Optimizing a Value-Based Managed Care Model

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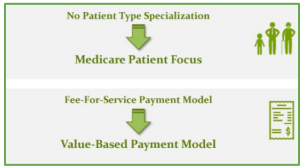
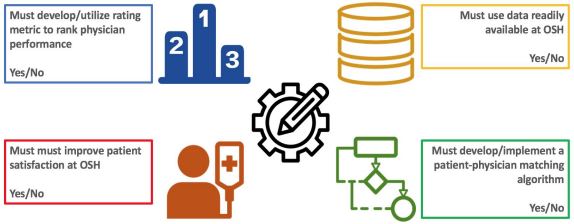
Background

- The current standard model for connecting doctors to patients optimizes for return visits and does not provide optimal results for the patients
- OSH promotes a Value-Based model which focuses on personalized care
- Currently patients are not being optimally matched with physicians based on their unique conditions (specific disease, demographics, etc.)

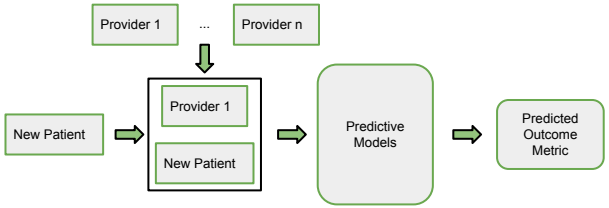


- Our goals are to:
  1. Define metrics to quantify the success of clinical/physician outcomes [1]
  2. Build a model to optimally match doctors to patients based on these metrics [2]

Design Criteria

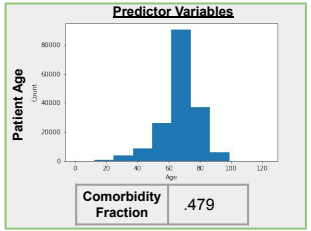


Patient-Physician Matching Plan

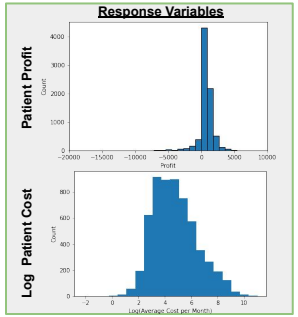


- Check every possible match
- Select the match optimizing the predicted metric

Exploratory Data Analysis



Comorbidity Fraction	.479



Key Inferences

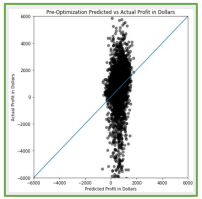
- Patient **Age Skews high**
- Very **high comorbidity** fraction
- Profit and log cost are both **normally distributed**

Linear Regression Models

Pre-Optimization Predictors:
Diagnostics
Social Determinants of Health
Provider Profit

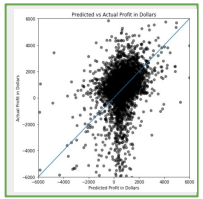
Post Optimization Predictors:
Diagnostics
Social Determinants of Health
Provider Profit
Comorbidities (Interaction Terms)

Predicting Patient Profit



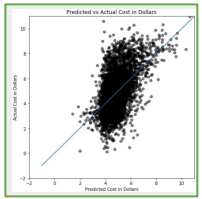
R-squared	.034

Predicting Patient Profit



R-squared	.187

Predicting Log Cost



R-squared	.283

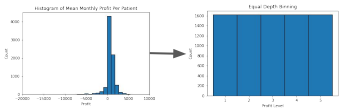
- Coefficient represents the percent change in cost
- A low P-value indicates a significant predictor
- Table contains interesting coefficients we identified

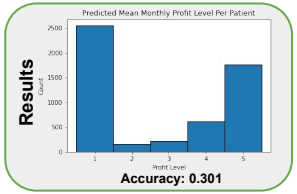
T-table for Log Cost Regression

	Coefficient Value	P Value
Cancer^CHF	0.4177	0.096
Cancer^LonelinessQ1_1.0	4.5468	0.036
gender_F	7.2711	0.004
gender_M	6.9896	0.005

RandomForest Model

- Fitted a RandomForest machine learning classifier
- Binned profit data (5 bins)
- Used predictors from linear regression





Accuracy: 0.301

Engineering Standards

- IEEE P7002 - IEEE Draft Standard for Data Privacy Process
- IEEE 11073-10201-2018 - IEEE Standard for Health Informatics - Point-of-care medical device communication - Part 10201: Domain Information Model
- IEEE 1516.2-2000 - IEEE Standard for Modeling and Simulation (M&S) High-Level Architecture (HLA) - HLA Object Model Template (OMT) Specification
- (FDA Digital Health Guideline) Standard Specification for Transferring Clinical Observations Between Independent Computer Systems

Future Directions

Short Term Plan

1. Familiarize with the complete OSH dataset
2. Utilize information from Interviews to determine new response/predictor variables
3. Fit new models

Long Term Plan

- Re-evaluate performance of models
- Refit models if performance decreases
- Variable selection (LASSO)

Acknowledgments

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References

[1] Identifying KPI: Cruz Villazón, Carolina, et al. “Identification of Key Performance Indicators in Project-Based Organisations through the Lean Approach.” Sustainability, vol. 12, no. 15, Jan. 2020, p. 5977. www.mdpi.com, https://doi.org/10.3390/su12155977.
[2] A Hybrid Recommender System for Patient-Doctor Matchmaking in Primary Care: *A hybrid recommender system for patient-doctor ... - arxiv*. (n.d.). Retrieved October 1, 2021, from https://arxiv.org/pdf/1808.03265.pdf.