

Automatic sepsis detection using MEWS scoring for ICU patients - PhysioNet/CinC Challenge 2019

P. Biglarbeigi, K. Rjoob, D. McLaughlin, Abdullah, N. McCallan, R. Bond, A. Rababah, A. Kennedy, J. McLaughlin

Ulster University, Jordanstown, UK

E-mail: p.biglarbeigi@ulster.ac.uk

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Abstract. Sepsis is a noted cause of mortality in hospitalised patients particularly those who have been admitted to the Intensive Care Unit (ICU). Early prediction of sepsis facilitates a better targeted therapy which in turn reduces patient mortality rate. This study has developed a methodology to allow automatic detection of sepsis 6 hours prior its clinical presentation in line with the Physionet/Computing in Cardiology Challenge 2019. The initial solution developed in this study focuses on four vital signs namely: Heart rate (HR), temperature, Systolic Blood Pressure (SBP) and respiration rate (Breaths Per Minute). Additionally, we have considered the patient's age and the hours since ICU admission. Data from the available training set of 40,000 subjects were studied. Ninety percent of the all available data (training set A and B) were used to train and validate the developed model. The remaining 10% were used to test the defined classifier. Missing measurement were replaced by the final measurement for each patient. Vital signs were automatically scored considering Modified Early Warning Scoring (MEWS) system using a custom developed software algorithm. In addition, in order to address the changes in a patient's conditions after entering ICU, at each timestep, the difference between the measurement of the selected vital signs and the first hour in ICU were calculated, scored and assigned a value -1 , 0 and 1 based on reference to a median for each subject. The provided labels of sepsis were shifted 6 hours to use the measurements of each timestep to predict the sepsis label in 6-hour time. As the sepsis labels are hugely imbalanced, RUSBoost classifier was used to first under-sample the dataset to produce a quasi-synthetically generated dataset and then classify it with decision trees. The proposed classifier has the accuracy of 0.95, normalised U-score of 0.48 with AUROC and AUPRC of 0.65 and 0.07, respectively for the whole dataset. It is concluded that classifying the four scored vital signs obtained by using MEWS and their differences with the first hour of entering the ICU, with RUSBoost classifier can be a good method to predict sepsis in 6-hr time for patients admitted in the ICU.