Author's response to reviews

Title: A Comparative Analysis of Multi-Level Computer-Assisted Decision Making Systems for Traumatic Brain Injuries

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Over the last 20 years, the development of computer decision support systems has been a growing field in the research medical domain. Trauma experts must make several difficult decisions considering a large number of patient attributes, often in a short period of time. These decisions are made at different stages of care giving, based on the available patient data at the time of each decision. Computer-aided systems can provide vital assistance to clinicians in deciding both diagnosis and treatment, and so provide a higher standard of patient care. This paper focuses on current medical issues, and proposes a predictive computer-assisted decision making system for traumatic head injury (TBI) using machine learning algorithms. Machine learning provides a good solution for dealing with missing values, a critical issue when working with medical data.

The main goal of this study is to develop a reliable rule-based decision making system that provides both recommendations and outcome predictions at critical stages of care giving, and to compare the existing machine learning methods available for medical informatics. We also suggest that using all available variables in rule generation may not be optimal for medical applications. The inclusion of less relevant and/or reliable attributes, with regards to some predefined means of measurement, can create random correlation in some rules that are ultimately clinically meaningless. Furthermore, retaining less informative and/or highly correlated attributes increases the length and complexity of the resulting rules, and so makes them less desirable for clinical application. To support this assertion, we compare five machine learning algorithms using both the all-available-variables and significant-variables-only methods, and then generate the most reliable rules using CART and C4.5, which are chosen due to their transparency. Sensitivity and specificity are also calculated to evaluate outcome identification.