Temporal trends and patterns in cause-specific mortality and hospitalisations after incident heart failure: a longitudinal analysis of 86,000 individuals

Authors:
N Conrad¹, A Judge¹, D Canoy¹, JG Cleland², JJV Mcmurray², K Rahimi¹, ¹University of Oxford - Oxford - United Kingdom of Great Britain & Northern Ireland, ²University of Glasgow - Glasgow - United Kingdom of Great Britain & Northern Ireland,

Topic(s):
Chronic Heart Failure – Epidemiology, Prognosis, Outcome

Citation:
British Heart Foundation, National Institute for Health Research, UK Research and Innovation.

Background: The past two decades have brought considerable improvements in heart failure care. Clinical trials have demonstrated effectiveness of several different treatments in reducing mortality and hospitalisations, and observational studies have shown that these treatments are increasingly being used in many countries. Little is known about whether these changes have been reflected in patient outcomes in routine clinical settings.

Methods: We used anonymised electronic health records that link information from primary care, secondary care, and the national death registry to investigate 86,000 individuals with newly diagnosed heart failure between 2002 and 2013 in the UK. We computed all-cause and cause-specific mortality rates and number of hospitalisations in the first year following diagnosis. We used Poisson regression models to calculate category-specific rate ratios and 95% confidence intervals, adjusting for patients’ age, sex, region, socioeconomic status and 17 major comorbidities.

Findings: One year after initial heart failure diagnosis, all-cause mortality rates were high (32%) and did not change significantly over the period of study (adjusted rate ratio (RR) 2013 vs 2002: 0.94 [0.88, 1]). Overall rates masked diverging trends in cause-specific outcomes: a decline in cardiovascular mortality (RR: 0.74 [0.68, 0.81]) was offset by an increase in non-cardiovascular mortality (RR: 1.28 [1.17, 1.39]), largely due to infections and chronic respiratory conditions. Sub-group analyses further showed that overall mortality declined among patients under 80 years of age (RR 2013 vs 2002: 0.79 [0.71, 0.88]), although not in older age groups (RR 2013 vs 2002: 0.97 [0.9, 1.06]). After cardiovascular causes (43%), the major causes of death identified in 2013 were neoplasms (15%), respiratory conditions (12%), and infections (11%). Hospital admissions within a year of heart failure diagnosis were common (1.15 hospitalisations per patient-year at risk), changed little over time (RR: 0.96 [0.92, 0.99]), and were largely (60%) due to non-cardiovascular causes.

Interpretation: Despite increased use of life-saving interventions, overall mortality and hospitalisations following a new diagnosis of heart failure have changed little over the past decade. Improved prognosis among young and middle-aged patients marks an important achievement and attests of complex barriers to progress in elderly patients. The shift from cardiovascular to non-cardiovascular causes of death suggest that management of associated comorbidities might offer additional opportunities to improve patients’ prognosis.
Temporal trends and patterns in cause-specific mortality and hospitalisations after incident heart failure: a longitudinal analysis of 86,000 individuals

Authors: N Conrad¹, A Judge¹, D Canoy¹, JG Cleland², JJV Mcmurray², KR Rahimi¹

¹University of Oxford - Oxford - United Kingdom of Great Britain & Northern Ireland, ²University of Glasgow - Glasgow - United Kingdom of Great Britain & Northern Ireland

Topic(s): Chronic Heart Failure - Epidemiology, Prognosis, Outcome

Background: The past two decades have brought considerable improvements in heart failure care. Clinical trials have demonstrated effectiveness of several different treatments in reducing mortality and hospitalisations, and observational studies have shown that these treatments are increasingly being used in many countries. Little is known about whether these changes have been reflected in patient outcomes in routine clinical settings.

Methods: We used anonymised electronic health records that link information from primary care, secondary care, and the national death registry to investigate 86,000 individuals with newly diagnosed heart failure between 2002 and 2013 in the UK. We computed all-cause and cause-specific mortality rates and number of hospitalisations in the first year following diagnosis. We used Poisson regression models to calculate category-specific rate ratios and 95% confidence intervals, adjusting for patients’ age, sex, region, socioeconomic status and 17 major comorbidities.

Findings: One year after initial heart failure diagnosis, all-cause mortality rates were high (32%) and did not change significantly over the period of study (adjusted rate ratio (RR) 2013 vs 2002: 0.94 [0.88, 1]). Overall rates masked diverging trends in cause-specific outcomes: a decline in cardiovascular mortality (RR: 0.74 [0.68, 0.81]) was offset by an increase in non-cardiovascular mortality (RR: 1.28 [1.17, 1.39]), largely due to infections and chronic respiratory conditions. Subgroup analyses further showed that overall mortality declined among patients under 80 years of age (RR 2013 vs 2002: 0.79 [0.71, 0.88]), although not in older age groups (RR 2013 vs 2002: 0.97 [0.9, 1.06]). After cardiovascular causes (43%), the major causes of death identified in 2013 were neoplasms (15%), respiratory conditions (12%), and infections (11%). Hospital admissions within a year of heart failure diagnosis were common (1.15 hospitalisations per patient-year at risk), changed little over time (RR: 0.96 [0.92, 0.99]), and were largely (60%) due to non-cardiovascular causes.

Interpretation: Despite increased use of life-saving interventions, overall mortality and hospitalisations following a new diagnosis of heart failure have changed little over the past decade. Improved prognosis among young and middle-aged patients marks an important achievement and attests of complex barriers to progress in elderly patients. The shift from cardiovascular to non-cardiovascular causes of death suggest that management of associated comorbidities might offer additional opportunities to improve patients' prognosis.

Figure: Temporal trends in all-cause and cause-specific mortality rates at 1-year following incident heart failure

A. Crude rates
From 2002 to 2013

B. Adjusted trends
Rate ratios comparing 2013 with 2002

A. Crude rates of all-cause and cause-specific mortality at 1 year following incident heart failure diagnosis. Labels for years 2002 and 2013 present individual causes of death as a share of the total number of deaths at 1-year.

B. Rate ratios from multivariable Poisson regression models comparing 1-year mortality rates in 2013 with 2002, by first reported cause, adjusting for patients’ age, sex, socioeconomic status, region, and 17 baseline comorbidities.