Reviewer's report

Title: Trends in incidence and costs of upper extremity injuries in The Netherlands between 1986 and 2008

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Reviewer: William D. Leslie

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Hip fractures, the single most expensive injury among older adults, have been well described epidemiologically and in terms of economic impact. Upper extremity injuries, both fracture and non-fracture related, are numerically much more common but less commonly the focus of analysis. The authors present a comprehensive population based analysis of upper extremity injury rates and direct health care costs for The Netherlands using a well validated registry covering 12% of the Dutch population. Secular trends in fracture incidence, as well as age and sex related patterns in incidence rates and costs, are reported.

The authors conclude that upper extremity injuries have increased over the period 1986–2008, peaking in 1999, with fractures in females (particularly elderly women with wrist fractures) accounting for a substantial share of total costs. Cost per female case were approximately double those of a male case. The data sources and analytic procedures are generally sound, and the data interpretation is appropriate. Some questions and concerns are outlined below.

Major Compulsory Revisions

1. The authors indicate on page 4 (Background, first paragraph, and Table 1) that distal radius and ulna fractures are included with carpal bone fractures as “Fracture wrist”, separate from other ulna and radius fractures grouped as “Fracture forearm”. Distal radius/ulna fractures (e.g., Colles fracture) are really a distal forearm fracture, even if they are casually but incorrectly referred to as “wrist” fractures. Indeed, the ICD-10 code for fractures of the forearm and Colles fractures all fall within ICD-10 S52. In contrast, wrist joint and carpal injuries all fall within ICD-10 S60-S63. It is quite likely that many (and probably the majority) of the “Wrist fractures” as defined in Table 1 are actually distal forearm (Colles) fractures. The authors need to justify their grouping of S52.5-S52.6 fractures with S62.0-S62.1 carpal fractures.

2. It seems unusual that the calendar year with the largest rate of missing values (2007) was used for the cost analysis, rather than a year which had much lower missingness (2006 or 2008). Can the authors explain why 2007 data collection was so different from other years? What was the pattern of the missingness and could this bias results (i.e., missing completely at random?)? Was missingness appropriately considered in extrapolating cost data to the Dutch population?

3. The coding presented by the authors is ICD-10 (Table 1), but this would not have been available in 1986. The authors should briefly indicate what coding(s)
were used in earlier years, how coding equivalence was established across the 22 years of data, and whether coding changes could affect results. I note a large jump in incidence rates for males age 15-64 years between 1996 and 1997 (Figure 1) – did coding practices change coincident with this jump? Could coding changes (e.g., ICD-9-CM to ICD-10) be contributing to the reported increase in wrist fractures (page 8, first paragraph)?

Discretionary Revisions

4. Recent reports on secular changes in hip fracture rates show that these appear to have stabilized or decreased in the developed world. Are the authors able to shed any light on recent secular changes in upper extremity fractures in The Netherlands given the paucity of non-hip fracture data that have been reported to date? Does the peak in 1999 indicate an “increase-plateau” or even an “increase-decrease” pattern in upper extremity fracture rates for The Netherlands?

Minor issues not for publication:

1. The concluding sentence of the abstract Conclusion beginning “Current treatment and rehabilitation programs…” is only weakly connected with the remainder of the abstract. This may be more appropriate in the Discussion section.

2. Page 7 (Results, first paragraph) describes the “overall age-adjusted incidence of upper extremity injuries” but does not indicate whether this is for males, females or the combination. Later in the same section (third paragraph) the authors report the “relatively high incidence of upper extremity injuries among boys…1,157 per 100,000 person years” but do not indicate which age range is being referred to (10-14 years?). The final sentence of the same paragraph notes “wrist fractures occurred more frequently in females than in males (290 versus 206 per 100,000)”. Are these incidence rates age-adjusted? Is the difference statistically significant?

3. On page 6 the authors used a direct standardization method in order to calculate age-adjusted incidence rates. The reference year and population should be stated.

4. Was the reported increase in wrist fractures for males (24%) and females (10%) during the study period (page 8, first paragraph) statistically significant?

5. On page 8 (Costs, first paragraph) the authors note that “mean costs of fractures were at least 20% higher than the overall average”. Since fractures contribute to the average, shouldn’t the comparison be between fracture and non-fracture injuries?

6. On page 9 (Discussion, first paragraph) the authors state that “the aging population” contributes to the increase in incidence of upper extremity injuries. I do not understand this statement since analyses were age-adjusted. Please explain.

7. On page 9 (third paragraph) the authors compare their results with several other studies. This may be problematic unless exactly the same approach is
used in terms of age standardization. Could this account for the observed differences?

8. On page 10 (second paragraph) the authors discuss the differences between males and females in terms of costs. Could part of this be the large number of fractures in younger males (which may be less expensive) versus the tendency of upper extremity injuries in females to occur in later life (with higher costs)? Did age specific costs in males versus females show a similar difference?

9. Why does Figure 4 use a different age grouping (0–17, 18–64, 65+) than elsewhere in the document (0–14, 15–64, 65+)?

10. The figures are difficult to visualize in grey scale, and the stacked bars series in the opposite order from the legend. The authors may wish to consider changes that will allow these to be more easily read, especially when printed in black and white.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.