



Machine Learning in Predicting the Occurance of Septic Shock

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Tag : Machine Learning, Medical informatics, Sepsis, Electronic hearlth records

Introduction:

A machine-learning algorithm has the capability to identify hospitalized patients at risk for severe sepsis and septic shock using data from electronic health records (EHRs). Sepsis is an extreme systemic response to infection. Mortality rate from septic shock is nearly 50%^[1]. A study shows that 41.6% of patients in BIRDEM General Hospital(Bangladesh) admitted in ICU due to severe sepsis^[2]. So, severe sepsis is also a great concern for our country. The goal of our study is to develop a proper machine learning model to predict the occurrence of septic shock based on the features of EHRs and decrease the mortality rate and hospital staying period by providing early treatment to them.

Goal:

- Predict the occurrence of septic shock based on patients' laboratory tests and previous diagnoses.
- Decrease the mortality rate and hospital LOS(length of stay) by providing early treatment.

Background Study:

From a study^[3], we found that the use of the machine learning-based predictor resulted in significant decreases in LOS and in-hospital mortality rate during a randomised controlled trial. Specifically, they found a 20.6% decrease in average LOS from 13.0 to 10.3 days($p=0.042$)(Fig 1a) and a 12.4% decrease in in-hospital mortality rate from 21.3% to 8.96%($p=0.018$)(Fig 2) when using the MLA. The average ICU LOS was 8.40 days in the control group and 6.31 days in the experimental group(Fig 1b).

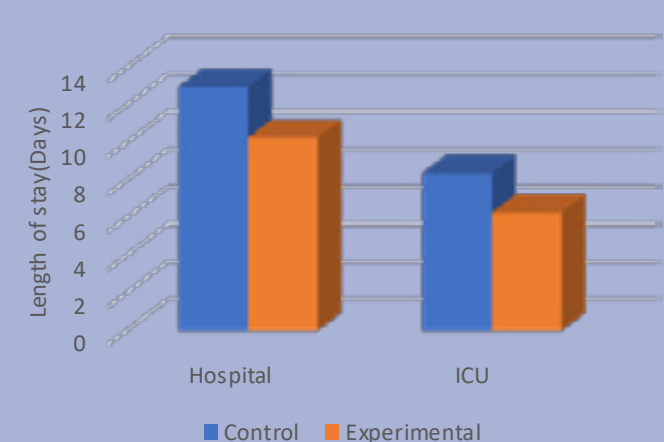


Fig 1: Decrease in average hospital and ICU length of stay with the use of the machine learning algorithm.

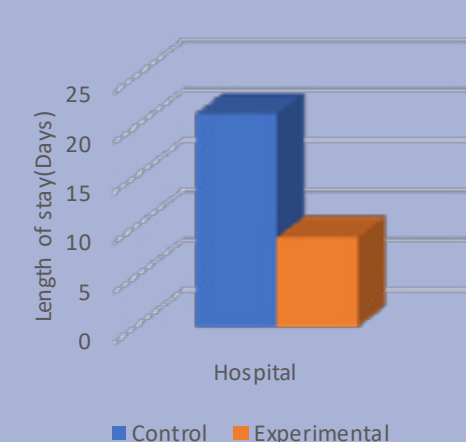


Fig 2: Reduction of in-hospital mortality rate when the machine learning algorithm.

So it is supposed to be efficient enough for predicting sepsis using MLA.

Methodology:

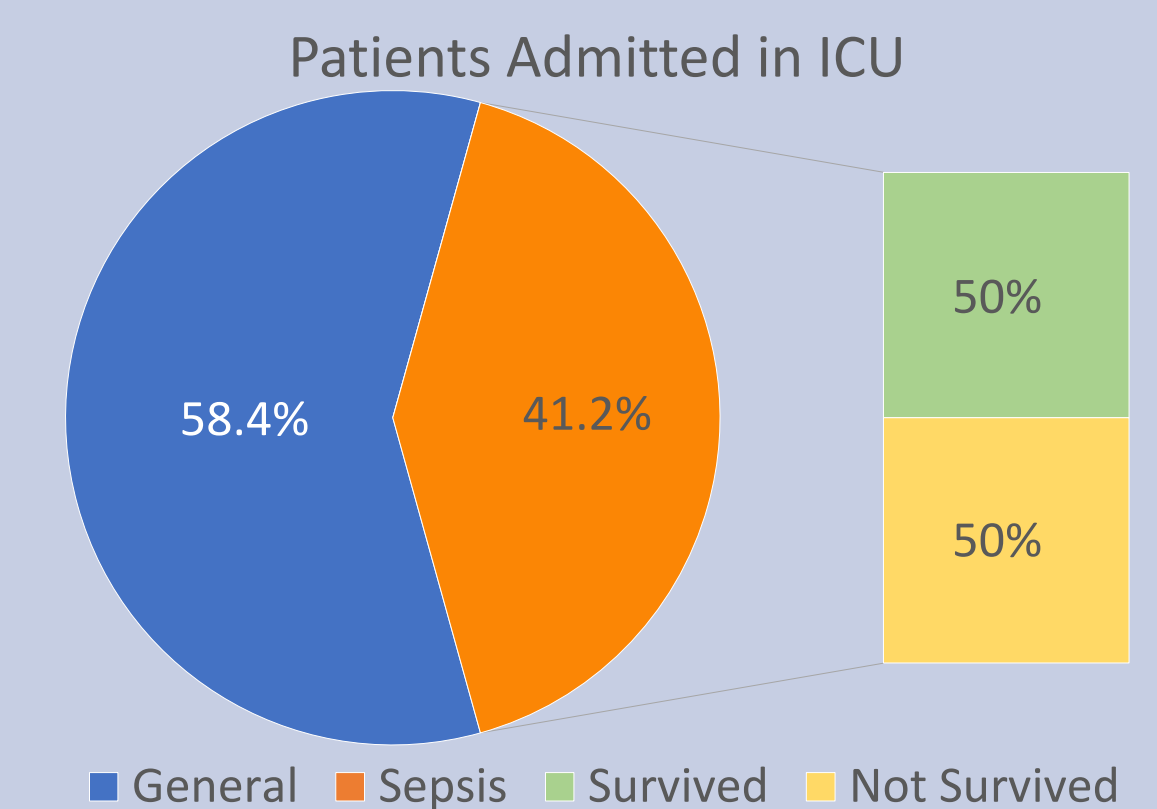
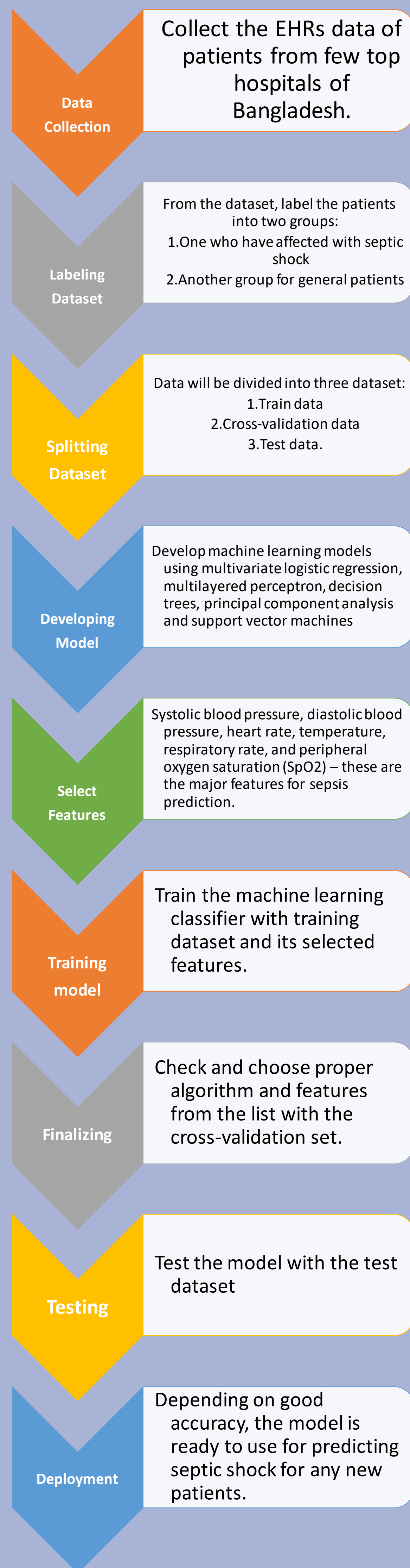


Fig 3: Percentage of general and sepsis patients admitted in ICU and mortality rate of sepsis patients.

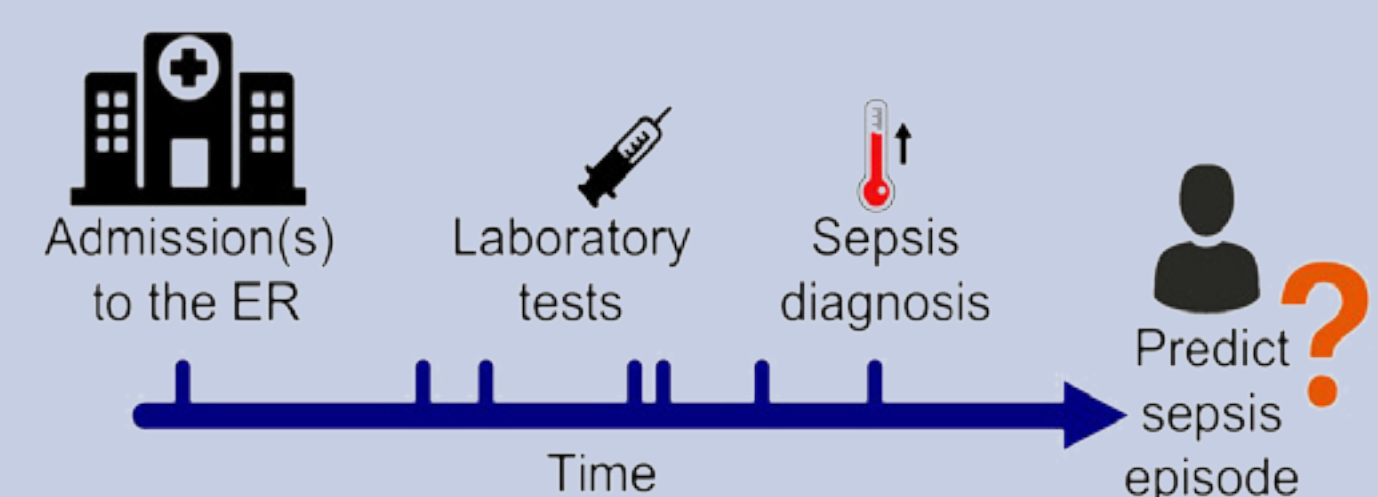


Fig 4: Timeline of process for predicting sepsis

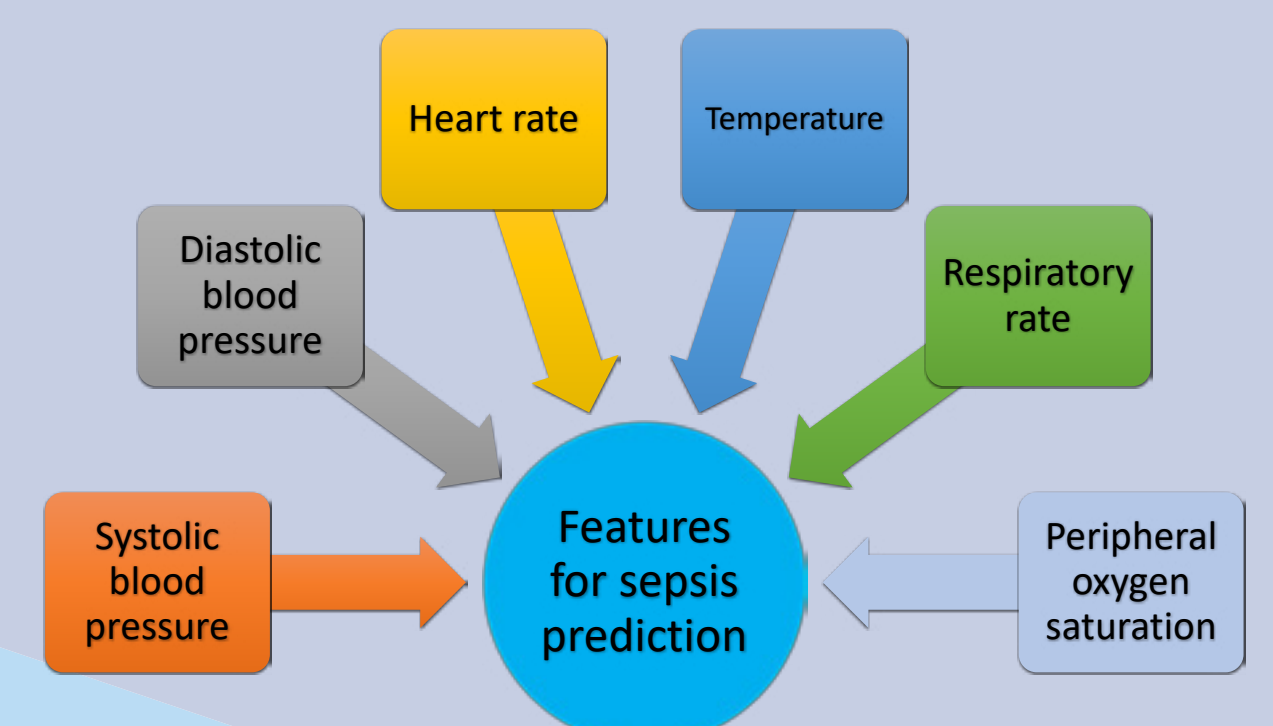


Fig 4: Major features of patients EHRs for sepsis prediction.

Result:

After implementing machine learning prediction system, mortality rate and average length of stay(LOS) in hospital is expected to be decreased.

Conclusion:

From our study, we have seen that machine learning algorithm(MLA) is very efficient for predicting septic shock. So, using this, we can provide early treatment to the patients and decrease mortality rate and LOS.

- "This is not unique for sepsis"

MLA is not just efficient for sepsis prediction, it can be similarly efficient for other critical health conditions. We are looking forward to applying MLAs in other medical fields too.

References:

- [1] www.mayoclinic.org/diseases-conditions/sepsis/symptoms-causes/syc-20351214
- [2] www.researchgate.net/publication/283879569_Spectrum_of_Severe_Sepsis_in_Critically_Ill_Adult_Patients_of_Bangladesh_A_Propective_Observational_study
- [3] bmjopenrespres.bmj.com/content/bmjresp/4/1/e000234.full.pdf

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