



Editorial

Scoring system in patients with acute heart failure[☆]Akihiro Shirakabe^{a,*}, Masato Matsushita^a, Kuniya Asai^a, Wataru Shimizu^b^a Division of Intensive Care Unit, Nippon Medical School Chiba Hokusoh Hospital, Japan^b Department of Cardiovascular Medicine, Nippon Medical School, Tokyo, Japan

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The rapid global increase in the number of patients with heart failure (HF) has reached an “HF pandemic” level. Worldwide, approximately 26 million patients are suffering from HF [1], with 5.1 million patients reported in the USA alone [2]. More than 1 million patients are hospitalized for HF in the USA and Europe annually [1]. In this “HF pandemic” situation, the rates of mortality and re-hospitalization remain high and increases annually despite the development of new treatments and approaches [3]. Therefore, it is important to predict future adverse outcomes in patients with severely decompensated acute heart failure (AHF) as early as possible, aiming toward early and effective management. AHF is fundamentally recognized as a heterogeneous condition, and its characteristics and management differ between individuals. Thus, a scoring system including numerous factors may be useful in predicting prognosis. Evidently, many types of scoring systems predicting adverse outcomes have been established [4–9].

Cameli et al. suggested a new multi-parametric scoring system, termed the “ACUTE HF score”, which combines clinical, biochemical, and echocardiographic indices for the early prediction of increased mortality in patients with AHF [10]. The ACUTE HF score was computed as $1.4 \times (\text{serum creatinine} > 2.0 \text{ mg/dl}) + 0.8 \times (\text{ejection fraction} < 30\%) + 0.7 \times (\text{age} > 76 \text{ years}) + 0.7 \times (\text{prior hospitalization for AHF}) + 0.9 \times (\text{prior stroke/transient ischemic attack}) + 0.5 \times (\text{more than moderate mitral regurgitation}) + 0.8 \times (\text{use of non-invasive ventilation (NIV)})$. The 771 AHF patients were assigned into three groups according to this score, and the prognostic impact during a follow-up schedule of 30-days, 6-months, and 5-year was investigated. They concluded that the

ACUTE HF score may be a comprehensive and useful tool for assessing the prognosis of AHF patients. Interestingly, they included in their scoring system various indices associated with prognosis (i.e., biochemical, clinical, and echocardiographic factors). Considering the heterogeneous nature of AHF and the expected differences between individual patients, this approach would be suitable for the early prediction of poor prognosis in the current “HF pandemic” era.

Regarding biochemical factors, numerous factors (i.e., serum creatinine, total bilirubin, sodium, and N-terminal pro-B-type natriuretic peptide) have been suggested as the component factor of the risk prediction score [4–6,8,9]. Each factor reflects co-morbidity with AHF (e.g., chronic kidney disease, acute kidney injury, and congestive liver), and are associated with adverse outcome, as shown in various multicenter studies and a meta-analysis. The N-terminal pro-B-type natriuretic peptide is the most established standard biomarker for the diagnosis and prognosis of HF. The ACUTE HF score employs the serum level of creatinine as the most weighted factor. Serum creatinine is easily and rapidly measured in the emergency room and accurately indicates renal dysfunction. Hence, it is an essential factor for the calculation of ACUTE HF score.

Owing to the heterogeneous nature of AHF cohorts, selecting appropriate clinical factors for the scoring system may be challenging. Thus, aging is an easily understandable factor. It is established that the population is aging faster and life expectancy is increasing annually worldwide. Therefore, it is expected that HF will become a more serious concern in the near future due to epidemiological transition and aging. Hence, aging has been included in previous scoring systems [4,8,9]. Past medical history has rarely been included in the scoring system as a clinical factor. Although history of hypertension and myocardial infarction were suggested as candidates for inclusion in the scoring system [7], ischemic brain events (prior stroke/transient ischemic attack) leading to adverse outcome of AHF have never been included. Past medical history was uniquely included in the ACUTE HF scoring system. Furthermore, the respiratory management of AHF has not been included in the risk prediction score. In previous decades, the potential benefit of NIV, in which pressure support and positive end-expiratory pressure are delivered via a face mask or nasal mask, was recognized as a new mode of ventilator management dispensed through endotracheal intubation. Continuous positive airway pressure was recognized as first-line treatment prior to mechanical ventilation and conservative therapy, including diuresis, nitroglycerin, and dobutamine. NIV is increasingly used to

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avoid endotracheal intubation, as recommended by various guidelines for AHF. The immediate requirement for NIV indicates a critical respiratory situation; therefore, it may be reasonable to include this in the risk stratification score.

Primarily, the inclusion of echocardiographic indices in a scoring system for AHF is revolutionary. Echocardiographic management in the emergency room is now more recommended than it was previously. Focused cardiac ultrasound examination in the emergency setting and/or limited transthoracic echocardiography may be performed by emergency physicians or cardiologists in the emergency room, as suggested in a consensus statement published by the American Society of Echocardiography and American College of Emergency. The European Society of Cardiology also recommended echocardiographic examination within 48 h from admission or immediately for hemodynamically unstable patients. Therefore, the risk stratification score, including echocardiographic indices, is appropriate for the treatment of AHF in the current era. Interestingly, the ACUTE HF score also includes the ejection fraction and degree of mitral regurgitation. Patients with young dilated cardiomyopathy or aged prolonged ischemic cardiomyopathy are occasionally complicated with secondary mitral regurgitation by the tethering. Furthermore, valvular disease as the etiology of AHF in aged individuals is rapidly increasing, and this critical information can be easily obtained through echocardiography.

Early risk stratification is essential when the clinical physician decides the treatment strategy in the emergency setting of AHF. The indices included in the ACUTE HF score are simple and easy to obtain through blood testing, imaging data, and past medical history. Moreover, the calculated score predicts the short-, mid-, and long-term prognosis. The ACUTE HF score may guide clinicians in selecting the most appropriate therapy and assist researchers in discovering new therapeutic strategies, depending on the patient's grade of risk. The prompt prediction of prognosis using a simple tool from various perspectives, such as the scoring system, is required in the current "HF pandemic" era.

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Declaration of Competing Interest

The authors declare no conflicts of interest associated with the present study.

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