Operating Room Utilization

Problem statement:

Operating room (OR) inefficiency is a significant financial burden on healthcare organizations, impacting both cost and patient care. While booked OR time represents a planned utilization metric, it often deviates from the actual time procedures take due to workflow delays, inaccurate booking estimates, and cancellations. This project aims to leverage a dataset containing surgical timestamps throughout the OR workflow to identify and quantify these areas of inefficiency. By analyzing this data, we can develop actionable insights to optimize OR utilization, potentially saving healthcare organizations substantial time and financial resources, and ultimately improving patient care delivery.

Dataset:
https://drive.google.com/file/d/1Y599SQf0EwCRJu9gsvY8Jw_z2BoymVBt/view?usp=drive_link

Dataset description:
https://docs.google.com/document/d/105w9QeWZxTioqBjkze1F7dkS-MFKYvBJ1m5-m5Xipek/edit?usp=sharing

Expectations:

- Analyze OR workflow data to pinpoint delays and inaccuracies in booking estimates.
- Provide actionable insights to improve scheduling and reduce cancellations.
- Estimate potential cost savings and increase procedure throughput.
- Propose strategies to streamline OR processes, reducing wait times and improving outcomes.
- Apply data analytics techniques and improve proficiency in statistical tools.
- Create clear visualizations and comprehensive reports to communicate recommendations.

- By completing this project, healthcare organizations can expect to save time and resources while enhancing patient care delivery.

Suggestions for approaching the case study:

Preprocessing of Data:

- Data Cleaning: Handle missing values, correct data entry errors, and standardize formats for dates and times.
- Timestamp Conversion: Convert timestamps to a consistent format and calculate necessary time differences.
- Filtering and Segmentation: Segment data based on relevant criteria (e.g., date ranges, OR suites, surgical specialties).

Overall Utilization Rates and Utilization Rate for Each Week:

- Overall Utilization: Calculate the total time the OR was used versus the total available OR time.
- Weekly Utilization: Determine utilization rates for each week to identify trends or fluctuations over time.

Identifying Workflow Delays:

- Calculate Time Differences: Measure the time between key stages (OR Schedule - Wheels In, Wheels In - Start Time, Start Time - End Time, End Time - Wheels Out).
- Analyze Delays: Identify average delays and standard deviations for each stage across different procedures, specialties, and OR suites.
- Identify Bottlenecks: Highlight stages with significant delays, indicating potential workflow inefficiencies.

Analyzing Booking Time Accuracy:

- Calculate Booking vs. Actual Time: Measure the difference between "Booked Time (min)" and actual surgical duration (End Time - Start Time).
- Identify Patterns: Analyze discrepancies across different procedures, specialties, or surgeons to spot consistent overbooking or underbooking trends.
- Recommendation for Booking Adjustments: Suggest adjustments based on historical data to improve booking accuracy.

Quantifying Cancellation Impact:

- Identify Cancellations: Detect procedures with missing key timestamps (e.g., no "Wheels In" time) as potential cancellations.
- Analyze Cancellation Rates: Determine the frequency of cancellations and the amount of time booked for these procedures.
- Impact on Utilization: Quantify the impact of cancellations on overall OR utilization and identify patterns in cancellation rates by specialty or surgeon.

Exploring Specialty and Procedure Variations:

- Segment Data: Divide the dataset by surgical specialty (Service) and CPT code.
- Analyze Workflow Times: Evaluate workflow times (e.g., average time from Wheels In to Start Time) for each specialty and procedure.
- Booking Accuracy: Assess the accuracy of booked times versus actual times within each segment.
- Cancellation Rates: Compare cancellation rates across specialties and procedures to identify any significant variations.
- Tailored Recommendations: Provide specific recommendations for each specialty or procedure based on identified patterns and inefficiencies.

Deliverables:

- A well-structured report (slide deck) with clear explanations of your analysis process, visualizations of key findings, and a concise summary of your recommendations.
- Code snippets (Python / SQL) used for data exploration and analysis (demonstrates technical skills).