CMS HOSPITAL RATINGS CASE STUDY

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BUSINESS UNDERSTANDING

To simplify comparisons between hospitals and their quality of services, CMS rates hospitals in the US on a scale of 1-5

Thus, hospitals should determine what factors affect their ratings so that they can work to improve them.

In this project, we will approach the 'CMS rating problem' of Evanston Hospital, US from different angles. We can think of it as 're-engineering the CMS rating system'.

The goal of this approach is to create a more effective and accurate rating system that better reflects the quality of care provided by hospitals

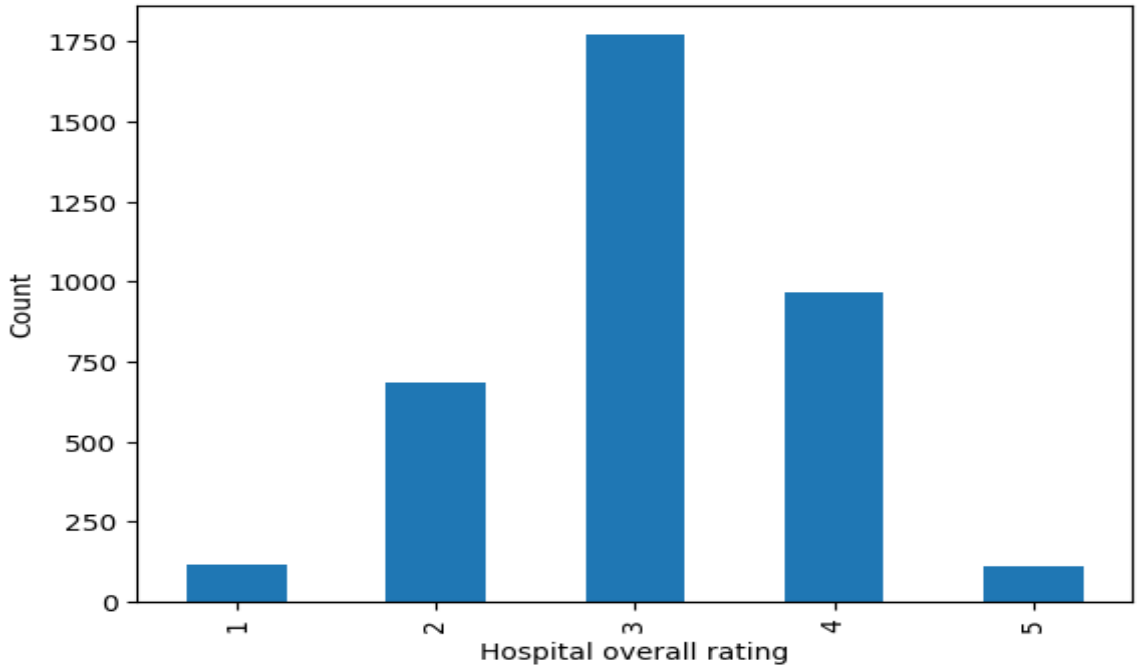
DATA UNDERSTANDING

1. CMS included 62 Measures including positive measures like: Patients given appropriate vaccines; patients given timely treatment etc. And negative measures like, all mortality measures, readmission measures, timeliness measures (avg. time taken to provide emergency care etc.)

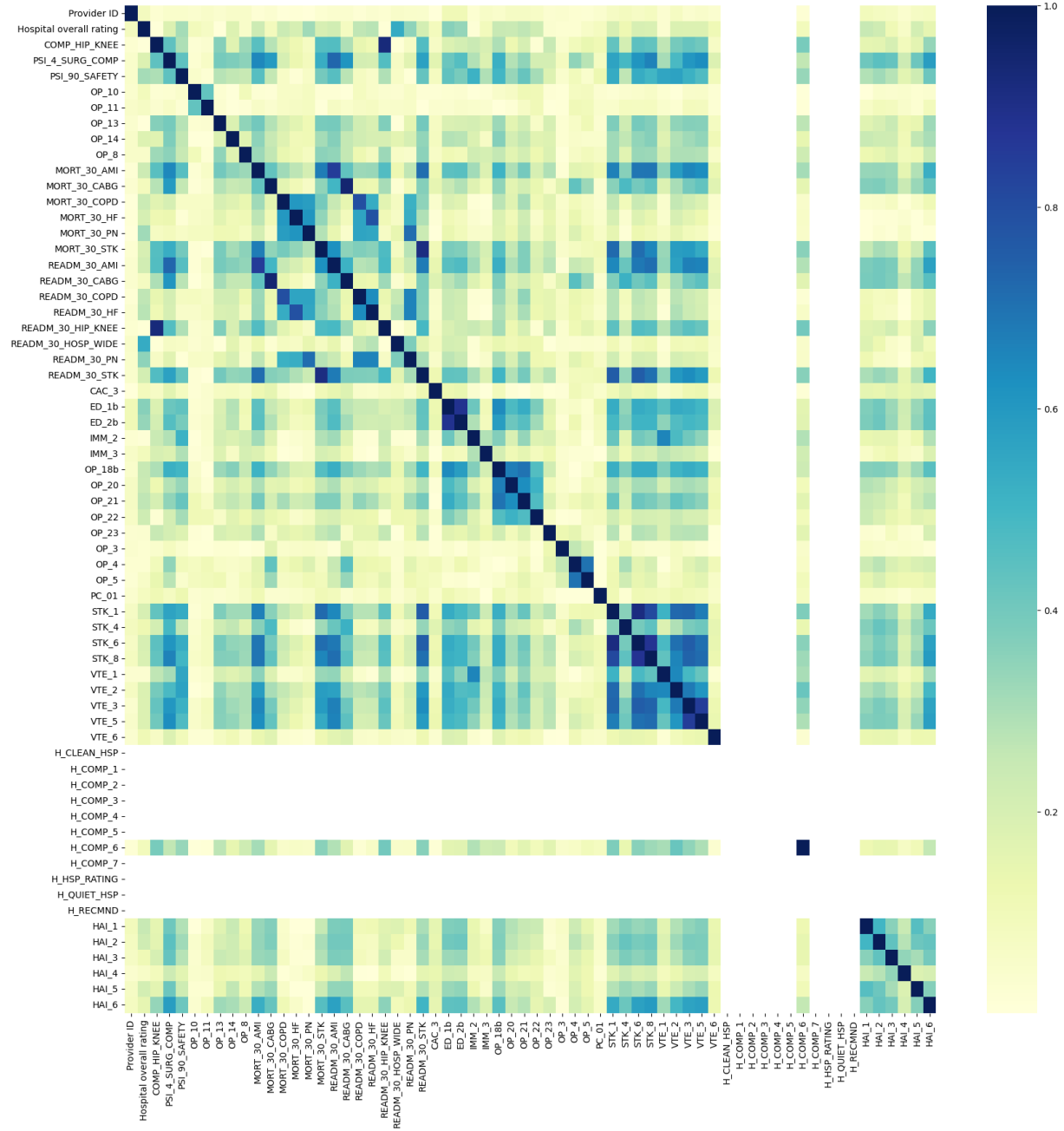
2. CMS classified them under 7 groups including, Readmission, Mortality, Safety of Care, Patient Experience (22% weightage groups) & Timeliness of care, Effectiveness of care, Medical Imaging Efficiency (4% weightage groups)

EXPLORATORY DATA ANALYSIS(EDA)

- Overview: Exploratory Data Analysis (EDA), visual techniques were used to discover trends, patterns, or to confirm assumptions using statistical summary and graphs.
- Data Sources: Hospital ratings data from the CMS, patient satisfaction surveys, and hospital safety data, etc were taken into account
- Data Cleaning and Preparation: Steps were taken such as handling missing values, normalising data, combining multiple sources, and handling outliers.
- Data visualization: Examples of data visualizations were used to explore the data, such as histograms, scatter plots, or bar charts.
- Provider Id and Measure Id were used from the data



Correlation among the variables

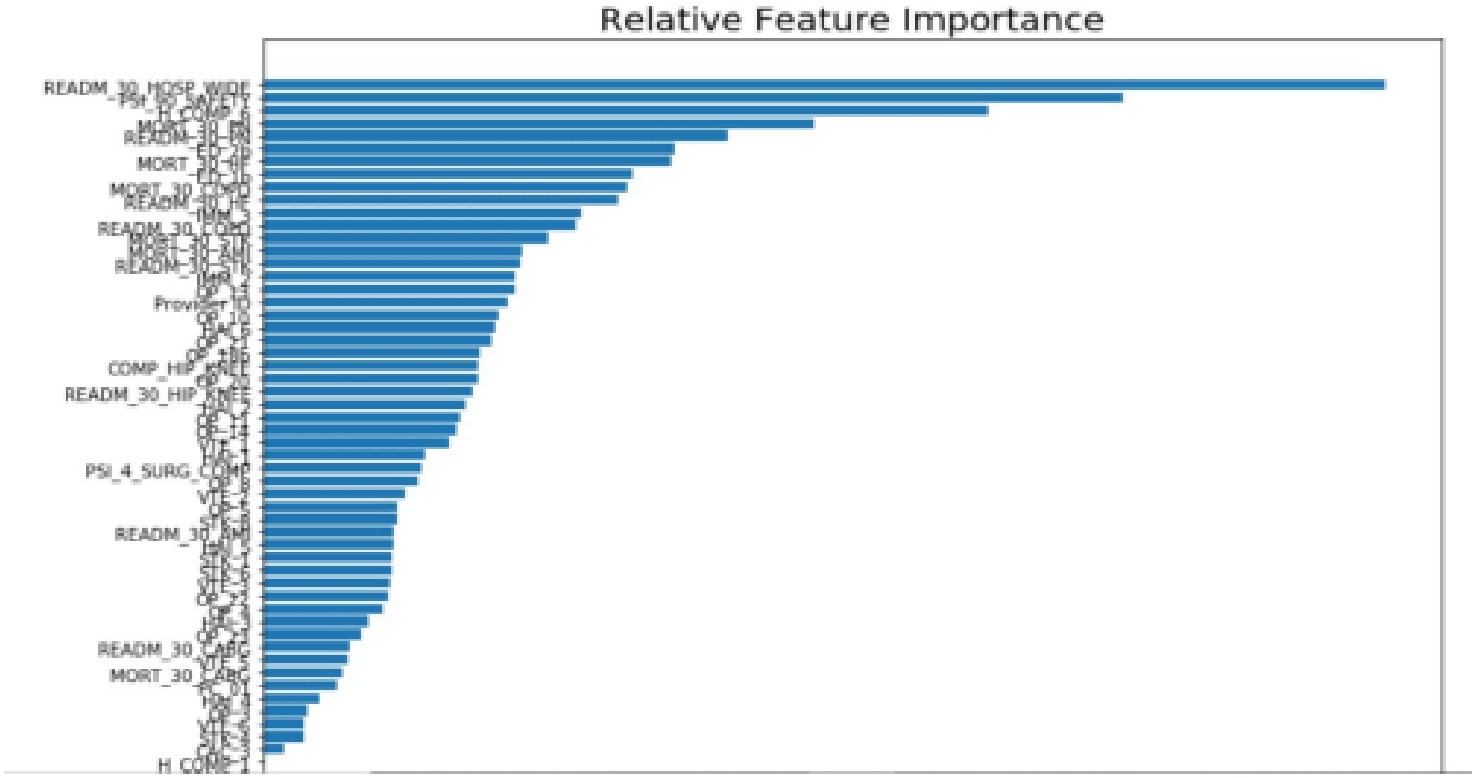


Top 10 measures highly affecting hospital rating

Measures	Group
READM_30_HOSP_WIDE	Readmission
READM_30_PN	
READM_30_HF	
PSI_90_SAFETY	Safety
H_COMP_6	Patient Experience
MORT_30_PN	Mortality
MORT_30_HF	
MORT_30_COPD	
ED_2b	Timeliness of Care
ED_1b	

MODELLING AND EVALUATION

- The Linear Regression model with about 61.3% overall accuracy.
- With Logistic Regression the overall accuracy was about 62.7%.
- With Random Forest Classifier the overall accuracy is about 68%
- Using fractal analysis and clustering model the accuracy is about 58%

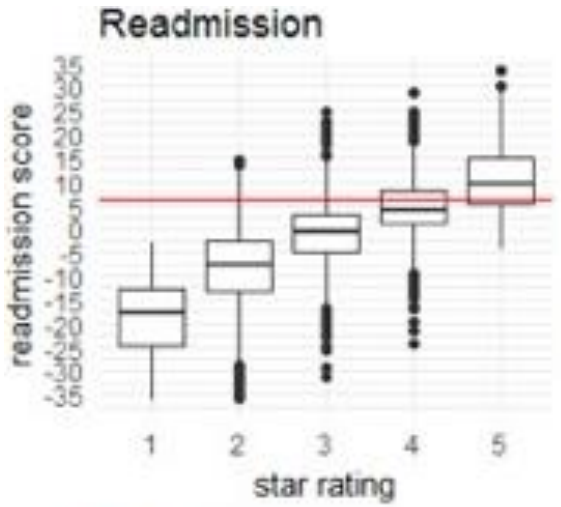


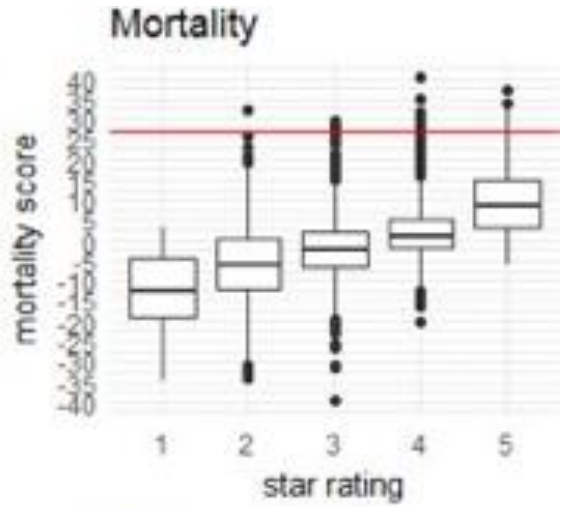
Random Forest gave max accuracy(68%) so that was chosen

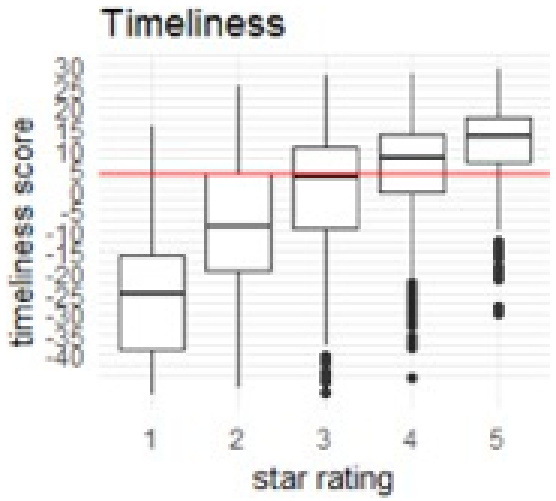
RECOMMENDATION FOR EVANSTON HOSPITAL - PROVIDER ANALYSIS

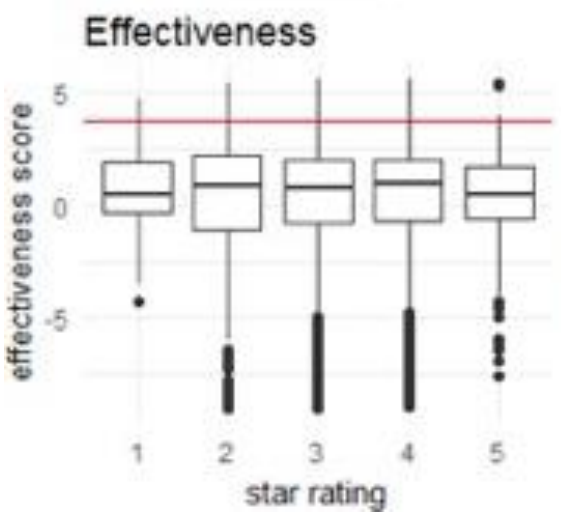
By next year, EVANSTON HOSPITAL should improve on the following parameters in order to achieve a rating of at least 4:

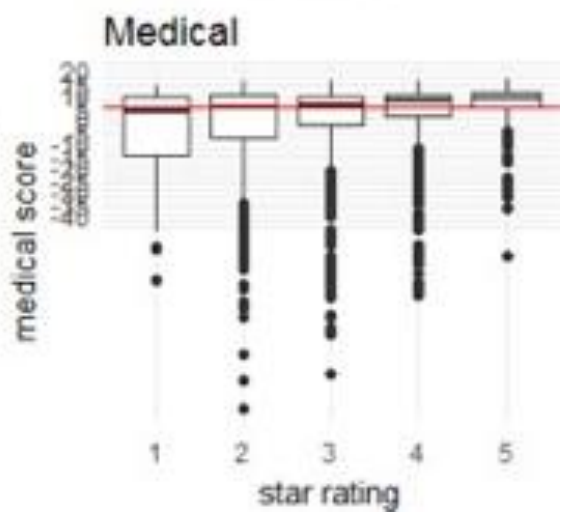
- Readmission (Hospital wide all cause unplanned readmission)
- Patient Experience (Discharge Information)
- Mortality (Pneumonia, Chronic Obstructive Pulmonary Disease, Heart Failure Mortality rate)
- Timeliness of Care (Median Time of ED Dep for admitted ED patients)
- Effectiveness of Care (Influenza Immunization and Healthcare personnel Influenza Vaccination)


Readmission
readmission score
star rating


Mortality
mortality score
star rating


Timeliness
timeliness score
star rating


Effectiveness
effectiveness score
star rating


Medical
medical score
star rating

- Upon validation, score of some important measures of Evanston Hospital was found.

	READM_30_HOSP_WIDE	PSI_90_SAFETY	H_COMP_6	MORT_30_PN	READM_30_PN	READM_30_HF	MORT_30_HF	MORT_30_COPD	ED_2b	ED_1b
1124	15.2	1.45	84.0	13.0	16.6	21.2	9.5	5.7	76.0	245.0

- The above values suggested that if Evanston Hospital could work on few of these measures, their rating can improve from 3 to 4 at least.

  - PSI_90_SAFETY from 1.45 to 0.62
  - H_COMP_6 from 84 to 85.7
  - MORT_30_PN from 13 to 14.9
  - READM_30_PN from 16.6 to 15.85
  - READM_30_HF from 21.2 to 19.93
  - MORT_30_HF from 9.5 to 11.02
  - MORT_30_COPD from 5.7 to 7.1
  - ED_2b FROM 76 to 77.4
  - ED_1b from 245 to 223


THE END