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ORIGINAL ARTICLE

# The Impact of Frailty on Mortality, Length of Stay and Re-hospitalisation in Older Patients with Atrial Fibrillation

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**Background** Frailty has been found to be associated with increased adverse outcomes in older patients, especially in patients with cardiovascular diseases. There has been no study focussing on the prognostic value of frailty amongst older hospitalised patients with atrial fibrillation. This study aims to investigate the impact of frailty on mortality, length of stay and re-hospitalisation in older hospitalised patients with atrial fibrillation.

**Methods** Prospective observational study in patients aged ≥65 years with atrial fibrillation admitted to a teaching hospital in Sydney, Australia. Frailty was assessed using the Reported Edmonton Frail Scale. Participants were followed up for six months for adverse outcomes.

**Results** We recruited 302 patients (mean age 84.7±7.1, 53.3% frail, 50% female). Frailty was associated with prolonged length of stay and increased mortality but not re-admission during six months after discharge. The coexistence of frailty and delirium significantly increased the risk of mortality.

**Conclusions** Frailty is a common geriatric syndrome in older inpatients with atrial fibrillation and is associated with poor outcomes. Screening for frailty along with other clinically important factors like delirium should be considered in older patients with atrial fibrillation to optimise individualised treatment plans.

**Keywords** Frailty • Atrial fibrillation • Mortality • Adverse outcomes

## Introduction

Atrial fibrillation (AF) is a common cardiac arrhythmia in older adults. The prevalence of AF in published studies in Western countries ranges from 0.5% to 3% in the general population, 5% to 6% in people older than 65 years and up to 5% to 15% among those aged 80 years or older [1–3]. The global burden of AF has been increasing due to the ageing of the world population [4]. The rates of AF related hospitalisations have increased worldwide over the last decades [5–8].

Older hospitalised patients are at increased risk of adverse outcomes and these outcomes can be predicted by many factors like advanced age, comorbidities, immobility, malnutrition, delirium, falls, polypharmacy and especially by a frailty status [9,10]. Frailty is an emerging concept in geriatric medicine. There have been many studies exploring the relationship between frailty and increased risk of cardiovascular diseases in community-dwelling older adults [11]. Frailty has been also found to be associated with increased adverse outcomes in older patients, especially in patients with

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cardiovascular diseases [12–21]. There have been several studies reporting that frailty is associated with adverse outcomes in older hospitalised patients with heart failure and myocardial infarction, and in patients after cardiovascular surgery [12,14,16,21,22]. However, there has been no study focussing on the prognostic value of frailty amongst older hospitalised patients with atrial fibrillation. In this study we aimed to investigate the impact of frailty on outcomes in older hospitalised patients with atrial fibrillation, including prolonged length of stay, re-admission and all-cause mortality six months after discharge.

# Methods

## Participant Selection

During a period of 15 consecutive months, a prospective observational study was performed on a cohort of patients aged ≥ 65 years with chronic nonvalvular AF admitted to Royal North Shore Hospital, Sydney, Australia (between October 2012 and January 2014). The study was approved by The Northern Sydney Local Health District Human Research Ethics Committee and The University of Sydney Human Research Ethics Committee. Patients were eligible to participate if they were aged ≥ 65 years and diagnosed with AF. Participants who were dying or receiving intensive care or who were identified as ''blind'' or ''deaf'' and unable to see or hear the investigators respectively on initial contact were excluded from the study. Eligible patients were identified daily from the target wards (aged care, cardiology and general medicine) and invited to participate. Consent was obtained from all participants or their caregivers. All participants were followed up for six months by conducting phone calls at the end of the sixth month after recruitment. In cases where participants or their caregivers could not be contacted, hospital medical records were assessed for outcomes during six months.

## Definition of Frailty

The Reported Edmonton Frail Scale (REFS) was used to identify frail participants. This scale was adapted from the Edmonton Frail Scale for use with Australian acute inpatients based on a questionnaire and has been validated [23]. The scale involves nine frailty domains (cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence and functional performance). With a maximum score of 18, the cutoff point used to identify frailty was 8, consistent with previous studies using this scale [24–26].

## Other Variables

For each participant, the number of comorbidities and the number of medications prescribed on discharge were taken from the medical records. Comorbidities were assessed with the Charlson Comorbidity Index [27]. The CHA2DS2-VASc score (congestive heart failure, hypertension, age ≥75 years [doubled], diabetes, stroke/transient ischaemic attack/thromboembolism [doubled], vascular disease [prior myocardial infarction, peripheral artery disease, or aortic atherosclerosis], age 65-75 years, female gender) was used to assess stroke risk, and bleeding risk for anticoagulants were assessed with the HAS-BLED score (hypertension, abnormal renal/liver function, stroke, bleeding history or predisposition, labile international normalised ratio, age ≥ 65 years, drugs or alcohol use) [28].

## Outcome Variables

Prolonged hospitalisation, hospital readmissions and deaths were assessed as adverse outcomes in this study. Prolonged hospitalisation was defined as those with a length of stay equal to or greater than the 75$^{th}$ percentile of the length of stay of the whole cohort (measured in days). Readmissions were defined as at least one readmission to hospital for any cause during six months. All deaths during hospitalisation were recorded. Discharged participants or their caregivers were contacted after six months for information on re-admissions and whether the participant had died during this period. In those cases (n=20) where participants or their caregivers could not be contacted, hospital records were used to ascertain study outcomes.

Analysis of the data was performed using SPSS for Windows 20.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation, and categorical variables as frequency and percentage. Comparisons between frail and non-frail participants were assessed using Chi-square tests for categorical variables and Student's t-tests or Mann-Whitney tests for continuous variables. Two-tailed P values < 0.05 were considered statistically significant. To compare the time to death in frail and non-frail participants, the Kaplan–Meier estimator was employed to compute survival curves over the six-month follow-up period and differences between frail and non-frail groups assessed using log rank tests. Cox proportional-hazards regression was used to determine whether frailty assessed with the RFES predicted mortality, with results presented as hazard ratios (HR) and 95% confidence intervals (CIs). Potential predictors of mortality in this cohort of older patients with AF were frailty status, age, gender, Charlson comorbidity Index, CHA2DS2-VASc score, HAS-BLED score, admission due to falls, delirium on admission, and the following medications on discharge: anticoagulants, digoxin, statin or psychotropic medication [29,30]. Based on a previous study that showed a combined effect of frailty and delirium on mortality in older inpatients [31], we also used Cox regression to analyse the combined association of frailty and delirium. Logistic regression was applied to investigate predictors of prolonged hospitalisation and results are presented as odds ratios (OR) and 95% CIs. Potential predictors of prolonged hospitalisation were frailty status, age, gender, Charlson comorbidity Index, CHA2DS2-VASc score, HAS-BLED score, admission due to falls, or delirium on admission. Univariate regression was performed on all the potential predictors for adverse outcomes. Those variables that had a p-value <0.20 on univariate analysis were entered into multivariate