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Identifying High Risk Patients for Readmission Using A Medication-based 15-day Readmission Risk Stratification Algorithm in A Tertiary Acute Care Hospital

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Introduction

- Identifying high risk patients for readmission allows for targeted use of intervention that may help to reduce preventable readmissions and healthcare burden.
- In Singapore, a prediction model⁽¹⁾ was recently developed with the aim to easily identify potentially avoidable early readmissions within 15 days post-discharge.

Objective

- Assess the model performance in predicting readmission 15 days post-discharge.
- Extrapolate and assess the model ability to predict for readmission 30 days post-discharge.

Methodology

- A prospective observational study, involving patients admitted to Alexandra Hospital (Sengkang Health) from Sep to Nov 2017.
- Admissions were pre-screened using the developed prediction model for risk of readmission.
- Patients likely ($\geq 50\%$ for readmission) and unlikely to readmit ($< 50\%$ for readmission) were then randomly selected for recruitment daily in a 1:1 allocation ratio.

Inclusion criteria

- ≥ 21 years old
- Gave written informed consent

Exclusion criteria

- Readmission was planned.
- Had been terminally discharged to home or a terminal care facility.
- Medical records were inaccessible.
- Enrolled in a home visit program.
- Uncontactable during the 30-day follow up period.
- Voluntarily withdrawn consent to be contacted post-discharge.

Electronic Medical Records

- Age
- Number of discharge medications
- Prior diagnosis of anemia, COPD, peptic ulcer disease, and malignancy
- Discharge destination
- Whether discharged against medical advice?

Compute Readmission Risk

- Patients received calls at 15 and 30 days post-discharge to ascertain if they had been readmitted to any hospital after the index discharge.
- Data was analyzed to calculate model sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), Hosmer-Lemeshow statistics, C-statistics, and Brier score.

Results

- In our study, 120 patients were recruited. According to exclusion criteria, 7 patients were excluded.
- Total 113 and 112 patients were included for data analysis of the primary and secondary outcome respectively.
- Median age of subjects was 67 years for both 15- and 30-day readmission groups.
- The model predicted 49% of subjects to be readmitted within 15 and 30 days post-discharge.
- The median (interquartile range) number of discharge medications was 8 (5-12).

Conclusions

- This model performed reproducibly against the original study. It presents as a viable routine risk assessment tool for discharge planning.
- The low PPV of 14-18% and correctly classified prediction rate of 53-54% could possibly be overcome by making the model more stringent in predicting readmissions by increasing the cut-off probability for readmission.
- Resources can then be channeled accordingly for intervention to reduce the incidence of unnecessary readmission.

Model Evaluation in Independent Validation Cohort and Original Study Cohort

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Correctly Classified (%)	C-statistic	Hosmer-Lemeshow	Brier Score
15-day readmission	61.5	52.0	14.3	91.2	53.1	0.64	7.28, p=0.507	0.26
30-day readmission	62.5	53.1	18.2	89.5	54.5	0.65	6.85, p=0.553	0.26
From original study (cut off 50%)								
Derivation cohort	55.8	85.1	-	-	69.4	0.75	8.73, p=0.558	0.20
Temporal cohort	55.6	70.7	-	-	69.3	0.65	94.4, p<0.001	0.23
Geographical cohort	57.5	60.9	-	-	60.4	0.64	390.1, p<0.001	0.26