Poster # 1025

Utility of a Risk Assessment Model in Predicting 30-day Unplanned Hospital Readmission in Adult Patients Receiving Outpatient Parenteral Antibiotic Therapy

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Background

- Published 30-day all-cause readmission rates in patients receiving outpatient parenteral antibiotic therapy (OPAT) range from 6-26%.[1,2,3]
- A 30-day unplanned readmission risk prediction model for OPAT patients in the United Kingdom (UK) was developed and validated with external cohorts totaling 2,500 patients.[2]
- Given the inherent differences in patient mix, acuity, and admission criteria in the United States (US) compared to the UK, there is a need for validity testing in local cohorts of patients in order to utilize this prediction model.

Methods

- **Design**: retrospective observational cohort study
- **Study population**: adult patients enrolled in the Duke University Health System (DUHS) OPAT program from 7/1/2019 – 2/1/2020
- **Key Exclusion Criteria:** Patients on dialysis and solid organ or hematopoietic stem cell transplant recipients
- **Primary endpoint**: 30-day unplanned readmission from index discharge
- **Data Collection**: parameters for the UK prediction model[1]: age, number of hospitalizations in the prior 12 months, Charlson comorbidity score, mode of OPAT administration, source of infection and IV combination therapy
- **Additional values** tested included vancomycin use, OPAT delivered via skilled nursing facility, and history of IV drug abuse.
- **Data analysis:** discriminative ability of the model to predict 30-day unplanned readmission was validated and assessed using a scaled Brier score, C-index, calibration plot, and Hosmer-Lemeshow goodness of fit test[4]. Logistic regression was used to update the UK model.

Results

Table 1. Cohort Demographics

Variable	UK Cohort n = 1073	Duke Cohort n = 470
Age, mean (SD)	56 (17.5)	60.4 (16.1)
Gender		
Male	611 (56.9%)	282 (60%)
Female	462 (43.1%)	188 (40%)
Charlson comorbidity score, median (IQR)	1 (0, 2)	3 (1, 5)
Hospitalizations in prior 12 months, median (IQR)	0 (0, 1)	0 (0, 1)
Indication for OPAT		
Skin/soft tissue	616 (57.4%)	33 (7%)
Bone and joint	137 (12.8%)	276 (58.7%)
Urogenital	70 (6.5%)	23 (4.9%)
Respiratory	45 (4.2%)	15 (3.2%)
Endovascular	45 (4.2%)	64 (13.6%)
Other	160 (14.9%)	59 (12.6%)
Mode of OPAT		
Home (self/caregiver)	105 (9.8%)	335 (71.3%)
Infusion center	767 (71.5%)	0 (0%)
Community nurse	201 (18.7%)	0 (0%)
Skilled nursing facility	0 (0%)	135 (28.7%)
Concurrent IV OPAT	81 (7.5%)	88 (18.7%)
Vancomycin use	98 (9.1%)	170 (36.2%)
Duration of OPAT, median (IQR)	7 (4, 14)	33 (19, 38)

Table 2. Cohort Outcomes

Outcomes	UK Cohort n = 1073	Duke Cohort n = 470
Readmissions within 30-day post-index discharge		
Any readmission	145 (13.5%)	105 (22.3%)
Planned readmission	22 (2.1%)	13 (2.8%)
Unplanned readmission	**123 (11.5%)**	**94 (20.0%)**
Unplanned OPAT-related readmission	73 (6.8%)	56 (11.9%)
30-day unplanned OPAT-related readmission		
Infection-related adverse effect	60 (83.3%)	30 (53.5%)
Antibiotic-related adverse effect	7 (9.7%)	17 (30.3%)
IV access	3 (2.4%)	2 (3.5%)
Other	3 (2.4%)	7 (12.5%)

sd, standard deviation; IQR inter-quartile range

Figure 1. Receiver Operating Curve

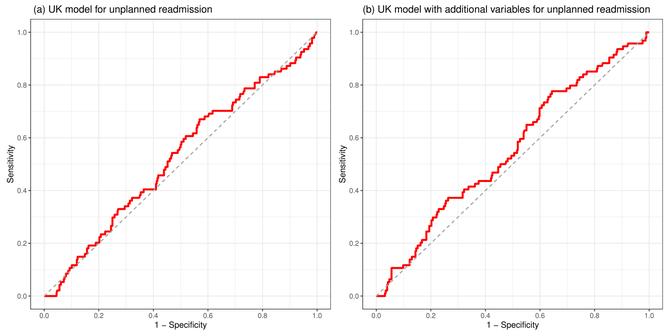

Figure 2. Calibration of Model

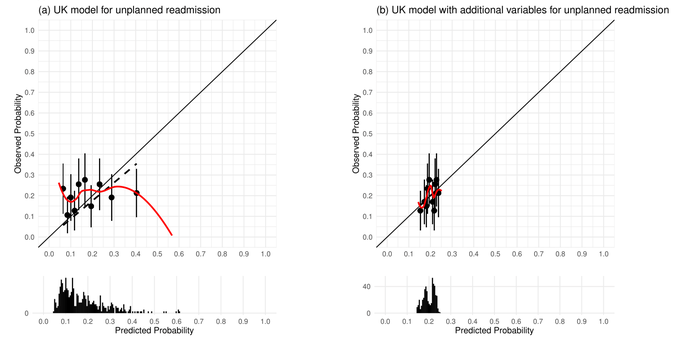

Table 3. Model Performance

Statistical Test	Original UK model			UK model with additional variables		
	aOR	95% CI	p-value	aOR	95% CI	p-value
Discrimination, c-statistic	0.52	(0.46, 0.59)	—	0.55	(0.49, 0.62)	—
Hosmer-Lemeshow (df)	47.54 (8)	—	<0.001	7.04 (8)	—	0.53
Scaled Brier score	-0.07	—	—	0	—	—
Calibration slope	0.06	(-0.28, 0.38)	—	1	(-0.39, 2.43)	—
Calibration-in-the-large	-1.29	(-1.9, -0.72)	—	0	(-1.94, 1.97)	—

aOR, adjusted odds ratio; CI, confidence interval; df, degrees of freedom

Discussion

- Almost half of the unplanned readmissions were not OPAT related, but in further analysis of only OPAT related unplanned readmissions, the model still had poor predictive ability.
- Decreases in the performance of a model are common in external validation studies, often caused by differences in populations.
- Patients who self-administer antibiotics at home, seen more in the DUHS cohort, do not undergo the same monitoring as patients who receive antibiotics at an infusion clinic.

Limitations

- The retrospective nature of the study introduces the potential for reduced accuracy of recorded data.
- Patients who had readmissions outside of the electronic health record would have been missed.
- The determination of some secondary characteristics, was done via the discretion of the reviewing clinicians.

Conclusions

- The prediction model was not able to reliably discriminate the risk of 30-day unplanned readmission in DUHS patients receiving OPAT.
- The additional variables tested did not improve the predictive ability of the model.

References

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Conflict of interest: Nothing to disclose