Readmissions: Data Quality and Prediction

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Introduction

- The greatest inter-hospital variability and hospital-quality signals for unplanned readmission risk are found the first day after discharge and reach nadir after seven days.[1]
- Same day readmissions may have even greater variability and quality signals. Yet, they are commonly excluded due to data quality concerns.[1-3]
- The University of Washington health system receives external visit data through a statewide Health Information Exchange facilitator, Collective Medical Technologies,[4] for attributed patients.
- However, data quality – namely currency and completeness are unknown overall

Methods (Part A) – Same Day Quality

- A total of 8,302,688 visits from 1/1/2012 - 4/15/2018 in the University of Washington health system were assessed. Emergency room visits (n=502,407) and outpatient visits (n=7,517,415) were excluded, yielding a cohort of inpatient visits (n=282,866) from a Community Hospital, a Level I Trauma Center, and an Academic Medical Center.

Methods (Part B) – Reconciling External Data

- Using a set of attributed patient admissions (n=77; total patient population n=827) data as a training set, we tested data quality of received data from Collective Medical Technologies for UW Medicine attributed patients.

Results – (Part A)

Before Same-day Data Quality Control:

- Same-day readmission sensitivity=1.0, specificity=unknown

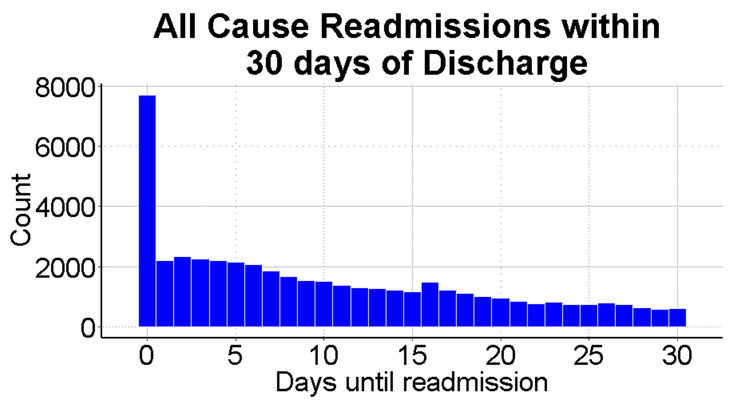

Figure1. All cause index visit counts with days until readmissions before Quality Control

After Same-day Data Quality Control:

- Excluded datetime difference=0:00 (n=686) or negative (n=266)
- Excluded readmissions <1 hour same facility (n=4,680)
- Excluded readmissions <2 hours other facility (n=1,316)
- Same-day readmission sensitivity=.91, specificity=1.0 (n=20)

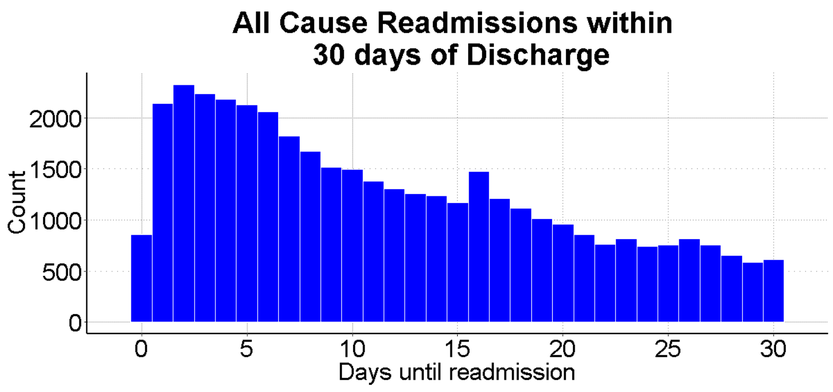

Figure2. All cause index visit counts with days till readmissions after Quality Control

- Trauma index visits result in plurality of same-day readmissions

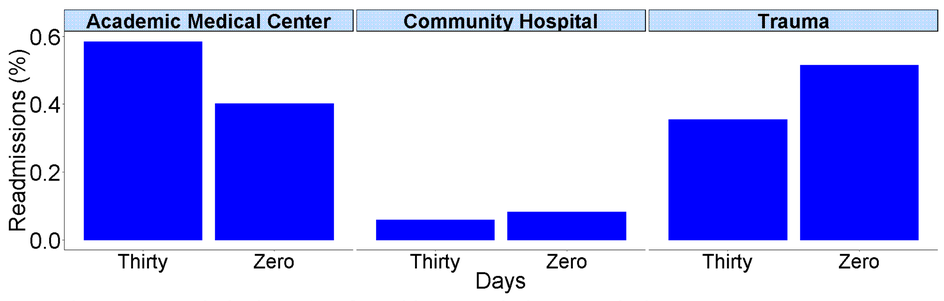

Figure3. Readmissions % of total by Hospital-type at index stay

Results – (Part B)

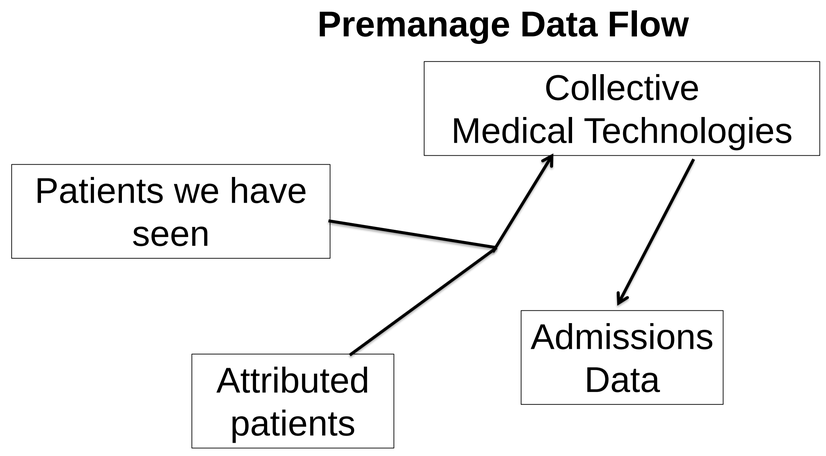

Figure4. Premanage Data Flow

- For a sample of UW medicine attributed patients, we matched 16 of 18 expected external visits (89%)
- Missing all patients whose first visit in the UW health system is a hospitalization (we have not seen them yet) but that is not an issue for data completeness, since we are not dependent on the HIE for internal visit data

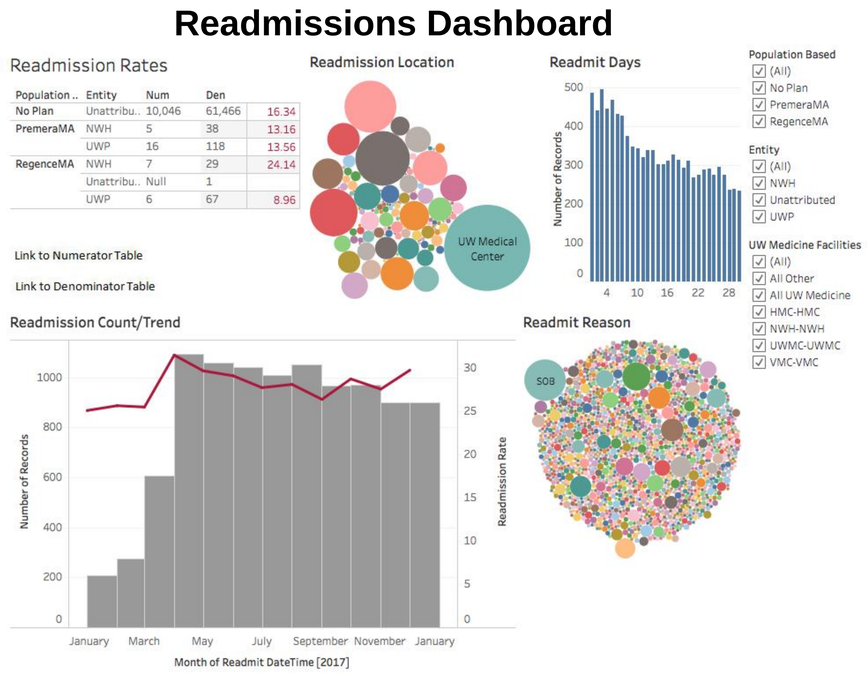

Figure5. Current Analytics Readmissions Dashboard for the UW health system

Discussion & Conclusions

- Intra-hospital readmission burden, as a percentage of total health system readmissions, changes greatly from same-day to 30-day.
- Optimal time cutoffs for same-day readmission quality control are health system specific. Our experience is vastly different than Peng et. al (2017) which found the highest PPV at a 9 hour cutoff in Canada.
- Future work: assess same-day index readmission principal diagnoses, inter-hospital variability and effect of same-day data quality on prediction
- In a small sample size studied, data sent from the HIE for external visits was nearing 90% completeness. This level can be useful for predicting readmission rates and planning population-based interventions.
- Future work: complete data visualization and build tools for readmissions including:
  - Improved dashboard
  - Decision support for translational care management

References & Acknowledgements

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1. Chin DL, Bang H, Manickam RN, Romano PS. Rethinking Thirty-Day Hospital Readmissions: Shorter Intervals Might Be Better Indicators Of Quality Of Care. Health affairs (Project Hope). 2016;35(10):1867.
2. Zhou H, Della PR, Roberts P, Goh L, Dhaliwal SS. Utility of models to predict 28- day or 30- day unplanned hospital readmissions: an updated systematic review. BMJ Open. 2016;6(6).
3. NRD Database Documentation. Healthcare Cost and Utilization Project (HCUP). December 2017. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/db/nation/nrd/nrddbdocumentation.jsp.
4. https://www.forbes.com/sites/zinamoukheiber/2017/11/29/how-collective-medical-technologies-conquered-emergency-rooms-on-a-bootstrap/#46c384f86824
5. Peng, M., Li, B., Southern, D., Eastwood, C., & Quan, H. (2017). Constructing Episodes of Inpatient Care: How to Define Hospital Transfer in Hospital Administrative Health Data? *Medical Care, 55*(1), 74-78.