How well are we managing fragility hip fractures? A narrative report on the review with the attempt to set up a Fragility Fracture Registry in Hong Kong

KS Leung *, WF Yuen, WK Ngai, CY Lam, TW Lau, KB Lee, KM Siu, N Tang, SH Wong, WH Cheung

ABSTRACT

Introduction: In setting up a disease registry for fragility fractures in Hong Kong, we conducted a retrospective systematic study on the management of fragility hip fractures. Patient outcomes were compared with the standards from our orthopaedic working group and those from the British Orthopaedic Association that runs a mature fracture registry in the United Kingdom.

Methods: Clinical data on fragility hip fracture patients admitted to six acute major hospitals in Hong Kong in 2012 were captured. These included demographics, pre- and post-operative assessments, discharge details, complications, and 1-year follow-up information. Analysis was performed according to the local standards with reference to those from the British Orthopaedic Association.

Results: Overall, 91.0% of patients received orthopaedic care within 4 hours of admission and 60.5% received surgery within 48 hours. Preoperative geri-orthopaedic co-management was received by 3.5% of patients and was one of the reasons for the delayed surgery in 22% of patients. Only 22.9% were discharged with medication that would promote bone health. Institutionalisation on discharge significantly increased by 16.2% (P<0.001). Only 35.1% of patients attended out-patient follow-up 1 year following fracture, and mobility had deteriorated in 69.9% compared with the premorbid state. Death occurred in 17.3% of patients within a year of surgery compared with 1.6% mortality rate in a Hong Kong age-matched population.

Conclusions: The efficiency and quality of acute care for fragility hip fracture patients was documented. Regular geri-orthopaedic co-management can enhance acute care. Much effort is needed to improve functional recovery, prescription of bone health medications, attendance for follow-up, and to decrease institutionalisation. A Fracture Liaison Service is vital to improve long-term care and prevent secondary fractures.
Introduction

Fragility hip fracture is one of the most common fragility fractures and is becoming one of the major health care burdens on a society with an ageing population. Statistics of the Hospital Authority (HA) of Hong Kong (HK) reveal that the incidence of fragility fractures in 2014 (14,000 cases) was much higher than that for acute myocardial infarction (6,383 cases) or acute cerebrovascular accident (11,187 cases). Number of patients admitted for hip fracture surgery increased from 3,678 in 2000 to 4,579 in 2011, ie 24.5% in 11 years.1 Although the annual age-specific risk of hip fracture slightly decreased, it is estimated that with the projected ageing population, fragility hip fractures in HK will number more than 6300 cases in 2020 and 14,000 cases in 2040, a 3-fold increase from 2011.1 Approximately 30% of patients under the age of 80 years were unable to walk independently 1 year after hip fracture and became home-bound; 20% to 40% of patients were admitted to an elderly care home; and all patients suffered both physically and psychologically with re-fracture and fear of falls.2 Hip fracture patients with poor functional recovery are unable to resume their pre-fracture function with a consequent deterioration in quality of life. Mortality at 1 year after hip fracture was as high as 27% in males and 15% in females.1

To monitor the outcomes of management and formulate standards of care in HK for fragility hip fracture, the Coordinating Committee in Orthopaedics & Traumatology of the HA proposed a Fragility Fracture Registry (www.ffr.hk) in 2013. It is hoped that the registry will ultimately help set the standards of care with respect to local demands, monitor patient care and implement preventive measures, thus improving the cost-effectiveness of fragility fracture care.

In the first phase of setting up the Fragility Fracture Registry, a retrospective study was conducted of fragility hip fractures treated at six acute public hospitals under the management of the HA. This study aimed to review the current fragility hip fracture management in HK, and compare the outcomes with the standards set by our working group with reference to the six evidence-based standards set by the British Orthopaedic Association (BOA) for the care of patients with fragility hip fracture.3

Methods

All patients with fragility hip fracture and admitted in the calendar year 2012 to the six hospitals in HK—Caritas Medical Centre, Prince of Wales Hospital, Princess Margaret Hospital, Queen Elizabeth Hospital, Queen Mary Hospital, and Tuen Mun Hospital—which are located in different clusters were included. Residents of HK aged 50 years and above with hip fracture sustained by a fall from a standing height were recruited. The number of fragility hip fractures from the six hospitals was approximately 60% of the total fragility hip fractures treated in Hong Kong during 2012. Those with atypical or pathological fracture were excluded. As 98% of patients with fragility hip fracture were treated in public hospitals, eligible patients were identified using the HA Clinical Data Analysis and Reporting System with disease coding of acute hip fracture (ICD-9-CM 820.X).4 Ethical approvals were obtained from all the six hospitals and the study was done in accordance with the principles outlined in the Declaration of Helsinki.

With reference to the National Hip Fracture Database of the United Kingdom (UK NHFD) and Scottish Hip Fracture Audit, the dataset was designed according to the acute, rehabilitation, and post-discharge practices in HK. Information was derived from the HA Clinical Management System and hospital records for the following: demographics, preoperative and postoperative assessments, surgical and discharge details, rehabilitation details, out-patient follow-up consultations and complications up to 1 year after fracture (Table 1). All data were input and managed using the Research Electronic Data Capture (REDCap) tool hosted at the Department of Orthopaedics and Traumatology, Hong Kong Medical Journal Volume 23 Number 3 June 2017 www.hkmj.org
TABLE 1. Data included in this study (a total of 103 data entry items, 70 to 80 items in a typical case)

<table>
<thead>
<tr>
<th>Data</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>Age, Gender, Living situation</td>
</tr>
<tr>
<td>Admission information</td>
<td>Date and time of first presentation, Date and time admitted to ward</td>
</tr>
<tr>
<td>Operation details</td>
<td>Type of fracture, Operation, Date and time of operation</td>
</tr>
<tr>
<td>Preoperative assessments</td>
<td>ASA grade, Falls assessment, Presence of pressure ulcer, Medical assessment, Bone health medication prescription, Multidisciplinary assessment</td>
</tr>
<tr>
<td>Postoperative assessments</td>
<td>Postoperative complications, Medical assessment, Bone health medication prescription, Multidisciplinary assessment</td>
</tr>
<tr>
<td>Discharge details</td>
<td>Discharge destination from acute ward, Length of stay on acute ward, Discharge destination from hospital, Unplanned admission &lt;28 days</td>
</tr>
<tr>
<td>1 Year after fracture</td>
<td>Follow-up rate, Mobility, Complication of fracture, Revision surgery, Secondary fracture, Mortality at 1 year</td>
</tr>
</tbody>
</table>

Abbreviation: ASA = American Society of Anesthesiologists

Faculty of Medicine, The Chinese University of Hong Kong.

Data were input by research assistants who understood medical terms and abbreviations. Data were validated for one in five cases selected randomly by six liaison teams located in the participating hospitals and composed of orthopaedic surgeons and nurses. Each liaison member was trained by the central research team in data validation and REDCap manipulation.

The data were analysed and compared with the standards set by our working group with reference to the six standards set by the BOA: Care of Patients with Fragility Fractures (known as the Blue Book; Box).

Descriptive statistics were used to describe the current hip fracture conditions in HK and outcomes compared with standards of care from HK orthopaedic working group with reference to BOA. The percentage was calculated based on the number of follow-up patients available at different time-points. Chi squared test was used to compare categorical data. The Statistical Package for the Social Sciences (Windows version 20.0; IBM Corp, Armonk [NY], US) was used to perform statistical analysis. Significance was set at P<0.05.

BOX. Standards for fragility hip fracture care set by working group and the Blue Book

1. *Admission to orthopaedic ward within 4 hours
2. *Surgery within 48 hours and during working hours
3. *Prevention of pressure ulcers
4. *Preoperative assessment by an ortho-geriatrician
5. Optimal surgical and non-surgical management
6. Short stay in acute hospital
7. Speedy discharge home
8. Multidisciplinary sustainable rehabilitation services in the community
9. *Discharged on bone protection medication
10. *Received a falls assessment prior to discharge
11. Prevention of secondary fractures

* Same as the six standards set by the Blue Book

Results

Demographics

A total of 2914 fragility hip fractures were captured in the calendar year 2012 and the mean (± standard deviation) patient age was 82.1 ± 8.6 years (range, 50-104 years). Of the patients, 1979 (67.9%) were female; 2017 (73.7%) came from home and 719 (26.3%) from an elderly care home; 1119 (40.9%), 1541 (56.3%), and 20 (0.7%) patients had an American Society of Anesthesiologists (ASA) score of grade 2, 3, and 4, respectively (Table 2).

Acute management

The mean time from presentation to the accident and emergency department to orthopaedic care was 2.3 hours (median time, 1.7 hours) with 91.0% patients receiving orthopaedic care within 4 hours. Geriatric or internal medicine review was performed in 764 (27.8%) patients although only 95 (3.5%) were routinely managed by a geriatrician preoperatively.

Surgery was performed in 2774 (96.8%) patients. The mean time to surgery was 62.7 hours (median time, 42.1 hours) with 1678 (60.5%) undergoing surgery in exactly 48 hours and 2172 (78.3%) within 2 calendar working days.

Intracapsular fracture occurred in 1358 (46.6%) patients of whom 277 (9.5%) underwent cannulated screw fixation, 829 (28.4%) uncemented unipolar hemiarthroplasty, and 109 (3.7%) cemented unipolar hemiarthroplasty. Intertrochanteric fracture occurred in 1446 (49.6%) patients of whom 571 (19.6%) underwent compression hip screw fixation and 983 (33.7%) intramedullary fixation (Tables 2 and 3).

During stay in acute hospitals, some of the patients developed acute complications, with nearly one fourth experienced urine retention. A small number of patients developed other complications like pressure sore, delirium, wound infection, and deep vein thrombosis (Table 3).
The mean length of stay in acute hospitals was 12.1 days. With regard to the discharge destination from the acute unit, a majority of patients (2284, 78.4%) were transferred to a rehabilitation unit, 290 (10.0%) to an old-age home, 236 (8.1%) to their previous home, and 77 (2.6%) died during the acute admission (Table 3).

### Rehabilitation phase

Allied health professionals provided preoperative multidisciplinary care to 1759 (64.0%) patients and postoperative care to 2886 (99.4%). Bone health medication was prescribed to 424 (15.3%) patients preoperatively and 666 (22.9%) postoperatively. Just over half of all patients (n=1573, 57.5%) were discharged to their home and 1163 (42.5%) to an old-age home. Old-age home admission at discharge significantly increased (P<0.001) [Table 4].

### Post-discharge management

There was a declining trend over time for attendance at follow-up; 2179 (74.8%) attended follow-up at 90 days after fracture, 2508 (86.1%) at 180 days, and only 1023 (35.1%) at 1 year. Postoperative mobility compared with premorbid had deteriorated at 90-day, 180-day, and 1-year follow-up in 1689 (77.5%), 2062 (82.2%), and 715 (69.9%) patients, respectively. With those 669 patients available for assessments at both 90-day and 1-year time-points,
511 patients had deterioration at 90 days and 426 patients deteriorated at 1 year. The deterioration was significant at 1-year follow-up (P<0.001) [Table 4]. Pressure sores were evident or developed in 58 (2.0%) patients preoperatively and 150 (5.3%) at 1 year. Presence of pressure sore significantly increased at 1 year (P<0.001) [Table 4].

Fracture complications occurred in 175 (6.0%) patients within a year (Table 3) with 90 (3.1%) requiring revision surgery. A secondary fracture occurred in 117 (4.0%) patients and 505 (17.3%) patients died in 1 year compared with the 1.6% mortality rate for a HK age-matched population.6,7

**Discussion**

This report reviewed the management of fragility hip fractures in HK based on the standards of care by our orthopaedic community and compared the outcomes with the standards set by our working group and by BOA in the UK. The demographics were comparable to previous studies in HK. The mean age of patients with fragility hip fracture in our 2012 data was 82.1 years, unchanged compared with local data from 2000 to 2011.1 The female-to-male ratio was around 2:1 indicating an increase in male fragility hip fractures compared with 2.5:1 from 2001 to 2010.54 This may be due to increasing life expectancy of the HK male population5 and bone mineral density (BMD) at the hip in men that decreases with age.10 There were 1257 (46.6%) femoral neck fractures, 1445 (49.6%) intertrochanteric fractures, and 110 (3.8%) subtrochanteric fractures, comparable with a previous local study of 1342 hip fracture patients from 2007 to 2010.4 The majority of patients had an ASA score of 2 and 3, comprising 40.9% and 56.3%, respectively and in line with Lau et al’s study.4 There was a marked increase in hemiarthroplasties and intramedullary fixations with 977 (33.5%) and 983 (3.7%) cases respectively in our study, compared with Lau et al’s study that reported 362 (27%) hemiarthroplasties and 218 (16%) cephalomedullary nail fixations.4 This reflects a change in the surgical treatment, possibly due to a lower re-operation rate,11 better functional outcomes,12 and higher cost-effectiveness13 in patients treated with hemiarthroplasty; and minimal rate of fixation failure, less blood loss, and shorter length of hospital stay in patients treated with intramedullary fixation.14

A low complication rate (6.0%) and revision rate (3.1%) are testimony to the improved standard of routine acute care, which includes early orthopaedic care and early surgeries.

**Consequences of fragility hip fracture**

Poor functional recovery was evident in the large proportion of patients (77.5%) with deteriorated mobility at 90-day out-patient clinic follow-up, not improved 1 year after fracture (69.9%). This compares with less than half of treated patients who regained their pre-fracture mobility in another study.15

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### TABLE 4. Change in residential status and mobility in Hong Kong

<table>
<thead>
<tr>
<th>Premorbid status (or compared with premorbid status)</th>
<th>Status at discharge or 1 year</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential status: premorbid</td>
<td>Residential status: at discharge</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>Home</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td>1556</td>
<td></td>
</tr>
<tr>
<td>OAH</td>
<td>461</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>702</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>719</td>
<td></td>
</tr>
<tr>
<td>Mobility at 90 days (compared with premorbid)</td>
<td>Deteriorated</td>
<td>511</td>
</tr>
<tr>
<td></td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>Unchanged or improved</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>511</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Presence of pressure ulcer: at 1 year</td>
<td>Yes</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Presence of pressure ulcer: preoperative</td>
<td>No</td>
<td>2791</td>
</tr>
<tr>
<td></td>
<td>138</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2653</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2791</td>
<td></td>
</tr>
<tr>
<td>Abbreviation: OAH = old-age home</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Managing fragility hip fractures

269 Hong Kong Med J Volume 23 Number 3 June 2017
www.hkmj.org

On discharge, HK patients discharged to an old-age home significantly increased from 26.3% to 42.5%, i.e. a 16.2% increase in institutionalisation compared with only 10.5% in a Spanish study.16 Poor functional recovery after hip fracture may contribute to this high institutionalisation rate, as fractures are significantly associated with mild-to-severe functional limitations.17 Lack of support in the community may mean a lack of sustained rehabilitation after discharge. Family support may also be suboptimal as many elderly are alone at home during the day.

Low follow-up attendance and high mortality

The attendance rate for out-patient clinic follow-up was only 35.1% at 1 year. A high proportion of elderly living alone (12.7% in 2011)18 and a high institutionalisation rate (5.7% in 2014)19 may explain the low follow-up rate due to lack of support. The mortality at 1 year after fracture was 17.3%, comparable with other local studies: 18.6% from 2000 to 20064 and 18.0% from 2001 to 2009,4 which are much higher than that for an age-matched population (1.6%).6,7

Comparison with standards in the United Kingdom

Data from this review were also compared with those of the UK NHFD 201220 collected from 180 hospitals across the UK with patients managed according to the UK Blue Book standards.3

Tables 2 and 5 summarise the demographics, surgery details, length of stay in acute hospitals, and comparison of six standards for hip fracture care between HK and UK NHFD, respectively. Major differences in hip fracture management between HK and UK NHFD are identified.

When comparing the demographics, our review showed a larger male hip fracture population (32%) than the UK (26%) while age and ASA grade distribution were similar. Patients treated surgically were similar in both databases; more HK patients had intertrochanteric fracture (49.6% vs 34.3%) and more UK patients had displaced intracapsular fracture (46.8% vs 36.5%). The length of stay in acute hospitals in HK was shorter than in UK (12.1 days vs 15.8 days). The mean length of post-acute stay in the UK was only 4.4 days, however, which is shorter than that in HK (around 3-4 weeks). This may be due to the differences in acute and post-discharge care between HK and the UK. Care by a general practitioner after being discharged from hospital is the usual practice in the UK; in HK, most patients will be cared for by an orthopaedic team in post-acute rehabilitation with follow-up in orthopaedic specialist clinics until discharge.

In HK, 98% of patients underwent a falls assessment on admission, similar to the UK (92%). In HK, a Morse Fall Scale27 will be calculated by orthopaedic nurses on admission; in the UK, a systematic assessment is performed by a geriatrician or a specialist nurse to prevent further falls.8

Quick surgery under Key Performance Indicator

With regard to the six standards for hip fracture care set by the BOA Blue Book (Box and Table 5), 61% of HK patients had surgery within exactly 48 hours, compared with 35% in Spain21 and less than 10% in China22; in the UK, 83% of patients received surgery within 48 hours and during working hours. The percentage of HK patients who underwent surgery within 2 calendar working days was 30% before 2007 and improved to 62% in 2008 after the establishment of Key Performance Indicator (KPI) by the HA and 78.3% in 2012.23 The aim of KPI is to ensure 70% of hip fracture patients receive surgery within 2 calendar working days.24,25 This may explain why a large proportion of patients had quick hip fracture surgery in HK. The delay in surgery for 22% of patients may have been due to time spent awaiting medical optimisation by physicians or geriatricians.

Importance of geri-orthopaedic co-management

Very few patients in HK (3.5%) received preoperative assessment by geriatricians in contrast to 43% of patients in the UK. In this review, only one of the six studied hospitals had a geriatrician who routinely assessed hip fracture patients pre- and post-

<table>
<thead>
<tr>
<th>Standard</th>
<th>HK (%)</th>
<th>UK NHFD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Admission to orthopaedic ward within 4 hours</td>
<td>91.0</td>
<td>52</td>
</tr>
<tr>
<td>2. Surgery within 48 hours and during working hours</td>
<td>60.5 (exactly 48 hours)</td>
<td>83</td>
</tr>
<tr>
<td>3. Patients developing pressure ulcers</td>
<td>5.3</td>
<td>3.7</td>
</tr>
<tr>
<td>4. Preoperative assessment by an ortho-geriatrician</td>
<td>3.5</td>
<td>43</td>
</tr>
<tr>
<td>5. Discharged with bone protection medication</td>
<td>22.9</td>
<td>69</td>
</tr>
<tr>
<td>6. Received a falls assessment prior to discharge</td>
<td>98</td>
<td>92</td>
</tr>
</tbody>
</table>
operatively, indicating a lack of geri-orthopaedic co-management in HK. Studies have shown better outcomes after hip fracture when patients receive geri-orthopaedic treatment, with a lower 1-year mortality rate, reduced acute hospital stay, and less need for further rehabilitation. A local study reviewed the effectiveness of geri-orthopaedic co-management and found that in the geri-orthopaedic group, time to surgery was shorter, 1-year mortality rate was lower, and more remained independent in daily living activities. Therefore, geri-orthopaedic care should be implemented in all hospitals in HK to achieve better patient care. This will further improve the KPI for fragility hip fractures in all hospitals in HK.

Low prescription rate of bone protection medication

Only 23% of HK patients were discharged with bone protection medication compared with almost 70% in the UK (Table 5) and nearly 40% in Korea (excluding calcium and vitamin D). A local study showed that 33% were prescribed medications for osteoporosis in the 6 months after discharge. Osteoporosis diagnosis and treatment were driven by BMD measurement, not fracture history. This may explain the low prescription rate of bone protection medication when the fracture patient did not undergo BMD measurement for a variety of reasons such as unavailability of dual-energy X-ray absorptiometry (DXA), long queuing time, or lack of referral from orthopaedic doctors. Although the need for DXA measurement prior to prescription of bone health medication to patients with fragility fracture remains controversial, it is clear that DXA measurement is not the only single indication for such medication.

Importance of Fracture Liaison Services

In view of the low follow-up rate, poor functional recovery, increased institutionalisation, and high mortality after fragility hip fracture, better post-discharge rehabilitation and secondary fracture prevention should be implemented to restore patients’ physical and psychological status.

Fracture Liaison Services (FLS) is a coordinator-based service for sustained rehabilitation in the community and secondary fracture prevention in patients with fragility fractures. It has been implemented in many countries—eg the UK, Australia, Canada—and studies reveal that FLS is cost-effective. Implementation of FLS in HK may improve current post-discharge care. Such services include osteoporosis identification and treatment (eg DXA scan and prescription of bone protection medication), education about secondary fracture prevention (exercise, dietary guidelines, and an education programme), and sustainable multidisciplinary services (follow-up by FLS coordinator regularly). With FLS, fragility hip fracture patients with osteoporosis can be identified and treated promptly with good compliance with medications. Patients will be instructed to exercise to improve functional status with a potential consequent decrease in old-age home admission. They will also be taught about falls prevention and sustained rehabilitation, and hence lower the chance of secondary fracture.

Limitations of this study

This study included approximately 60% of all HK fragility hip fractures. It would be better to include all HK hospitals in future studies to reflect the full situation across the territory. This study retrospectively reviewed medical records from 2012 with data retrieved from electronic and handwritten records so a small percentage of data may have been missing due to illegible records. A standardised electronic format from the Clinical Management System will improve data capture and analysis. A disease registry is important to enable better documentation.

Conclusions

This study reviewed the current fragility hip fracture care in HK. Although acute surgical treatment complies with international standards, standardised geri-orthopaedic co-management will further improve the acute care. Recognising fragility hip fracture as a chronic disease model, the increased rate in old-age home admission, poor functional recovery, low prescription rate of bone health medications, and low attendance rate for follow-up were identified as problems in subsequent management. These may explain the higher 1-year mortality rate, high secondary fracture rate, and deterioration in the quality of life after fracture among these elderly. With an ageing population and increasing longevity, the hip fracture rate is expected to increase continuously. A comprehensive multidisciplinary chronic disease management model that includes geri-orthopaedic co-management and FLS programmes should be implemented to improve patient outcomes, prevent secondary fractures, and reduce the economic burden on HK. The setting up and maintenance of a registry of all fragility fractures is imminent and will help health care professionals monitor and continuously improve the standards of patient care as well as prevent fractures.

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Declaration

All authors have disclosed no conflicts of interest.

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