On Risk Stratification Strategies in Intensive Care Medicine

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Outcome in critically ill patients is thought to be dependent upon multiple parameters that interact in a complex manner. Experienced critical care doctors are capable of making reasonably accurate prognoses however variation between prognoses is very high. Objective risk estimation procedures help to overcome these differences. With advances in automated patient surveillance there is increasing potential for more rapid and accurate prognostication by means of computational models. We show that state-of-the-art machine learning techniques employed on real world intensive care unit data are on par with conventional risk estimation models developed on pristine research data sets. We set up a rigorous validation environment to estimate objective performance values of both conventional and novel risk and mortality models. Our results show that multiple performance measures must be taken into account when assessing the value of a model. With regard to application into routine medical practice, no single classifier is superior. Careful definition of the model characteristics most desirable to health care providers are essential before choosing one risk model over another.

There is broad consensus supporting the use of risk stratification however using them as a basis for clinical decision making on an individual patient basis is not appropriate. In this work we investigate state-of-the-art machine learning methods as risk stratifiers. In particular we apply support vector machines, decision trees and random forest approaches. A novel database (MIMICII, [1]) is used as the data source enabling our models to integrate time series markers. We incorporate information generated during the first 48 hours of admission and so our models can be said to be learning from the clinical development of a patient over time.

References

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