DUCEN
Intelligence to Decision Making

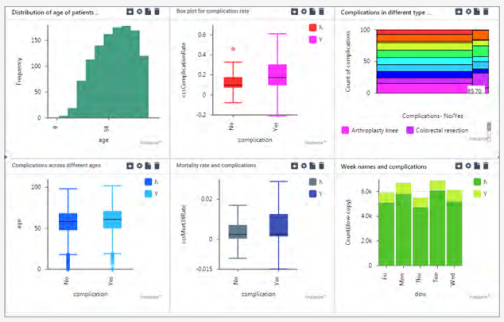
MACHINE LEARNING AND ARTIFICAL INTELLIGENCE

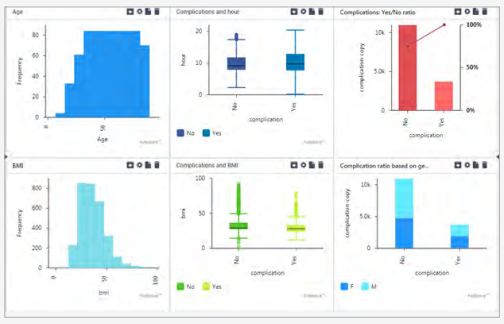
Predicting Surgical Complications

Data Source :
US Government's Open Data

Data Type :
Patient Surgical Data Set

Application :
Analance





Analance

PROOF OF CONCEPT – POWERED BY ANALANCE

Research has shown that errors in care contributes to a significant portion of Surgical Complications.[1] This link to provider error presents a prime opportunity to streamline patient care and improve health outcomes.

Leveraging ML and AI to Facilitate Early Intervention

Analance used an open patient surgical data set to forecast whether a surgery will become complicated or not—with summaries and findings easy to explore through dashboards and reports.

By leveraging Analance machine learning (ML) and artificial intelligence (AI), patients can be classified into risk categories based on their likelihood of having surgical complications and future outcomes can be predicted with accuracy as high as 78%. With built-in automations, alerts can be scheduled to notify surgeons and healthcare professionals when surgeries are likely to have complications. This allows them to take the necessary precautions and create well-informed assessments.

Exploratory Data and Modeling Process

With insight into whether a surgery will have complications or not, surgeons will have more information to create an assessment and patients will have a better idea of the risks posed.

A number of different predictor variables were considered such as type of surgery, cancer diagnosis, CVD diagnosis, dementia diagnosis, osteoarthritis diagnosis, and more.

All variables available were studied to understand distributions. Data was cleaned by the means of handling outlying values, missing values, and looking for interrelationships between predictors before looking to see if any data had a significant relationship with the outcome. A Bivariate Analysis (Chi-Squared) was done for all predictor-outcome combinations, which helped in restricting the analysis to only those predictors that majorly influence surgical complications.

Data Modeling and Findings

A total of 50 different models were built but the Two-Class Adaptive Boosting model was chosen as the winning model based on the model accuracy. From the analysis performed, the risk of surgical complications is linked to a number of variables:

- There is a risk of complications regardless of the patient's gender. (Female: 12.8%, Male: 14.4%)
- The type of surgery has a significant relationship with complications.
- There is a risk of complications regardless of the patient's age. (Median age with complications: 60.9; Median age without complications: 58.3)

Data Analysis and Insights

While gender and age do not seem to be closely linked to post-operative complications, the type of surgery looks to play a significant role. Every surgery is different, after all. There are certain surgeries that naturally present a higher risk, whether it's because of the difficulty of the procedure, the condition of the patient, or the importance of the organ or body part that's being operated on.

Next Steps

Surgeons can hold reliable pre-operative counselling sessions, provide accurate information to surgical patients, and improve shared decision making for better health outcomes. They can predict in order to prevent surgical complications.

SOURCES:

1. NCBI, "Complications in Surgical Patients"