

# HEALTHCARE CAPSTONE PROJECT

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Source

<https://www.beckershospitalreview.com/50-of-the-greenest-hospitals-in-america-2015/northshore-university-healthsystem-evanston-hospital-15.html>

# OVERVIEW

1. Problem introduction
2. Root causes analysis using issue tree framework
3. The hospital compare & dataset selection
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# PROBLEM INTRODUCTION

## PROBLEM STATEMENT

- Target Hospital:** Evanston Hospital (Acute Care Hospital)
- Issue:** Its rating is stuck at 3/5 for the past 5 years
- Consequence:** Decline in revenue for the hospital
- Impact of Ratings:** Ratings directly influence the choice made by consumers who are looking for a healthcare provider and would, therefore, have a significant impact on the hospitals' revenues.
- Mitigation steps:** The hospital has spent a considerable number of resources on improving its services

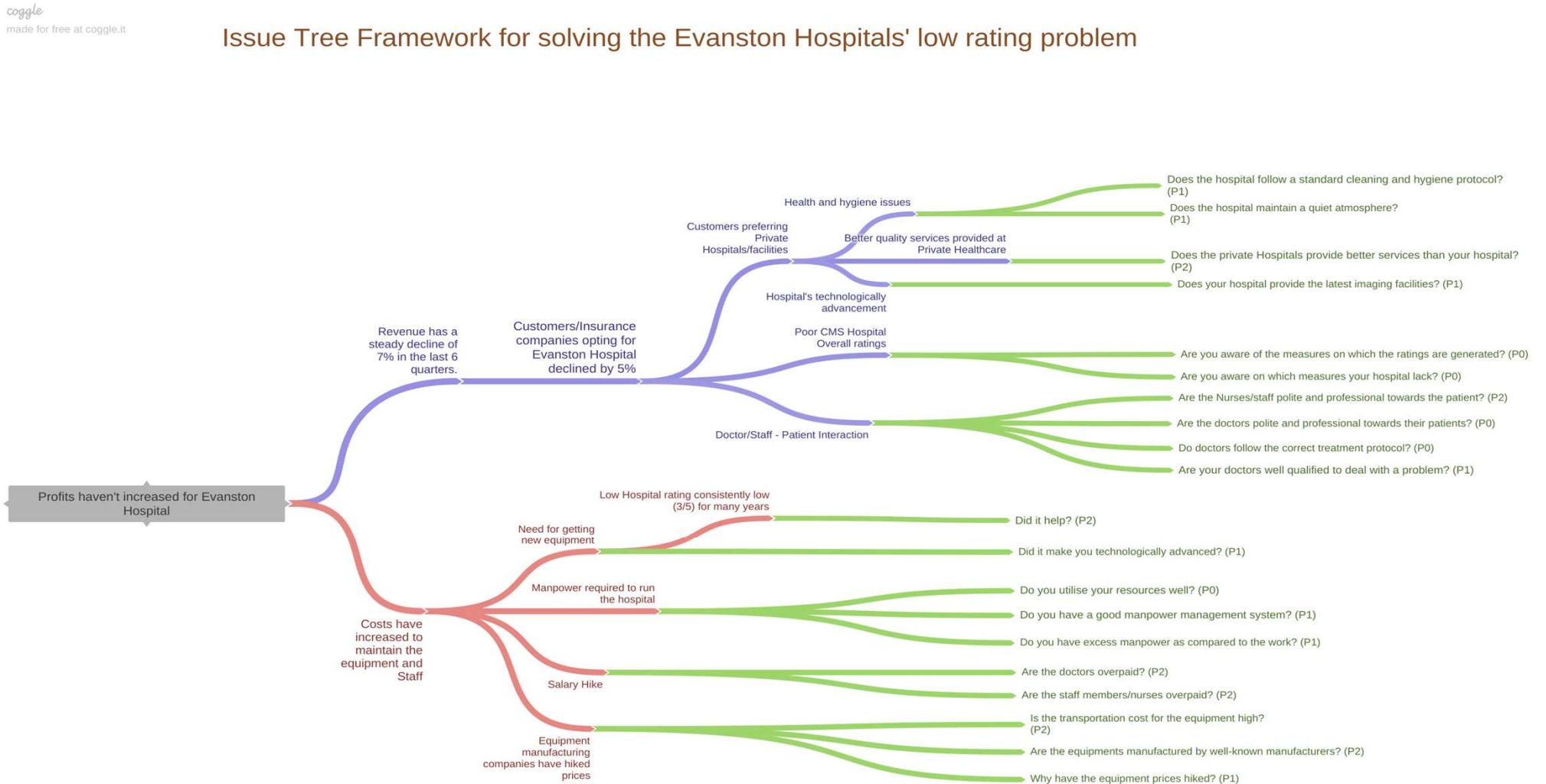
Still, there were no improvements in the rating.

## OBJECTIVE

- Identify the root causes that had lead to such consistent poor rating of Evanston Hospital.
- Performing analysis and finding out the various areas and measures that were responsible for the Overall Hospital Ratings.
- Predicting which measures impacted the ratings most for Evanston Hospital
- Suggesting new mitigation measures that can be put to use by the hospital to improve the hospitals rating.

# ROOT CAUSES ANALYSIS USING ISSUE TREE FRAMEWORK

## Issue Tree Framework for solving the Evanston Hospitals' low rating problem



# THE HOSPITAL COMPARE & DATASET SELECTION

Hospital Compare is a consumer oriented- website that provides information on how well hospitals provide recommended care to patient.

To decide which datasets are important for our analysis, we made the use of two main documents -

1. Overall Hospital Quality Star Ratings on Hospital Compare Methodology Report (v2.0) [2016]
2. Overall Hospital Quality Star Rating on Hospital Compare: January 2020 Updates and Specifications Report (Appendix C)

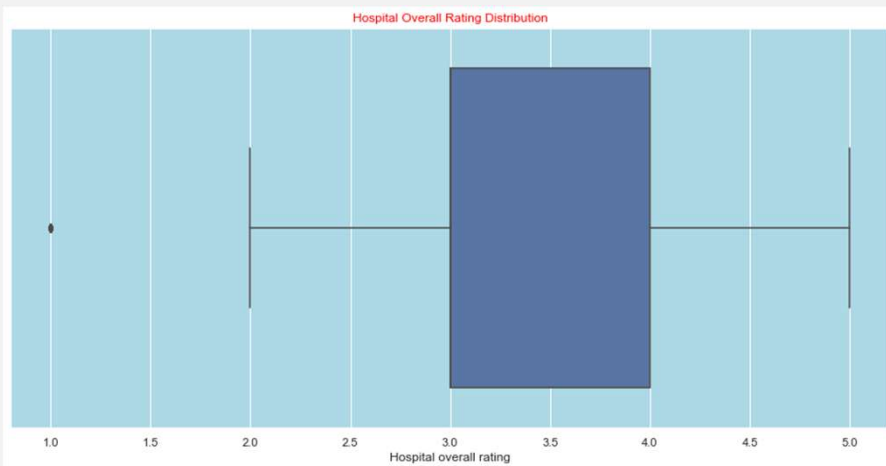
We comprehended that there were 51 measures divided into 7 groups, which contribute towards the calculation of the overall Star Rating by the CMS. They were –

- 1) Mortality
- 2) Readmission
- 3) Safety of Care
- 4) Timeliness of Care
- 5) Effectiveness of Care
- 6) Patient Experience
- 7) Outpatient Imaging Efficiency

## CODING METHODOLOGY

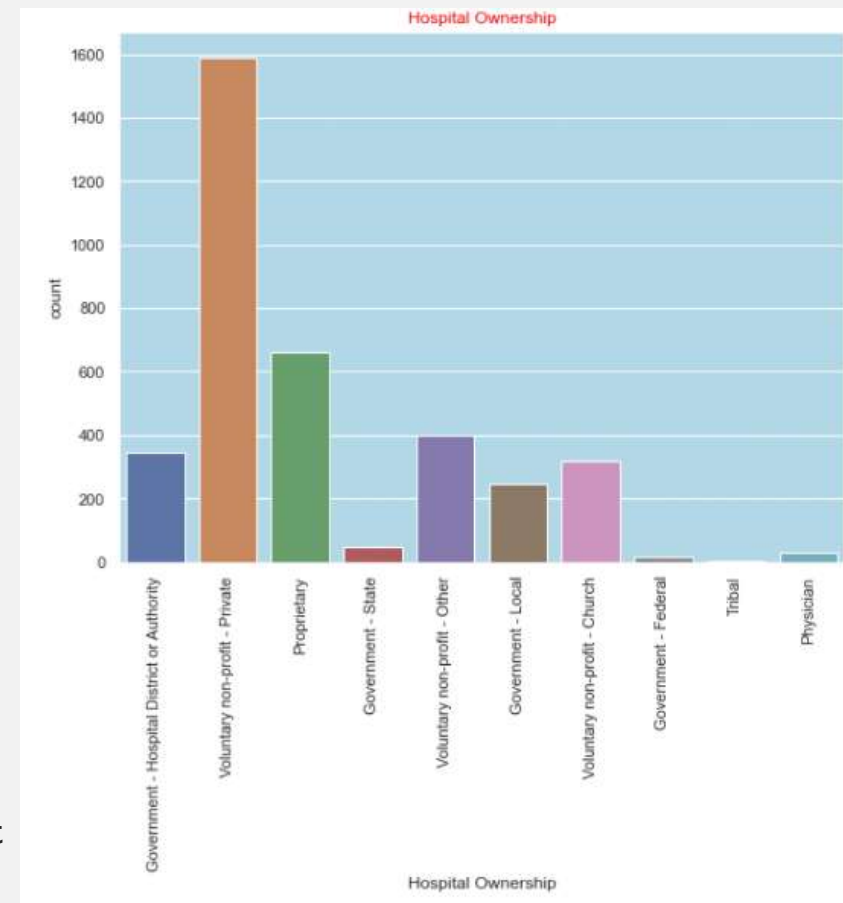
- 1) Found the datasets that includes all the above measures. (7 datasets)
- 2) Performed EDA and analysis on those datasets.
- 3) Merged all the datasets to form the final datasets.
- 4) Performed EDA on the Final Datasets.
- 5) Performed Univariate, Bivariate & Multivariate Analysis
- 6) Prepared the data for Modelling
- 7) Performed Modelling using the following 4 models. I also used Hyperparameter tuning and Stratified K-fold Cross Validation on all the models.
  - 1) Logistic Regression
  - 2) Decision Tree
  - 3) Random Forest
  - 4) K Nearest Neighbor (KNN)
- 8) Selected the best estimator based on Precision score and ran the model for Evanston hospital to calculate its rating and the variable weightage.

# IMPORTANT INSIGHTS



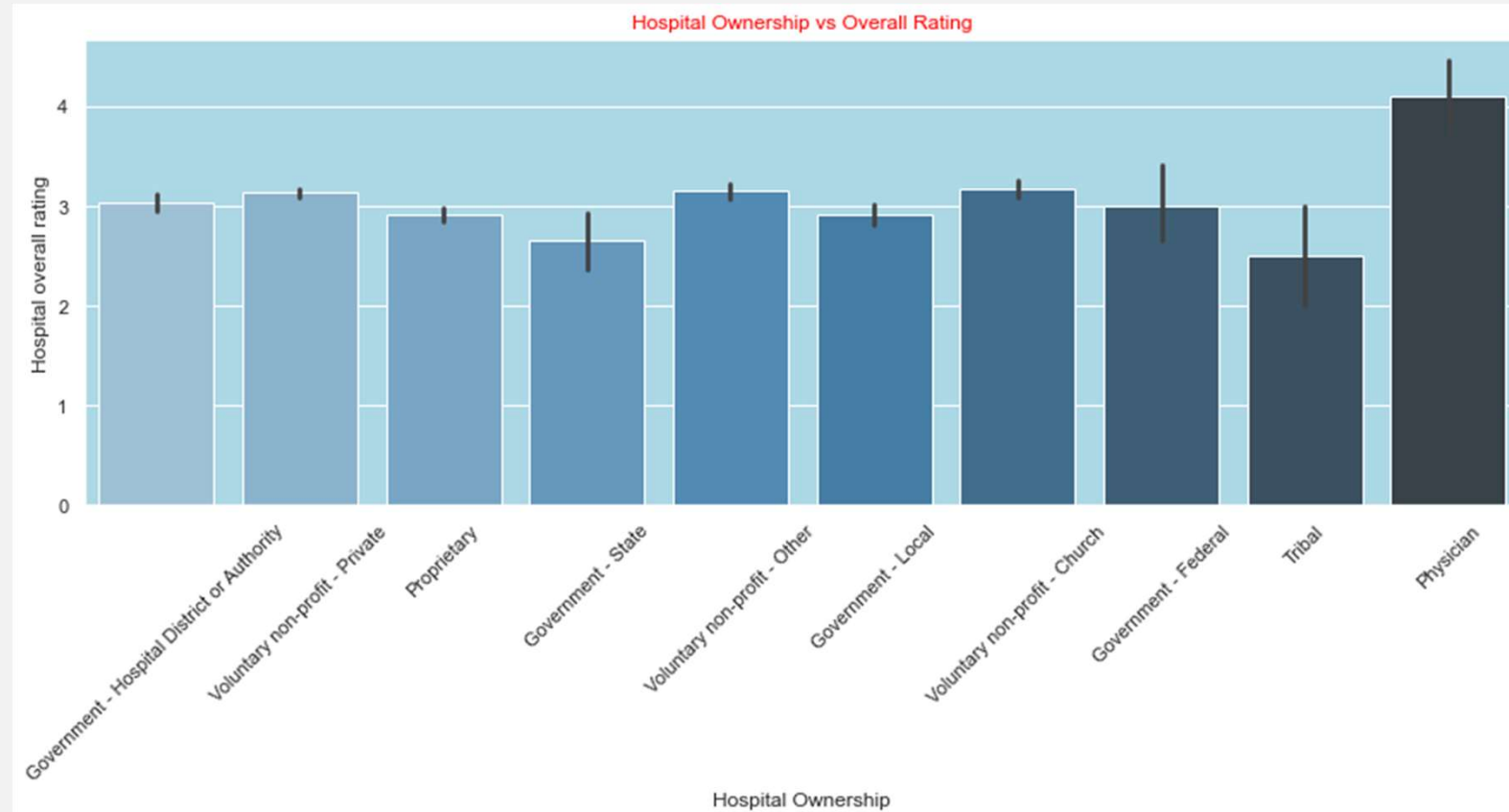
I observed that most of the Hospital ratings lie in the range 2 & 5. The median rating is 3.5/5.

I observed that most of the Hospitals on the list are Voluntary Non-Profit private type hospitals



## IMPORTANT INSIGHTS

One important observation that I made was that Physician run Clinics / Hospitals score better in than other types of Hospitals





## CONCLUSION

Weight	Feature
0.1000 ± 0.0564	PatientExperience_H_CLEAN
0.0622 ± 0.0339	Readmissions_READM_30_COPD
0.0520 ± 0.0933	PatientExperience_H_HSP_RATING
0.0452 ± 0.0286	Mortality_MORT_30_PN
0.0433 ± 0.0415	Readmission_national_comparison_Below
0.0416 ± 0.0317	Safetyofcare_HAI_2_SIR
0.0386 ± 0.0754	PatientExperience_H_COMP_2
0.0362 ± 0.0946	Patient_experience_national_comparison_Below
0.0360 ± 0.0510	Patient_experience_national_comparison_Same
0.0344 ± 0.0640	Effectivenessofcare_MORT_30_AMI
0.0339 ± 0.0234	Mortality_MORT_30_HF
0.0327 ± 0.0702	PatientExperience_H_QUIET_HSP
0.0297 ± 0.0444	Safety of care_national_comparison_Below
0.0294 ± 0.0256	Timelinessofcare_ED_2b
0.0281 ± 0.0572	PatientExperience_H_COMP_5
0.0264 ± 0.0242	Timelinessofcare_OP_18b
0.0253 ± 0.0199	Emergency Services
0.0244 ± 0.0218	Medical_Imaging_OP_10
0.0236 ± 0.0188	Safetyofcare_PSI_90_SAFETY
0.0231 ± 0.0190	Medical_Imaging_OP_11
... 30 more ...	

Table generation using the Python eli5 library

**We found that the Random Forest Classifier model worked best for our data with a Precision score of 80.9 +/- (1.65).**

The analysis of the Evanston Hospital rating criteria, lead to our understanding that the following 4 measure groups were the ones severely impacting its ratings.

They had around 50% weightage in deciding the ratings –

- 1) Patient Experience
- 2) Readmission Rates / Procedures
- 3) Mortality Rates
- 4) Safety of Care

## BUSINESS INSIGHTS & SUGGESTIONS

### PATIENT EXPERIENCE

Patient Experience is one of the most important factors that Evanston Hospital should work on improving. Their patient experience score is below the national average, which is a bad sign.

- ❑ Maintaining the cleanliness and hygiene of the place of and its surrounding areas, by following good cleaning protocols.
- ❑ The Doctor-Patient Communication is also seems to be poor. The doctors can be given some mandatory communications training, so that they could interact with a patient in a more polite and professional manner.
- ❑ Overall Patient Experience Rating (past ratings) matters, so the hospital should look at all the areas where patient is directly interacting or is directly involved in. They should all be improved.

### READMISSION

Overall the Readmission score is at par with the national average, but there is still an area where the Hospital can work that is the

- ❑ Readmission rate for Chronic Obstructive Pulmonary Disease 30 days which is higher. Hospital should check that a patient with this illness follows the best and proper recovery procedures.

## BUSINESS INSIGHTS & SUGGESTIONS

### **SAFETY OF CARE**

Poor performance compared to national standards.

One of the main areas is the complications of various illness that the patient endures. The most common and important one is the Catheter Associated Urinary tract infection.

The hospital staff should be responsible for cleanliness of the catheter instruments and devices, so that no infectious catheter is used on a patient. This is one of the most easiest the things that the Hospital can improve in.

### **MORTALITY**

Prominent areas where the hospital is lacking. It is witnessing a high amount of mortality rates.

- Pneumonia 30 days mortality rate
- Acute Myocardial Infarction (Heart attack) 30 days mortality rate
- Heart Failure 30 days mortality rate.

The hospital should personally assign a person/counsellor who can make sure that the person recovering from the above mentioned problem is following the best and proper recovery procedures. A doctor should be always available on call if there is an emergency situation with any of the patients those who are recovering.

THANK YOU