Improvement of OT Listing and Scheduling System with Data Visualization

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Singapore Healthcare Management 2015

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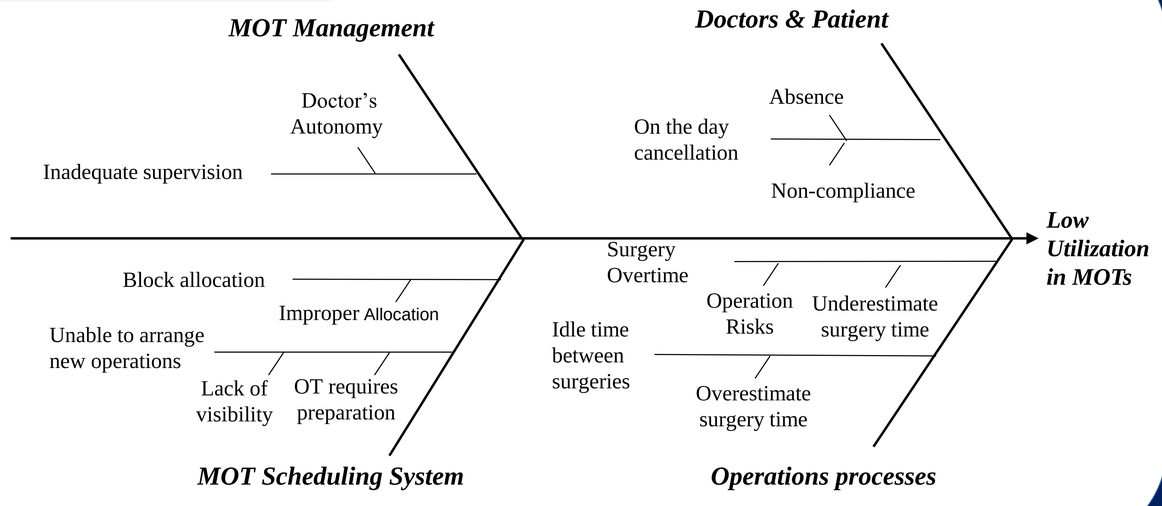
Introduction

The Major Operating Theatre (MOT) at Singapore General Hospital (SGH) provides acute surgical care and tertiary and quaternary surgical services. They provide comprehensive surgical services in general and surgical subspecialties including endovascular surgery, surgical oncology, minimally invasive surgery, surgical endoscopy, trauma and liver transplant.

Problem Definition & Objectives

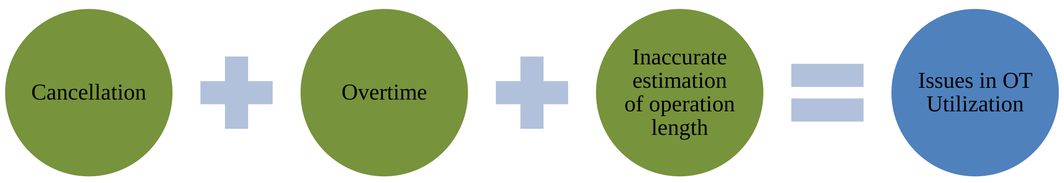
Problem Definition	• Significant Idle Time in operating theatres • Perceived low utilization in MOTs
Objective	• Visualization of Scheduling System via the development of a Dashboard using retrospective data from the past 3 years
Scope	• Impacts on Cancellations of MOTs • Impacts on Utilization of MOT • Limited to Elective MOTs Only

Root Cause Analysis

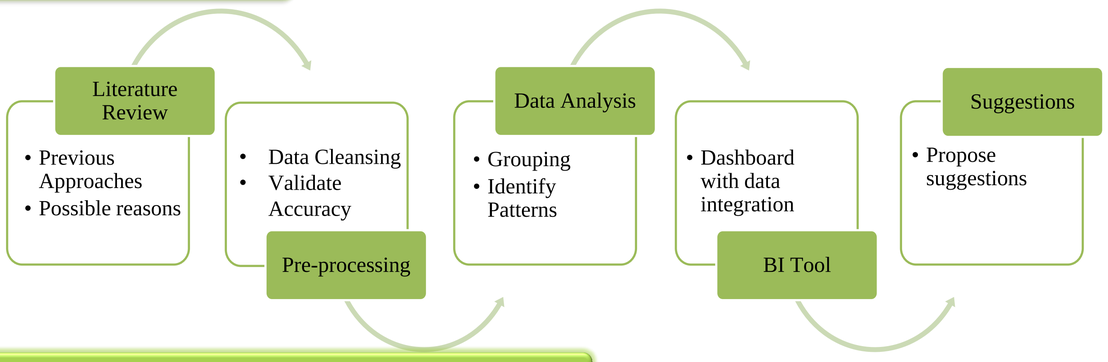


* The analysis does not include operations performed at day surgery OT's (Ambulatory Surgical Centre)

Hypothesis



Methodology



Key Performance Indicator (KPI)

- **Utilization:** Usage of each Operating theatre in MOT during working hours
- **Overtime:** Usage of operation theatre after working hours
- **Operation time deviation:** Scheduled duration for operation – Actual duration for operation
- **Nominal Cancellation:** Length of scheduled operations being cancelled
- **Absolute Cancellation:** Length of scheduled Operations being cancelled without replacement

Conclusion

The development of the BI prototype enables management of large volume of data. It provides a brand new approach that continuously monitors the MOT performance. Timely update will be possible with the flexible BI tool. It provides the users a snapshot of the current system. The use of BI tool facilitates the managerial decision in SGH.

Dashboard Features

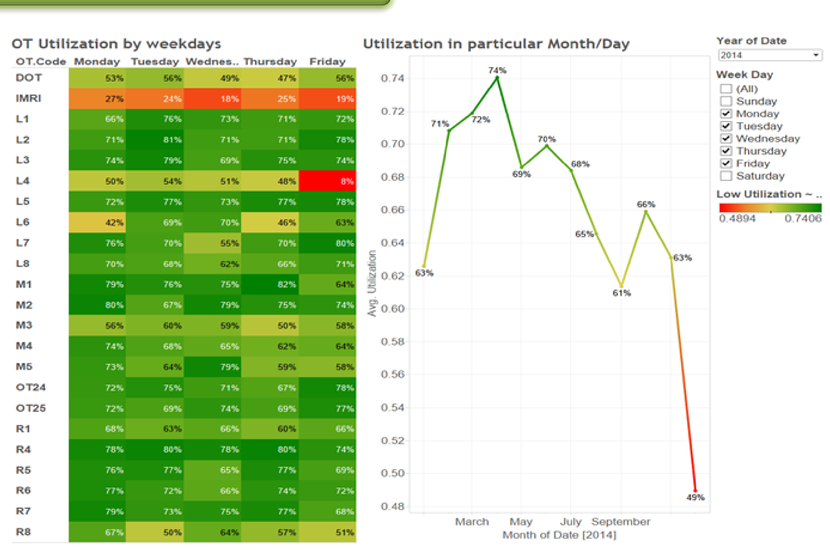


Figure 1. Utilization of different MOTs

Figure 1: This dashboard features the utilization of different MOTs during the week. A spectrum of colors are used to represent the level of utilization from low (red) to high (green). Dashboard also features a graphical representation of the utilization of different MOTs over the different days of the month. Across the years, the utilization in January and December are generally low. This aids the MOT management to monitor the utilization of all MOTs at a glance conveniently.

Figure 2: This dashboard depicts the nominal cancellation rate for patients of different age groups. Overall patients that are above 60 have a 30 percent chance to cancel their operations appointments as compared to younger patients. Patient's Request ranks the top for the reasons of cancellation followed by Doctor's Requests.

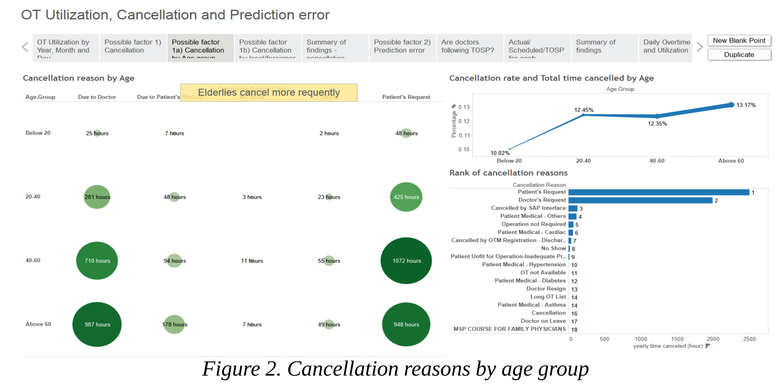


Figure 2. Cancellation reasons by age group

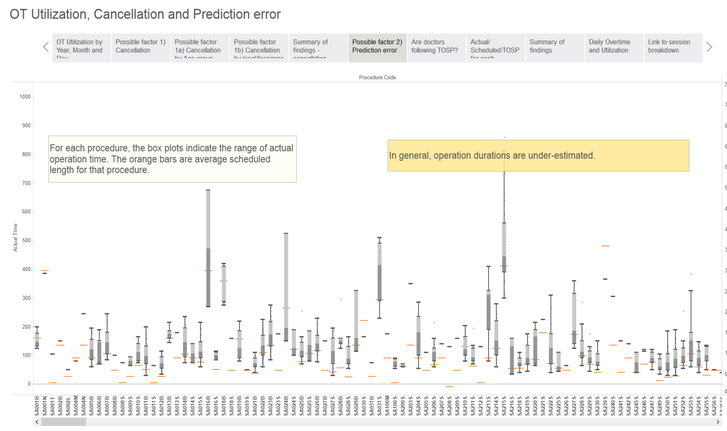


Figure 3. Actual Operation Length Vs Scheduled Operation Length

Figure 3: This dashboard reveals the actual length of time of procedure (represented by the boxplot) compared to the average scheduled length of time for different operating procedure (represented by the orange bar). Overall for most of the procedures, the scheduled time to perform the procedure is generally shorter than the actual time to complete the procedure.

Figure 4: This dashboard displays the Overtime (thickness of line) compared to its utilization (the peaks). Overtime generally occurs during high utilization. Yet, some outliers have been observed. Utilization can be low whereas overtime can be high if the MOT is utilized beyond operating hours.

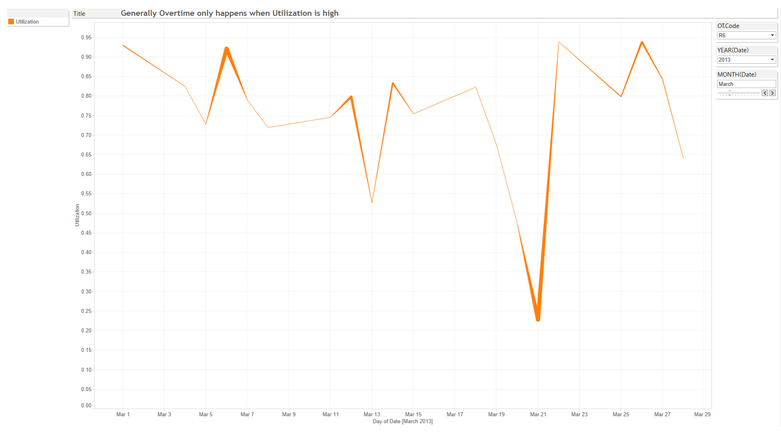


Figure 4. Utilization and Overtime

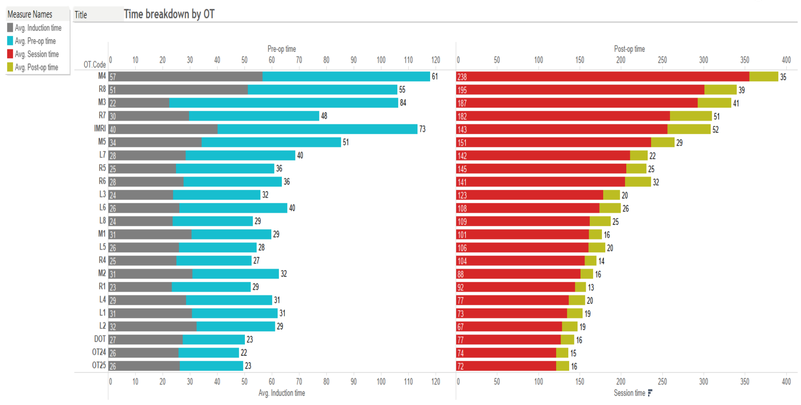


Figure 5. Average Operation Time Breakdown

Figure 5: This dashboard renders the average operation time breakdown for different MOTs in SGH. The breakdown for every operation performed on a patient is broken down into:

1. Induction time
2. Pre-Operation time
3. Session time
4. Post-Operation time

Results and Recommendations

- *Improvements in communication* between doctors and patients can lead to reduced cancellations in surgery
- *Flexibility in rescheduling* can help to achieve high utilization
- *Additional supervision of the scheduling system* is recommended in order to keep track of the status of MOT
- Comprehensive guideline for predicting the *length of surgery*
- *Revision of administrative policies* in order to relieve seasonal cancellations (Example: Vacation periods - December and January)