Acute care of hip fractures in centenarians—Do we need more resources?

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ARTICLE INFO

Article history:
Accepted 8 September 2008

Keywords:
Centenarians
Hip fracture
Cost implications

ABSTRACT

The centenarian population in England and Wales is the most rapidly increasing age group, yet we have little information as regards their acute hospital stay and delay in surgery after hip fracture. We reviewed the records of 26 centenarians with hip fracture between 2000 and 2007 and compared them to a randomly selected control group of 50 hip fracture patients between the ages of 75 and 85 years. The mean stay in acute orthopaedic wards for centenarians was 20.7 days and for the control group was 14.9 days (p = 0.015). Centenarians had a mean delay in surgery of 3.6 days while non-centenarians were operated within a mean of 1.9 days, which was not statistically significant (p = 0.241). The longer acute hospital stay in our centenarian cohort would amount to a mean extra cost of £2511 per patient.

Introduction

Centenarians are the fastest increasing age group in England and Wales. According to current population projections, the number of centenarians in England and Wales will increase at an annual mean of 6% per annum to four times the current number, reaching almost 40,000 by mid-2031. The prognosis following hip fracture in centenarians might be expected to be extremely poor, due to diminishing physiological reserve with age and the likelihood of medical co-morbidities. Indeed, it has been shown that in-hospital mortality after hip fracture in centenarians ranges from 11 to 31%. Furthermore, delays optimising these patients for surgery and mobilising post-operatively might also be expected, increasing total length of stay in comparison with other fractured neck of femur patients. However, two previous case series have observed no statistically significant difference in acute hospital stay between centenarians and non-centenarians following hip fracture. Currently however, there are no studies examining delays in surgery and acute hospital stay in centenarians with hip fractures.

The primary aim of our study was to compare stay in the acute orthopaedic wards and time delay to surgery between centenarian and non-centenarian hip fracture patients. Our secondary aim was to see if there were any additional cost implications for acute treatment of hip fractures in centenarians.

Patients and methods

All adult patients with hip fractures admitted to our teaching hospital are entered into a prospective database. Paediatric patients, as well as those with acetabular or isolated femoral head fractures are excluded. Two dedicated orthopaedic audit clerks collect relevant data before and after surgery with use of a detailed audit form, similar to the “Standardised Audit of Hip Fractures in Europe (SAHFE)”. We identified 26 centenarians with hip fractures out of a total database of 3812 patients from 1 October 2000 to 31 December 2007. The centenarians were compared to a randomly selected control group of 50 hip fracture patients in the age group 75–85 years. This age group was selected as being representative of the average age of hip fracture patients.

The data analysed included age, sex, type of housing, date of admission and date of operation, delay in surgery, American Society of Anaesthesiology (ASA) grade, acute hospital stay, pre-fracture mobility, medical co-morbidities (specifically chest infection, heart disease and past cerebrovascular accident). The admission source was classified according to Oliver et al. into own home, residential home, nursing home or current in-patient admission. Pre-fracture mobility was graded from 1 to 5, grade 1 being ability to walk alone outdoors and grade 5 signifying inability to walk. Grade 2 patients walk only accompanied out of doors, grade 3 walk alone indoors but not out of doors and grade 4 walk indoors only if accompanied. Patients were assigned an ASA grade at the time of surgery by the attending anaesthetic staff.

Patients too frail to undergo operative treatment, patients managed non-operatively and those patients who did not survive...
the initial injury and died before surgery were excluded from the study.

Statistical methods

Statistical Package for Social Sciences version 15.0 (SPSS) was used for statistical calculations. Fisher’s exact probability test and the unpaired Student’s t-test were used to determine baseline differences between the two age groups for categorical and continuous variables, respectively. We used univariate linear least squares regression models to adjust for baseline covariates (delay in surgery, ASA grade, admission source, pre-op mobility, heart disease, CHF, past history of deep vein thrombosis or pulmonary embolus, pneumonia, CVA) in hospital stay and calculated the adjusted mean difference and significance. Residuals were checked for normality by plotting histograms. Missing values in ASA grade (one each for centenarians and non-centenarians) were replaced by the series medians. Coefficients in the linear regression models were considered statistically significant when their 95% confidence interval did not include zero.

Results

Over the 7-year period from October 2000 to December 2007, 26 centenarians presented to our institution with hip fracture (0.68% of the total hip fracture patients). The mean age was 102 years (range, 100–105 years). There were 3 men and 23 women. Three centenarians were excluded from the study according to our pre-defined exclusion criteria; two of them did not survive the initial injury and died within 48 h, while one was pain-free and too frail to have an operation and was treated non-operatively. The mean age of the non-centenarians was 80.5 years (range, 75–85 years). There were nine men and 41 women. One non-centenarian patient refused surgery.

Table 1 gives the baseline characteristics of acute hospital stay, delay in surgery, ASA grade, admission source, pre-op mobility, heart disease, pneumonia and CVA. None of the patients in either group had CCF, past history of pulmonary embolus, pneumonia, or CVA. However, 12% of centenarians had a mean delay in surgery of 3.6 days while non-centenarians had their surgery within a mean of 1.9 days, which was not statistically significant (p = 0.241). 10% of the centenarians were admitted from a nursing home while only 9% of the non-centenarians came from a nursing home (p = 0.038).

There was a statistically significant difference between the pre-fracture walking abilities of the two groups of patients (p = 0.053). Interestingly there was no statistically significant difference (p = 0.32) between the ASA grade and medical co-morbidities of centenarians and non-centenarians although 12% of centenarians had an ASA grade of III–IV. The mortality for centenarians in our study was similar to previous studies.2,12 Our in-patient and 30-day mortalities in centenarians was 17.3 and 30.4%, respectively, while in non-centenarians they were 2 and 4.1%, respectively.

Discussion

Hospital stay

A number of studies have shown that advancing age is associated with increased length of hospital stay after hip fracture surgery.6,7,10 Equally some studies have shown that the mean length of stay on the acute orthopaedic ward is not significantly different between age groups.4,12 In our study we found that centenarians stay in acute orthopaedic unit 5.8 days (unadjusted; 95% CI 2.3–9.2 days) longer than non-centenarians, which obviously has implications for bed occupancy. After adjusting for covariates the difference in mean hospital stay was not statistically significant; this could be because we had a small number in our study group.

Our data showed that surgery in centenarians was delayed by a mean of 3.6 days as compared to 1.9 days in non-centenarians, primarily due to the need to optimise physiologically this often frail group of patients. Though this was not statistically significant, it further contributes to bed occupancy rate.

Cost implications

According to Lawrence et al., the acute cost of treating a hip fracture is £12,163, of which ward stay amounted for 84%. Mean daily cost in an acute orthopaedic ward was estimated at £433.9 In our centenarian cohort this would amount to an overall extra cost of £2511 (£2208 if the adjusted mean difference of 5.1 days is used). Centenarians are thus a unique group of patients requiring extra resources when treating hip fractures.

Limitations

Though this is the largest series examining acute hospital stay and delays in surgery in centenarians, there are several limitations which must be considered when interpreting the results. Firstly, this is an observational study and therefore less accurate and more prone to bias than a protocol driven, case controlled, prospective study. Secondly, missing values are always an issue in such research. Missing values were imputed by the median (for ease) but it was not felt that more sophisticated methods were warranted, given the very few missing values. For a review of the general problem the reader is directed to the paper by Engels et al.1

Conclusion

The acute care of hip fractures in centenarians poses an increasing challenge. Any hospital treating centenarians for hip fracture should

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Table 1

Baseline characteristics of centenarians and cohort of 75–85 years old hip fracture patients.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Centenarians</th>
<th>75–85 years cohort</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital stay (mean, 95% CI)</strong></td>
<td>20.7 (14.5–26.8)</td>
<td>14.9 (12.2–17.6)</td>
<td>0.01</td>
</tr>
<tr>
<td>Delay in surgery (mean, 95% CI)</td>
<td>3.65 (0.59–6.7)</td>
<td>1.9 (0.45–3.37)</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Admission source</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own home</td>
<td>26.1% (6)</td>
<td>59.2% (29)</td>
<td>0.03</td>
</tr>
<tr>
<td>Residential home</td>
<td>30.4% (7)</td>
<td>20.4% (10)</td>
<td></td>
</tr>
<tr>
<td>Nursing home</td>
<td>43.5% (10)</td>
<td>18.4% (9)</td>
<td></td>
</tr>
<tr>
<td>Hospital transfer</td>
<td>0% (0)</td>
<td>2% (1)</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-op mobility</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(median, inter-quartile range)</td>
<td>4 (1,5)</td>
<td>1 (1,5)</td>
<td>0.05</td>
</tr>
<tr>
<td>ASA grade (median, inter-quartile range)</td>
<td>III (II, IV)</td>
<td>II (I, III)</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>Heart disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHF</td>
<td>26.1% (6)</td>
<td>12.2% (6)</td>
<td>0.18</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0% (0)</td>
<td>25% (1)</td>
<td>1.00</td>
</tr>
<tr>
<td>CVA</td>
<td>4.3% (1)</td>
<td>14.3% (7)</td>
<td>0.42</td>
</tr>
</tbody>
</table>

*Percent, (Percent, numbers).
consider changing its costing criteria as this paper demonstrates. We recommend that costing in centenarians should take into account an extended stay in an acute orthopaedic unit. A large multi-centre case controlled study is further needed for improved power.

Conflict of interest

None.

Acknowledgement

We are grateful to R. Hamilton and her colleague involved in the Hip Fracture Audit in Hull Royal Infirmary.

References