Quality of Care and Outcomes of Heart Failure Among Patients With Schizophrenia in Denmark

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Research on the association between schizophrenia and the quality of care and clinical outcomes of heart failure (HF) remains sparse. This nationwide study compared the quality of care and clinical outcomes of HF among Danish patients with and without schizophrenia. In a population-based cohort study, we identified 36,718 patients with incident HF with hospital contacts, including 108 with schizophrenia, using Danish registries between 2004 and 2013. High quality of HF care was defined as receiving ≥ 80% guideline-recommended process-performance measures of care. Potential predictors of HF care among patients with schizophrenia included patient-specific factors (age, gender, Global Assessment of Functioning [GAF] score, alcohol or drug abuse, duration of schizophrenia); provider-specific factors (quality of schizophrenia care); and system-specific factors (patient-volume defined as hospital departments and clinics yearly average patient-volume of patients with incident HF). Clinical outcomes included 4-week all-cause readmission and 1-year all-cause mortality after a first-time hospital contact with incident HF. Results showed that compared with patients with incident HF who have no schizophrenia, patients with incident HF who have schizophrenia had a lower chance of receiving high-quality HF care (relative risk 0.66, 95% confidence interval 0.48 to 0.91). A high GAF score was associated with a higher chance of receiving high-quality HF care among patients with incident HF who have schizophrenia. Patients with incident HF who have schizophrenia had a higher risk of 1-year mortality (adjusted hazard ratio 2.83, 95% confidence interval 1.59 to 5.04), but not a higher risk of readmission than patients with incident HF who have no schizophrenia. In conclusion, efforts are warranted to reduce the high mortality among patients with incident HF who have schizophrenia. **(Am J Cardiol 2017;120:980–985)**

Excess mortality in schizophrenia represents a serious global health problem, and most of the premature deaths are attributed to chronic medical co-morbidities.[1–4] Cardiovascular disease is a predominant cause of the 10- to 20-year reduction in life expectancy in patients with schizophrenia,[3–6] which emphasizes the urgent need to ensure effective prevention, early diagnosis, and treatment. However, there is a shortage of population-based studies examining cardiovascular care and clinical outcomes among patients with schizophrenia.[7–11] For nearly 2 decades, a nationwide multidisciplinary initiative has systematically monitored the quality of care provided by the public and mainly tax-financed Danish health care system, which in principle ensures free and equal access to hospital care for all citizens regardless of their socioeconomic status.[12–14] We conducted a nationwide population-based cohort study (1) to examine the quality of heart failure (HF) care, defined as meeting clinical guideline-recommended process-performance measures of care among Danish patients with incident HF who have and do not have schizophrenia; (2) to identify potential patient-, provider-, and system-specific predictors of quality of HF care among patients with incident HF who have schizophrenia; and (3) to compare 4-week readmission and 1-year mortality after a first-time hospital contact with HF among patients with incident HF who have and do not have schizophrenia.

Methods

This study was based on data from the following population-based registries, linked using the unique, 10-digit civil registration number assigned to all Danish citizens: the Danish Clinical Registries (the Danish HF Registry [DHFR] and the Danish Schizophrenia Registry [DSR]), the Danish Psychiatric Central Research Register (PCRR), and the Danish Civil Registration System (CRS).[12–21] It is mandatory for all Danish public hospitals to report to these registries.

A nationwide multidisciplinary initiative was launched in 2000 to routinely monitor the quality of care delivered by the Danish health care system. Subsequent, population-based clinical registries were established to document the care for several diseases, including HF (DHFR) and schizophrenia (DSR). The registries monitor disease-specific performance measures of care representing recommendations from national and international practice guidelines.[12,18–21] A multidisciplinary expert panel identified the performance measures of care and several covariates also collected in the registries. The data are prospectively collected using registration forms with detailed data

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definitions. The registration form is completed for HF inpatients and outpatients at their first-time hospital contact at departments or outpatient clinics with HF as the primary diagnosis. These patients are defined as patients with incident HF. For patients with schizophrenia, data on the quality of care are recorded for inpatients at discharge from psychiatric hospitals and yearly for outpatients seen at hospital outpatient clinics. The registries include records for 84% of all hospital inpatients and outpatients with incident HF as well as 93% of hospital inpatient and 92% of hospital outpatients with schizophrenia.[18–21] Since 2004, most incident HF patients and patients with schizophrenia treated at public hospitals can be identified from the DHFR and DSR.

The PCRR has recorded all psychiatric diagnoses and dates of admission and discharge in Danish psychiatric hospitals since 1969, as well as beginning and end of emergency room and hospital outpatient contacts since 1995.[15–17] Since 1968, the CRS has recorded continuously updated information on gender, residence, and vital status on all Danish residents.[13]

From the DHFR, we identified all inpatients and outpatients (≥18 years old) registered with a first-time hospital contact at any hospital department or outpatient clinic with HF as the primary diagnosis between January 1, 2004, and December 31, 2013. An experienced cardiologist has validated the diagnosis of HF according to the guidelines of the European Society of Cardiology (*International Classification of Diseases, Tenth Revision* [ICD-10] codes I11.0, I13.0, I13.2, I42.0, I42.6, I42.7, I42.9, I50.0, I50.1, I50.9).[19,22] Before enrollment in the DHFR, patients with HF also have to meet specific criteria made by a cardiologist to ensure the validity of the diagnosis of incident HF. The inclusion criteria include symptoms (e.g., dyspnea) and objective signs (e.g., reduced systolic function) of HF at rest or clinical response to HF treatment. Exclusion criteria comprise isolated right-sided HF, previously verified diagnosis and treatment of HF, tachycardia-induced HF or noncorrectable structural heart diseases, and HF secondary to valvular heart diseases. Patients discharged with a diagnosis of concomitant HF with acute myocardial infarction as the primary reason for a hospital contact are included in the DHFR only if they later are treated for HF as the primary diagnosis.[19]

Patients with incident HF who have schizophrenia were identified by linkage with the DSR. We included inpatients and outpatients with schizophrenia (ICD-10 codes: F20.0-F20.99) recorded in the DSR between January 1, 2004, and December 31, 2011. However, patients were excluded if they did not have schizophrenia recorded before their first-time hospital contact with incident HF (n = 26), or had >5 years between the recording for schizophrenia and the incident HF contact (n = 6). A total of 36,718 patients with incident HF were included in the analysis (35% female and 65% male). Within this sample, 108 (0.3%) patients also had a diagnosis of schizophrenia.

Patient-, provider- and system-specific factors that are considered predictors of the quality of HF care among patients with incident HF who have schizophrenia were identified. The patient-specific predictors were obtained from the DHFR, DSR, and PCRR and included gender, age, duration of schizophrenia at the first-time hospital contact with incident HF, alcohol or drug abuse (illegal drugs, benzodiazepines, or central stimulants), and score on the Global Assessment of Functioning (GAF) scale, which assesses the psychosocial functioning of patients with schizophrenia ranging from 1 to 100.[15,18–21] The provider-specific predictor included the quality of schizophrenia care that was delivered to patients with schizophrenia before their first-time hospital contact with incident HF.[20,21] We assessed the quality of schizophrenia care overall by dividing the number of received process-performance measures of schizophrenia care with the number of relevant measures for each patient. Receiving ≥ 80% of the relevant measures was defined as a high overall quality of schizophrenia care. HF patient-volume, defined as the average number of patients with incident HF in hospital departments and outpatient clinics per year from 2004 to 2013, was obtained from the DHFR and included as a system-specific predictor. The patient-volume was divided into four quartiles: low-volume (quartile 1, ≤78 patients with incident HF per year), medium-volume (quartile 2, >78 to 103 patients with incident HF per year), high-volume (quartile 3, >103 to 120 patients with incident HF per year), and very–high-volume (quartile 4, >120 patients with incident HF per year).

Collected from the DHFR, the quality of HF care was defined as meeting 7 individual process-performance measures of care.[18,19] Furthermore, the quality of HF care was summarized by dividing the number of received process-performance measures of care with the number of relevant performance measures for the individual patient. A high overall quality of HF care was defined as meeting ≥ 80% of the relevant process-performance measures.

Clinical outcomes of HF including 4-week all-cause unplanned hospital readmission (nonpsychiatric) and 1-year all-cause mortality after a first-time hospital contact with incident HF were ascertained from the DHFR and the CRS, respectively.[13,18,19]

Binary regression was used to compute the relative risk (RR) of meeting the 7 individual process-performance measures of care and the overall quality of HF care among patients with incident HF who have and do not have schizophrenia. We repeated the analysis for a high overall quality of HF care using alternative cut points varying from 60% to 90% to assess the robustness of our findings. The analyses were stratified according to gender, age and left ventricular ejection fraction (LVEF). Binary regression was used to estimate the RR of the impact of patient-, provider-, and system-specific predictors on the quality of HF care among patients with incident HF who have schizophrenia. The predictors included age, gender, alcohol or drug abuse, duration of schizophrenia, GAF score, quality of schizophrenia care, and patient-volume. We mutually adjusted only for predictors that were significantly associated with the quality of HF care in the unadjusted analysis. We used logistic regression to calculate the odds ratio (OR) for 4-week readmission and Cox proportional hazards regression analysis to estimate the hazard ratio (HR) for 1-year mortality. To control for confounding factors, ORs and HRs were adjusted for patient characteristics presented in Table 1 (excluding New York Heart Association classification because of several missing data and the percentage meeting relevant HF process-performance measures of HF care). The Kaplan-Meier estimator was used to plot cumulative 1-year mortality curves among patients with incident HF who have and do not have schizophrenia. All 95% confidence intervals (CI) were corrected for clustering of incident HF patients within the