

# Post-fracture care gap: a retrospective population-based analysis of Hong Kong from 2009 to 2012

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## ABSTRACT

**Introduction:** Patients who sustain an osteoporotic fracture are at increased risk of sustaining further osteoporotic fracture. The risk can be reduced by prescription of anti-osteoporosis medication. The aim of the present study was to determine the current practice in Hong Kong regarding secondary drug prevention of fragility fractures after osteoporotic hip fracture.

**Methods:** Dispensation of anti-osteoporosis medication records from patients with new fragility hip fractures aged  $\geq 65$  years were retrieved using the Hospital Authority Clinical Data Analysis and Reporting System from 2009 to 2012. The intervention rate each year was determined from the percentage of patients receiving anti-osteoporosis medication within 1 year after hip fracture.

**Results:** A total of 15 866 patients with osteoporotic hip fracture who met the criteria were included. The intervention rate differed each year from 2009 to 2012, ranging between 9% and 15%. Orthopaedic surgeons initiated 63% of anti-osteoporosis

medication, whereas physicians initiated 37%. The anti-osteoporosis drugs being prescribed included alendronic acid (76%), ibandronic acid (12%), strontium ranelate (5%), and zoledronic acid (4%).

**Conclusion:** Most patients with hip fracture remained untreated for 1 year after the osteoporotic hip fracture. The Hospital Authority should allocate more resources to implement a best practice framework for treatment of patients with hip fracture at high risk of secondary fracture.

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### New knowledge added by this study

- Few patients receive anti-osteoporosis medication after hip fracture.
- Implementation of secondary drug prevention of osteoporotic fractures differs among hospitals and specialties.

### Implications for clinical practice or policy

- The Hong Kong government should allocate more resources for secondary drug prevention of osteoporotic fractures.
- By reducing subsequent fractures, the government can realise substantial cost-savings.

## Introduction

There are increasing numbers of geriatric hip fractures among the ageing population in Hong Kong.<sup>1</sup> Patients who sustain an osteoporotic fracture are at increased risk of sustaining further osteoporotic fractures.<sup>2,3</sup> The cumulative incidence of second hip fracture was 5.1% at 2 years and 8.6% at 8 years.<sup>4</sup> This situation can be improved by implementing better guidelines for secondary drug prevention of fragility fractures. Appropriate treatment of patients with fragility fractures has been shown to reduce subsequent risk of fragility fracture by up to 50%.<sup>5-7</sup>

Many countries in the world have well-established guidelines to close this post-fracture care gap. However, this problem has been overlooked

in Hong Kong and the situation is not improving. Diagnosis and treatment of osteoporosis differs among hospitals and specialties. There are no standardised guidelines for treating this particular group of elderly patients. The aim of the present study was to determine the current practice in Hong Kong regarding secondary drug prevention of fragility fractures after osteoporotic hip fracture, in order to make recommendations to implement better guidelines.

## Methods

In Hong Kong, about 98% of all hospital admissions for hip fracture were admitted to public hospitals rather than private hospitals.<sup>8</sup> Patient records from

## 長者髖部骨折後護理差距：2009年至2012年 香港回顧性人口分析

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**引言：**服用治療骨質疏鬆藥物能減低患有脆性骨折的病人再次骨折的風險。本研究旨在分析香港病人在髖部骨折後獲處方相關藥物的比率。

**方法：**透過醫院管理局的臨床數據分析及報告系統調查在2009年至2012年期間患有髖部骨折病人在一年內獲處方骨質疏鬆藥物的比率。

**結果：**本研究分析15 866名病人的資料，在2009年至2012年間每年介乎9%至15%病人獲處方治療骨質疏鬆藥物。其中63%的藥物是由骨科醫生處方，其次是內科醫生，佔37%。最多病人獲處方阿倫麟酸（76%），其他包括伊班麟酸（12%）、雷奈酸鋇（5%）和唑來麟酸（4%）。

**結論：**大部分髖部骨折病人在骨折一年內仍未獲處方治療骨質疏鬆藥物。針對這些患有脆性骨折的病人，醫院管理局應撥出更多資源並訂立更完善的護理框架去預防繼發性骨折。

2009 to 2012, including data on the dispensation of anti-osteoporosis medication to patients aged  $\geq 65$  years with new fragility hip fractures, were retrieved from the Hospital Authority Clinical Data Analysis and Reporting System. Patients with hip fracture were identified using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes 81.52, 81.51, 81.40, 79.15, 79.35, or 78.55 under subdivision Operation Theatre Management System-linked diagnosis. Patients who took anti-osteoporosis medication before the fracture and those with pathological fractures were excluded. For the remaining patients who were eligible for secondary drug prevention, we determined the intervention rate each year by determining the percentage of patients receiving

anti-osteoporosis medication within 1 year after hip fracture. Version 4 of the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines for cross-sectional studies was used in the preparation of this manuscript.

## Results

A total of 15866 patients with osteoporotic hip fracture who met the criteria were included. From records on anti-osteoporosis medicine initiation, the intervention rate between 2009 and 2012 was found to be different each year, from as low as 9% in 2010 and as high as 15% in 2009 (Fig). The prescription rate for anti-osteoporosis medication was 14.78% in 2009, 25.03% in 2010, 9.24% in 2011, and 11.26% in 2012. Among the specialties prescribing anti-osteoporosis medication, orthopaedic surgeons initiated 63% of the prescriptions, whereas physicians initiated 37%. The anti-osteoporosis drugs prescribed in descending order were alendronic acid (76%), ibandronic acid (12%), strontium ranelate (5%), zoledronic acid (4%), risedronic acid (1%), teriparatide (1%), and denosumab (1%). The rate of anti-osteoporosis medication prescription was between 7% and 31% among the seven public acute hospitals with orthopaedic emergency admission included in the study.

## Discussion

A 2015 study of geriatric hip fractures showed that there had been a steady increase in the incidence of geriatric hip fracture in Hong Kong.<sup>1</sup> The worldwide incidence of geriatric hip fractures is also projected to increase.<sup>9</sup> We expect to see more patients with fragility fractures in our daily practice with the growing ageing population.

Patients with geriatric hip fracture carry a high mortality rate; the overall 30-day mortality is 3.01% and 1-year mortality is 18.56%.<sup>1</sup> Older age and male sex are associated with an increase in mortality and a higher excess mortality rate following surgery.<sup>1</sup> Patients with a second episode of hip fracture have been found to have an even higher mortality rate.<sup>4</sup> By initiating anti-osteoporosis medication, those subsequent fragility fractures could be prevented.

The British Orthopaedic Association sets standards for surgeons to comply with in order to improve the quality and outcomes of care and also to reduce costs.<sup>2</sup> Bone health management includes calcium and vitamin D supplement, osteoporosis treatment, and bone densitometry measurement. According to the American Society for Bone and Mineral Research Task Force 2012, patients with hip fracture should receive pharmacological treatment to prevent additional fractures, because they are clearly at risk for recurrent hip or other osteoporotic fractures, and initiation of bisphosphonate therapy

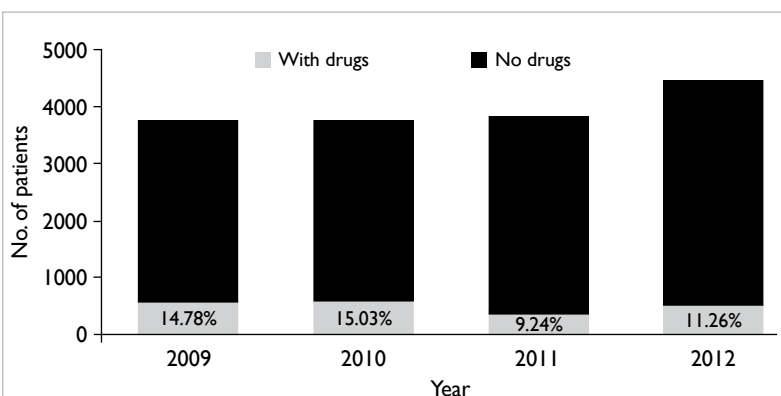


FIG. Patients with and without post-fracture anti-osteoporosis medication from 2009 to 2012

after hip fracture has been shown to reduce the risk of a second hip fracture.<sup>10</sup>

The main limitation of the present study was that the data were mainly retrieved from a database of patient records. The accuracy of these records depends on the correct entry by clinicians of the diagnosis of hip fracture. Another limitation is that the government drug dispensation record does not include data from patients who choose to receive anti-osteoporosis medication in the private sector. This may create an underestimation of the treatment rate.

Although the treatment rate may have been underestimated in the present study, worldwide rates of osteoporosis treatment after hip fracture have been reported to be as low as 10% to 20% within 1 year.<sup>11-20</sup> A recent study in Hong Kong showed that 33% of patients with hip fracture were prescribed medication for osteoporosis in the 6 months after discharge from the hospital.<sup>21</sup> There are also wide discrepancies in drug prescription rates among different hospitals.

There are several potential reasons for these differences in drug prescription rates among hospitals. Firstly, different hospitals follow different working guidelines for the treatment of osteoporosis after hip fracture. Without standardisation of the guidelines, there can be a lack of clarity regarding the responsibility to undertake this care. Siris et al<sup>14</sup> found that some physicians did not realise the significance of the initiation of anti-osteoporosis medication after fragility fractures, causing underdiagnosis and undertreatment of osteoporosis. Secondly, some clinicians refer patients to physicians for initiating osteoporosis treatment; especially in centres without geriatric support, these follow-up appointments with physicians can be up to 1 year after discharge from the hospital. Thirdly, many geriatric patients may have renal failure and may be contra-indicated for certain first-line anti-osteoporosis medication such as bisphosphonates. They may be unable to afford other more expensive self-financed anti-osteoporosis medication. Other factors that affect prescription rates include concerns about medication, and the available time and funds for diagnosis and treatment.<sup>13</sup>

The prevalence of femoral neck osteoporosis based on hip T-score of less than -2.5 was 47.8% in men and 59.1% in women in a Hong Kong study of 239 geriatric hip fractures.<sup>21</sup> In the present study, the intervention rate each year was found to be only 9% to 15% across 2009 to 2012. There is obviously still a huge post-fracture gap in secondary prevention. Many patients with fragility fracture do not receive osteoporosis treatment for >1 year after hip fracture. Furthermore, there was little to no improvement in the prescription rates among the 4 years studied. Huge improvements could be achieved by raising

the awareness of secondary drug prevention of osteoporosis and increasing the motivation of physicians.

Improvements can only be achieved with involvement of both the government and the individual specialties. The government should allocate more resources and implement a best practice framework for patients with hip fracture at high risk of secondary fracture. The government should also subsidise more anti-osteoporosis medications, so that better treatment can be provided in complicated and severe cases. Because the treatment of osteoporosis differs among hospitals and specialties, a fragility fracture committee or a fracture liaison service can coordinate and standardise patient care by setting up and implementing an easy-to-follow protocol. More education on the treatment of osteoporosis should be provided for orthopaedic and medical departments, to raise awareness and update the relevant knowledge in anti-osteoporosis medication advancement. In some complicated cases of osteoporosis, the involvement of different specialties is essential. The formation of geriatric-orthopaedic working groups and their early involvement in the perioperative and postoperative period can help ensure that optimal care is provided to all patients. Even with anti-osteoporosis medication, a good rehabilitation programme with fall prevention is required; this should be set up in collaboration with allied health professionals. With cooperation between the government and different hospital specialties, more secondary fragility fractures can be prevented. Patients will benefit from prevention of the morbidity and mortality associated with secondary fragility fracture.

Recently there has been debate on osteoporosis treatment and atypical femur fractures. Modi et al<sup>22</sup> report that adherence to oral bisphosphonates is low, estimating that, of patients who are prescribed oral bisphosphonates, fewer than 40% are still taking them after 1 year. Although atypical femur fractures have been reported at very low frequencies, not only with bisphosphonate use but also following treatment with denosumab,<sup>23</sup> patients are becoming increasingly reluctant to take anti-osteoporosis medication. An analysis of three randomised controlled trials of bisphosphonates concluded that treating 1000 women with osteoporosis for 3 years with a bisphosphonate will prevent approximately 100 vertebral or non-vertebral fractures (number needed to treat: 10).<sup>24</sup> Importantly, for the 100 fractures prevented, bisphosphonates might cause 0.02 to 1.25 atypical femur fractures, assuming the relative risk ranges from 1.2 to 11.8 (number needed to harm: 800 to 43 300).<sup>25</sup> Hence the beneficial effect of osteoporosis treatment still outweighs the risk for atypical femur fracture.

In Hong Kong, about 98% of all hospital

admissions for hip fracture were admitted to public hospitals rather than private hospitals.<sup>8</sup> Public hospitals in Hong Kong face a huge financial burden and lack of health care resources for providing optimal care to the ageing population. The cost associated with the prescription of anti-osteoporosis medication is of concern of the government. However, the tremendous hospital expenditure related to hip fracture care can be easily overlooked. In Hong Kong, the direct medical cost for each hip fracture was US\$8831.9 in 2018, with the projected direct cost of US\$84.7 million in total.<sup>26</sup> In 2014, 84% of the drugs prescribed for osteoporosis were bisphosphonates.<sup>27</sup> The annual cost of prescription of bisphosphonates per patient was approximately HK\$174. Although multiple patients must be treated to prevent a single fracture, reducing the number of subsequent osteoporotic fractures can help the government to achieve significant cost-savings.

Despite the numerous benefits of anti-osteoporosis medication for patients with fragility fractures, the prescription rate remains low not only in Hong Kong, but also in the other parts of the world. Physicians should be aware of the benefits of anti-osteoporosis medication for patients with fragility fractures and guidelines for osteoporosis treatment should be developed and used more widely.

## Conclusion

There is a large post-fracture care gap in secondary drug prevention for patients with osteoporotic hip fracture in Hong Kong. The majority of the patients are neither diagnosed nor tested for osteoporosis. Most remained untreated for 1 year after the osteoporotic hip fracture. The Hong Kong Hospital Authority needs to allocate more resources to implement a best practice framework for patients with hip fracture at high risk of secondary fracture, so that they receive appropriate anti-osteoporosis medication. By reducing the number of subsequent osteoporotic fractures, the Hospital Authority can realise substantial cost-savings.

## Author contributions

Concept and design: All authors.

Acquisition of data: MY Cheung, AWH Ho.

Analysis or interpretation of data: MY Cheung, AWH Ho.

Drafting of the article: MY Cheung, AWH Ho.

Critical revision for important intellectual content: MY Cheung, AWH Ho.

## Declaration

All authors have disclosed no conflicts of interest. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity. An earlier version of this paper was presented as a poster at the Annual Congress of the Hong Kong Orthopaedic Association, 6 to 8 November 2015, Hong

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