An External Independent Validation of APACHE IV in a Malaysian Intensive Care Unit
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Abstract
Introduction: Intensive care unit (ICU) prognostic models are predominantly used in more developed nations such as the United States, Europe and Australia. These are not that popular in Southeast Asian countries due to costs and technology considerations. The purpose of this study is to evaluate the suitability of the acute physiology and chronic health evaluation (APACHE) IV model in a single centre Malaysian ICU. Materials and Methods: A prospective study was conducted at the single centre ICU in Hospital Sultanah Aminah (HSA) Malaysia. External validation of APACHE IV involved a cohort of 916 patients who were admitted in 2009. Model performance was assessed through its calibration and discrimination abilities. A first-level customisation using logistic regression approach was also applied to improve model calibration. Results: APACHE IV exhibited good discrimination, with an area under receiver operating characteristic (ROC) curve of 0.78. However, the model’s overall fit was observed to be poor, as indicated by the Hosmer-Lemeshow goodness-of-fit test ($\hat{C}=113, P<0.001$). Predicted in-ICU mortality rate (28.1%) was significantly higher than the actual in-ICU mortality rate (18.8%). Model calibration was improved after applying first-level customisation ($\hat{C}=6.39, P=0.78$) although discrimination was not affected. Conclusion: APACHE IV is not suitable for application in HSA ICU, without further customisation. The model’s lack of fit in the Malaysian study is attributed to differences in the baseline characteristics between HSA ICU and APACHE IV datasets. Other possible factors could be due to differences in clinical practice, quality and services of health care systems between Malaysia and the United States.

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