

# Excess mortality for operated geriatric hip fracture in Hong Kong

LP Man \*, Angela WH Ho, SH Wong

## ABSTRACT

**Introduction:** Geriatric hip fracture places an increasing burden to health care systems around the world. We studied the latest epidemiology trend of geriatric hip fracture in Hong Kong, as well as the excess mortality for patients who had undergone surgery for hip fracture.

**Methods:** This descriptive epidemiology study was conducted in the public hospitals in Hong Kong. All patients who underwent surgery for geriatric hip fracture in public hospitals from January 2000 to December 2011 were studied. They were retrieved from the Clinical Management System of the Hospital Authority of Hong Kong. Relevant data were collected using the Clinical Data Analysis and Reporting System of the Hospital Authority. The actual and projected population size, and the age- and sex-specific mortality rates were obtained from the Census and Statistics Department of Hong Kong. The 30-day, 1-year and 5-year mortality, and excess mortality following surgery for geriatric hip fracture were calculated.

**Results:** There was a steady increase in the incidence

of geriatric hip fracture in Hong Kong. The annual risk of geriatric hip fracture was decreasing in both sexes. Female patients aged 65 to 69 years had the lowest 1-year and 5-year mortality of 6.91% and 23.80%, respectively. Advancing age and male sex were associated with an increase in mortality and a higher excess mortality rate following surgery.

**Conclusion:** The incidence of geriatric hip fracture is expected to increase in the future. The exact reason for a higher excess mortality rate in male patients remains unclear and should be the direction for future studies.

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## New knowledge added by this study

- Advancing age and male sex were associated with an increase in mortality and a higher excess mortality rate in Hong Kong following surgery for hip fracture.

## Implications for clinical practice or policy

- The burden of geriatric hip fracture is expected to increase.
- Future studies should investigate the cause of an increased excess mortality in male patients who sustain a geriatric hip fracture.

## Introduction

Geriatric hip fracture places an increasing burden on health care service providers around the world. Previous studies have shown that it is associated with significant morbidity and mortality.<sup>1–3</sup> With the ageing population in many parts of Asia, it has been estimated that over half of all hip fractures will occur in Asia in 2050.<sup>4</sup> Studies in France<sup>5</sup> and the US<sup>6</sup> have reported a drop in the incidence rate of geriatric hip fracture in the elderly population. This trend, however, has not been echoed by similar studies in Korea<sup>7</sup> and Japan.<sup>8</sup> Epidemiological studies performed in Hong Kong in 2007 and 2012 showed that, similar to western countries, there was a drop in the incidence rate of hip fracture in the territory.<sup>9,10</sup>

Hong Kong has one of the longest life

expectancies in the world.<sup>11</sup> The total number of geriatric hip fractures is expected to increase. It will therefore be important for policy-makers and society as a whole to adequately forecast future trends in the disease to prepare for the challenges ahead. This study aimed to analyse the latest trend in the epidemiology of geriatric hip fracture in Hong Kong, as well as to investigate the mortality rate and excess mortality rate in patients who underwent surgery for geriatric hip fracture.

## Methods

Approximately 98% of geriatric hip fractures are managed in public hospitals run by the Hospital Authority of Hong Kong.<sup>10</sup> All patients admitted to a public hospital in Hong Kong are assigned a code

in the Clinical Management System by the attending doctor(s). The system also includes information on age, sex, principal diagnosis, and period of hospitalisation. Relevant data, including date of death, were collected using the Clinical Data Analysis and Reporting System (CDARS) from the Hospital Authority. All cases between January 2000 and December 2011 with a disease coding of acute hip fracture (ICD-9-CM diagnosis codes 820.8, 820.09, 820.02, 820.03, 820.20, and 820.22) were retrieved. Operations for geriatric hip fracture were defined as a patient-episode with ICD-9-CM procedure code of 81.52, 51.51, 81.40, 79.15, 79.35, or 78.55.

Only patients with a disease code for acute hip fracture and procedure code for geriatric hip fracture were included in the current study. Patients who were non-Chinese, who had an old fracture, were managed non-operatively, had a second hip fracture or complications of primary hip fracture were excluded. Based on the date of death, we analysed the 30-day and 1-year mortality regardless of cause of death. Postoperative 5-year mortality rate was calculated based on data from patients who underwent surgery year from 2000 to 2006.

Excess mortality is defined by the World Health Organization as "Mortality above what would be expected based on the non-crisis mortality rate in the population of interest."<sup>12</sup> In this study, the excess mortality rate was calculated by subtracting the age- and sex-specific mortality from the age- and sex-specified 1-year mortality of operated geriatric hip fracture. The age- and sex-specific mortality rates for the year 2006 were used for analysis. The actual and projected population size, and the age- and sex-specific mortality rates<sup>13</sup> were obtained from the Census and Statistics Department of the HKSAR Government.

## Results

From January 2000 to December 2011, the annual number of patients admitted to public hospitals and who underwent surgery for hip fracture increased from 3678 to 4579. The annual incidence of geriatric hip fracture during the study period is shown in Figure 1. A slightly decreasing annual risk of hip fracture was observed for both male and female patients (Figs 2 and 3).

A total of 48 992 cases were retrieved after excluding non-Chinese patients, old fractures, cases managed non-operatively, second hip fractures, repeated admission for the same fracture, and complications of primary hip fracture.

Patient age ranged from 65 to 112 years with a mean and median age of 82.1 and 82.0 years, respectively. The overall 30-day and 1-year mortality was 3.01% and 18.56%, respectively.

The age- and sex-specific mortality after 30 days, 1 year, and 5 years for operated hip fracture are

## 香港老年髖部骨折的超額死亡率

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**引言：**老年髖部骨折不斷增加各國醫療系統的負擔。本研究旨在探討香港老年髖部骨折的最新流行病學趨勢，以及進行手術的髖部骨折患者的超額死亡率。

**方法：**我們採用描述性流行病學的方法研究香港公立醫院的數據。我們從香港醫院管理局的臨床管理系統檢索了所有在2000年1月至2011年12月期間在公立醫院接受手術治療的老年髖部骨折病例，並且從醫院管理局的檢索系統收集相關數據。從香港政府統計處獲得了實際和預計人口數字以及年齡和性別的具體死亡率。利用有關數據計算老年髖部骨折後的30天、1年和5年死亡率，以及手術後的超額死亡率。

**結果：**香港的老年髖部骨折發病率穩步上升，而老年髖部骨折的年度風險率卻呈現減少的趨勢。65至69歲女性患者的1年和5年內死亡率為各年齡性別中最低，分別為6.91%和23.80%。年老的男性手術後的超額死亡率為各年齡性別中最高的。

**結論：**預計在未來老年髖部骨折的現患率將持續上升。導致男性病人有較高超額死亡的原因仍然不明，日後的研究可循此方向進行。

shown in Table 1. Female patients aged 65 to 69 years had the lowest 1-year and 5-year mortality of 6.91% and 23.80%, respectively. An increase in mortality was observed with advancing age and male sex.

The excess mortality rate in different age and sex groups is shown in Table 2 and Figure 4. Male gender and increasing age were associated with a higher excess mortality rate after operation for geriatric hip fracture. The excess mortality for a male patient aged  $\geq 85$  years was 23.45%.

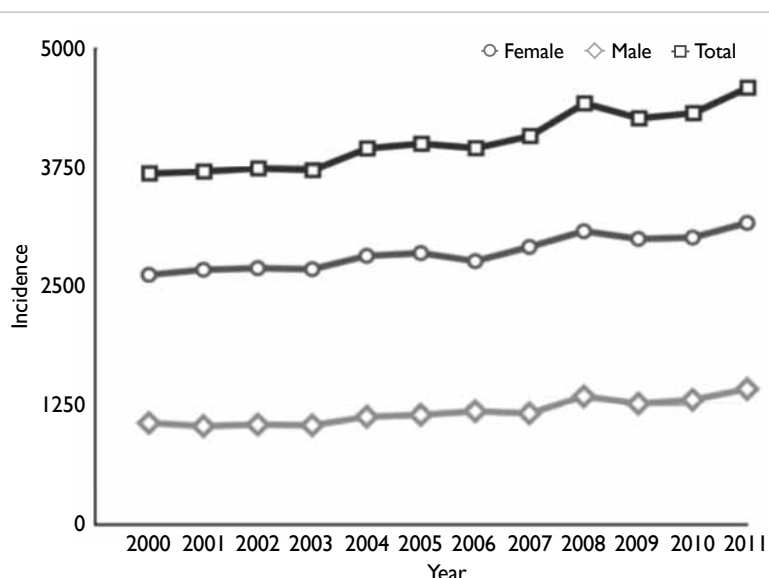


FIG 1. Incidence of geriatric hip fracture from 2000 to 2011

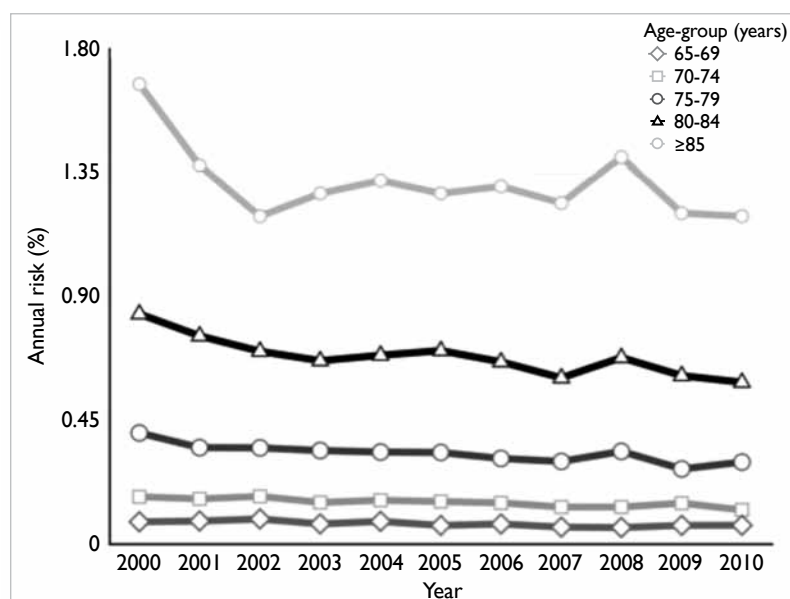


FIG 2. Annual risk of hip fracture in men

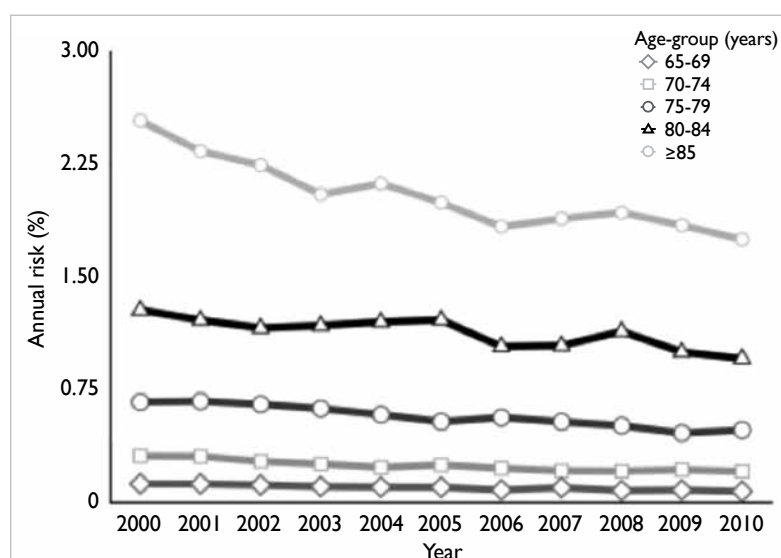


FIG 3. Annual risk of hip fracture in women

## Discussion

A slight decrease in the annual risk of geriatric hip fracture was noted in this study. This trend echoes that of similar studies in the territory and in some western countries.<sup>5,6,10</sup> Such a decrease has been postulated to be related to improved availability of medical intervention to prevent osteoporosis, increased attention to menopause and hormonal replacement therapy, changes in lifestyle, and community fall prevention programmes. Nonetheless few studies have been able to prove any causal relationship.

Surgery is generally offered to patients with geriatric hip fracture in order to decrease the morbidity and mortality associated with prolonged immobilisation. In this study, patients who were managed non-operatively were excluded as they represented a very small proportion of patients (estimated to be <1%) with poor pre-morbid medical conditions and very high anaesthetic risk.

Despite the decreasing annual risk of geriatric hip fracture, it is important to relate this to the ageing population in the territory. Using the projected percentage of elderly aged  $\geq 65$  years in Hong Kong,<sup>11</sup> and assuming that the annual risk of hip fracture remains the same, we estimate that there will be more than 6300 cases of hip fracture in the year 2020. In the year 2040, the annual incidence of geriatric hip fracture will be more than 14 500, more than a 3-fold increase from 2011. Unless effective primary prevention measures are put in place, the burden of geriatric hip fracture on the public health system will continue to increase. Policy-makers should invest in the relevant specialties and departments in order to tackle the inevitable challenges ahead.

To our knowledge this is the first study to review the excess mortality of operated geriatric hip fracture in the territory. A systematic epidemiological review by Abrahamsen et al<sup>14</sup> showed that the 1-year excess mortality rate following hip fracture ranged from 8.4% to 36%. In this study, the 1-year excess mortality following surgery for geriatric hip fracture ranged from 6.22% to 23.45%. Echoing the result of

TABLE 1. Postoperative mortality rates for geriatric hip fracture

| Age-group (years) | Postoperative mortality (%) |      |        |       |         |       |
|-------------------|-----------------------------|------|--------|-------|---------|-------|
|                   | 30-Day                      |      | 1-Year |       | 5-Year* |       |
|                   | Female                      | Male | Female | Male  | Female  | Male  |
| 65-69             | 0.61                        | 2.47 | 6.91   | 15.68 | 23.80   | 39.30 |
| 70-74             | 1.12                        | 3.11 | 9.01   | 18.29 | 28.30   | 48.80 |
| 75-79             | 1.54                        | 3.95 | 11.10  | 22.10 | 33.50   | 57.70 |
| 80-84             | 2.10                        | 4.90 | 13.63  | 27.19 | 43.40   | 68.20 |
| $\geq 85$         | 2.98                        | 6.93 | 19.80  | 36.40 | 60.90   | 36.40 |
| Overall           | 2.22                        | 4.88 | 15.03  | 26.78 | 45.70   | 63.10 |

\* Calculation based on data from patients who underwent surgery from year 2000 to 2006

TABLE 2. Age- and sex-specific excess mortality of geriatric hip fracture

| Age-group (years) | 1-Year postoperative mortality (%) |       | Age-specific mortality rate in Hong Kong (%) |       | Age- and sex-specific excess mortality rate (%) |       |
|-------------------|------------------------------------|-------|--|-------|---|-------|
|                   | Female                             | Male  | Female                                       | Male  | Female  | Male  |
| 65-69             | 6.91                               | 15.68 | 0.69   | 1.54  | 6.22  | 14.14 |
| 70-74             | 9.01                               | 18.29 | 1.31   | 2.68  | 7.70  | 15.61 |
| 75-79             | 11.10                              | 22.10 | 2.38   | 4.41  | 8.72  | 17.69 |
| 80-84             | 13.63                              | 27.19 | 4.33   | 7.60  | 9.30  | 19.59 |
| ≥85               | 19.80                              | 36.40 | 9.82   | 12.95 | 9.98  | 23.45 |

Abrahamsen et al,<sup>14</sup> we also identified that men had a higher excess mortality rate after operation for geriatric hip fracture. The reasons for this higher excess mortality rate in males remain unclear. Endo et al<sup>15</sup> reported that male gender was a risk factor for sustaining postoperative complications such as pneumonia, arrhythmia, delirium, and pulmonary embolism, even after controlling for age and the American Society of Anesthesiologists rating, as well as a higher mortality 1 year after hip fracture. Another study by Wehren et al<sup>16</sup> reported an increased rate of death from infection in males for at least 2 years after hip fracture, suggesting that infection may contribute to the differential risk of death.

There are limitations to the present study. Patients with geriatric hip fracture who were treated in the private sector were not included, although they constituted only a small proportion of the total number of cases. Chau et al<sup>10</sup> reported that approximately 98% of hip fractures were managed in the Hospital Authority.

In the CDARS of the Hospital Authority, the date of death was provided by the death registry of the Immigration Department of Hong Kong. We were unable to capture data for deaths that occurred outside the territory. Under the laws of Hong Kong, only deaths that occur in Hong Kong are registered with the Deaths Registries. According to the Census and Statistics Department, approximately 9% of the elderly population resides in the mainland.<sup>17</sup> As Hong Kong residents are currently not eligible for free or subsidised health services in the mainland, we believe many elderly people will return to Hong Kong for medical treatment.

Other risk factors that may contribute to the excess mortality such as smoking and pre-morbid health status were not included in the present study. Further studies should also investigate the incidence and mortality of other fragility fractures. The effect of primary and secondary prevention by anti-osteoporotic medications on the incidence of geriatric hip fracture is also a potential area for further study.

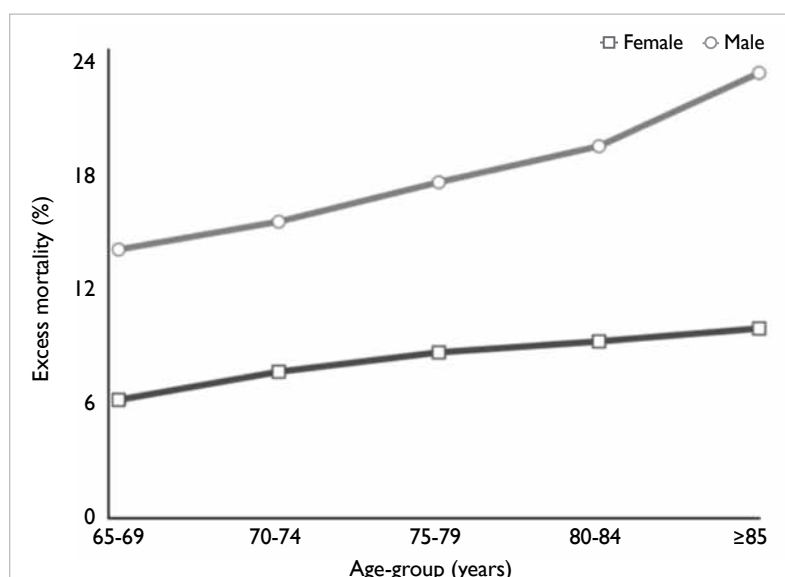


FIG 4. Age- and sex-specific excess mortality of geriatric hip fracture

## Conclusion

Geriatric hip fracture will continue to be a major challenge for the health care system in the foreseeable future. Despite the emphasis on early surgery for geriatric hip fractures in recent years, the risk of premature death remained high for patients who underwent surgery for hip fracture. Future studies should be directed to identify the causes of this excess mortality and patients who are at increased risk of premature death, so that early interventions can be initiated to reduce their risk.

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# References

1. Mullen JO, Mullen NL. Hip fracture mortality. A prospective, multifactorial study to predict and minimize death risk. *Clin Orthop Relat Res* 1992;(280):214-22.
2. Omsland TK, Emaus N, Tell GS, et al. Mortality following the first hip fracture in Norwegian women and men (1999-2008). A NOREPOS study. *Bone* 2014;63:81-6.
3. Randell AG, Nguyen TV, Bhalerao N, Silverman SL, Sambrook PN, Eisman JA. Deterioration in quality of life following hip fracture: a prospective study. *Osteoporos Int* 2000;11:460-6.
4. Cooper C, Campion G, Melton LJ 3rd. Hip fractures in the elderly: a world-wide projection. *Osteoporos Int* 1992;2:285-9.
5. Maravic M, Taupin P, Landais P, Roux C. Change in hip fracture incidence over the last 6 years in France. *Osteoporos Int* 2011;22:797-801.
6. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB. Incidence and mortality of hip fractures in the United States. *JAMA* 2009;302:1573-9.
7. Yoon HK, Park C, Jang S, Jang S, Lee YK, Ha YC. Incidence and mortality following hip fracture in Korea. *J Korean Med Sci* 2011;26:1087-92.
8. Hagino H, Yamamoto K, Ohshiro H, Nakamura T, Kishimoto H, Nose T. Changing incidence of hip, distal radius, and proximal humerus fractures in Tottori Prefecture, Japan. *Bone* 1999;24:265-70.
9. Kung AW, Yates S, Wong V. Changing epidemiology of osteoporotic hip fracture rates in Hong Kong. *Arch Osteoporos* 2007;2:53-8.
10. Chau PH, Wong M, Lee A, Ling M, Woo J. Trends in hip fracture incidence and mortality in Chinese population from Hong Kong 2001-09. *Age Ageing* 2013;42:229-33.
11. Hong Kong Population Projections 2012-2041, Census and Statistics Department. Available from: <http://www.censtatd.gov.hk/>. Accessed Jun 2015.
12. Definitions: emergencies. Available from: <http://www.who.int/hac/about/definitions/en/>. Accessed Jun 2015.
13. The mortality trend in Hong Kong, 1981 to 2013. Hong Kong Monthly Digest of Statistics. November 2014, HKSAR: Census and Statistics Department. Available from: <http://www.statistics.gov.hk/pub/B71411FB2014XXXXB0100.pdf>. Accessed Jun 2015.
14. Abrahamsen B, va Staa T, Ariely R, Olson M, Cooper C. Excess mortality following hip fracture: a systematic epidemiological review. *Osteoporos Int* 2009;20:1633-50.
15. Endo Y, Aharonoff GB, Zuckerman JD, Egol KA, Koval KJ. Gender differences in patients with hip fracture: a greater risk of morbidity and mortality in men. *J Orthop Trauma* 2005;19:29-35.
16. Wehren LE, Hawkes WG, Orwig DL, Hebel JR, Zimmerman SI, Magaziner J. Gender differences in mortality after hip fracture: the role of infection. *J Bone Miner Res* 2003;18:2231-7.
17. Characteristics of Hong Kong older persons residing in the Mainland of China. Hong Kong Monthly Digest of Statistics. September 2011. HKSAR: Census and Statistics Department. Available from: <http://www.statistics.gov.hk/pub/B71109FC2011XXXXB0100.pdf>. Accessed Jul 2015.