

Abstract

Although the rapid response system (RRS) is a standard system for preventing adverse event, low activation rate and high mortality were reported in Japan. National Early Warning score (NEWS) is expected as one of the solutions, but it is not validated in the Japanese population. This study aimed to validate NEWS among Japanese population.

Methods

This was retrospective observational study. Adult patients registered in the In-Hospital Emergency Registry in Japan between January 2014 and March 2018 were eligible for this study. The primary outcome was the mortality rate at after 30 days of RRS activation. First, accuracy of NEWS was analyzed with the correlation coefficient and area under the receiver operating characteristics curve (AUC). Second, NEWS parameters were analyzed for its weight for prediction, using multiple logistic regression and CART (Classification and regression trees, a machine learning method).

Results

There were 2,255 cases from 33 facilities included for this study. Correlation coefficient of NEWS for 30 days mortality was 0.95 (95%CI, 0.88-0.98) and AUC

was 0.668 (95%CI, 0.642-0.693). Sensitivity and specificity with seven as cut-off score were 89.8% and 45.1%, respectively. In terms of the prediction value of the parameters, oxygen saturation showed highest odds ratio of 1.36 (95%CI, 1.25-1.48), followed by altered mental status (AMS) 1.23 (95%CI, 1.14-1.32), heart rate 1.21 (95%CI, 1.09-1.34), systolic blood pressure 1.12 (95%CI, 1.04-1.22), respiratory rate 1.03 (95%CI, 1.05-1.26). Body temperature and oxygen supplement were not significantly associated. CART showed that oxygen saturation was the most weighted parameter, followed by AMS, and respiratory rate.

Conclusions

NEWS could stratify the risk of 30 days mortality after RRS activation in Japanese population. Oxygen saturation was most weighted parameter for predicting cardiac arrest. This work was supported by JSPS KAKENHI (#JP18K16548).

Keywords: in-hospital cardiac arrest, medical emergency team, rapid response team, rapid response system, national early warning score, statistical evaluation, machine learning