Comparisons of APACHE II, CURB-65, Pneumonia severity index, and CHA2DS2-VAS score on new onset cardiovascular events, including atrial fibrillation, for critical illness with pneumonia

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Background: pneumonia patients afflicted with cardiac disease were frequented with higher rates of short-term mortality. Furthermore, the most common arrhythmia (25%) in critically ill patients is atrial fibrillation and its increased incidences in hospital mortality and extended length of hospital stays. The early detection of the occurrence of atrial fibrillation and other CV events is important among these severely pneumonia patients.

Purpose: The purpose of this article is to determine the appropriate risk assessments and to make a comparison of predictive performance among four common practice risk scores: APACHE II, CURB-65, pneumonia severity index and CHA2DS2-VASc.

Methods: This was a retrospective, observational study from consecutive critical pneumonia patients admitted to medical intensive care unit. Heart failure, acute coronary syndrome, atrial fibrillation, ventricular tachycardia or stroke are defined as a cardiovascular event. Those who had the missing data about APACHE II, CURB-65, PSI and CHA2DS2-VASc scores had already been excluded from this study. The baseline characteristics of patients between the disease groups (CV vs. non-CV; AF vs. non-AF) were compared by using the independent sample t-test for continuous variables and the chi-square test for categorical variables, respectively. The performance of discriminating in-hospital CV and AF events for the four risk scores was evaluated using the ROC curve analysis. The areas under the ROC curve (AUC) of the four risk scores were compared using the Delong’s non-parametric method.

Results: 252 (22.6%) of the 1,117 patients suffered from CV events during the hospitalization. Compared to patients averting CV events, those who experienced CV events during hospitalization were older, more likely to smoke, experiencing more altered mental states, of poor renal function, of higher prevalence of all comorbidities except liver disease, of a long duration of ICU and yielded higher values of the four risk scores. There were 99 patients who suffered from CV events other than an AF episode. After excluding the 99 patients, 153 (15%) of the remaining 1,018 patients had an AF event during hospitalization. The values of the four risk scores were also significantly greater in the AF group. The performance of discriminating CV events for the four risk scores was fair with the values of AUC ranging from 61.8% of APACHE II to 64.8% of CURB 65 (Fig 1). However, no significant difference of the AUC values between any two risk scores. In terms of discriminating AF episode (Fig 2) for the four risk scores, the performance was obviously poorer with the values of AUC less than 60%, except for the CURB 65.

Conclusion: CURB 65 is simple and effective tool for predicting new onset cardiovascular events, including atrial fibrillation, in ICU patients with pneumonia.
new onset CV event

Fig 1

AUC (95% CI)
- CURB 65: 64.8 (61.0 to 68.6)
- PSI score: 63.1 (59.0 to 67.2)
- CHA2DS2-VASc: 62.2 (58.0 to 66.5)
- APACHE II: 61.8 (57.5 to 66.1)

1 - Specificity

new onset AF event

Fig 2

AUC (95% CI)
- CURB 65: 63.6 (58.8 to 68.3)
- PSI score: 59.7 (54.7 to 64.6)
- CHA2DS2-VASc: 58.4 (53.2 to 63.6)
- APACHE II: 56.7 (51.5 to 62.0)

1 - Specificity