

Multi-morbidity, frailty and self-care: important considerations in treatment with anticoagulation drugs. Outcomes of the AFASTER study

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Caleb Ferguson¹, Sally C Inglis², Phillip J Newton²,
Sandy Middleton^{3,4}, Peter S Macdonald^{5,6} and Patricia M Davidson^{2,7}

Abstract

Background: Chronic heart failure (CHF) and atrial fibrillation (AF) are complex cardiogeriatric syndromes mediated by physical, psychological and social factors. Thromboprophylaxis is an important part of avoiding adverse events in these syndromes, particularly stroke.

Purpose: This study sought to describe the clinical characteristics of a cohort of patients admitted to hospital with CHF and concomitant AF and to document the rate and type of thromboprophylaxis. We examined the practice patterns of the prescription of treatment and determined the predictors of adverse events.

Methods: Prospective consecutive participants with CHF and concomitant AF were enrolled during the period April to October 2013. Outcomes were assessed at 12 months, including all-cause readmission to hospital and mortality, stroke or transient ischaemic attack, and bleeding.

Results: All-cause readmission to hospital was frequent (68%) and the 12-month all-cause mortality was high (29%). The prescription of anticoagulant drugs at discharge was statistically significantly associated with a lower mortality at 12 months (23 vs. 40%; $p=0.037$; hazards ratio 0.506; 95% confidence interval 0.267–0.956), but was not associated with lower rates of readmission to hospital among patients with CHF and AF. Sixty-six per cent of participants were prescribed anticoagulant drugs on discharge from hospital. Self-reported self-care behaviour and 'not for cardiopulmonary resuscitation' were associated with not receiving anticoagulant drugs at discharge. Although statistical significance was not achieved, those patients who were assessed as frail or having greater comorbidity were less likely to receive anticoagulant drugs at discharge.

Conclusion: This study highlights multi-morbidity, frailty and self-care to be important considerations in thromboprophylaxis. Shared decision-making with patients and caregivers offers the potential to improve treatment knowledge, adherence and outcomes in this group of patients with complex care needs.

Keywords

Chronic heart failure, atrial fibrillation, anticoagulation drugs, readmission to hospital, mortality, multi-morbidity, frailty, self-care

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¹Graduate School of Health, University of Technology Sydney, Australia

²Centre for Cardiovascular and Chronic Care, Faculty of Health, University of Technology Sydney, Australia

³St Vincent's Health Australia (Sydney), Australia

⁴Australian Catholic University, Australia

⁵St Vincent's Hospital, Sydney, Australia

⁶Victor Chang Cardiac Research Institute, Darlinghurst, Australia

⁷School of Nursing, Johns Hopkins University, Baltimore, MD, USA

Corresponding author:

Caleb Ferguson, Graduate School of Health, University of Technology Sydney, 67 Thomas St, Ultimo, Sydney, NSW 2007, Australia.

Email: caleb.ferguson@uts.edu.au

Introduction

Chronic heart failure (CHF) is a common and multifaceted syndrome with complex self-care needs.¹ Previous studies² have highlighted that atrial fibrillation (AF) is a concomitant condition in up to 50% of patients with CHF and, as a consequence, these patients have a high risk of stroke. The use of thromboprophylaxis, including anticoagulant drugs, significantly reduces the risk of stroke.³ In spite of evidence-based recommendations, the rates of thromboprophylaxis remain poor.⁴ There are many factors underpinning the clinical decisions about why individual patients may not receive evidence-based treatment when indicated – these factors may be related to the healthcare system, treatment, socioeconomic status, the individual patient, or the condition. Specifically, these barriers can include poor self-care behaviour, non-adherence to medication, frailty, cognitive and functional impairment, or a lack of caregiver assistance. The research team have summarized these factors in previously published work.⁵ There is still a need to better understand the factors that influence decision-making in thromboprophylaxis within the context of existing stroke and bleeding risk prediction models and complex comorbidities. Nurses have a key part to play in anticoagulation decision-making for stroke prevention. The key aspects of our role include education, counselling, advocacy and supporting patients and caregivers to make sense of complex risk–benefit information to elicit treatment preferences.⁶ There is a need for an improvement in nurses' knowledge and practice of care of patients with AF, as a lack of treatment knowledge may lead to inappropriate counselling and education.⁷ Therefore it is important that nurses understand the key factors that influence the choice of anticoagulant and the decision-making process, and also the strengths and limitations of current risk prediction models.

Purpose

The aim of this study was to: (a) describe the clinical characteristics of a cohort of patients admitted to hospital with CHF and concomitant AF; (b) to describe the frequency and type of thromboprophylaxis used; (c) to examine practice patterns of the prescription of treatment; (d) to compare the overall quality of AF and CHF care in this cohort of patients when benchmarked against the recommendations of international guidelines; and (e) to determine the predictors of adverse events (including all-cause readmission to hospital and all-cause mortality, stroke/transient ischaemic attack (TIA) and bleeding events).

Methods

Design and setting

The AFASTER (Atrial Fibrillation And Stroke Thromboprophylaxis in hEart failuRe) cohort study was an observational single-site, six-month cohort study of

adults aged ≥ 18 years conducted from April to October 2013, enrolling prospective consecutive participants with CHF and concomitant AF of any type and aetiology (consistent with international guidelines and confirmed by a physician) admitted to a cardiology ward at an academic medical centre. The exclusion criteria were age < 18 years, AF due to reversible causes or enrolment in another clinical trial. The patients' socio-demographic and clinical characteristics, including medical history, frailty and prescription of thromboprophylaxis, were assessed at the index admission to hospital (Table 1).

Measurements

Baseline demographic and clinical data were obtained using a standardized case report form. Biochemical, haematological, echocardiographic and medication data were obtained at discharge from hospital. The Charlson Comorbidity Index was used to quantify comorbidity. This index is a simple and valid method to classify comorbid disease.⁸ The patients' social and living situation and social support information were collected.

Stroke and bleeding risk. The CHA₂DS₂VASc⁹ and HAS-BLED^{10,11} stroke and bleeding risk stratification tools were used to stratify stroke and bleeding risk. Both schemata are well validated and simple to use in clinical practice and they are both recommended for use throughout international guidelines for the management of AF.^{12–14}

In a retrospective study of patients with a history of AF and an implanted pacemaker, the CHA₂DS₂-VASc score had a high sensitivity to predict stroke with good sensitivity and predictive ability; however, it has a low specificity (7–24%).¹⁵ The CHADS₂ tool is more widely used in clinical practice; CHADS₂ data can be derived from a CHA₂DS₂-VASc score and they assess for a greater number of well-established independent risk factors for stroke. In a recent post hoc analysis of the AMADEUS study population comparing the performance of the HEMORR₂HAGES, ATRIA and HAS-BLED bleeding risk prediction scores in patients with AF undergoing treatment with anticoagulant drugs, the HAS-BLED score was identified as having a superior predictive performance for overall bleeding and intracranial haemorrhage (*c*-index 0.75).¹⁶ A CHA₂DS₂VASc risk score of 0 identifies patients at low risk of stroke, a score of 1–2 identifies patients at moderate risk of stroke and a score > 2 identifies patients at high risk of stroke. A HAS-BLED score ≥ 3 identifies patients at a high risk of bleeding.¹⁷

Current international guidelines advocate stroke risk stratification using the CHA₂DS₂VASc score and the prescription of a vitamin K antagonist or novel oral anticoagulant drug if CHA₂DS₂VASc score > 1 . Further assessment of bleeding risk is made using the HAS-BLED score and considerations should be made towards the

Table 1. Baseline demographics and clinical characteristics of participants.

Characteristic	Total sample (n = 137)	No anticoagulant drug (n =45)	Anticoagulant drug (n =88)	p value
Age (years)	72±16 (19–94)	77±13	70±16	0.169
Male sex	87 (65)	27 (60)	60 (68)	0.348
Unplanned admission to hospital	117 (88)	44 (98)	73 (83)	0.013
Admission related to heart failure	90 (68)	30 (67)	60 (68)	0.860
Median length of stay (days)	7	7	8	0.600
White ethnicity (n=127)	114 (90)	36 (86)	78 (92)	0.290
Lived alone (n=119)	33 (28)	14 (34)	19 (24)	0.257
English language spoken at home (n=126)	94 (75)	28 (68)	66 (79)	0.148
Myocardial infarction (n=131)	33 (25)	16 (36)	17 (20)	0.036
Hypertension (n=133)	85 (64)	29 (65)	56 (64)	0.927
Hypercholesterolaemia (n=131)	68 (52)	24 (55)	44 (51)	0.667
Diabetes (n=133)	46 (37)	18 (40)	28 (32)	0.348
Stroke or transient ischaemic attack (n=133)	29 (22)	9 (20)	20 (23)	0.719
Coronary artery disease (n=129)	56 (43)	22 (52)	34 (40)	0.209
Renal disease (n=131)	50 (38)	18 (41)	32 (37)	0.646
Asthma or lung disease (n=131)	52 (40)	20 (46)	32 (39)	0.338
Left ventricular ejection fraction <45% (n=110)	65 (59)	24 (60)	41 (59)	0.883
Sodium (n=133)	138±3.83	138±3.41	138±3.97	0.365
International normalized ratio (n=100)	1.9±0.65	1.5±0.7	2.0±0.6	0.890
Estimated glomerular filtration rate (n=133)	50±19	46±18	52±19	0.264
Creatinine (n=133)	130±67	143±93	124±49	0.086
Haemoglobin (n=133)	118±21	119±19	118±21	0.666
Angiotensin-converting enzyme inhibitor or angiotensin II receptor blocker (n=133)	52 (39)	12 (27)	40 (46)	0.036
Warfarin (n=133)	77 (58)	0 (0)	77 (88)	<0.01
Novel anticoagulant (n=133)	5 (4)	0 (0)	5 (6)	0.103
Any antiplatelet drug (n=133)	55 (41)	31 (70)	24 (27)	<0.01
Digoxin (n=133)	43 (32)	10 (22)	33 (38)	0.075
Diuretic (n=133)	106 (80)	34 (76)	72 (82)	0.396
β-Blocker (n=133)	75 (56)	22 (49)	53 (60)	0.212
Antiarrhythmic drug (n=133)	33 (25)	10 (22)	23 (26)	0.621
Calcium channel blocker (n=133)	16 (12)	3 (7)	13 (15)	0.174
CHA ₂ DS ₂ VASc	4.25±1.85	4.71±1.74	4.13±1.83	0.571
HAS-BLED score	2.85±1.55	3.42±1.53	2.66±1.45	0.569
Charlson Comorbidity Score	3.86±2.05	4.58±2.38	3.52±1.74	0.085
NYHA Class II–III (n=99)	61 (62)	17 (65)	44 (60)	0.645
Frailty status (n=92)	58 (63)	18 (78)	40 (58)	0.081
Not for cardiopulmonary resuscitation (n=121)	15 (12)	9 (22)	6 (8)	0.038
Median (IQR) self-care behaviour (European Heart Failure Self Care Behaviour Scale) (n=42, 11 vs. 32)	31 (16)	41 (17)	28 (16)	0.010
Medication adherence (Morisky Self Report) (n=83) (one or more responses to non-adherence)	36 (43)	8 (42)	28 (44)	0.899

Data presented as mean±SD (range) values or n(%).

patient's individual values and preferences. Antiplatelet treatment should only be considered for thromboprophylaxis in AF for low-risk patients (CHA₂DS₂VASc <1) or those deemed unsuitable for treatment with a vitamin K antagonist or novel oral anticoagulant.¹² Given the validity, reliability and widespread recommendation for use of the CHA₂DS₂VASc and HAS-BLED scores within international guidelines, we selected these as suitable

instruments for the stratification of stroke and bleeding risk in this study.

Adherence to medication. Patient self-reporting is a useful method of assessing adherence to medication. Self-reporting offers reliable predictors of a variety of cardiovascular health outcomes, such as blood pressure control and admission to hospital for CHF.¹⁸ There are a number of

tools available to measure self-reported adherence; the four-point Morisky Scale (MMAS) provides good predictive ability and can be easily integrated into a patient assessment.¹⁹ The MMAS has a reported sensitivity and specificity of 81 and 44%, respectively; the Cronbach's α for reliability is 0.61, which is below the accepted value of 0.7. This tool has been implemented in a large number of studies in clinical research and has the advantage of being easily integrated into a quick clinical assessment.²⁰

Self-care behaviour. The European Heart Failure Self Care Behaviour Scale²¹ was used to measure self-care behaviour. This questionnaire is widely used in heart failure research and has been validated using pooled data from six European countries. Cronbach's α was 0.81. This is a five-point scale ranging from 1 (I completely agree) to 5 (I completely disagree), with a global score ranging from 12 (better self-care behaviour) to 60 (worse self-care behaviour). This scale is specifically designed for evaluating the outcome of the management of CHF with a focus on self-care behaviour in patients with heart failure. A lower score indicates better self-care behaviour and a higher score indicates poorer self-care behaviour.²²

Frailty. The Survey of Health, Ageing and Retirement in Europe (SHARE) Frailty Index (FI) is a simple frailty screening instrument.²³ This instrument has been validated for use in primary care settings with a community-dwelling population and has demonstrated good predictive validity. This instrument is available with free and easy-to-access web-based calculators. There are five key variables in the SHARE-FI, including: fatigue, loss of appetite, handgrip strength, functional difficulties and physical activity. The SHARE-FI was selected for use in the study as a result of its brevity and simplicity to use during an assessment by a research nurse. Many other frailty instruments include a variable for weight; this is replaced with a variable for 'loss of appetite' in the SHARE-FI. This is an important consideration in the management of heart failure, where weight fluctuations may influence measurement. This instrument was delivered using a standardized method, which was important in the measurement of handgrip strength using the dynamometer. Frailty was assessed as close to discharge from hospital as clinically possible to maintain consistency in measurement. Two research nurses were trained to deliver the frailty screen to achieve consistent measurements.

Data management, statistical analyses and missing data

Data were managed and analysed using IBM SPSS Statistics version 21 (IBM Corp., Armonk, NY, USA). The baseline characteristics of the study cohort were described using frequencies and percentages for categorical variables and values for the mean \pm SD, median and interquartile

range for continuous variables. Event-free survival time was calculated using Kaplan–Meier survival analysis for a composite endpoint of all-cause admission to hospital and mortality. Cox regression analysis was used to calculate hazards ratios.

Ethical considerations

This study was approved by the hospital and university Human Research Ethics Committee, approvals LNR/12/SVH/62 and 2013000181. Consent was waived for baseline data collection and a routine 12-month follow-up phone call. Participants were provided with written information on the study and were free to withdraw at any stage.

Results

Sample baseline demographic information and clinical characteristics

A total of 1860 patients was screened between April and October 2013 at a single site. Of these, 365 patients had a diagnosis of CHF, consistent with international guidelines. From this sample, 156/365 (43%) patients were eligible for inclusion as they had concomitant AF of any type. Six patients died during hospital admission, 11 patients were not included for other reasons (declined or enrolled in another clinical trial) and two withdrew patients from the study. Of the final cohort of 137 participants, four were not included in the comparative analysis as a result of missing medication data at discharge (Figure 1).

The baseline analysis included 137 hospitalized patients who were consecutively enrolled into the study on discharge between April and October 2013. The mean \pm SD age was 72 \pm 16 years, 65% were men, 62% were NYHA class II–III and 59% had a left ventricular ejection fraction <45%. The mean \pm SD CHA₂DS₂VASc score was 4.25 \pm 1.85, the mean \pm SD HAS-BLED score was 2.85 \pm 1.55, the mean \pm SD Charlson Comorbidity Score was 3.86 \pm 2.05 and the mean \pm SD number of drugs on discharge was 11 \pm 4. Twenty-eight per cent of participants lived alone.

Seventy per cent of participants (96/137) had a CHA₂DS₂VASc score \geq 4 points with a mean \pm SD of 4.25 \pm 1.85 (Figure 2). Sixty-eight per cent of participants (56/137) had a HAS-BLED score \geq 3. This equates to >3.74 bleeds/100 patient-years (mean \pm SD 2.85 \pm 1.55) (Figure 3). Although the differences were not significant, participants who were not prescribed anticoagulant drugs at discharge were generally at greater risk of stroke (4.71 vs. 4.13; $p=0.571$) and bleeding (3.42 vs. 2.66; $p=0.569$), as indicated by the CHA₂DS₂VASc and HAS-BLED schemata, and tended to have greater comorbidity ($p=0.085$) than those prescribed anticoagulant drugs. Only 66% of participants were prescribed an anticoagulant drug

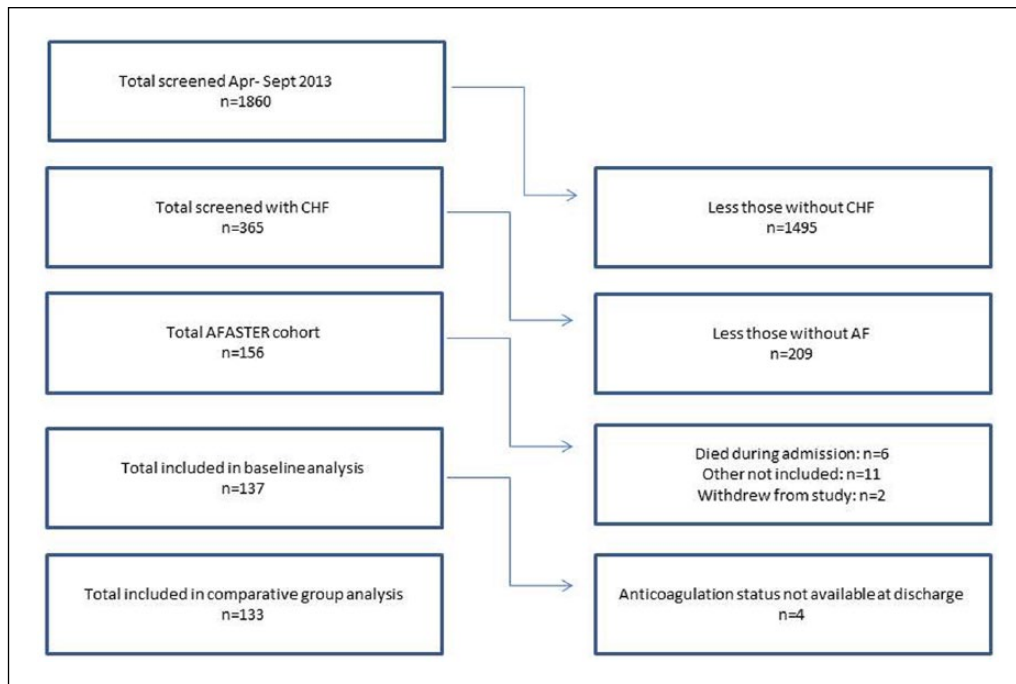


Figure 1. Screening and recruitment of participants. AF: atrial fibrillation; CHF: chronic heart failure.

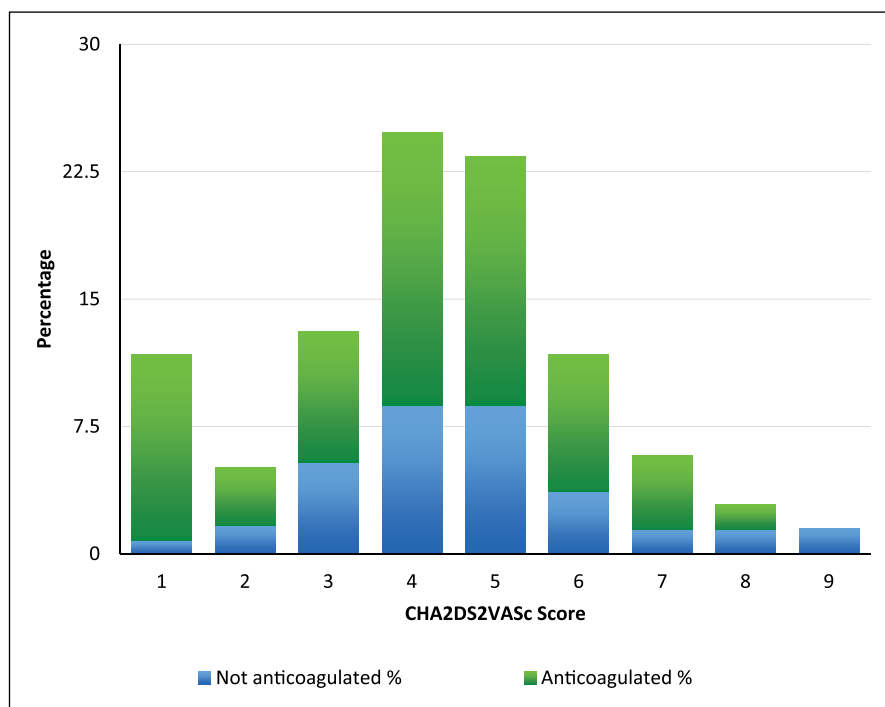


Figure 2. Stroke risk distribution at discharge based on treatment with or without anticoagulant drugs.

(58% warfarin, 4% novel oral anticoagulant and 2% subcutaneous anticoagulation).

Poorer self-reported heart failure self-care behaviour ($p=0.010$) and having a resuscitation status as 'not for cardiopulmonary resuscitation' ($p=0.038$) were associated

with not receiving anticoagulant drugs at discharge. Sixty-three per cent of 58 patients were classified as frail. Although statistical significance was not achieved, being frail and having a higher comorbidity were associated with not receiving anticoagulant drugs at discharge. When the

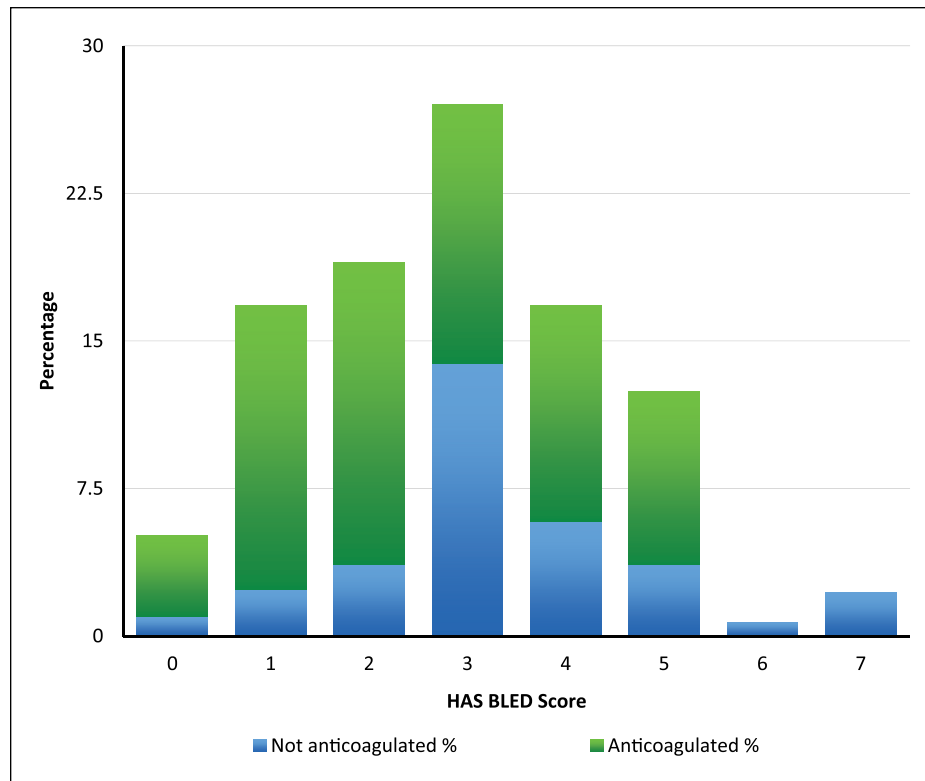


Figure 3. Bleeding risk distribution at discharge based on treatment with or without anticoagulant drugs.

categories of non-frail and pre-frail were combined, frailty was associated with a suboptimum prescription of anticoagulant in patients with CHF and concomitant AF (78 vs. 58%; $p=0.081$).

12-month outcomes

All-cause readmission to hospital was frequent (68%) and the 12-month all-cause mortality was high (29%) (Figure 4; Table 2). The prescription of anticoagulant drugs at discharge was significantly associated with a lower mortality at 12 months, but was not associated with lower rates of readmission to hospital among patients with CHF and concomitant AF. Patients prescribed anticoagulant drugs at discharge had lower unadjusted rates of all-cause mortality (23 vs. 40%; $p=0.037$) at 12 months (Figure 5). All-cause mortality at 12 months in patients receiving anticoagulant drugs was almost half that of patients not receiving anticoagulant drugs at baseline ($p=0.037$; hazards ratio (HR) 0.506; 95% confidence interval (CI) 0.267–0.956).

Discussion

The 43% incidence of AF in patients with CHF within our overarching screening sample is consistent with other studies.²⁴ This study demonstrates that thromboprophylaxis is underused in this frail, elderly, high-risk cohort.

Our findings are similar to those reported in existing studies and systematic review data.⁴ There is scope for improvement in thromboprophylaxis for stroke prevention in these patients.

Most patients in the group who did not receive anticoagulant drugs were prescribed antiplatelet drugs at discharge (70% compared with 27% in the group who received anticoagulant drugs; $p<0.01$). This could be explained by coexistent coronary artery disease (52%) or separate carotid disease (20% previous stroke or TIA). This suggests that clinicians are prepared to prescribe an antiplatelet drug as thromboprophylaxis in some patients under circumstances in which they are not prepared to use oral anticoagulant drugs.

Within the AFASTER cohort, 56% of patients were prescribed β -blockers at the time of discharge from hospital. A recent study by Kotecha et al.²⁵ found that the use of β -blockers led to a significant reduction in all-cause mortality in patients with sinus rhythm (HR 0.73, CI 0.67–0.80; $p<0.001$), but not in patients with AF (HR 0.97, 95% CI 0.83–1.14; $p=0.73$), with a significant p value for interaction of the baseline rhythm ($p=0.002$). The study authors recommended that β -blockers should not be used preferentially over other rate-control drugs and should not be regarded as standard treatment to improve the prognosis in patients with concomitant heart failure and AF.

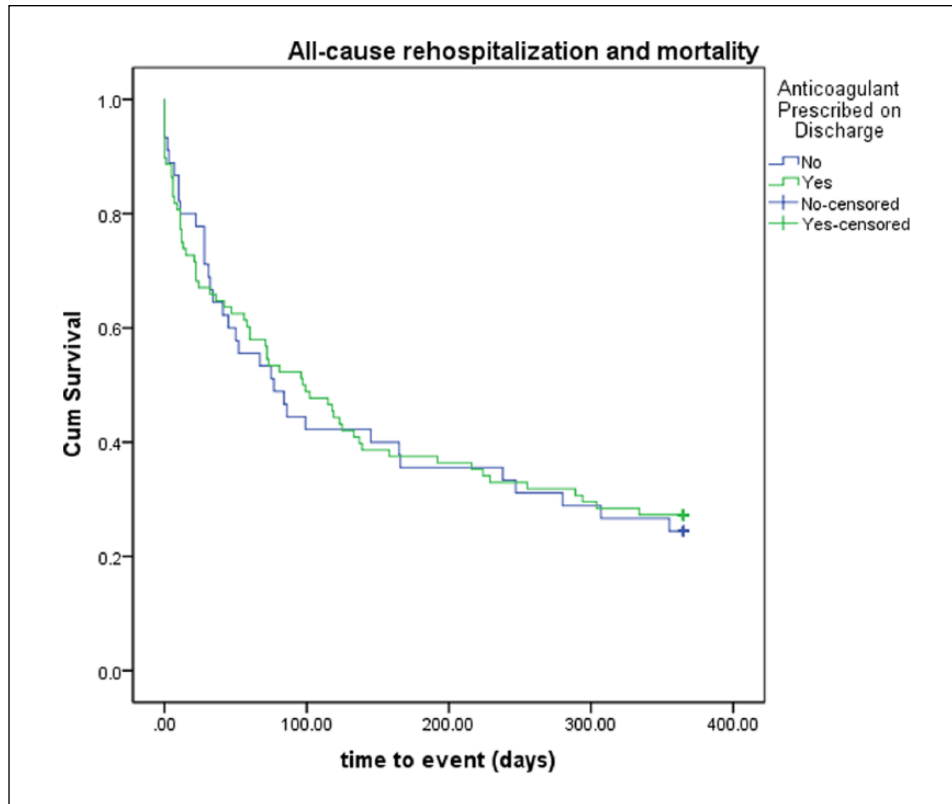


Figure 4. Kaplan–Meier survival analysis for composite endpoint of all-cause admission to hospital and mortality.

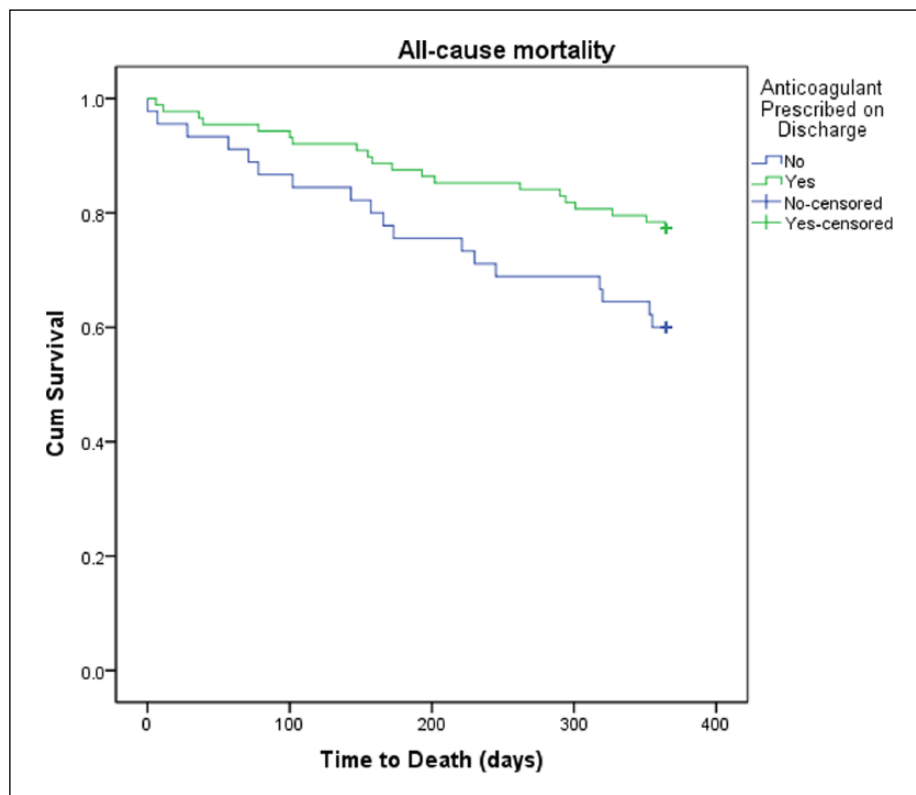


Figure 5. Kaplan–Meier survival analysis for all-cause mortality.

Table 2. Unadjusted events at 12 months after admission to hospital.

Event type	No. (%) of total sample	No. (%) not receiving anticoagulant drugs	No. (%) receiving anticoagulant drugs	p value	Hazard ratio (95% confidence interval)
All-cause mortality (n=133)	38 (29)	18 (40)	20 (23)	0.037	0.506 (0.267–0.956)
All-cause readmission to hospital (n=133)	90 (68)	31 (69)	59 (67)	0.830	1.360 (0.867–2.133)
Transient ischaemic attack (n=133)	2 (2)	0 (0)	2 (2)	0.308	
Stroke (n=133)	4 (3)	3 (7)	1 (1)	0.077	
Composite for all-cause transient ischaemic attack and stroke	6 (5)	3 (7)	3 (3)	0.392	0.423 (0.068–2.630)
Bleeding (n=133)	25 (19)	6 (13)	19 (22)	0.249	
Composite for all-cause readmission to hospital and mortality (n=133)	98 (80)	34 (76)	64 (73)	0.726	0.961 (0.634–1.458)

Importance of considering multi-morbidity

CHF and AF occur with a complex interplay. They seldom exist independently of other comorbidities and cardiovascular risk factors.^{26,27} Multi-morbidity, including AF, adds to the complexity of care management for patients with CHF. Clinical practice guidelines have a vital role in the translation of evidence into practice and the improvement in quality of care for patients with chronic conditions. However, in patients with multi-morbidities, the application of key care recommendations may lead to polypharmacy and an overwhelming treatment burden.²⁸ This may negatively affect their adherence to treatment regimens, including thromboprophylaxis.

There is robust evidence that the use of thromboprophylaxis (including warfarin, dabigatran, rivaroxaban and apixaban) significantly reduces the risk of stroke in patients with CHF and AF. In contrast, there is insufficient evidence to support the use of anticoagulant drugs in CHF alone.²⁹ Systematic review evidence reveals that thromboprophylaxis in patients with AF continues to be underused in clinical practice.⁴ International data from the Global Anticoagulant Registry in the FIELD registry draws attention to the concern that thromboprophylaxis is not being best used in accordance with stroke risk scores and guidelines. These data, which include 10,641 participants, also highlight the overuse of thromboprophylaxis in low-risk patients and underuse in those at high risk of stroke.²⁷ The decision to treat high-risk patients with thromboprophylaxis is a complex choice for patients, caregivers and healthcare providers.³⁰ Previous research has highlighted the frequent mismatch between patient and clinician values in the context of decision-making.³¹ For example, physicians are likely to advocate against thromboprophylaxis when patients would choose it and, in contrast, patients are likely to be prescribed treatment they would not choose.³¹ Treatment decisions around thromboprophylaxis ought to be patient-centred. They must be considered in the context of the best evidence to date, within the scope of the

clinician's expertise, and be a treatment that is central to the individual patient's situation, knowledge, attitudes, values and beliefs.³⁰

Luong et al.³² emphasized the importance of recognizing that, although stroke continues to be the most worrisome consequence of AF, it is not the primary cause of death in patients with AF. The increased utilization of anticoagulant drugs in the last three decades has seen a decrease in the incidence of stroke in patients with AF.³³ However, there has been no reduction in mortality, regardless of effective thromboprophylaxis. This highlights that stroke is not the best predictor of mortality in patients with AF. These patients are more likely to die as a result of heart failure than from a stroke.^{32,34}

Guideline-based treatment in the context of multi-morbidity

There is a need to address comorbidity in the provision of patient-centred care. Guidance incongruence and recommendation divergence may exist for complex patients, when recommendations are based on a singular comorbidity. Guideline blending is needed for similar chronic conditions.²⁸ There is scope for the amalgamation of CHF and AF practice guidance and future models of the delivery of a long-term care service. There is also a need to tailor clinical practice guidelines to account for clinical judgement, acknowledging the role of the patient throughout person-centred models of care.³⁵

High risk of readmission to hospital and death

The prevalence of CHF and AF are predicted to increase, with the incidence of AF expected to double in the next 20 years.³⁶ The prevalence of AF increases with the severity of CHF, as defined by the NYHA functional class.³⁷ Readmission to hospital is common and costly for both chronic conditions. Over 50% of patients with CHF are

readmitted to hospital within six months and approximately 40% of patients with AF are readmitted within 12 months.^{38,39} Pre-existing AF has been previously established as an independent predictor of 30-day readmission for patients with CHF in an analysis using data from 3758 patients enrolled in the AFA Get-with-the-Guidelines registry from 2007 to 2010.⁴⁰ These data suggest that patients with CHF and AF had 1.39 times increased odds of readmission than those with CHF without AF. From this cohort, 21% (780/3758) patients were admitted to hospital within 30 days.⁴⁰ Patients who experience a CHF-related admission to hospital have more than double the likelihood of not being alive within two years.⁴¹ CHF-related admission to hospital is a recognized indicator of syndrome progression and is associated with poor outcomes.⁴¹

Despite recent advances in healthcare technology and pharmacotherapy, CHF continues to place a large burden on the healthcare budget.⁴² The annual cost of heart failure was recently estimated at 2% of the total US healthcare budget, amounting to US\$39.2 billion in 2010. Almost 60% of these costs are related to hospital care.⁴² There has been renewed attention and debate on innovative methods to prevent potentially avoidable HF-related admissions to hospital.

Living alone and frailty as risk factors for increased admission to hospital and mortality

Previous studies have demonstrated that living alone and loneliness are predictors of increased mortality. Data from the Global Reduction of Atherothrombosis for Continued Health Registry, which followed up 44,573 participants aged ≥ 45 years from 44 countries for four years, showed that 19% (8594/44,573) of this cohort lived alone. Living alone was associated with a higher four-year mortality.⁴³

Associations between frailty and adverse outcomes (including readmission to hospital and mortality) have previously been established. Poorer outcomes are evidenced with increasing severity of frailty.⁴⁴ Fried et al.,⁴⁵ using data from the Cardiovascular Health Study, which included 5317 participants with a seven-year follow-up, identified poorer outcomes for severely frail patients when compared with patients with intermediate frailty, including admission to hospital (HR 1.27, 95% CI 1.11–1.46 vs. HR 1.11, 95% CI 1.03–1.19) and mortality (HR 1.63, 95% CI 1.27–2.08 vs. HR 1.32, 95% CI 1.13–1.55). Similarly, previous research by Perera et al.⁴⁶ has demonstrated that frail elderly inpatients with AF are less likely to receive warfarin than non-frail patients ($p < 0.001$) and appear more susceptible to adverse outcomes, regardless of treatment with or without thromboprophylaxis.

Self-care behaviour

Our finding of poorer self-reported heart failure self-care behaviour associated with not receiving anticoagulant drugs at discharge should be interpreted with caution,

given some missing data. It is widely recognized, however, that self-care behaviour is an important measurement in improving other important outcomes, such as reduced admission to hospital and mortality.⁴⁷ There remains a need for the development and validation of tools for the assessment of self-care behaviour in AF. To date, much research has focused on self-care behaviour in patients with heart failure and the quality of self-care behaviour in patients with AF remains to be clearly defined within the nursing literature.

Patient preferences

Although our study has revealed that only 66% of participants received anticoagulant drugs at discharge, the reasons for the non-prescription of these drugs warrants deeper exploration within future studies. Our study highlights that barriers remain for the prescription of stroke thromboprophylaxis for patients with CHF and AF. It is increasingly recognized that shared decision-making has the ability to improve treatment choices for patients and may favourably affect adherence to treatment regimens and patient outcomes. Recent research by Siouta et al.⁴⁸ draws attention to improvements in clinician–patient relationships to create the optimum climate for patient partnerships in clinical consultations. It is important that patients and caregivers are viewed as active partners in clinical decision-making for anticoagulant drugs and not as passive recipients of clinician-led decisions. Importantly, the conversation ought to be bidirectional, with supportive and clear conversation that builds confidence.^{48,49}

Limitations

This study has some limitations. First, the SHARE-FI is not validated for use in the inpatient setting,²³ although it is quick and simple to conduct in an acute inpatient setting. Initially developed for the community setting, it has not been validated for the heart failure population in an inpatient setting. Second, participants with cognitive dysfunction and those speaking languages other than English were excluded from some measures, including the assessment of frailty, heart failure, self-care behaviour and self-reported adherence to medication. Third, the outcome assessment of stroke/TIA and bleeding events were often self-reported. Stroke was confirmed by via electronic methods where a computed tomography brain report was available. Fourth, the status of living alone was obtained via a review of the medical records. Although statistical significance was not achieved to compare differences in multi-morbidity and frailty, the values trended towards significance. Therefore a larger and more comprehensive snapshot that provides prospective observational data is recommended. The majority of

our cohort were English-speaking with a white ethnic background, thus limiting the utility and generalizability of this research. In spite of these limitations, this study has several strengths. This study offered a detailed insight using multiple, routinely collectable clinical variables. Selection bias was reduced through the recruitment of prospective consecutive participants and the waiver of consent for enrolment at baseline.

Conclusion and implications

The results of our study demonstrate that thromboprophylaxis was underused in this frail, elderly and high-risk cohort. All-cause readmission to hospital was frequent and the 12-month all-cause mortality was high. The prescription of anticoagulant drugs at discharge was significantly associated with an improved mortality at 12 months, but was not associated with improved rates of readmission to hospital among patients with CHF and concomitant AF. This study highlights that frailty, multi-morbidity and self-care abilities are important considerations in thromboprophylaxis decision-making. Patients and caregivers must be central to treatment choices for thromboprophylaxis, although the CHA₂DS₂VASc and HAS-BLED schemata are useful in practice to risk-stratify stroke and bleeding. It is problematic to simply use these tools in isolation to guide treatment decisions. Although helpful, they lack the ability to provide a comprehensive assessment that includes key considerations including multi-morbidity, frailty and self-care ability.

Implications for clinical practice

- Although the CHA₂DS₂VASc and HAS-BLED models are useful tools in clinical practice to stratify stroke and bleeding risk, they do not consider other important factors in thromboprophylaxis decision-making and should not be used in isolation.
- Although preventing stroke is important in this high-risk cohort of patients, the rates of readmission to hospital and mortality are very high and are often related to the management of heart failure symptoms.
- Future research should explore clinicians' fear and patient choice in thromboprophylaxis.
- Optimizing atrial fibrillation management needs to be considered in the context of multi-morbidity, frailty, self-care ability, cognitive functioning and caregiver support.
- There is need to target clinical interventions that improve self-care behaviour and self-management of atrial fibrillation in the setting of chronic heart failure.

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Conflict of interest statement

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References

1. Krum H, Jelinek MV, Stewart S, et al. 2011 Update to National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand. Guidelines for the prevention, detection and management of chronic heart failure in Australia, 2006. *Med J Aust* 2011; 194: 405–409.
2. Stewart S, Carrington MJ, Marwick T, et al. The WHICH? trial: rationale and design of a pragmatic randomized, multicentre comparison of home- vs. clinic-based management of chronic heart failure patients. *Eur J Heart Fail* 2011; 13: 909–916.
3. January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS Guideline for the management of patients with atrial fibrillation: executive summary a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines and the Heart Rhythm Society. *J Am Coll Cardiol* 2014; 64: 2246–2280.
4. Ogilvie IM, Newton N, Welner SA, et al. Underuse of oral anticoagulants in atrial fibrillation: a systematic review. *Am J Med* 2010; 123: 638–645.
5. Ferguson C, Inglis S, Newton P, et al. Atrial fibrillation and thromboprophylaxis in heart failure: the need for patient-centered approaches to address adherence. *Vasc Health Risk Manage* 2013; 9: 3–11.
6. Ferguson C, Inglis SC, Newton PJ, et al. The caregiver role in thromboprophylaxis management in atrial fibrillation: a literature review. *Eur J Cardiovasc Nurs* 2015; 14: 98–107.

7. Ferguson C, Inglis SC, Newton PJ, et al. Education and practice gaps on atrial fibrillation and anticoagulation: a survey of cardiovascular nurses. *BMC Med Educ* 2016; 16: 1–10.
8. Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987; 40: 373–383.
9. Lip GYH. Implications of the CHA2DS2-VASc and HAS-BLED scores for thromboprophylaxis in atrial fibrillation. *Am J Med* 2011; 124: 111–114.
10. Gage BF, Yan Y, Milligan PE, et al. Clinical classification schemes for predicting hemorrhage: results from the National Registry of Atrial Fibrillation (NRAF). *Am Heart J* 2006; 151: 713–719.
11. Lip GYH, Frison L, Halperin JL and Lane DA. Comparative validation of a novel risk score for predicting bleeding risk in anticoagulated patients with atrial fibrillation. *J Am Coll Cardiol* 2011; 57: 173–180.
12. Camm AJ, Lip GYH, De Caterina R, et al. 2012 focused update of the ESC Guidelines for the management of atrial fibrillation. *Eur Heart J* 2012; 33: 2719–2747.
13. Wann L, Curtis A, January C, et al. 2011 ACCF/AHA/HRS focused update on the management of patients with atrial fibrillation: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation* 2011; 123: 104–123.
14. National Institute for Health and Care Excellence. *Atrial fibrillation: the management of atrial fibrillation*. London: NICE; 2014.
15. Boriani G, Botto GL, Padeletti L, et al. Improving stroke risk stratification using the CHADS2 and CHA2DS2VASc risk scores in patients with paroxysmal atrial fibrillation by continuous arrhythmia burden monitoring. *Stroke* 2011; 42: 1768–1770.
16. Apostolakis S, Lane DA, Guo Y, et al. Performance of the HEMORR2HAGES, ATRIA, and HAS-BLED bleeding risk-prediction scores in patients with atrial fibrillation undergoing anticoagulation. *J Am Coll Cardiol* 2012; 60: 861–867.
17. Ferguson C, Inglis SC, Newton PJ, et al. Atrial fibrillation: stroke prevention in focus. *Aust Crit Care* 2014; 27: 92–98.
18. Gehi A, Haas D, Pipkin S, et al. Depression and medication adherence in outpatients with coronary heart disease: findings from the Heart and Soul Study. *Arch Intern Med* 2005; 165: 2508–2513.
19. Morisky DE, Green LW and Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care* 1986; 24: 67–74.
20. Tan X, Patel I and Chang J. Review of the four item Morisky Medication Adherence Scale (MMAS-4) and eight item Morisky Medication Scale (MMAS-8). *Innovations in Pharmacy*. 2014; 5: 1–8.
21. Jaarsma T, Strömberg A, Mårtensson J, et al. Development and testing of the European Heart Failure Self-Care Behaviour Scale. *Eur J Heart Fail* 2003; 5: 363–370.
22. Cameron J, Worrall-Carter L, Driscoll A, et al. Measuring self-care in chronic heart failure: a review of the psychometric properties of clinical instruments. *J Cardiovasc Nurs* 2009; 24: E10–E22. DOI: 10.1097/JCN.1090b1013e3181b5660f.
23. Romero-Ortuno R, Walsh CD, Lawlor BA, et al. A frailty instrument for primary care: findings from the survey of health, ageing and retirement in Europe (SHARE). *BMC Geriatr* 2010; 10: 1–12.
24. Stewart S, Carrington MJ, Marwick TH, et al. Impact of home versus clinic-based management of chronic heart failure: the WHICH? (Which Heart Failure Intervention Is Most Cost-Effective & Consumer Friendly in Reducing Hospital Care) multicenter, randomized trial. *J Am Coll Cardiol* 2012; 60: 1239–1248.
25. Kotecha D, Holmes J, Krum H, et al. Efficacy of B-blockers in patients with heart failure plus atrial fibrillation: an individual-patient data meta-analysis. *Lancet* 2014; 384(9961): 2235–2243.
26. Saczynski JS, Go AS, Magid DJ, et al. Patterns of comorbidity in older adults with heart failure: the Cardiovascular Research Network PRESERVE study. *J Am Geriatr Soc* 2013; 61: 26–33.
27. Kakkar AK, Mueller I, Bassand JP, et al. Risk profiles and antithrombotic treatment of patients newly diagnosed with atrial fibrillation at risk of stroke: perspectives from the international, observational, prospective GARFIELD registry. *PloS ONE* 2013; 8: e63479.
28. Hughes LD, McMurdo MET and Guthrie B. Guidelines for people not for diseases: the challenges of applying UK clinical guidelines to people with multi-morbidity. *Age Ageing* 2013; 42: 62–69.
29. Fuster V, Rydén LE, Cannom DS, et al. ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation. *Circulation* 2006; 114: e257–e354.
30. Ferguson C, Inglis S, Newton P, et al. Atrial fibrillation and thromboprophylaxis in heart failure: the need for patient-centered approaches to address adherence. *Vasc Health Risk Manage* 2013; 9: 3–11.
31. Alonso-Coello P, Montori VM, Díaz MG, et al. Values and preferences for oral antithrombotic therapy in patients with atrial fibrillation: physician and patient perspectives. *Health Expect* 2014; 18(6): 2318–2327.
32. Luong C, Barnes M and Tsang TM. Atrial fibrillation and heart failure: cause or effect? *Curr Heart Fail Rep* 2014; 11:463–470.
33. Miyasaka Y, Barnes ME, Bailey KR, et al. Mortality trends in patients diagnosed with first atrial fibrillation: a 21-year community-based study. *J Am Coll Cardiol* 2007; 49: 986–992.
34. Marijon E, Le Heuzey J-Y, Connolly S, et al. Causes of death and influencing factors in patients with atrial fibrillation: a competing risk analysis from the randomized evaluation of long-term anticoagulant therapy study. *Circulation* 2013; 128(20): 2192–2201.
35. Arnett DK, Goodman RA, Halperin JL, et al. AHA/ACC/HHS strategies to enhance application of clinical practice guidelines in patients with cardiovascular disease and comorbid conditions: from the American Heart Association, American College of Cardiology, and US Department of Health and Human Services. *Circulation* 2014; 64(17): 1851–1856.
36. Colilla S, Crow A, Petkun W, et al. Estimates of current and future incidence and prevalence of atrial fibrillation in the U.S. adult population. *Am J Cardiol* 2013; 112: 1142–1147.

37. Maisel WH and Stevenson LW. Atrial fibrillation in heart failure: epidemiology, pathophysiology, and rationale for therapy. *Am J Cardiol* 2003; 91: 2d–8d.
38. Desai AS and Stevenson LW. Rehospitalization for heart failure: predict or prevent? *Circulation* 2012; 126: 501–506.
39. Amin AN, Jhaveri M and Lin J. Hospital readmissions in US atrial fibrillation patients: occurrence and costs. *Am J Ther* 2013; 20: 143–150.
40. Desai NK, Powell M, Skaf J, et al. Atrial fibrillation as an independent predictor of heart failure readmissions: analysis of “Get-with-the-Guidelines” heart failure. *J Am Coll Cardiol* 2014; 63(12_S).
41. Ahmed A, Allman RM, Fonarow GC, et al. Incident heart failure hospitalization and subsequent mortality in chronic heart failure: a propensity-matched study. *J Card Fail* 2008; 14: 211–218.
42. Braunschweig F, Cowie MR and Auricchio A. What are the costs of heart failure? *Europace* 2011; 13: ii13–ii17.
43. Udell JA, Steg PG, Scirica BM, et al. Living alone and cardiovascular risk in outpatients at risk of or with atherothrombosis. *Arch Intern Med* 2012; 172: 1086–1095.
44. Clegg A, Young J, Iliffe S, et al. Frailty in elderly people. *Lancet* 2013; 381: 752–762.
45. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci* 2001; 56: M146–M156.
46. Perera V, Bajorek BV, Matthews S, et al. The impact of frailty on the utilisation of antithrombotic therapy in older patients with atrial fibrillation. *Age Ageing* 2009; 38: 156–162.
47. Jaarsma T, Abu-Saad HH, Dracup K, et al. Self-care behaviour of patients with heart failure. *Scand J Caring Sci* 2000; 14: 112–119.
48. Siouta E, Hellstrom Muhli U, Hedberg B, et al. Patients’ experiences of communication and involvement in decision-making about atrial fibrillation treatment in consultations with nurses and physicians. *Scand J Caring Sci* 2016; 30: 535–546.
49. Siouta E, Broström A and Hedberg B. Content and distribution of discursive space in consultations between patients with atrial fibrillation and healthcare professionals. *Eur J Cardiovasc Nurs* 2013; 12: 47–55.