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MACHINE LEARNING IMPROVES MORTALITY PREDICTION IN A PROSPECTIVELY ENROLLED WORLDWIDE COHORT OF >7700 PATIENTS HOSPITALIZED WITH CIRRHOSIS

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Accurate prediction of outcomes in hospitalized patients with cirrhosis across the world is important to improve outcomes. Machine learning (ML) techniques could improve prediction and need to be evaluated in a global cohort. Aim: Determine ML techniques to predict inpatient and 30-day mortality in a prospective inpatient cirrhosis cohort.
Methods: CLEARED consortium consists of prospectively enrolled inpatients with cirrhosis admitted non-electively around the world. Cirrhosis details and history, demographics, inpatient course and medications, and 30-day post-discharge death are recorded. Using World Bank classifications, we divided centers into high income (HIC), upper-middle (UMIC) & low/low-middle income countries (LMICs). Two outcomes were assessed: inpatient and 30-day mortality excluding those who underwent LT.
Machine-Learning Analysis Four classification algorithms were examined and compared, these included logistic regression, LASSO, Random Forest (RFA), and Extreme Gradient Boosting (XGBoost). Full dataset was split randomly 75/25 for training and testing each model. We calculated the ten-fold cross-validated AUC within the training set and evaluated each model on the test set and compared to traditional logistic regression (LR). Test-set performance was compared, and the best model was selected based on AUC. Within the best-performing model for each outcome, the top-15 variables were obtained.
Results:
7,733 patients were included from 127 centers and 34 countries (age 56.2Â±13.4, 64.2% male, 41.9% alcohol etiology, Fig 1A/B). Among those not lost to follow-up, 11.1% of patients died in-hospital and 14.0% of patients died at 30-days.
Machine-Learning Analysis RFAs performed the best for both outcomes.
Inpatient mortality: High AUC for inpatient mortality (AUC: 0.818, 5.0-point gain over traditional LR) was seen with RFA (Fig 2A). Admission for AKI, HE, high MELD-Na/WBC and not being in high income country were variables associated with death while higher age, albumin, and hemoglobin and being in a high-income country were protective (Fig 2B).
30-day mortality AUC with RFA was the best (0.938, 2.0-point gain over LR, Fig 2C). For inpatient mortality, top-importance variables included admission labs, reason for admission, and income level of the facility. For 30-day mortality, top variables included ICU procedures/outcomes such as vasopressor use and sepsis, AKI history, organ failures, and admission labs, while again admission hemoglobin, albumin & high income facility was protective (Fig 2D).
Conclusion: Machine learning using Random forest analysis in >7000 patient inpatient global cohort of hospitalized patients with cirrhosis showed superiority over traditional logistic regression for prediction of inpatient and 30-day post-discharge mortality.

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