

Predicting hospital length-of-stay at time of admission

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Context

Over the past few years, there has been increased interest in data mining and machine learning methods to improve hospital performance, in particular hospitals want to improve their intensive care unit (ICU) statistics by reducing the number of patients dying inside the ICUⁱ, increasingly larger elderly population, combined with economic challenges, lack of expertise, staff and hospital beds, it is clear that the healthcare will have to battle enormous challenges in the years to comeⁱⁱ

In order to face these challenges, hospitals need to allocate the available resources in an efficient manner. For hospitals to optimize resource allocation many different methods have been implemented and explored for these purposes.

In order for hospitals to optimize resource allocation, it is important to predict accurately how long a newly admitted patient will stay in the hospital. The length-of-stay (LOS) prediction provides better services, managing hospital resources and controls their costs. According to Canadian Institute for Health Information, A high cost of a standard hospital stay indicates a relative high cost of treating the average acute inpatient and a low cost of a standard hospital stay indicates the cost of treating the average acute inpatient is relatively lowerⁱⁱⁱ. Then length-of-stay is important healthcare performance metric to explore.

Problem Statement

The goal of this project is creating a model that predicts the length-of-stay for each patient at time of admission and also identify factors are associated with length of hospital stay, based on health records, in order to manage hospital stay more efficiently.

Criteria for success

In order for hospitals to optimize resource allocation, it is important to predict accurately how long a newly admitted patient will stay in the hospital.

Scope of solution space

Advanced LOS prediction at the time of admission can greatly enhance the quality of care as well as operational workload efficiency and help with accurate planning for discharges resulting in lowering of various other quality measures such as readmissions.

Constraints

Creating a model that predicts the length-of-stay for each patient at time of admission and also identify factors are associated with length of hospital stay

Stakeholders

Chief Medical Information Officer (CMIO)

Care Line Manager^{iv}

Data sources

The project makes use of the MIMIC database: "MIMIC is an openly available dataset developed by the MIT Lab for Computational Physiology, comprising de-identified health data associated with ~40,000 critical care patients. It includes demographics, vital signs, laboratory tests, medications, and more." ^v

References

ⁱ Patient Length of Stay and Mortality Prediction: a survey

ⁱⁱ Predicting Patient Length Of Stay at Time of Admission Using Machine Learning, by OLLE ANDERSSON 2019

ⁱⁱⁱ Cost of a Standard Hospital Stay, Methodology Notes , May 2020

^{iv} Predicting Hospital Length of Stay, Implemented with Microsoft Machine Learning Services

^v <https://physionet.org/content/mimiciii-demo/1.4/>