Recent in-hospital mortality trends among patients with heart failure in the Netherlands

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Purpose
From 1980 to 1993, in-hospital mortality among heart failure (HF) patients in the Netherlands decreased from 19 to 15%. However, more recent mortality data are lacking. This study describes in-hospital mortality rates among patients with HF in the Netherlands from 2005 to 2009.

Methods
Design
- A retrospective cohort study.

Setting
- The PHARMO database network including several linked databases, among which drug dispensing and hospitalization records of approximately 3.2 million residents in the Netherlands.

Study cohort
- Patients ≥18 years with a primary hospital discharge code for HF (ICD-9-CM codes 402.01, 402.11, 402.91, 428.0, 428.1, and 428.9) were selected.
- The date of the first HF admission between 2005 and 2008 was defined as the index date.
- Patients hospitalized for HF in the 12 months prior to index date were excluded.
- Patients were followed from the index date until the end of data collection, death, or a maximum of 12 months, whichever occurred first.

In-hospital mortality
- Crude in-hospital mortality rates were determined by dividing the number of deaths during an admission by the total number of admissions. No statistical adjustments were made.
- Crude mortality rates over time were determined during the index HF admission, during any HF readmission, and during any non-HF readmission (defined as ICD-9-CM codes for any reason other than ICD-9-CM codes for HF) during follow-up.
- Length of stay (LOS) of (re)admission and number of days between (re)admission and death were determined.

Table 1: Characteristics of patients with an index HF admission, HF readmission, and non-HF readmission

<table>
<thead>
<tr>
<th>Gender</th>
<th>Index HF admission N = 9,786 n (%)</th>
<th>HF readmission N = 1,563 n (%)</th>
<th>Non-HF readmission N = 4,542 n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>4,656 (48)</td>
<td>752 (48)</td>
<td>2,349 (52)</td>
</tr>
<tr>
<td>Female</td>
<td>5,130 (52)</td>
<td>811 (52)</td>
<td>2,193 (48)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-64</td>
<td>1,392 (14)</td>
<td>196 (13)</td>
<td>778 (17)</td>
</tr>
<tr>
<td>65-74</td>
<td>2,013 (21)</td>
<td>340 (22)</td>
<td>1,075 (24)</td>
</tr>
<tr>
<td>75-84</td>
<td>3,850 (39)</td>
<td>650 (42)</td>
<td>1,790 (39)</td>
</tr>
<tr>
<td>≥85</td>
<td>2,531 (26)</td>
<td>377 (24)</td>
<td>899 (20)</td>
</tr>
<tr>
<td>mean ± SD</td>
<td>77 ± 11</td>
<td>77 ± 11</td>
<td>75 ± 11</td>
</tr>
</tbody>
</table>

Results
- Of the total of 9,786 patients hospitalized for HF, mean (±SD) age was 77 (±11) years and 52% was female (Table 1).
- During follow-up, 1,563 (18%) patients were readmitted for HF and 4,542 (51%) patients had a non-HF readmission (Table 1).
- Per year of index date, characteristics of patients with an index HF admission, HF readmission, and non-HF readmission did not differ (data not shown).
- In-hospital mortality (Figure 1 and 2)
  - Mortality rates and LOS over time were stable.
  - Index HF admission: 10% of patients died (mean (±SD) LOS of 11 (±10) days)
  - HF readmission: 10% of patients died (mean (±SD) LOS of 11 (±9) days)
  - Non-HF readmission: 5% of patients died (mean (±SD) LOS of 7 (±11) days)
- Number of days between hospital admission and death (data not shown)
  - Mean (±SD) number of days between hospital admission and death was 10 (±13) days for the index HF admission.
  - Mean (±SD) number of days between hospital readmission and death was 12 (±12) days for HF readmission as well as for non-HF readmission (12 (±15) days).

Conclusion
- Compared to published 1993 data, in-hospital mortality among HF patients in the Netherlands decreased. However, in most recent years, in-hospital mortality remains unchanged with 10% of HF patients dying during HF admission, indicating that there still may be opportunity for improvement of outcomes in this hospitalized population.

Figure 1: In-hospital mortality rates among patients with HF
Figure 2: Mean LOS per admission for patients with HF