INCREASING RISK OF POST-SURGERY INFECTIONS AMONG HIP FRACTURE PATIENTS: A NATIONWIDE STUDY 2005-2016

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DISCLOSURES:

• Kaja E. Kjørholt, Søren P. Johnsen, Nickolaj R. Kristensen and Alma B. Pedersen declare that they have no conflict of interest.
• Daniel Prieto-Alhambra’s department has received unrelated industry funding in the forms of: 1. research grants from Amgen and UCB Biopharma; 2. consultancy fees from UCB; and speaker fees from Amgen.
Background: Post-surgery infections
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- 10% Mortality within 30 days after surgery
- 30% Mortality within 1 year after surgery

Background:
- Post-surgery infections
  - 10% Mortality within 30 days after surgery
  - 30% Mortality within 1 year after surgery
Background: Post-surgery infections

- Pneumonia is one of the leading causes of death among hip fracture patients (1-3)

Background: Post-surgery infections

- 9-11% develop pneumonia \(^{(4-7)}\)
- 4-18% develop urinary tract infection \(^{(4-6)}\)

within a varying follow-up time after hip fracture surgery

4. Roche JJ et al. 2005
6. Folbert EC et al. 2017
7. Hansson S et al. 2015
Background: Post-surgery infections

- Data on recent trends in the risk of infections is lacking
Objective

- To examine temporal trends in the risk of infections following hip fracture surgery in Denmark from 2005 to 2016
- Compare the trends of infections in hip fracture patients with a trend in the general population cohort
Methods

Data sources

Danish National Health Service Prescription Database

Danish National Patient Register

Danish Multidisciplinary Hip Fracture Registry

Danish Civil Registration System

We conducted a population-based cohort study, based on individual-level linkage of 4 different nationwide registries.
Methods

Study population

Danish Multidisciplinary Hip Fracture Registry

*Hip fracture cohort:*
- Age >65 years
- First-time hip fracture, 2005-2016
Methods

Study population

**Hip fracture cohort:**
Age >65 years
First-time hip fracture, 2005-2016

74,771 Patients undergoing hip fracture surgery
**Study population**

**Hip fracture cohort:**
- Age > 65 years
- First-time hip fracture, 2005-2016

> 74,771 Patients undergoing hip fracture surgery

**General population cohort:**
- Matched 5 persons on age and gender from the general population to each hip fracture patient
**Outcome**

Hospital-treated infection:
- Any infection
- Pneumonia
- Urinary Tract Infection

Community-based infection = dispensing antibiotics outside hospital:
- Any antibiotics
- Narrow-spectrum
- Broad-spectrum

Calendar period of hip fracture surgery

Methods
Methods

Statistical analysis: **Within 30 days after surgery:**

- Cumulative incidences of infection, considering death as competing risk
- Risk Ratio (RR):
  - Operation year 2005-2006 as reference
- Hazard Ratio (HR) to compare the risk with the matched cohort from the general population
  - General population cohort as reference
### Any hospital-treated infection in hip fracture pt.: 30 Days

<table>
<thead>
<tr>
<th>Calendar Period of Operation</th>
<th>Number of Infections</th>
<th>Cumulative Incidence % (95% CI)</th>
<th>Adjusted* Risk Ratio (RR) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2006</td>
<td>1,339</td>
<td>10.8% (10.2-11.3)</td>
<td>Reference</td>
</tr>
<tr>
<td>2007-2008</td>
<td>1,482</td>
<td>11.2% (10.7-11.7)</td>
<td>1.03 (0.96-1.10)</td>
</tr>
<tr>
<td>2009-2010</td>
<td>1,679</td>
<td>13.2% (12.6-13.8)</td>
<td>1.21 (1.13-1.30)</td>
</tr>
<tr>
<td>2011-2012</td>
<td>1,690</td>
<td>13.3% (12.7-13.9)</td>
<td>1.22 (1.14-1.31)</td>
</tr>
<tr>
<td>2013-2014</td>
<td>1,771</td>
<td>14.4% (13.8-15.0)</td>
<td>1.32 (1.23-1.41)</td>
</tr>
<tr>
<td>2015-2016</td>
<td>1,631</td>
<td>14.3% (13.7-15.0)</td>
<td>1.32 (1.23-1.41)</td>
</tr>
</tbody>
</table>

*Adjusted by age, comorbidity level and sex
Any hospital-treated infection: Hip fracture vs general population

30 Days Cumulative incidence-%

Time Trends of 30 Days Adjusted HR
<table>
<thead>
<tr>
<th>Calendar Period of Operation</th>
<th>Cumulative Incidence % (95 % CI)</th>
<th>Adjusted Cumulative Risk Ratio (95 % CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2006</td>
<td>5.7 (5.3-6.1)</td>
<td>Reference</td>
</tr>
<tr>
<td>2007-2008</td>
<td>5.5 (5.1-5.9)</td>
<td>0.99 (0.89-1.10)</td>
</tr>
<tr>
<td>2009-2010</td>
<td>6.0 (5.6-6.4)</td>
<td>1.01 (0.91-1.12)</td>
</tr>
<tr>
<td>2011-2012</td>
<td>6.0 (5.6-6.4)</td>
<td>1.05 (0.95-1.16)</td>
</tr>
<tr>
<td>2013-2014</td>
<td>6.5 (6.1-7.0)</td>
<td>Reference</td>
</tr>
<tr>
<td>2015-2016</td>
<td>6.5 (6.1-7.0)</td>
<td>1.02 (0.92-1.13)</td>
</tr>
<tr>
<td>2017-2018</td>
<td>6.0 (5.6-6.4)</td>
<td>1.05 (0.95-1.16)</td>
</tr>
</tbody>
</table>

Results

Hospital-treated infection in hip fracture pt.: 30 Days

<table>
<thead>
<tr>
<th>Calendar Period of Operation</th>
<th>Cumulative Incidence % (95 % CI)</th>
<th>Adjusted Cumulative Risk Ratio (95 % CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2006</td>
<td>3.7 (3.4-4.0)</td>
<td>Reference</td>
</tr>
<tr>
<td>2007-2008</td>
<td>4.2 (3.8-4.5)</td>
<td>1.10 (0.96-1.26)</td>
</tr>
<tr>
<td>2009-2010</td>
<td>5.3 (4.9-5.7)</td>
<td>1.42 (1.25-1.61)</td>
</tr>
<tr>
<td>2011-2012</td>
<td>5.3 (4.9-5.7)</td>
<td>1.37 (1.20-1.56)</td>
</tr>
<tr>
<td>2013-2014</td>
<td>6.0 (5.6-6.4)</td>
<td>1.70 (1.50-1.92)</td>
</tr>
<tr>
<td>2015-2016</td>
<td>6.0 (5.6-6.4)</td>
<td>1.70 (1.50-1.92)</td>
</tr>
</tbody>
</table>

Urinary tract infection

Pneumonia
Hospital-treated pneumonia:
Hip fracture vs general population

30 Days Cumulative incidence

Time Trends of 30 Days Adjusted HR
### Results

Any community-based antibiotics in hip fracture pt. : 30 Days

<table>
<thead>
<tr>
<th>Calendar Period of Operation</th>
<th>Number of Prescriptions</th>
<th>Cumulative Incidence % (95% CI)</th>
<th>Adjusted* Risk Ratio (RR) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2006</td>
<td>2,179</td>
<td>17.5 (16.8-18.2)</td>
<td>Reference</td>
</tr>
<tr>
<td>2007-2008</td>
<td>2,472</td>
<td>18.7 (18.0-19.3)</td>
<td>1.05 (1.00-1.11)</td>
</tr>
<tr>
<td>2009-2010</td>
<td>2,702</td>
<td>21.2 (20.5-22.0)</td>
<td>1.21 (1.15-1.27)</td>
</tr>
<tr>
<td>2011-2012</td>
<td>3,023</td>
<td>23.8 (23.1-24.5)</td>
<td>1.35 (1.28-1.41)</td>
</tr>
<tr>
<td>2013-2014</td>
<td>3,187</td>
<td>25.9 (25.2-26.7)</td>
<td>1.47 (1.40-1.55)</td>
</tr>
<tr>
<td>2015-2016</td>
<td>3,082</td>
<td>27.1 (26.3-27.9)</td>
<td>1.54 (1.47-1.67)</td>
</tr>
</tbody>
</table>

*Adjusted by age, comorbidity level and gender
Community-based antibiotics in hip fracture pt.: 30 Days

Results

RR = 1.79 (95% CI 1.68-1.90)

RR = 1.56 (95% CI 1.47-1.62)

RR = 1.26 (95% CI 1.14-1.39)
Any community-based antibiotics: Hip fracture vs general population

30 Days Cumulative incidence - %

- Hip fracture cohort
- General population cohort

Time Trends of 30 Days Adjusted HR

- Any Community-based Antibiotic
### 30-days mortality risk after hospital-treated infection

<table>
<thead>
<tr>
<th>Postoperative infection within 30 days after surgery</th>
<th>Mortality rate pr. 1000 Person Years</th>
<th>Adjusted Hazard Ratio* (95 % CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8.43 (8.00-8.88)</td>
<td>2.72 (2.56-2.88)</td>
</tr>
<tr>
<td>No</td>
<td>3.34 (3.26-3.43)</td>
<td>Reference</td>
</tr>
<tr>
<td>Pneumonia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14.83 (13.92-15.79)</td>
<td>4.18 (3.91-4.48)</td>
</tr>
<tr>
<td>No</td>
<td>3.40 (3.32-3.48)</td>
<td>Reference</td>
</tr>
<tr>
<td>Sepsis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>33.14 (29.60-37.11)</td>
<td>8.86 (7.88-9.95)</td>
</tr>
<tr>
<td>No</td>
<td>3.63 (3.56-3.71)</td>
<td>Reference</td>
</tr>
<tr>
<td>Reoperation due to infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7.50 (4.78-11.76)</td>
<td>2.95 (1.88-4.64)</td>
</tr>
<tr>
<td>No</td>
<td>3.75 (3.67-3.84)</td>
<td>Reference</td>
</tr>
</tbody>
</table>

*Adjusted by age, comorbidity level, sex, marital status and current medication use
Conclusion

- We found increasing risk of hospital-treated post-surgery infections and antibiotic use among hip fracture patients from 2005-2016.

- The increase could not be explained by increase seen in general population.

- Any type of infection is associated with high mortality after hip fracture surgery.

- Thus, further focus on infections could potentially reduce high mortality in hip fracture patients.
Thank you for the attention

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