



## Incremental utility of prognostic variables at discharge for risk prediction in hospitalized patients with acutely decompensated chronic heart failure



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### ABSTRACT

**Objectives:** To assess the incremental prognostic utility of discharge serum creatinine (Scr), systolic blood pressure (SBP), and NT-proBNP and sodium concentrations in hospitalized patients with acutely decompensated chronic heart failure.

**Background:** Whether key prognostic variables at discharge provide incremental prognostic information beyond that provided by a model based on admission variables (referent) remains incompletely defined. **Methods:** The primary outcome was a composite of death, urgent heart transplantation, or ventricular assist device implantation at 1 year. The gain in predictive performance was assessed using C index, Bayesian Information Criterion, and Net Reclassification Improvement.

**Results:** The best fit was obtained when discharge NT-proBNP was added to the referent model. No interaction between admission and discharge NT-proBNP was found. Discharge Scr, SBP, and sodium did not improve goodness-of-fit.

**Conclusions:** Admission and discharge NT-proBNP provide complementary and independent prognostic information; as such, they should be taken into account concurrently.

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### Introduction

Acute heart failure is a leading cause of hospitalization and is burdened by a 20%–30% mortality within 1 year after discharge.<sup>1,2</sup> Roughly 80% of admissions are attributable to acute exacerbation of chronic heart failure (CHF).<sup>3,4</sup> Accurate estimation of risk is essential to developing a tailored management plan.<sup>5,6</sup> In order to best identify high-risk patients, several predictive models, based on admission, discharge, or a combination of admission and discharge variables, were developed in the past years.<sup>7–16</sup> Renal dysfunction, hypotension, hyponatremia, and high natriuretic peptides (NP) concentrations at hospital admission consistently emerged as

powerful predictors of early and mid-term mortality.<sup>6</sup> However, changes in these parameters commonly occur from admission to discharge and have been associated with outcome.<sup>17–20</sup> Moreover, an interplay among changes in prognostic variables may exist,<sup>21,22</sup> making prognostication of outcomes even more challenging. Although prognostic variables measured at discharge have been found to be independently associated with outcome, their clinical utility, i.e., whether they provide incremental prognostic information beyond that provided by a predictive model based on admission variables resulting in improved risk stratification, remains incompletely resolved.<sup>23</sup>

In the present study, we sought to assess whether discharge values of systolic blood pressure (SBP), serum creatinine (Scr), NT-proBNP and serum sodium add to the performance of a model based on variables collected at admission in predicting post-discharge prognosis in hospitalized patients with acutely decompensated CHF.

Conflict of interest: none.

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## Methods

This was a retrospective multicentre study. The study population consisted of 1021 hospitalized patients fulfilling the following selection criteria. Inclusion criteria were: admission for acutely decompensated CHF, history of HF of at least 1 year on chronic treatment with standard therapies, and NT-proBNP concentrations >900 pg/mL at admission.<sup>24</sup> Exclusion criteria were: “de novo” acute HF; cardiogenic shock; acute HF listed as a secondary discharge diagnosis, developed after admission for another admitting diagnosis, or due to acute myocarditis or restrictive cardiomyopathy; acute coronary syndromes; recent (<3 months) cardiac surgical or percutaneous procedures; planned coronary revascularization; congenital heart disease; stenotic valvular disease; and NT-proBNP concentrations ≤900 pg/mL at admission.<sup>24</sup> Of the 1021 patients, 50 (4.9%) died and 22 (2.1%) underwent

urgent heart transplantation (UHT) or ventricular assist device (VAD) implantation during the index hospitalization. Of the 949 patients discharged alive free of UHT/VAD implantation, 431 (45.4%) had paired admission and discharge data for each of SBP, SCr, serum sodium, and NT-proBNP and were included in the analysis (Fig. 1). The study was approved by the Institutional Review Board of the coordinating center (S. Maugeri Foundation, IRCCS, Institute of Cassano Murge). Patients’ data were de-identified.

### Primary outcome

The primary outcome was a composite of death, UHT, or VAD implantation within 1 year after discharge. The primary outcome was ascertained by linking with the regional Health Information

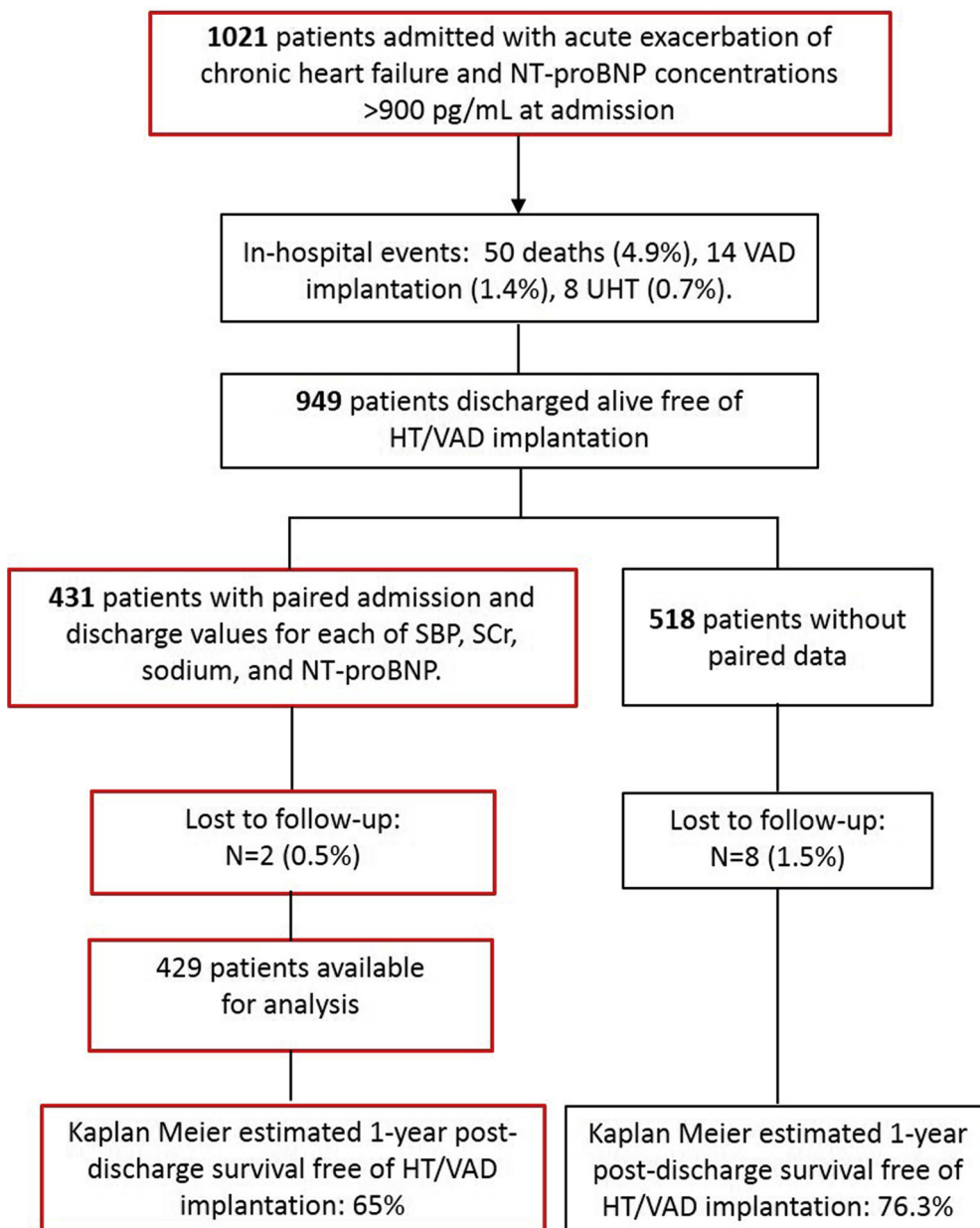


Fig. 1. Flow-chart of patient selection. Abbreviations: VAD, ventricular assist device; HT, heart transplantation.

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