

## Stress Levels amongst Caregivers of Patients with Osteoporotic Hip Fractures – A Prospective Cohort Study

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### Abstract

**Introduction:** We evaluated if there was significant stress in caregivers of elderly patients with osteoporotic hip fractures and determine any contributory factors. **Materials and Methods:** A prospective cohort study was performed from June 2005 to June 2006 in a single tertiary hospital. Patients admitted during this period and their primary caregivers were interviewed on admission and at 6 months. Information on patient's demographics, comorbidities, functional and mental status, placement post-discharge and financial strain were noted. Caregiver stress was measured using the caregiver strain index (CSI). Relationships between key variables were analysed to derive possible correlations. **Results:** The study comprised caregivers of 76 patients with a mean age of 77 years (range, 50 to 95; SD, 11). Within 1 week of admission, 45 of the 76 caregivers (59.2%) were significantly stressed based on the CSI while at 6 months, 30 of the caregivers (50%) were significantly stressed. The mean CSI within 1 week of admission and at 6 months post-admission was 7.18 and 6.25 respectively ( $P = 0.042$ ). The most significant contributory factor to stress was financial strain ( $P = 0.01$ ) attributable to medical bills, rehabilitation costs and transport expenses. **Conclusion:** There is a significant amount of stress that is experienced by caregivers of elderly patients with hip fractures which commences from admission of the patient and it remains high at 6-months post-fracture. Financial strain has been found to be the only significant cause on both univariate and multivariate analysis. Adequate resources should be available to caregivers of patients with osteoporotic hip fractures.

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**Key words:** Caregiver strain index, Hip fractures

### Introduction

With the issue of an ageing population in many first-world countries, osteoporotic hip fractures remain a concern. These fractures are known to have a significant impact on the functional status, quality of life and mental health of patients.<sup>1-3</sup> Post discharge rehabilitation and caregiver support are important to ensure these patients are able to cope during their convalescence and reach their pre-morbid functional levels. Although much research has been done to look at the impact of hip fractures and its psychosocial effect on patients,<sup>3-5</sup> the impact on their caregivers has not been well studied or published in the literature. This aspect should not be ignored as caregivers play an important role in providing social, emotional and financial support to integrate the patients back into society after discharge. Factors identified that contribute to caregiver strain will also

allow adequate utilisation of limited resources to decrease caregiver burden and to minimise caregiver burnout.

The aim of this paper was to evaluate if there are significant stress levels in caregivers of elderly patients with osteoporotic hip fractures and identify factors that contribute to the stress.

### Materials and Methods

A prospective cohort study was performed from June 2005 to June 2006 in a single tertiary hospital in Singapore. The inclusion criterion was the primary caregivers of all patients who were admitted to the hospital from June 2005 to December 2005 after having sustained an osteoporotic hip (neck of femur or intertrochanteric) fracture as the only isolated fracture or significant injury, following low energy impact. Caregivers of trauma patients and patients

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who were not operated on were excluded from the study. The primary caregiver was defined as the person, such as a family member, who provided regular and sustained care and assistance to another person without payment other than a pension or benefit (adapted from the Australian Institute of Health and Welfare).

Patients and caregivers were interviewed by professionals with a nursing background. Within 1 week of admission, the patient's mental state was assessed using the Abbreviated Mental Test (AMT) and the functional status was assessed using the Modified Barthel Index.<sup>6</sup> Cognitive impairment was defined as a score of less than 7 on the AMT. Some of the items in the Modified Barthel Index (MBI) included the patient's ability to dress, control bladder and bowel, as well as his/her ambulatory status. The categories of functional status based on MBI scores were: independent (score of 100), minimal dependency (score of 91-99), mild dependency (score of 75-90); moderate dependency (score of 50-74), severe dependency (score of 25-49) and total dependency (score of 0-24). The Charlson Co-morbidity Index, which contain 19 categories of co-morbidities such as hypertension, ischaemic heart disease, cerebrovascular disease and chronic obstructive pulmonary disease, was also calculated to predict the 1-year mortality risk of these patients. The patient's placement on discharge and the presence of a maid to care for the patient were also noted.

Caregivers were interviewed within 1 week of admission and again at 6 months post-admission. The Caregiver Strain Index (CSI),<sup>7</sup> a 13-question tool looking at domains of employment, finance, time, physical and social re-adjustment, was used to quantify caregiver strain. A positive response to at least 7 of the 13 questions (score of 7 or more) indicated a significant level of strain on the caregiver. At 6 months post-admission, financial strain was independently assessed.

#### Statistical Methods

SPSS Version 11.0 statistical package was used for statistical analysis. Using both univariate and multivariate analysis, correlations were investigated between CSI score and patient's co-morbidities, mental/functional status, patient's placement on discharge/at 6 months and financial strain. Results were considered as significant if  $P < 0.05$ .

## Results

Ninety-two patients were operated on for hip fractures as the only significant injury following low energy impact between June 2005 and December 2005. Three patients passed away within 1 month of admission and were not included in the study. Thirteen other patients' caregivers were not included in the study as 7 patients were living alone and did not identify a primary caregiver. Primary caregivers of the remaining 6 patients were either uncontactable or they did not wish to participate in the study.

The study comprised caregivers of 76 patients (23 males and 53 females) with a mean age of 77 years (range, 50 to 95; SD, 11). The majority of patients were Chinese (86.8%). Forty-eight patients (63.2%) had hypertension, 34 patients (44.7%) had diabetes mellitus, 21 patients (27.6%) had hyperlipidaemia, 20 patients (26.3%) had ischaemia heart disease and 13 patients (17.1%) had stroke. Forty-eight patients (63.2%) had a high Charlson Co-morbidity Index, 15 (19.7%) had a moderate score and 13 (17.1%) had a low score. By the end of the follow-up period, 6 patients had passed away, 5 were independent and thus had no caregivers, 5 caregivers were either not contactable or had withdrawn from the study.

Within a week of admission, 33 patients (43.4%) had significant cognitive impairment based on the AMT score compared to 19 patients (25.0%) at 6 months post-admission. Seventy-two patients (94.7%) were either severely or totally dependent based on the MBI within a week of admission while 16 patients (21.1%) were severely or totally dependent 6 months after admission. Within 1 week of admission, 45 of the 76 caregivers (59.2%) were significantly stressed based on the CSI while at 6 months, 30 of the caregivers (50%) were significantly stressed. The mean CSI within 1 week of admission and at 6 months post-admission was 7.18 and 6.25, respectively. The difference was found to be statistically significant ( $P = 0.042$ ).

Table 1 shows the proportion of caregivers with significant stress and the mean CSI on admission and at 6 months. Table 2 summarises the patient's demographics and the co-relations with CSI upon discharge. Figures 1 to 3 shows the patient's functional and mental status within 1 week of admission and at 6 months post-admission with

Table 1. Proportion of Caregivers with Significant Stress Levels and the Mean CSI on Admission and at 6 Months Post-admission

No. of caregivers	On admission	At 6 months	Significance ( $P$ value)
Significant stress (CSI $\geq 7$ )	45 (59.2%)	30 (50.0%)	
No significant stress (CSI $\leq 6$ )	31 (40.8%)	30 (50.0%)	
Missing	0 (0%)	16 (21.1%)	
Mean caregiver strain index (CSI)	7.18	6.25	0.042

*P* values indicated to reflect their co-relation with CSI. Table 3 shows the patients' placement on discharge and at 6 months, and co-relation with CSI. There was a tendency to increased caregiver strain in caregivers for patients who were discharged to nursing homes ( $P = 0.066$ ) and for patients who were cognitively impaired at 6 months ( $P = 0.175$ ). There was no correlation between CSI within 1 week of admission and patient's co-morbidities, mental or functional statuses on admission.

Caregivers of 43 patients (53.1%) expressed there was a palpable financial strain. There was significant correlation between those who indicated a financial strain and caregiver stress ( $P = 0.01$ ). A stepwise logistic regression was performed on the outcome of caregivers with significant stress, with financial strain, mental status and functional status as independent predictors. Only financial strain was found to be significant. The risk of caregivers with financial strain having caregiver strain was 5 times more compared to caregivers without financial strain (OR, 5.04; 95% CI for OR, 1.46-17.38). Caregivers of 24 patients (31.6%) had maids and caregivers of 21 patients (27.6%) stated that the maid was very much involved in caring for the patient.

Table 2. Co-relation of Patient Demographics with CSI

Demographics	n (%)	Co-relation with CSI at 6 months ( <i>P</i> value)
<b>Total number of subjects (n = 76)</b>		
Gender		
Male	23 (30.3%)	0.846
Female	53 (69.7%)	
Race		
Chinese	66 (86.8%)	0.436
Malay	5 (6.6%)	
Indian	5 (6.6%)	
Mean age $\pm$ SD (years)	77 $\pm$ 11	0.437
Medical co-morbidities		
Hypertension	48 (63.2%)	0.212
Diabetes mellitus	34 (44.7%)	0.595
Hyperlipidaemia	21 (27.6%)	0.768
Ischaemic heart disease	20 (26.3%)	0.539
Stroke/transient ischaemic attack	13 (17.1%)	0.666
Charlson Co-morbidity Index		
High	48 (63.2%)	0.308
Moderate	15 (19.7%)	
Low	13 (17.1%)	

## Discussion

Caregiver strain has been studied in both the trauma setting as well as in chronic mental health conditions. It has been well documented in relatives of patients with traumatic brain injuries,<sup>8-10</sup> burns<sup>11</sup> and spinal cord injuries (SCI).<sup>12</sup> Caregiver strain has also been documented for patients with dementia or Alzheimer's disease.<sup>13-17</sup> However, to our knowledge, this is the first published study looking at caregiver strain in caregivers managing patients with low injury osteoporotic hip fractures. Our study indicates there is a significant stressor effect on caregivers of patients with hip fractures, which is present from the time of admission of the patient to 6 months post-injury. It is important to identify this early especially during acute inpatient admission as the stress can have adverse effects on the health of caregivers. In a population-based cohort study, participants who were providing care and experiencing caregiver strain had mortality risks that were 63% higher than non-caregiver controls, thus leading its researchers to conclude that being a caregiver who is experiencing mental or emotional strain is an independent risk factor for mortality, especially amongst elderly spousal carers.<sup>18</sup>

In the orthopaedic setting, postoperative rehabilitation is as important as the technical aspects of surgery in patients with hip fractures as the aim of the surgery is to try and restore the patient's pre-morbid ambulatory status. Caregivers play an important role in the rehabilitation of these patients postoperatively. However, poorer health of caregivers may translate into sub-optimal rehabilitation which in turn may effect the final ambulatory status of the patient that is reached at the end of the rehabilitation period. Thus, it is important that caregiver strain is minimised to maximise their contribution to the patient in order to achieve the goal that was set out preoperatively in terms of the patient's ambulatory status.

Caregiver strain may arise from changes in the patient's mental or functional statuses, caregiver's role and daily schedules. In our study, we found multiple factors that may contribute to caregiver strain including financial burden, patient's destination of discharge from hospital as well as the patient's mental status at 6 months post admission. However, financial strain was found to be the most significant cause of caregiver strain ( $P = 0.01$ ). The key cause of financial problems stems from having to incur expenses on medical bills, rehabilitation and transport. This can add to both mental and physical stress to the caregiver. There was no significant correlation between caregiver strain and the patient's mental status on admission and functional status within a week of admission and at 6 months. This could be because 24 of the 76 caregivers had maids (31.5%) and 21 of the caregivers identified the maids as playing an important role in taking care of the patient. This could have

Table 3. Placement of Patients at Discharge and at 6 months Post-admission, and their Co-relation with CSI

Placement	On discharge	6-months post-admission
Community Hospital	45 (59.2%)	1 (1.3%)
Nursing Home	6 (7.9%)	6 (7.9%)
Home with community placement	25 (32.9%)	53 (69.7%)
Home without community placement	0	7 (9.2%)
Patient died	0	6 (7.9%)
Patient has been re-admitted	NA	2 (2.6%)
Uncontactable	NA	1 (1.3%)
	$P = 0.066$	$P = 0.395$

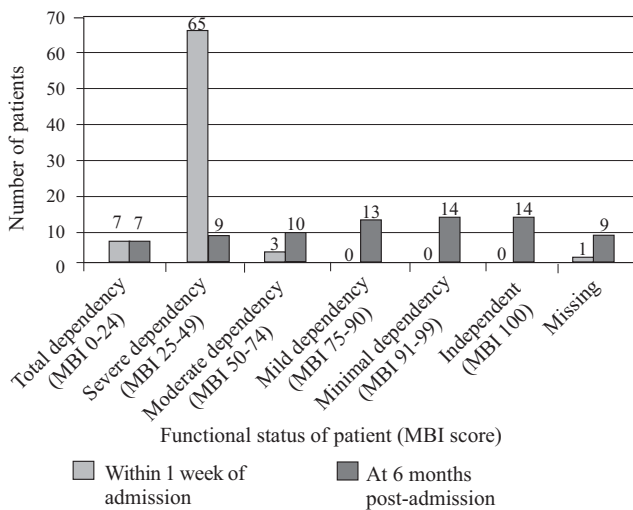


Fig. 1. Functional status of patients within 1 week of admission (co-relation with CSI,  $P = 0.225$ ) and at 6 months post-admission (co-relation with CSI,  $P = 0.354$ ).

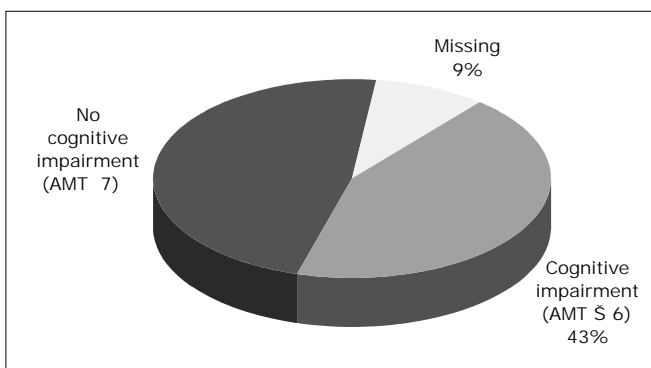


Fig. 2. Mental status of patients within 1 week of admission (co-relation with CSI,  $P = 0.422$ ).

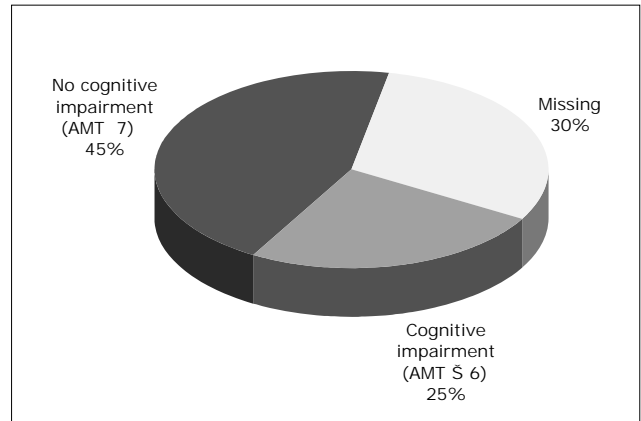


Fig. 3. Mental status of patients at 6 months post-admission (co-relation with CSI,  $P = 0.175$ ).

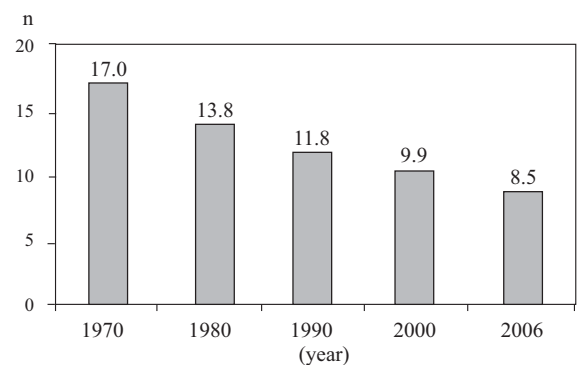


Fig. 4. Bar chart showing the support ratio of elderly population (elderly residents refer to those aged 65 years and over; working-age residents refer to those aged 15 to 64 years).

Source: Department of Statistics, Singapore

alleviated the family caregiver from the physical strains of caregiving for a patient who may be cognitively impaired or functionally dependent.

There was a significant difference in the mean CSI on admission and at 6 months post-admission ( $P = 0.03$ ). Moreover, 59.2% of caregivers were significantly stressed as compared to 42.3% of caregivers at 6 months post-admission. This suggests the stressor induced is more short term and if targeted early, e.g. at point of patient admission or during patient’s stay at the hospital, can help the caregiver cope with the “acute” situation. It is important to note that about 40% of caregivers still have significant strain at 6-months post admission, though this is a decrease albeit statistically significant, from about 60% who had significant strain at point of patient admission to the hospital.

In the 21<sup>st</sup> century, the majority of the world’s older people will be residing in Asia. Singapore is the 2<sup>nd</sup> most rapidly ageing country in Asia with close to 95% of older people co-residing with family members.<sup>19</sup> Coupled with the ageing population is a falling birth rate. Thus the support

ratio for the elderly has been gradually decreasing (Fig. 4). This highlights the importance of community support for caregivers. Based on this study, there should be adequate availability of resources, increased social and financial support, and caregiver education for caregivers of patients with hip fractures. It is also important to prevent osteoporotic fractures of the lower limb through prevention of falls and gait training.<sup>20</sup> There may also be a role for pharmacologic prevention of osteoporotic hip fractures, which can have a significant psychosocial impact on both the patient and his/her caregiver.

In conclusion, there is a significant amount of stress that is experienced by caregivers of elderly patients with hip fractures which commences from admission of the patient and it remains high at 6-months post-fracture. Financial strain has been found to be the only significant cause on both univariate and multivariate analysis. Adequate resources should be available to caregivers of patients with osteoporotic hip fractures for both the benefit of the caregiver and the patient.

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