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Editorial Comment
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CHA_2DS_2-VASc Score: A Simple But Not Appropriate Risk Score for Predicting Mortality Risk in Patients with Heart Failure

Chun-Li Wang[1,2]

Despite recent advancesin heart failure (HF) therapies, the prognosis for patients suffering HF remains poor, witha 5-year 50% mortality rate.[1] However, estimating patient survival probability based on risk profile will help to identify high-risk patients, and assist patients and their families in selecting the most appropriate treatments or facilitate end-of-life decisions. There are numerous factors associated with adverse outcomes in HF including demographic variables (e.g., advanced age, male, ischemic etiology, and resuscitated sudden death),[2,3] clinical factors [e.g., hypotension, New York Heart Association (NYHA) functional class III-IV, and prior HF hospitalization],[4] co-morbidities (e.g., anemia, diabetes, and renal dysfunction),[5] imaging markers (e.g., ejection fraction, global longitudinal strain),[6,7] and serum markers (e.g., hyponatremia, natriuretic peptides).[7-9] However, no single parameter can be expected to reliably predict outcomes in HF. The combination of several variables in prognostic models has emerged as the most appropriate approach to predict outcomes in the heterogeneous HF population.[10-12]

In a systematic review of risk prediction models in HF between January 1995 to March 2013, 64 models from 48 studies were found.[10] Of the 64 models, 43 models predicted death, 10 hospitalization, and 11 death or hospitalization.[10] Despite the marked differences in clinical factors, demographic data, and choice of candidate variables, several variables emerged as consistent and strong predictors of mortality.[10] These variables included age, renal function, blood pressure, blood sodium, ejection fraction, male, NYHA functional class, diabetes, natriuretic peptides, weight or body mass index, and exercise tolerance.[10] In this review,[10] two prediction models for mortality were recommended: the Cardiac and Comorbid Conditions HF (3C-HF) score, and the Meta-Analysis Global Group in Chronic HF (MAGGIC) score.[11,12] The 3C-HF score has a very good discriminatory ability for predicting 1-year mortality (C-statistic of 0.87), has been externally validated (C-statistic of 0.82), and enables risk calculations in a wide variety of cases of HF.[11] The MAGGIC integer score used information from 30 studies and 39,372 HF patients to derive a risk score for three-year mortality.[12] The large size of the study and the derivation of patients from wide geographic regions provide a distinctively robust and generalizable tool to assess mortality risk in HF.[12]

The CHA_2DS_2-VASc score [congestive heart failure, hypertension, age $\geq$ 75 years (doubled), diabetes, stroke/transient ischemic attack (doubled), vascular disease, age 65-74 years, female] is used clinically for stroke risk stratification in nonvalvular atrial fibrillation (AF).[13] Recently, use of the CHA_2DS_2-VASc score in predicting stroke risk in AF has extended beyond AF and stroke risk predicting.[14] In a cohort study of 42,987 HF patients not receiving anticoagulation, the CHA_2DS_2-VASc score was able to predict mortality in patients with and without AF, with a high negative predictive value (92% and 91% for patients with and without AF, respectively) at 1-year follow-up.[14] The absolute risks of stroke, thromboembolism and death increased in a comparable manner in patients with and without AF, exhibiting a clear dose-response relationship.[14] In addition, a higher CHA_2DS_2-VASc score has been shown to be associated with increased risks of acute stent thrombosis after percutaneous coronary intervention,[15] mortality in acute pulmonary embolism,[16] and no reflow phenomenon in

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[1]Department of Cardiovascular, Chang Gung Memorial Hospital, Linkou; [2]College of Medicine, Chang Gung University, Taoyuan, Taiwan.
Corresponding author: Dr. Chun-Li Wang, Department of Cardiovascular, Chang Gung Memorial Hospital, No. 5, Fushin Street, Kweishan District, Taoyuan City 33305, Taiwan. Tel: 886-3-328-1200 ext. 8162; Fax: 886-3-327-1192; E-mail: wang3015@cgmh.org.tw

ST-elevation myocardial infarction.[17]

In this issue of Acta Cardiologica Sinica, Yayla et al. conducted a prospective study to investigate the association between the CHA_2DS_2-VASc score and mortality in 106 hospitalized HF patients.[18] The authors have shown that the CHA_2DS_2-VASc score was independently predictive of mortality in HF patients with reduced ejection fraction in a conditional stepwise regression model.[18] In this study, 21 patients (20%) died within one year.[18] Compared to the surviving patients, the patients who died were more likely to have a poorer NYHA functional class, higher values of urea, creatinine, B-natriuretic peptide, and CHA_2DS_2-VASc score, as well as lower hemoglobin. In the multivariate regression analysis, the CHA_2DS_2-VASc score and NYHA functional class III-IV were independent predictors of mortality.[18] The authors observed that 1 point increase in the CHA_2DS_2-VASc score was associated with a 2-fold increase in mortality (hazard ratio 2.13, 95% confidence interval 1.48-3.15). However, there are several points that require further attention.[18] First, the patients in this study are younger (mean 60 y/o) than most of the HF studies (mean 67-70 y/o).[10-12] Therefore, the generalization of the results to other HF populations is questionable. Second, there was no significant age difference between the surviving and non-surviving patients. However, in the CHA_2DS_2-VASc score, age is a significant risk marker, where a double weight is factored in for patients who are 75 y/o or older.[13] It is not appropriate to apply the CHA_2DS_2-VASc score for predicting mortality in this study cohort. Third, male rather than female was more likely to be associated with higher mortality risk in most of the prior HF studies.[10] The association between stroke/transient ischemic attack and mortality in HF has not been previously documented.[10] Therefore, it is not appropriate to apply the CHA_2DS_2-VASc score for predicting mortality in HF.

Despite the factor that a CHA_2DS_2-VASc score is a simple risk score and obtainable in most of the patients,[14] the score was originally designed and validated for predicting stroke risk in nonvalvular AF.[13] It is not appropriate to be used for mortality prediction in HF. For mortality prediction, we suggest evaluation of all possible factors to determine the independent risk factors, or use a prior established risk model for outcome prediction.[11,12]

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