Heart failure epidemiology 2000–2013: insights from the German Federal Health Monitoring System

Michael Christ1*, Stefan Störk2, Marcus Dörr3, Hans J. Heppner4, Christian Müller5, Rolf Wachter6, and Uwe Riemer7, for the Trend HF Germany Project

1Department of Emergency and Critical Care Medicine, Paracelsus Medical University Nuremberg, Prof. Ernst Nathan Strasse 1, D–90419, Nuremberg, Germany;
2Comprehensive Heart Failure Centre, University of Würzburg, Würzburg, Germany; Department of Internal Medicine I – Cardiology, University Hospital Würzburg, Würzburg, Germany;
3DZHK (German Centre for Cardiovascular Research), Partner Site Greifswald, University Medicine Greifswald, Greifswald, Germany; Department of Cardiology, University Medicine Greifswald, Germany;
4Department of Geriatrics, HELIOS Klinikum Schwelm, University of Witten/Herdecke, Schwelm, Germany; 5Department of Cardiology, University Hospital Basel, Basel, Switzerland; 6Clinic for Cardiology and Pneumology, University Medicine Göttingen, Göttingen, Germany; DZHK (German Cardiovascular Research Centre), partner site Göttingen, Göttingen, Germany; 7Novartis Pharma GmbH, Medical Affairs, Nuremberg, Germany

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Aims
Considerable differences in the long-term trends of heart failure (HF) exist between different countries. To extend the existing knowledge on HF epidemiology in Germany, we analysed trends of HF-related hospitalizations, hospital days and in-hospital deaths during a 14-year period (2000–2013).

Methods and results
Data were derived from the official German Federal Health Monitoring System, which includes an annual and complete enumeration of inpatients at the time of discharge from the hospital. HF cases were identified by the primary diagnosis code for HF (I50). From 2000 to 2013, the absolute number of HF-related hospitalizations increased by 65.4% (239 694–396 380 cases) and by 28.4% after age-standardization (261–335 per 100 000 population). Accordingly, the absolute number of HF-related hospital days increased by 22.1% (3.4–4.2 million hospital days), despite a marked decrease by 25.9% in average length of stay (14.3–10.6 days). With approximately 35 000 in-hospital deaths (∼45 per 100 000 population), the annual number of HF-related in-hospital deaths remained consistently high, and in-hospital mortality rate in HF patients constituted 9.3% in 2013. Patients aged >65 years were disproportionately affected. In 2013, HF was the leading cause of disease-related hospitalizations and in-hospital deaths, representing 2.1% and 8.8% of all cases, respectively.

Conclusion
In Germany, the burden of HF is growing further, and the risk of death in HF remains high. These trends can only be partly attributed to demographic developments suggesting an exigent need for increased awareness and enhanced efforts in the prevention and management of HF.

Keywords
Heart failure • Germany • Epidemiology • Hospitalization • In-hospital mortality

Introduction
The epidemiological burden of heart failure (HF) is tremendous, with an estimated 26 million people affected worldwide, leading some to describe it as a global epidemic.1,2 Despite this, data on prevalence and, in particular, incidence of HF often lack validity and consistency.2 Reported prevalence rates of HF vary over a wide range, highlighting the need for a detailed description of national trends in HF-related hospitalization and mortality.1,2 The annual number of hospitalizations is higher in Germany, compared with other European countries.1 Hence, large amounts of data on inpatients with HF have been collected and well documented.2,4 To extend the existing epidemiological data on HF, we analysed temporal trends of HF-related hospitalizations, hospital days and in-hospital deaths in Germany during a 14-year period (2000–2013).

*Corresponding author. Tel: +49 911 398 2369, Fax: +49 911 398 3167, Email: michael.christ@klinikum-nuernberg.de

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Methods

Data source
Administrative data on inpatients with HF in Germany were obtained from the German Federal Health Monitoring System (Gesundheitsberichterstattung des Bundes), an annual census of inpatient characteristics in all German hospitals provided by the Federal Statistical Office. Data were selected using the primary discharge diagnosis ‘heart failure’ (HF; I50) using the German Modification of ICD-10 (ICD-10-GM). Data collection is mandatory owing to regulatory requirements. Statistical information includes sex, age, primary diagnosis at the time of discharge from the hospital, place of residence and treatment, length of stay, and vital status at discharge.

Ethics statement
Ethical approval was waived by the Ethics Committee of the Friedrich-Alexander-University Erlangen-Nuremberg, Germany, because of the retrospective nature of this analysis, which was conducted in accordance with the Declaration of Helsinki. All data have been routinely collected during clinical practice, therefore written and informed consent from subjects under study for anonymized storage of information and its use for research was not needed.

Data extraction and analysis
The analyses cover a period of 14 years (2000–2013) and use the most recent data available. The database comprises all hospitalized HF cases identified by the German Federal Health Monitoring System (‘diagnosis-related groups’, DRG) have any effect on the coding of discharge diagnosis.

Results

Trends in hospitalization for heart failure
The absolute number of hospitalizations owing to HF increased from 239,694 in 2000 to 396,380 in 2013 (65.4%; Figure 1). After age-standardization, the increase in HF-related hospitalizations was 28.4% (i.e. from 261 to 335 per 100,000 population; Figure 2a). Across all age groups, the rate of HF-related hospitalizations per 100,000 population was consistently higher for male than for female patients. However, the increase in HF-related hospitalization rates was more pronounced in men (men 33.2%, women 21.2%). Sex-specific increase in HF-related admission rates was found in most age groups (Figure 2b).

Between 2000 and 2013, approximately two-thirds of patients diagnosed with HF were aged ≥75 years; in 2013, 31% vs. 69% of HF-related hospitalizations occurred in patients aged <75 years vs. ≥75 years, respectively. Only a few HF cases were reported in patients aged <45 years (Figure 3). There was a significant increase in HF-related hospitalizations across all age groups, the most pronounced being in the age group 75 to <85 years (89.6%), followed by the age group ≥85 years (62.6%). Using narrower age categories does not meaningfully alter these findings.

Comparison of heart failure-related and overall disease-related trends
Long-term trends of HF-related hospitalizations and hospital days substantially differed from those found for all discharge diagnoses in Germany during the observation period (Figure 1). While the number of HF-related hospitalizations markedly increased by 65.4% between 2000 and 2013, the number of overall hospitalization remained constant until 2006 and only modestly increased during subsequent years (12.0%). A short-term deviation from HF trends occurred in 2004, coincident with (and probably related to) the ICD-10 modification (ICD-10-GM) in Germany (see the Methods section). Heart failure-related hospital days increased by 22.1% [3.4 million days (2000) to 4.2 million days (2013)], whereas the overall number of hospital days in Germany decreased by 12.6% during this period. In contrast to hospitalizations and hospital days, the numbers of both HF-related and overall in-hospital deaths remained constant at approximately 35,000 and 400,000 per year, respectively (Figure 1).
In 2013, a total of 2.1% of all hospitalizations, 2.9% of all hospital days, and 8.8% of all in-hospital deaths were related to HF (see the Supplementary material online, Figure S1), resulting from continuously rising numbers of HF cases and constant numbers of HF-related in-hospital deaths. Accordingly, HF was the most common cause of disease-related hospitalization, the second leading cause of hospital days (preceded by the diagnosis of recurrent depressive disorder), and the leading cause of in-hospital deaths in 2013, followed by pneumonia, acute myocardial infarction, and neoplasms of bronchus and lung (Table 1).

Heart failure-related hospital days and length of stay

In 2000, the absolute number of HF-related hospital days (3.4 million) had been substantially lower for male than for female HF patients (1.4 vs. 2.0 million). Until 2013, the increase in the number of HF-related hospital days was more pronounced in male patients (46.4%) than in female patients (5.3%). Hence, sex-based differences were nullified and the absolute number of HF-related hospital days was 2.1 million for both male and female patients (total: 4.2 million; see the Supplementary material online, Table S1). During the same period, the average length of stay for HF patients decreased from 14.3 days to 10.6 days (total −25.9%; female −28.1%, male −23.7%), paralleling and even exceeding the overall decrease of the average length of stay for any diagnosis from 9.7–7.6 days (total −21.6%; female −21.6%, male −21.9%; see the Supplementary material online, Table S2). As patient age and average length of stay did not correlate, the number of hospital days per age group corresponds to the number of cases, as represented above.

In-hospital deaths

Between 2000 and 2013, the annual number of HF-related in-hospital deaths remained consistently high (in 2013 there were 36,717 deaths: i.e. 45 per 100,000 population). Absolute numbers and the rate of in-hospital death per 100,000 population were consistently higher in female HF patients than in male HF patients (see the Supplementary material online, Figure S2 and Table S3). In 2013, the absolute number of HF-related in-hospital deaths comprised 19,749 female and 16,968 male patients. Thus, the male proportion increased from 41.1% in 2000 to 46.2% in 2013 (see the Supplementary material online, Figure S2). In 2013, there were 48 vs. 43 HF-related in-hospital deaths per 100,000 population in women and men, respectively (see the Supplementary material online, Table S3).

Overall, in-hospital mortality rate in HF inpatients dropped from 14.8% in 2000 to 9.3% in 2013 (female 9.7%, male 8.8%). In 2013, HF mortality accounted for 8.8% of all cases of in-hospital deaths with marked differences in the rates between female and male patients (9.8% vs. 7.8%; see the Supplementary material online, Figure S2). Within each age group, the number of HF-related in-hospital deaths per 100,000 population declined between 2000 and 2013, with less pronounced declines in older age groups (see the Supplementary material online, Table S3). Heart failure disproportionately affected elderly people, as is evident from the higher numbers of admissions, hospital days, and of in-hospital deaths (Figure 3, see the Supplementary material online, Tables S1 and S3).

Discussion

The present study analysed temporal trends of HF burden in Germany yielding the following main results: (i) in contrast to the
overall development in all diagnoses, absolute numbers of both HF-related hospitalizations and hospital days markedly increased between 2000 and 2013 by 65.4% and 22.1%, respectively; (ii) this increment of HF burden was observed across all age groups and was most pronounced in subjects aged >65 years; (iii) the number of HF-related in-hospital deaths remained consistently high; and (iv) in 2013, HF was the leading cause of disease-related hospitalizations, the second leading cause for hospital days, and the leading cause of in-hospital deaths. Our analysis corroborates and extends previous findings on a still growing burden of HF in
Heart failure disproportionately affects older patients supporting the need for improvement of HF care, particularly in this population.

In 2013, HF accounted for 2.1% of all hospitalizations, 2.9% of all hospital days and 8.8% of in-hospital deaths in Germany. These data support the notion that HF-related hospitalizations are frequent and that HF is the major reason for in-hospital mortality. In 2013, the top five diagnostic categories in terms of hospital days comprised two somatic diseases (stroke and HF) and three mental disorders. Stroke-related hospitalization contributed to 29% fewer hospital days compared with HF (4 194 103 HF vs. 2 979 430 stroke days; Table 1). Heart failure was also the leading cause of in-hospital death—considerably higher than pneumonia and acute myocardial infarction, which account for 28% and 45% less in-hospital deaths, respectively, compared with HF. In summary, the burden of HF remains excruciatingly high and is associated with very high health-care costs. Although we cannot provide further data on hospital costs on HF-related hospitalization or health-care expenditure, the cost of care for HF patients is estimated to be over 2.9 billion euros in Germany.7 Hospitalizations account for the majority of the economic burden of HF care,1–7 which represents about 1–3% of total health-care expenditure in developed countries and is expected to rise further.1

Heart failure is a clinical syndrome and a high proportion of HF cases may result from previous myocardial infarction. However, the source of the data presented does not allow further conclusion because of the lack of coding of HF aetiology. Future studies may analyse further details and relations in order to improve the prevention of HF and related morbidity and mortality.1

### In-hospital mortality

Between 2000 and 2013, the annual absolute number of HF-related in-hospital deaths in Germany remained consistently high at approximately 35 000. Owing to the steady increase in hospitalizations for HF, the in-hospital mortality rate in HF patients has continuously declined. In face of the recent efforts aimed at improving prevention, diagnosis and management of HF, the number of HF-related in-hospital deaths and its 8.8% share in the total in-hospital mortality are still alarmingly high and HF remains the leading cause of in-hospital deaths.

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**Table 1** Top five list of coded primary diagnoses in Germany (year 2013). The leading causes of hospital admissions, hospital days, and in-hospital deaths in 2013 (diagnosis, ICD-10-GM code, absolute number of cases) are displayed

<table>
<thead>
<tr>
<th>Hospital admissions</th>
<th>Hospital days</th>
<th>In-hospital deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live-born infants</td>
<td>Recurrent depressive disorder</td>
<td>Heart failure</td>
</tr>
<tr>
<td>(Z38) (n = 483 183)</td>
<td>(F33) (n = 4 804 461)</td>
<td>(I50) (n = 36 717)</td>
</tr>
<tr>
<td>Heart failure (I50)</td>
<td>Heart failure</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>(n = 396 380)</td>
<td>(I50) (n = 4 194 103)</td>
<td>(I18) (n = 26 389)</td>
</tr>
<tr>
<td>Mental and behaviour disorders caused by alcohol (F10)</td>
<td>Depressive episode</td>
<td>Acute myocardial infarction</td>
</tr>
<tr>
<td>(n = 338 204)</td>
<td>(F32) (n = 3 894 591)</td>
<td>(I21) (n = 20 033)</td>
</tr>
<tr>
<td>Atrial fibrillation and atrial flutter (I48)</td>
<td>Cerebral infarction</td>
<td>Other sepsis</td>
</tr>
<tr>
<td>(n = 280 977)</td>
<td>(I63) (n = 2 979 430)</td>
<td>(A41) (n = 17 392)</td>
</tr>
<tr>
<td>Intracranial injury (S06)</td>
<td>Schizophrenia</td>
<td>Malignant neoplasm of bronchus and lung</td>
</tr>
<tr>
<td>(n = 256 875)</td>
<td>(F20) (n = 2 841 305)</td>
<td>(C34) (n = 16 781)</td>
</tr>
</tbody>
</table>

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Table 2 Temporal trends of heart failure-related hospitalizations, length of stay and in-hospital mortality in different countries worldwide

<table>
<thead>
<tr>
<th>Region and reference</th>
<th>Time period</th>
<th>Selection criteria</th>
<th>Inclusion</th>
<th>Temporal trends (absolute numbers)</th>
<th>Temporal trends (hospitalizations per 100000 inhabitants)</th>
<th>Temporal trends (length of stay)</th>
<th>Temporal trends (in-hospital mortality)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada17</td>
<td>1994–2004</td>
<td>428/150 (ICD 9/ICD 10)</td>
<td>Hospital Morbidity Database (patients ≥20 years old)</td>
<td>▼ (Cases: 56484–53706)</td>
<td>▼ crude: 268.6–223.3; age- and sex-standardized: 260.1–189.3</td>
<td>n/a</td>
<td>▼ Cases: 4760–4533</td>
</tr>
<tr>
<td>England14</td>
<td>2004/5–2010/11</td>
<td>I11.0, I13.0, I13.2, I50, J81 (ICD 10)</td>
<td>National observational study</td>
<td>n/a</td>
<td>▼ 6.96–5.6</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>France18</td>
<td>2002–2012</td>
<td>I50 (about 96.5% of patients included), I11.0, I13.0, I13.2; additionally I13.9, J81 and K76.1 if to a discharge diagnosis ISO, I11.0, I13.0, or I13.2 (ICD 10)</td>
<td>French national hospitalization database</td>
<td>n/a</td>
<td>≈ 2012: crude: 246.4; age-standardized: 246.2</td>
<td>2012: 9.9 days</td>
<td>Relative change in case fatality rate: −12.9% (m), −13.7% (f)</td>
</tr>
<tr>
<td>Ireland15</td>
<td>2002–2010</td>
<td>I50 (ICD 10)</td>
<td>Cross-sectional data from Eurostat database</td>
<td>n/a</td>
<td>▼ Age-standardized: 157.3–127.2</td>
<td>▼ 12.0–12.4 days</td>
<td>n/a</td>
</tr>
<tr>
<td>Italy21</td>
<td>2001–2003</td>
<td>402.01, 402.11, 402.91, 404.01, 404.03, 404.011, 404.013, 404.91, 404.93, 428.0, 428.1, 429.9 (ICD 9)</td>
<td>Analysis of hospitalization discharge reports</td>
<td>▲ (Cases: 193042–211183)</td>
<td>▲ 315–329 (m)/301–322 (f)</td>
<td>▲ 10.2–9.8 days</td>
<td>▲ Case fatality rate: 7.85–8.19%</td>
</tr>
</tbody>
</table>
### Table 2 Continued

<table>
<thead>
<tr>
<th>Region and reference</th>
<th>Time period</th>
<th>Selection criteria</th>
<th>Inclusion</th>
<th>Temporal trends (absolute numbers)</th>
<th>Temporal trends (hospitalizations per 100,000 inhabitants)</th>
<th>Temporal trends (length of stay)</th>
<th>Temporal trends (in-hospital mortality)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand&lt;sup&gt;16&lt;/sup&gt;</td>
<td>1988–2008</td>
<td>428, 429.1, 429.3, 402, 422, 425, 429.0, 429.4; also 393–398, 410–414 and 424 if to a secondary diagnosis of 428, 429.1, or 429.3 (ICD 9)</td>
<td>New Zealand Health Information Service (patients ≥18 years old)</td>
<td>↓ (Cases, 2000–2008: 12,455–10,829)</td>
<td>↓ 1998–2008: age-standardized: 244–174.3 (m)/155.3–106.9 (f)</td>
<td>≈ 5 days</td>
<td>n/a</td>
</tr>
<tr>
<td>Spain&lt;sup&gt;22&lt;/sup&gt;</td>
<td>2003–2011</td>
<td>428 (ICD 9)</td>
<td>National Institute of Statistics</td>
<td>↑ (Cases: increase in patients ≥65 years old twofold greater than population growth)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Sweden&lt;sup&gt;19&lt;/sup&gt;</td>
<td>1990–2007</td>
<td>150 (ICD 10) from 1997 onwards (principal or contributory diagnosis)</td>
<td>Swedish National Inpatient Register (patients 19–99 years old)</td>
<td>≈ (Cases, 2000–2007: 143,862–144,925)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>USA&lt;sup&gt;23&lt;/sup&gt;</td>
<td>2000–2010</td>
<td>428.0 and 428.2–428.4 (ICD 9)</td>
<td>National Hospital Discharge Survey</td>
<td>≈ (Cases: about 1,000,000 every year)</td>
<td>≈ 355–328</td>
<td>n/a</td>
<td>≈ Case fatality rate: 3–3% in patients &lt;65 years old, 5–4% in patients ≥65 years old</td>
</tr>
<tr>
<td>USA&lt;sup&gt;12&lt;/sup&gt;</td>
<td>2001–2009</td>
<td>402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428 (ICD 9)</td>
<td>National inpatient sample (patients ≥18 years old)</td>
<td>↓ Cases: 999,801–802,796</td>
<td>↓ 633–463</td>
<td>5.6–5.3 days</td>
<td>↓ Case fatality rate: 4.5–3.3%</td>
</tr>
</tbody>
</table>

n/a, Not available; ↓, decrease; ↑, increase; ↘, mild decrease; ↗, mild increase; ≈, stable; m, male; f, female.
In addition, the reduction in the length of hospital stay of HF patients may relate to higher frequencies of adverse post-discharge events, including HF-related death. An observational study of 6,955-461 Medicare fee-for-service hospitalizations for HF in the USA showed that reduction of length of stay was associated with a steady decline in in-hospital mortality. This 28.1% considerable reduction of length of stay (roughly 9–6 days) was associated with a continuous rise in post-discharge mortality. Dutch data report a positive association between in-hospital mortality rate and length of hospital stay, and an inverse association between in-hospital mortality rate and early post-discharge mortality corroborating HF-specific US data. Indeed, we also observed a >25% reduction in length of hospital stay and a significant decline in in-hospital mortality rate in HF patients. However, data on post-discharge mortality are lacking in Germany. Thus, we cannot elucidate whether or not this also translates into benefits or even disadvantages in 30-day mortality risk and propose to implement measures to survey the overall quality of health-care in HF patients.

Age- and sex-related aspects

Most HF-related hospitalizations, hospital days, and in-hospital deaths occurred in adults aged >65 years, reflecting both the nature of the disease as well as the aging population with the associated burden of co-morbidities in an industrialized country. Improved conditions of living, in addition to successful preventive measures and medical and non-medical management of other cardiac diseases such as acute myocardial infarction, improved survival but mediated a subsequently increased susceptibility of survivors to HF. Nowossadeck showed that increases in HF-related hospitalizations in Germany between 2000 and 2009 (+51.9%) were caused not only by demographic aging (+22.0%) but also by changed risk patterns for hospitalization (+24.5%). In the present study, the increase in HF-related hospitalizations per 100,000 population between 2000 and 2013 was 28.4% after age-standardization, thus suggesting yet to be identified additional mechanisms that are at least partly responsible for the increase in HF hospitalizations in Germany.

Correlation with other diagnoses is not feasible because of the database structure in Germany. We hypothesize that socioeconomic factors as well as changes in risk patterns (e.g. improved survival of acute myocardial infarction resulting in increased susceptibility to HF) are possible contributors. In addition, increases in age-standardized HF-related hospitalization may reflect changes in hospitalization patterns and/or an increase in re-hospitalizations owing to factors such as reduction in length of stay or a better survival in preceding admissions for worsening HF or a potential increase in preventable or avoidable hospital admissions. Our analysis also shows that in 2013, middle-aged patients <75 years contributed to more than 120,000 HF-related hospitalizations and almost 1.3 million hospital days, respectively.

In 2000, the proportion of female patients hospitalized for HF was considerably higher than that of male patients. In line with Nowossadeck, we are convinced that this reflects an imbalanced sex distribution in the elderly resulting from a more distinct longevity in women and an excess in death in men that served in World War II, rather than a higher susceptibility to HF in women. At present, we are caring for HF patients who were born after 1930, which may explain the converging numbers of male and female HF patients in 2013.

Similarly, HF-related in-hospital deaths in female patients were consistently higher but tended to converge with those of male patients, which may predominantly reflect the demographic trends already mentioned. Despite the apparently higher proportion of HF mortality in female patients (see the Supplementary material online, Figure S1 and S2C), the higher number of male patients affected in each individual age group per 100,000 population (Figure 2) suggests the disproportionate aging patterns in male and female patients as a plausible explanation.

Comparison with international trends

During the first decade of the 21st century, declining trends of HF hospitalizations were reported in the USA, Australia, England, Ireland, New Zealand, and Canada or unchanged. Comparing HF-related hospitalizations, however, were observed in the Netherlands, Italy, Spain, and Germany (Figure 1, Table 2). Interpretation of temporal trends of HF-related hospitalizations among different countries are challenging because of different definitions of enrolment criteria and reporting of data. Possibly, the German-specific reimbursement system, which was introduced in 2004, may have improved quality of coding. However, the reimbursement system has not changed during recent years, while HF-related cases have substantially increased in this period (Table 7). It is tempting to speculate whether this increase in Germany is related to the aging population and/or improvement of diagnostic procedures. While HF-related length of stay within the hospital is decreasing, in-hospital mortality caused by HF remains consistently high. With some authors reporting decreases, no changes, or even increased rates of HF-related mortality: Comparable to reports on acute myocardial infarction, comparisons and in-depth analyses of epidemiological data among countries might help to identify further options for improved HF management.

Limitations and strengths

Some limitations of the present analyses warrant discussion. First, the hospital discharge statistics used for our analyses solely provide inpatient data. Thus, the results of the present study cannot be extrapolated to outpatient population. Moreover, they do not cover information regarding diagnostics, NYHA class, ejection fraction, and treatment. Nevertheless, this is a complete survey of all German hospitals, corroborating and extending previous data from Germany and other countries confirming the high burden of HF. The respective data sources have also been shown to provide an internal confirmation of inpatient HF diagnosis in 98% of cases. Second, hospital discharge statistics are event-based and not person-based; hence, the hospitalization count refers to all events within the course of the same year precluding firm conclusions on the number of patients affected. Nevertheless, this impression
does not apply to either the total number of HF-related hospital days (a composite measure per se) or the number of in-hospital deaths (an individual event). Third, the ICD-10 modification and the concurrent introduction of the DRG renumeration system in Germany may have contributed to the observed deviation in HF trends occurring in 2004. Further limitations may relate to coding errors and evolving coding practices. The validation of HF diagnosis, as adjudicated by discharging, is considered high and studies reported positive predictive values of >90%. In addition, criteria for HF diagnosis were statutorily regulated. In summary, we are convinced that this large dataset and the representative character of these data facilitate valuable insights into current trends of HF burden in Germany and might also add information for extrapolation to Europe in general.

Conclusion

The absolute number of HF cases and related hospital days in Germany considerably increased between 2000 and 2013, whereas the number of HF-related deaths remained consistently high. These findings support the profound impact exerted by HF on both the patients and the health-care system. The increasing burden of HF necessitates a further increase in awareness for this disease and underscores an urgent need for improved diagnostic, therapeutic, and preventive strategies.

Supplementary Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Heart failure-related in-hospital deaths during 2000–2013.

Figure S2. Trends of heart failure-related hospitalizations, hospital days, and in-hospital deaths during 2000–2013.

Table S1. Temporal trends of heart failure-related in-hospital deaths in Germany (years 2000–2013).

Table S2. Temporal trends of length of stay in the hospital in Germany (years 2000–2013).

Table S3. Temporal trends of heart failure-related in-hospital mortality in Germany (years 2000–2013).

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References


