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Comparison of Risk Adjustment Methods in Patients with Liver Disease Using Electronic Medical Record

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Background

Risk adjustment methods are widely used to compare quality of care or predict health outcome, but the optimal approach is unclear for liver disease. This study is to compare the performance of common risk adjustment methods for predicting in-hospital mortality in patients with liver disease using Electronic Medical Record (EMR).

Approach

The EMR data was derived from Beijing YouAn Hospital between 2010 and 2015. 85,526 EMRs were included. Previously developed and validated automated EMR case definitions were applied to define the conditions including primary liver cancer, cirrhosis and other conditions included in Charlson, Elixhauser comorbidity algorithms, Child-Turcotte-Pugh (CTP) score and Model for End-Stage Liver Disease (MELD). Logistic regression was conducted and C-statistic was obtained to compare the performance of the different methods for predicting in-hospital mortality. To eliminate the effect of the model complexity on model performance, we compared Akaike Information Criterion (AIC) of different methods (smaller AIC is better).

Results

In total, we included three liver diseases cohort: 7,178 Primary Liver Cancer (PLC) patients, 11,121 cirrhosis patients and 7,298 cirrhosis without PLC patient. For PLC cohort, C-statistics of these compared indexes ranged from 0.72 to 0.84; AIC was between 4312.3 and 5048.4. For cirrhosis cohort, C-statistics of these compared indexes ranged from 0.73 to 0.83; AIC was between 4952.1 and 5788.2. For cirrhosis without PLC cohort, C-statistics ranged from 0.73 to 0.84; AIC was between 2608.3 and 3240.5. It was consistent across the three cohorts that

MELD +sodium (MELD_Na) score (a variant of MELD score) had the highest C-statistic and lowest AIC; CTP had the lowest C-statistic and highest AIC. Integrating Charlson Comorbidity to MELD_Na, C-statistic improved to 0.86 and AIC reduced.

Conclusions

Among the compared risk adjustment methods, MELD_Na performed best for predicting in-hospital mortality among patients with PLC or cirrhosis using Chinese EMRs. Adding clinical information to comorbidity algorithms improved the performance of the model.

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