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Changes of Natriuretic Peptides Predict Hospital Admissions in Patients With Chronic Heart Failure

A Meta-Analysis

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Objectives The goal of this study was to explore the association between changes in B-type natriuretic peptide (BNP) and N-terminal pro–B-type natriuretic peptide (NT-proBNP) plasma levels and risk of hospital admission for heart failure (HF) worsening in patients with chronic HF.

Background The relationship between BNP and NT-proBNP plasma levels and risk of cardiovascular events in patients with chronic HF has been previously demonstrated. However, it is unclear whether changes in BNP and NT-proBNP levels predict morbidity in patients with chronic HF.

Methods The MEDLINE, Cochrane, ISI Web of Science, and SCOPUS databases were searched for papers about HF treatment up to August 2013. Randomized trials enrolling patients with systolic HF, assessing BNP and/or NT-proBNP at baseline and at end of follow-up, and reporting hospital stay for HF were included in the analysis. Meta-regression analysis was performed to test the relationship between BNP and NT-proBNP changes and the clinical endpoint. Sensitivity analysis was performed to assess the influence of baseline variables on results. Egger's linear regression was used to assess publication bias.

Results Nineteen trials enrolling 12,891 participants were included. The median follow-up was 9.5 months (interquartile range: 6 to 18 months), and 22% of patients were women. Active treatments significantly reduced the risk of hospital stay for HF worsening. In meta-regression analysis, changes in BNP and NT-proBNP were significantly associated with risk of hospital stay for HF worsening. Results were confirmed by using sensitivity analysis. No publication bias was detected.

Conclusions In patients with HF, reduction of BNP or NT-proBNP levels was associated with reduced risk of hospital stay for HF worsening. (J Am Coll Cardiol HF 2014;2:148–58) © 2014 by the American College of Cardiology Foundation

Heart failure (HF) is a major and growing public health problem, affecting 1% of people aged 65 years and older. At 40 years of age, the lifetime risk of developing HF for both men and women is 1 in 5; at 80 years of age, it remains at 20% despite shorter life expectancy (1). Despite significant advances in diagnosis and treatment, HF is currently the leading cause of hospital stays in people aged 65 years or older, with a rate of death increasing from about 10% after 1 year to about 50% after 5 years from diagnosis. Notably, health expenditures for the yearly 1.1 million hospital stays for chronic HF in the United States amount to nearly $29 billion, corresponding to 10% of total health expenditures.

Plasma concentrations of B-type natriuretic peptide (BNP) and N-terminal pro–B-type natriuretic peptide (NT-proBNP) are useful for the diagnosis and management of patients with chronic HF. BNP is a cardiac hormone produced from ventricular muscle cells in response to ventricular dilation and pressure overload, and NT-proBNP is the inactive N-terminal fragment produced from the cleavage of proBNP (2,3). BNP and NT-proBNP levels are elevated in patients with left ventricular dysfunction and correlate to New York Heart Association functional class,

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left ventricular filling pressure, left ventricular ejection fraction assessed by using radionuclide angiography and echocardiography, and with other indices of HF (including pulmonary artery wedge pressure) (4–7). Furthermore, evidence exists supporting the use of BNP and NT-proBNP levels for hospital stay/discharge decision making and for identifying patients at risk of clinical events (8). In addition, it has been reported that, in patients hospitalized for decompensated HF, changes in natriuretic peptide levels from baseline to hospital discharge predict the composite outcome of death and hospital stay in the following 6 months (9) or 12 months (10). Similarly, changes in natriuretic peptide levels at 4 or 12 months from baseline assessment predict mortality and morbidity (11–13) and left ventricular remodeling (14) in outpatients with stable HF. However, a recent meta-analysis reported no association between changes in natriuretic peptides and mortality in HF patients, whereas in the same study, the relationship with the risk of hospital stay was not investigated (15). This information would be valuable in clinical practice for assessing and predicting the effects of new drugs or devices in HF.

The aim of the present study was therefore to investigate whether changes in BNP and/or NT-proBNP plasma levels reflect the risk of hospital stay for worsening HF in patients with chronic systolic HF.

Abbreviations and Acronyms

BNP = B-type natriuretic peptide
CI = confidence interval
DQS = Detsky Quality Score
HF = heart failure
NT-proBNP = N-terminal pro–B-type natriuretic peptide
OR = odds ratio
RC = regression coefficient

Methods

Data sources and searches. The study was designed according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (16). The MEDLINE, Cochrane, ISI Web of Science, and SCOPUS databases were searched for reports published in

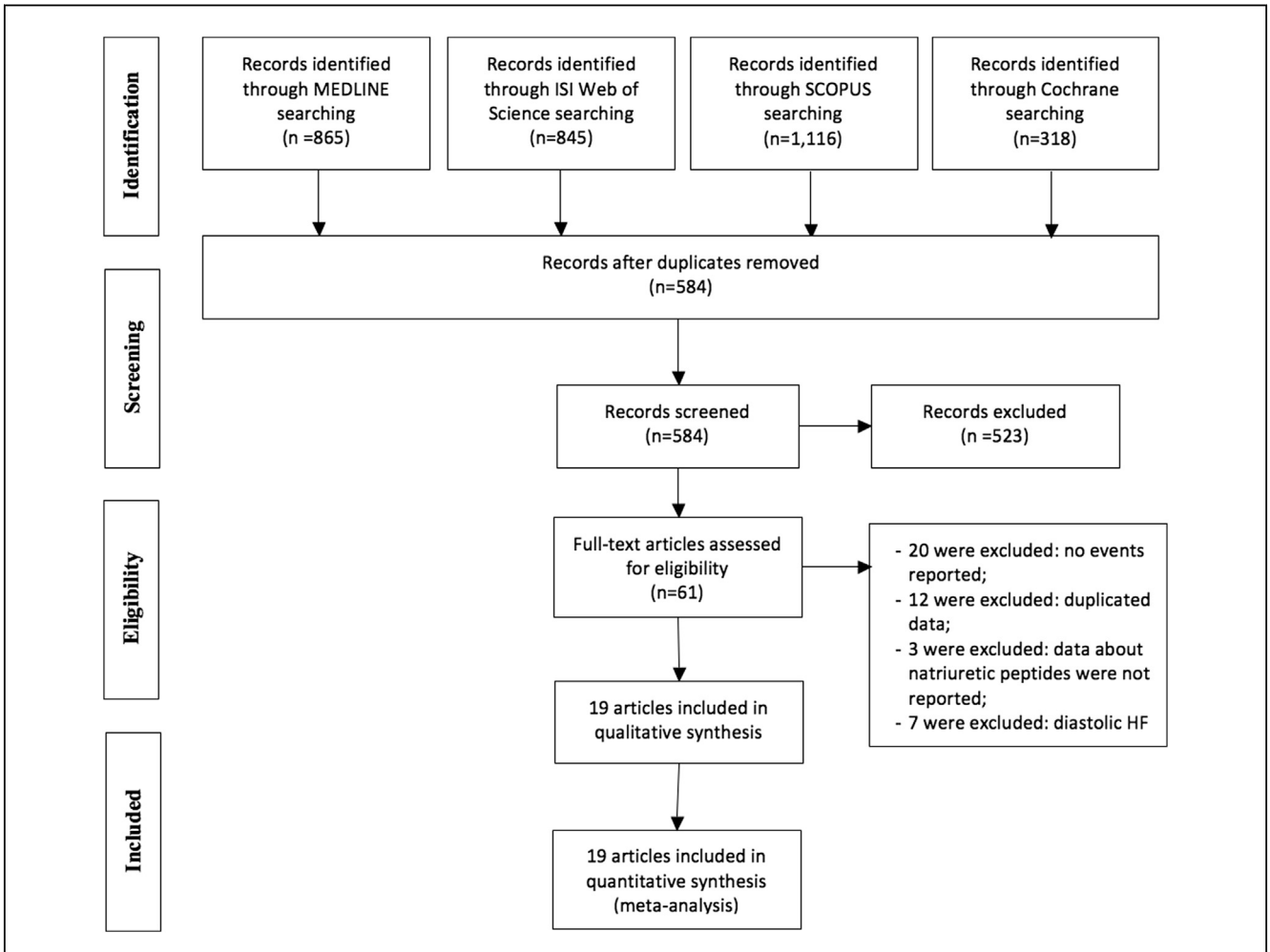

Figure 1 Meta-Analysis Flow Diagram

Flow diagram depicting the flow of information through the different phases of the systematic review. HF = heart failure.