Abstract

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Additional Value of Laboratory Results for a Machine Learning Algorithm to Predict In-Hospital Cardiac Arrest: A Single-Center Retrospective Cohort Study

[1]Ryo Ueno,[2]Wataru Uegami,[3]Liyuan Xu,[4]Hiroki Matsui,[5]Jun Okui,[5]Toru Miyajima,[5]Hiroshi Hayashi,[6]Yoshiro Hayashi,[7]David Pilcher,[8]Daryl Jones

[1]Department of Intensive Care, Austin Hopital, Australia
[2]Department of Pathology, Kameda Medical Center, Japan
[3]Department of Computer Science, Graduate School of Information Science and Technology, The University of Tokyo, Japan
[4]Clinical Research Science Division, Kameda Medical Center, Japan
[5]Postgraduate Education Center, Kameda Medical Center, Japan
[6]Intensive Care Unit, Kameda Medical Center, Japan
[7]Intensive Care Unit, The Alfred Hospital,, Australia
[8]Department of Intensive Care, Austin Hospital, Australia

Objectives:

To compare the discrimination of a machine learning-based predictive score built on vital signs (Vital model) with the one built on both vital signs and laboratory results (Lab model).

Methods:

All adult patients hospitalized in a tertiary care hospital between October 2011 and October 2018 were included. Prediction models with/without laboratory results both were trained using data from October 2011 to June 2018 with random forest algorithms, and tested using the data from July to October 2018. The most recent laboratory results prior to the prediction were used for the Lab model. Patient demographics and the 8-hourly vital signs within the previous 48 hours were used in both models to predict in-hospital cardiac arrest by the end of the next calendar day. The area under the receiver operating characteristic curve (AUROC) was used as a comparative measure. Sets of sensitivity analyses were performed with various statistical assumptions.

Results:

A total of 142,104 patient admissions (Train data: 134,843, Test data: 7261) were included with 415 in-hospital cardiac arrests (Train data: 385, Test data: 30) occurring during the study period. Lab model (AUROC: 0.863 [95% CI 0.862-0.864]) outperformed Vital model (AUROC: 0.808 [95% CI 0.807-0.809]). Amongst all the input features, the number of hospital stay had the biggest weight in our random forest model.

Conclusions:

In this single-center study, the addition of laboratory results only marginally improved the discrimination of our prediction model. This finding is noteworthy in that it encourages further investigations of parsimonious models, which have wider applicability in various clinical situations, especially in low-resource settings.