Reviewers report

Title: Mortality and cause of death in hip fracture patients aged 65 or older - a population-based study

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Reviewer: Jian Sheng Chen

Reviewers report:

The paper presents the results of a prospective cohort study evaluating mortality and causes of death in 428 patients after a hip fracture surgery. The authors reported that age and gender adjusted mortality was higher in the 428 patients than in the general population; and the increased risk persisted over 9 years of the follow up. They also observed that the two most common causes of death after hip fracture were diseases of the circulatory system and dementia, and male patients were more likely to die from the two causes compared to female patients. The authors concluded that long-term optimal treatment of all major comorbidities shall be provided to patients with a hip fracture.

The manuscript could be strengthened by addressing following issues:

- Major Compulsory Revisions

1. The questions posed by the authors are not well defined. The aims stated in the introduction were “to evaluate mortality and cause of death in patients sustaining a hip fracture over both the short and long-term ...”. In fact, the authors focused on reporting (1) age-adjusted HR of men to women for different causes of death and (2) age- and sex-adjusted HR of cervical fracture patients to trochanteric fracture patients for different causes of death in the results. These works do not appear to fit the study aim well. Do the authors want to evaluate patterns of death after hip fracture or to identify risk factors for death in hip fracture patients?

2. Issues related to identifying mortality risk factors in the cohort of 428 patients (Results, 3rd – 6th paragraphs) are (1) not adjusting for potential confounders such as comorbidities at baseline, (2) not checked for proportional hazard assumption and (3) multiple testing. One regression model (e.g. models for hip fracture types) can be used to evaluate differences between sexes as well as differences between fracture types. If proportional hazards assumption did not hold over the whole time period (9 years), it should be split at some time points to give more homogeneous time periods, in which the assumption might hold and hence the hazard ratio could validly be estimated. Also, the authors might consider use competing risks analysis treating different death causes as competing risk.

3. Discussion, 1st paragraph - “The principal finding of the present population-based study conducted in one central hospital district was that
mortality after hip fracture surgery was increased for up to 9 years.”. Based on the present study, it is not possible to determine the duration of the increasing mortality attributable to hip fracture. It is possible that the increased risk observed at 9 years is solely due to the increased mortality in the first few years.

4. Discussion, 14th paragraph – “To reduce mortality after hip fracture, efforts are needed to identify the patients at increased risk, i.e. men with circulatory system disease and dementia and patients with a cervical hip fracture based on the present study.” - This statement is not adequately supported by the data. How do the authors conclude from the data that men with circulatory system disease and dementia are at increased risk of death after hip fracture?

- Minor Essential Revisions

5. Comparing death rate of hip fracture patients with the age and sex adjusted rate of the general population will at least result in an overestimated risk of death due to hip fracture. Hip fractures occur more often in persons who have a greater number of medical and functional deficits and therefore higher chances of dying even without the fracture. This limitation should be stated.

6. Issues related to reporting are:

a. Abstract, 3rd paragraph - “Age-adjusted mortality after hip fracture surgery was higher in men than in women from the beginning till the end of the follow-up with a hazard ratio (HR) of 2.12 (95% confidence interval [CI] 1.12-4.01) in men and HR 1.55 (95% CI 1.21-2.00) in women.”- What was HR of 2.12 for men and HR of 1.55 for women compared to? Where do the results come from?

b. Table 1 – Information such as follow up time, died during follow up, underlying cause of death and place of death do not belong in baseline patient characteristics.

c. Table 2 – Consider adding one column for RR of death for hip fracture patients compared to the general population.

d. Figure 1 – Presenting different HRs for men compared to women for different time points implies that proportional hazards assumption for sex does not hold over the whole time period. If this was the case, HRs in the figure were not estimated validly.

- Discretionary Revisions

The authors should consider comparing risk of death of hip fracture patients with the same age residents in the Satakunta district since there are regional differences in mortality in Finland.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable
Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:
I declare that I have no competing interests