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POSTER ABSTRACT

Identifying patients at highest-risk: the best timing to apply a readmission predictive model

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Introduction: Most of readmission prediction models are implemented at the time of patient discharge. [1] However, interventions which include an early in-hospital component are critical for reducing readmissions and improving patient outcomes. [2] Thus, at-discharge high-risk identification may be too late for effective intervention. Nonetheless, the tradeoff between early versus at-discharge prediction and the optimal timing of the risk prediction model application remains to be determined. We examined a high-risk patient selection with readmission prediction models using data available at two time points: at admission and at the time of hospital discharge.

Methods: A retrospective cohort study of adults (≥65 years) discharged alive from internal medicine units in Clalit's (the largest integrated payer-provider health fund in Israel) general hospitals in 2015.The outcome was all-cause 30-day emergency readmissions to any internal medicine ward at any hospital. We used the previously validated Preadmission Readmission Detection Model (PREADM) [3] and developed a new model incorporating PREADM with hospital data (PREADM-H). We compared the percentage of overlap between the models and calculated the positive predictive value (PPV) for the subgroups identified by each model separately and by both models.

Results: The final cohort included 35,156 index hospital admissions. The PREADM-H model included 17 variables with a C-statistic of 0.68 (95% CI: 0.67–0.70) and PPV of 43.0% in the highest-risk categories. Of patients categorized by the PREADM-H in the highest-risk decile, 78% were classified similarly by the PREADM. The 22% classified by the PREADM-H at the highest decile, but not by the PREADM, had a PPV of 37%. Applying both the PREADM and PREADM-H allowed accurate detection of additional subsequently readmitted patients at the 10% highest-risk group.

Discussions: Our results show that the timing of readmission risk prediction both at admission and discharge should be considered when making the decision regarding which population should be identified for inclusion in readmission prevention programs. Use of the PREADM model allowed early identification of high-risk patients, yet missed a portion whose readmission risk was almost as high. Alternatively, the PREADM-H enabled accounting for risk factors that accrued during the hospital stay, though missed some patients who had an a priori high-risk according to the PREADM and whose actual readmission rate was much higher than the general population.

Conclusions: Readmission prediction models should be implemented twice, to allow for early intervention at-admission and to capture new at-risk patients at-discharge.

Lessons learned: The timing of readmission risk prediction makes a difference in terms of the population identified at each prediction time point.

Limitations: Our results may not be generalizable to other settings where clinic and hospital data are not linked. However, with the growing use of EHRs,[4] the data included in the final PREADM-H may be increasingly available to many healthcare organizations.

Suggestions for future research: Our results provide an example of the potential complementary implementation of the predictive models to maximize their power in identifying various groups of high-risk patients for inclusion in within as well as post-discharge interventions. Further studies are needed to strengthen our findings.

Keywords: timing of readmission predictive model