hip fractures in terms of pre-operative interval, duration of hospital stay, morbidity, and mortality through a multidisciplinary team approach. Linear regression showed that timing of hospitalization was not a significant predictor of overall and post-operative hospital stay, as well as, hospitalization expenses. This emphasized that regardless of DTH interval, the UPMOMMA-FLS has established an efficient and standardized management of patients with acute fragility hip fractures.

Although not all components demonstrated statistically significant differences, mean and median differences show clinically significant values in favor of early hospitalization. Furthermore, the collective contributions of all components resulted in the statistically significant difference in the overall treatment cost. This highlights the need for interventions that promote awareness and early recognition of hip fractures in the elderly to prevent not only the complications of such morbidity but also to lessen its financial impact.

5. Conclusions

We conclude that early hospitalization of patients with acute fragility hip fractures leads to less treatment cost when compared to patients who were hospitalized late. Direct hospitalization cost and out-of-pocket expenses contribute mostly to the total treatment cost. Overall, the economic burden of acute fragility hip fractures, using data obtained from a tertiary government hospital is PhP 1,094,048,363.00 or USD 22,595,007.79 per year.
CRediT author statement

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Conflicts of interest

The authors declare no competing interests.

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References

[1] Mithal A, Ebeling PR, Kyer CS. The Asia-Pacific regional Audit: Epidemiology, costs, and burden of osteoporosis in 2013 [book on the internet]. In: Singapore: International Osteoporosis Foundation; 2013 [cited 2019 Jun 1].

Available from: https://www.osteoporosis.foundation/educational-hub/files/asia-pacific-regional-audit-2013.
[2] Reyes PVSJ, Tabu IA. Does adapting a multidisciplinary approach in the management of acute hip fractures in orthopedic geriatric patients lead to better outcomes? In: A preliminary report of the UPM-PGH orthogeriatric multidisciplinary fracture management Model and fracture Liaison service; 2018 (In-house Hospital Report).
[3] Lee DJ, Elfar JC. Timing of hip fracture surgery in the elderly. Geriatr Orthop Surg Rehabil 2014;5:138–40.
[4] Pouramin P, Li CS, Busse JW, Sprague S, Devereaux P, Jagnoor J, et al. Delays in hospital admissions in patients with fractures across 18 low-income and middle-income countries (INORMUS): a prospective observational study. Lancet Glob Health 2020;8:e111–20.
[5] Leung F, Lau TW, Kwan K, Chow SP, Kung AWC. Does timing of surgery matter in fragility hip fractures? J Osteoporos Int 2010;21:529–34.
[6] Kloster T, Röder C, Storfer C, Winkler B, Nehrer S, Lutz M, et al. Impact of timing of surgery in elderly hip fracture patients: a systematic review and metanalysis. Sci Rep 2018;8:1–13.
[7] Drummond M, Sculpher M, Torrance G, O'Brien B, Stoddart G. Methods for the economic evaluation of health care programmes. 2005.
[8] World Health Organization. WHO guide to identifying the economic consequences of disease and injury. 2009.
[9] Abcnews News. Philippines moving toward aging population: POPCOM [Internet] [cited 2019 Jun 1]. Available from: https://news.abs-cbn.com/news/01/03/18/philippines-moving-toward-aging-population-popcom; 2018.
[10] Williamson S, Landeiro F, McConnell T, Fulford-Smith L, Javadi MK, Judge A, et al. Costs of fragility hip fractures globally: a systematic review and meta-regression analysis. Osteoporos Int 2017;28:2791–800.
[11] Nurmi I, Narinen A, Lutfje P, Taminen S. Cost analysis of hip fracture treatment among the elderly for the public health services: a 1-year prospective study in 106 consecutive patients. Arch Orthop Trauma Surg 2003;123:551–4.
[12] Braithwaite RS, Col NF, Wong JR. Estimating hip fracture morbidity, mortality and costs. J Am Geriatr Soc 2003;51:364–70.
[13] Mohd-Tahir NA, Li SC. Economic burden of osteoporosis-related hip fracture in Asia: a systematic review. Osteoporos Int 2017;28:2035–44.
[14] Cheung C-L, Ang SB, Chatha M, Chow ES-L, Chung Y-S, Hew FL, et al. An updated hip fracture projection in Asia: the Asian Federation of Osteoporosis Societies study. Osteoporos Sarcopenia 2018;4:16–21.
[15] Loures FB, Chaouba A, de Oliveira VM, Almeida AM, Campos EM de S, de Paiva EP. Economic analysis of surgical treatment of hip fracture in older adults. Rev Saude Publica 2015;49:1–7.
[16] Judd KT, Christianson E. Expedited operative care of hip fractures results in significantly lower cost of treatment. Iowa Orthop J 2015;35:62–4.