Temporal trends in infection-related hospitalizations in patients with heart failure: a nationwide study from 1997 to 2017

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Background: Over the last 20 years mortality has decreased for patients with heart failure (HF). However, re-hospitalization for HF is still a challenge. Further, whether the improved survival has resulted in increased rates of non HF hospitalization is unknown.

Purpose: This study examined the temporal trends in infection-related hospitalizations among new-onset HF patients and compared it to temporal trends in risk of worsening HF and death.

Methods: The study population included all Danish patients aged between 18 and 100 years old, with new-onset HF (defined according to the ICD10-code system) diagnosed between 1st January 1997 and 31st December 2017. Patients who were diagnosed with any type of cancer up to five years before their HF diagnosis were excluded to avoid cancer related infections. The outcomes of interest were infections (defined according to the ICD10-code system) and worsening of heart failure (defined as a hospital admission with HF covering at least two dates).

The Aalen Johansen’s estimator was used to estimate unadjusted 5-year absolute risk for all outcomes. Furthermore, a multivariate Cox analysis was made, and hazard ratios were estimated for the four time periods presented in a forest plot with the period 1997–2001 being the reference group. Adjustments for sex, age and history of comorbidities were conducted. Additionally, we stratified the infection outcome on different types of infections illustrated in 5-year cumulative incidence curves.

Results: The total population consisted of 147,737 patients. Over time there was a slight decrease in median age (1997–2001: 76.8 years, 2011–2017: 73.1 years) and the patients were more likely to be male (1997–2001: 53.5%, 2011–2017: 60%).

Figure 1 illustrates overall absolute risk of death decreased over time 1997–2001 (62.7% [95% CI 62.2–63.2]) vs. 2011–2017 (57.9% [95% CI 41.5–42.7]). Unadjusted curves for absolute risk showed that patients with HF had a higher risk of infection over time 1997–2001 (16.4% [95% CI 16.0–16.8]) vs. 2011–2017 (24.5% [95% CI 24.0–24.9]). In contrast, they have a lower risk of worsening HF 1997–2011 (26.5% [95% CI 26.1–27.0] vs. 2011–2017 (23.2% [95% CI 22.8–23.7]). Adjusted analyses provided the same result for all outcomes illustrated in figure 2.

The risk of infection stratified by infection type, mark the risk of pneumonia infection as the most significant in all subintervals 1997–2001 (11.4% [95% CI 11.1–11.7]) vs. 2011–2017 (16.1% [95% CI 15.7–16.5]). The second most important was the risk of urogenital infection 1997–2001 (3.5% [95% CI 3.3–3.6]) vs. 2011–2017 (7.8% [95% CI 7.5–8.1]).

Conclusion: In this nationwide study, we observed that overall mortality risk and risk of hospitalization for worsening HF decreased from 1997 to 2017. In contrast, an increase in the risk of hospitalization for infection, especially pneumonia infections, increased during the same period. Future HF management programs should include strategies to prevent infections.