Clinical Nutrition ESPEN 12 (2016) e20–e29

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

Nutritional risk is associated with long term mortality in hospitalized patients with chronic heart failure☆

Kjerstin Tevik [a, b, c], Hanne Thürmer [d], Marit Inderhaug Husby [a], Ann Kristin de Soysa [e], Anne-Sofie Helvik [b, c, f, *]

[a] Department of Cardiology, St. Olav's University Hospital, Postbox 3250 Sluppen, 7006 Trondheim, Norway
[b] Department of Public Health and General Practice, Faculty of Medicine, Norwegian University of Science and Technology (NTNU), Postbox 8905, NO-7491 Trondheim, Norway
[c] Norwegian National Advisory Unit on Ageing and Health, Vestfold Hospital Trust, Postbox 2136, 3013 Tønsberg, Norway
[d] Telemark Hospital, Medical Department, Postbox 234, 3672 Notodden, Norway
[e] Department of Clinical Nutrition, St. Olav's University Hospital, Postbox 3250 Sluppen, 7006 Trondheim, Norway
[f] St. Olav's University Hospital, Postbox 3250 Sluppen, 7006 Trondheim, Norway

ARTICLE INFO

Article history:
Received 2 November 2015
Accepted 25 February 2016

Keywords:
Nutritional Risk Screening (NRS-2002)
Nutritional condition
Nutritional status
Severity of disease
Age
Survival

SUMMARY

Background & aims: Mortality among patients with chronic heart failure (CHF) is still high despite progress in medical and surgical treatment. The patients' nutritional condition may play an important role, and needs further investigation. The aim of this study was to evaluate whether nutritional risk in hospitalized patients with CHF was associated with three-year mortality.

Methods: A prospective study was conducted in 131 hospitalized Norwegian patients with CHF. Nutritional screening was performed using Nutritional Risk Screening (NRS-2002). The primary clinical outcome was death from any cause.

Results: The prevalence of nutritional risk was 57% (NRS-2002 score ≥ 3). The overall mortality rate was 52.6% within three-year follow up. More patients at nutritional risk (N = 51) died compared to patients not at nutritional risk (N = 18) ($P < 0.001$). In adjusted analyses patients at nutritional risk had more than five-time higher odds (OR 5.85; 95% CI 2.10–16.24) to die before three-year follow-up than those not at nutritional risk. In adjusted Cox multivariate analysis, the nutritional risk was associated with increased mortality (HR 2.78; 95% CI 1.53–5.03). Furthermore, in adjusted analysis components in NRS-2002 were associated with mortality, i.e. nutritional status (HR 1.82; 95% CI 1.03–3.22), severity of disease (NYHA-class IV) (HR 1.78; 95% CI 1.00–3.16) and age ($\geq$ 70 year) (HR 3.24; 95% CI 1.48–7.10).

Conclusion: Nutritional risk as defined by NRS-2002 in hospitalized patients with CHF was significantly associated with long term mortality.

1. Introduction

Chronic heart failure (CHF) is characterized by high mortality, multiple comorbidities, a complex therapeutic regimen, frequent hospitalization and reduced quality of life [1]. Implementation of guideline-recommended pharmacologic and non-pharmacologic therapies [2] has significantly improved survival among CHF patients, but the mortality rate is still high [3,4]. Known predictors of mortality in patients with CHF are older age [5,6], diabetes [5,6], lower left ventricular ejection fraction (EF) [5,6], higher New York Heart Association classification (NYHA class) [5], elevated N-terminal pro-B-type natriuretic peptide (NT-proBNP) [7,8], frailty [9] and cardiac cachexia [10,11]. Observational studies also indicate

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; EF, ejection fraction; CHF, chronic heart failure; CRP, C-reactive protein; ESPEN, European Society of Clinical Nutrition and Metabolism; LRA, logistic regression analysis; MNA, Mini Nutritional Assessment; NRS-2002, Nutritional Risk Screening; NSD, Norwegian Social Science Data Service; NT-proBNP, N-terminal pro-B-type natriuretic peptide; NYHA, New York Heart Association; REK, Regional Research Ethics Committee; SGA, Subjective Global Assessment.

☆ Conference presentation: Data from the study has not been presented at a congress.

* Corresponding author. ISM DMF, NTNU, Postbox 8905, MTFS, 7491 Trondheim, Norway. Tel.: +47 73 597565; fax: +47 73 597577.

E-mail addresses: kjtev@online.no (K. Tevik), thuh@sthf.no (H. Thürmer), Marit.Inderhaug.Husby@stolav.no (M.I. Husby), Ann.Kristin.Hjelle.De.Soysa@stolav.no (A.K. de Soysa), Anne-Sofie.Helvik@ntnu.no (A.-S. Helvik).

http://dx.doi.org/10.1016/j.clnesp.2016.02.095

that in patients with CHF, the mortality risk increases with lower levels of BMI [5,6,12–14], total cholesterol [13,15] and systolic blood pressure [13]. This inverse relationship between traditional cardiovascular risk factor and mortality in the heart failure patient has been described as "reverse epidemiology" [13].

In addition, poor nutritional conditions have in several studies been strongly associated with mortality in hospitalized patients with CHF [16–19]. At two [16] and three [17,19] years follow up the mortality in CHF patients with a poor nutritional condition has been found to vary between 26.5 and 76%. Furthermore, the prevalence of nutritional risk in hospitalized patients with CHF has been found to vary between 34 and 90% [16–20].

Several screening tools have been designed to assess the patient's nutritional risk, like Mini Nutritional Assessment (MNA), Subjective Global Assessment (SGA), Malnutrition Universal Screening Tool (MUST) and Nutritional Risk Screening (NRS-2002) [21]. The screening tool NRS-2002 was designed and validated by the European Society for Clinical Nutrition and Metabolism (ESPEN) [21,22], and is recommended for use in the hospital setting [21]. NRS-2002 is shown to provide a simple and rapid screening of hospitalized patients [21,22]. ESPEN has described the purpose of nutritional screening as a method "to predict the probability of a better or worse outcome due to nutritional factors, and whether nutritional treatment is likely to influence this" [21, s. 415].

MUST is recommended by ESPEN as a screening tool for the community [21]. The screening tools SGA and MNA are used in hospital settings, but may be more time consuming compared with NRS-2002. In a hospital setting it therefore would be an advantage using NRS-2002 to obtain a rapid and easy screening [21].

NRS-2002 has previously been validated in different hospital settings [23]. Recently, it was evaluated in CHF patients and found adequate to detect nutritional risk in these patients [24]. The predictive validity of nutritional screening tools has often been evaluated against clinical outcome, and especially mortality has been investigated in relation to nutritional risk [25]. In a meta-analysis NRS-2002 has shown fair to good predictive validity to predict in-hospital mortality for adult patients [23]. The association between NRS-2002 and long term mortality (>12 months) is yet to be confirmed in most groups of patients. As far as we know mortality has not been investigated in a CHF sample using the NRS-2002.

The primary objective of this study was therefore to explore the association between nutritional risk assessed with NRS-2002 at admittance to hospital and three-year overall mortality in patients with CHF. In addition we wanted to investigate the association between mortality and the three different components in NRS-2002 (nutritional status, severity of disease and age).

2. Materials and methods

2.1. Design

An observational study with three-year follow-up was performed based on hospitalized CHF patients at St. Olav's University Hospital in Trondheim, Norway. The recruitment period was between October 2008 and February 2010.

2.2. Participants

CHF was diagnosed according to the recommendation of the European Society of Cardiology [26]. The CHF patients were classified according to the international statistical classification of diseases (ICD-10) for the diagnoses of heart failure (I50) [27]. The following criteria were used to identify hospitalized patients with CHF eligible for the study: 1) directly admitted to the department of cardiology, St. Olav's University Hospital, 2) age > 18 years, 3) heart failure ≥ 3 months, 4) ejection fraction (EF) ≤ 50% and 5) NYHA classification II, III or IV [28].

In our study a total of 131 patients were included. Fig. 1 (flowcharts) gives a detailed description of excluded patients (N = 157).

2.3. Variables

2.3.1. New York Heart Failure Association classification (NYHA-class)

Heart failure severity was divided into four categories according to the NYHA-classification. NYHA-class I = no symptoms during ordinary physical activity; NYHA-class II = slight limitation during ordinary physical activity; NYHA-class III = marked limitation during ordinary physical activity; NYHA-class IV = inability to carry on any physical activity without discomfort or discomfort at rest [28].

2.3.2. Medication

Information about beta-blockers and angiotensin-converting-enzyme (ACE) inhibitors was obtained from the patient's records at screening time.

2.3.3. Ejection fraction

Ejection fraction (EF) was measured using cardiac ultrasound (Echocardiography). At the cardiac medical outpatient clinic at St. Olav's University Hospital all examinations were done by a cardiologist. EF was obtained from the standardized ultrasound result record.

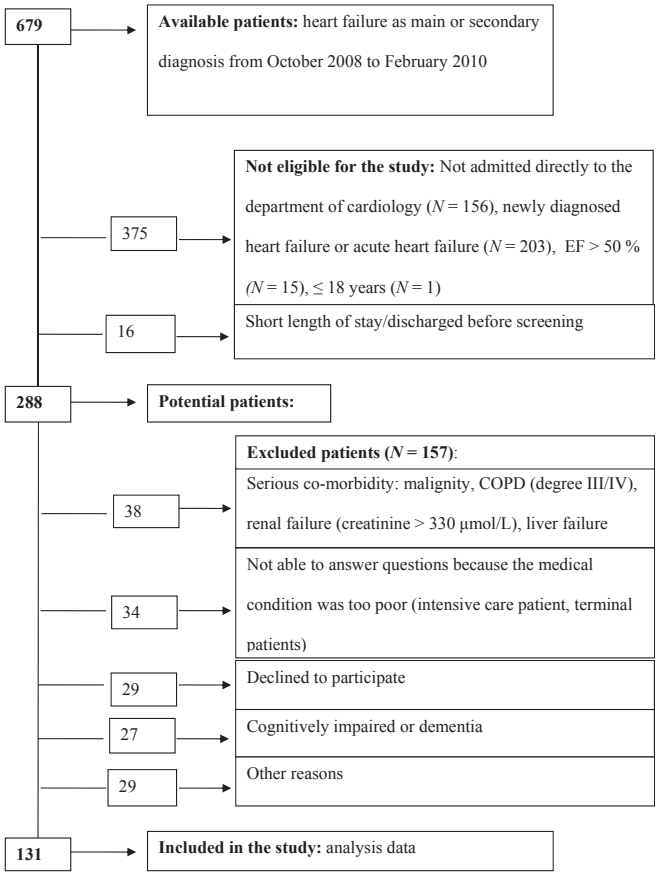

Fig. 1. Flowchart. COPD = chronic obstructive pulmonary disease; EF = ejection fraction.