Automated Target Based Care at Lucile Packard Children's Hospital

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Introduction

- Lack of standardized clinical pathways lead to high variation in clinical practice, high rates of inappropriate care, and higher medical costs
- The current clustering process done by doctors is manual, time intensive and not easily generalizable to other services

Project Objective

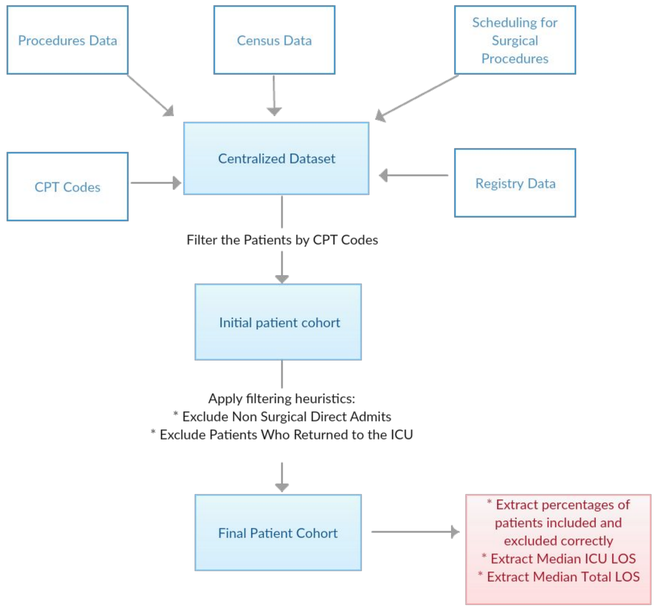
- Expand target based care by developing a partially automated clustering algorithm to define patient cohorts based on EHR and Registry data
- Predict patient LOS based on their predicted cohort
- Design clinical workflow based on median outcomes in each cohort (e.g. ICU and total LOS, number on central line days)

Methods & Materials

- Replicate a cohort for Ventricular Septal Defect (VSD), one of the surgical procedures for which a cohort has been created at LPCH
- Aggregate datasets, including procedures, midnight census, schedule of surgical procedures, CPT codes and registry data
- Filter relevant patients by CPT codes
- Engineered exclusion criteria from the centralized dataset
- Exclude non direct surgical admits, and patients who returned to the ICU
- Calculate the percentage of people who were correctly included and excluded in the final cohort, and determined median ICU LOS and total LOS

Results

High Level Overview of Workflow



Pulmonary Valve Repair Case Study

		Replicated	
	n=52	Included	Excluded
Actual	Included	10	5
	Excluded	5	32

Accuracy	81%
Specificity	86%
Sensitivity	66%

Automated Workflow Performance

	ICU Days			Total Postop Days		
Procedure	**Proposed Target**	**Replicated Median**	**Difference**	**Proposed Target**	**Replicated Median**	**Difference**
Mitral Valve Repair	2	2	0	4	4	0
Mitral Valve Replacement	3	3	0	7	7	0
Aortic Valve Repair	1	1	0	4	3	-1
Aortic Valve Replacement	2	2	0	5	5	0
Coronary Artery Repair	1	1	0	3	3	0
Pacemaker Insertion	1	1	0	3	4	1
Ventricular Septal Defect	2	2	0	4	4	0

- Reproduced results for included patients closely resemble original results
- Not all original patients were identified in our centralized dataset

Conclusions

- Using a simple filtering heuristic, we were able to closely match the median ICU and total LOS for included VSD patients
- Applying this process to other cohorts would allow us to expand target based care, define clinical workflows, and improve patient care

Limitations

- Patient cohort identification through CPT codes was challenging
- Combined with missing patient data, this resulted in incomplete cohorts and affects the accuracy of matched patients and LOS
- Limited set of filtering features

Future Directions

Further Analyze Results

- Compute confusion matrices for all the replicated cohorts
- Calculate accuracy, specificity and sensitivity

Data Aggregation Best Practices

- Create a guide on where different types of data can be queried from
- Set up a direct data pipeline

Refine Algorithm

- Add more filtering features based on Hospital Acquired Conditions or patient demographics
- Build supervised and unsupervised learning algorithm to replicate or create unseen cohorts

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