Project Title

Gazing the Crystal Ball – Optimising Bed Utilisation Through Accurate Prediction of Bed Availability

Project Lead and Members

- Amran bin Abdul
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Organisation(s) Involved

SingHealth Community Hospitals (SCH)

Healthcare Family Group Involved in this Project

Healthcare Administration

Specialty or Discipline (if applicable)

Finance, Business Liaison Office

Aims

1. Establish a mathematical relationship of supply and demand for beds in order to predict bed availability more accurately.
2. With better predictive capability, to stack admission (above the reported beds available) that will enable quick replacement due to changes in planned admissions and discharges.
3. Improve Bed Occupancy Rate (BOR) through optimal bed utilisation.

Background

See poster appended / below

Methods

See poster appended / below

Results

See poster appended / below

Conclusion

See poster appended / below

Additional Information

Singapore Healthcare Management (SHM) Conference 2021 – Shortlisted Project (Finance Category)

Project Category

Care & Process Redesign, Access to Care, Bed Occupancy Rate, Value Based Care, Utilisation, Operational Management, Resource Allocation

Keywords

Predictive Model, Lean Methodology

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Gazing the Crystal Ball – Optimizing Bed Utilisation Through Accurate Prediction of Bed Availability

Singapore Healthcare Management 2021

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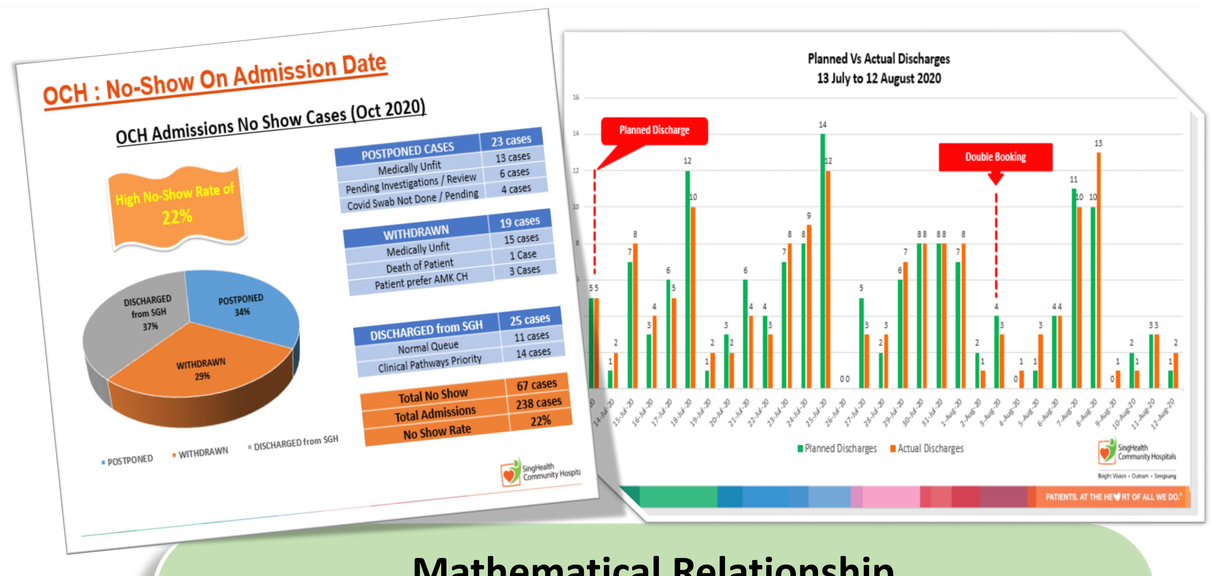
Introduction

Despite the long wait list for its beds, SCH was not able to maximise bed utilization due to the high drop-outs on admission day and unplanned discharges. To understand the phenomena, the team studied the factors that affect supply and demand variations in SCH beds and developed a predictive model and establish stacking admission tool to better forecast bed availability and address potential admission day drop-outs with replacement admissions.

Objectives

1. Establish a mathematical relationship of supply and demand for beds in order to predict bed availability more accurately.
2. With better predictive capability, to stack admission (above the reported beds available) that will enable quick replacement due to changes in planned admissions and discharges.
3. Improve BOR through optimal bed utilization.



Mathematical Relationship

$$\text{Bed Available} = \text{Empty Beds} + \text{Plan Discharges} \times (1 - D_{dr}) - \text{Plan Admission} \times (1 - A_{dr}) - \text{Ringfenced Beds}$$

where

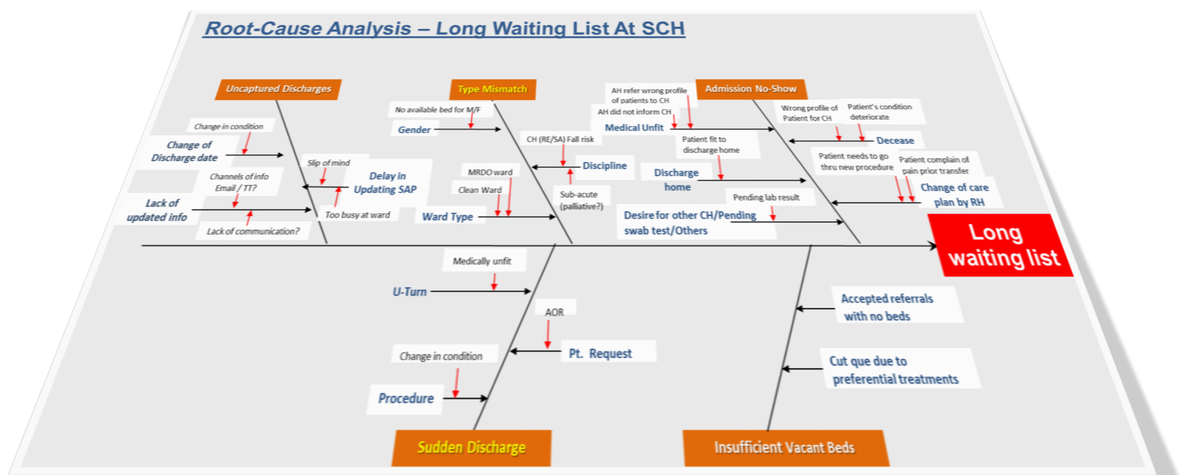
D_{dr} = *Discharge Dropout Rate in %*

A_{dr} = *Admission Dropout Rate in %*

Method

A group of Finance staff from the Business Liaison Office (BL0) came together to;

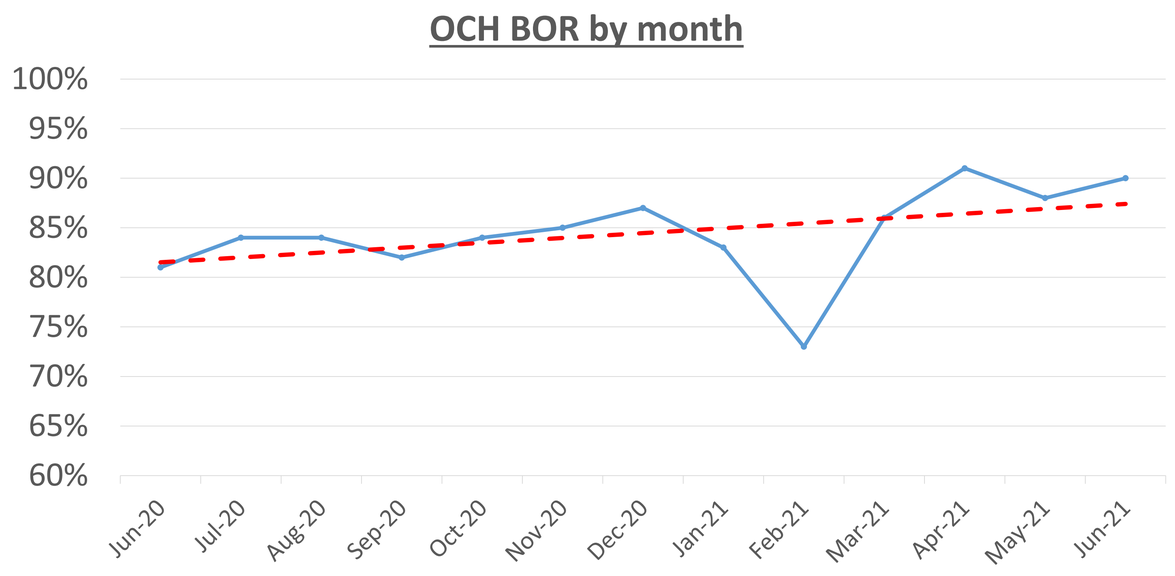
- Conduct a ***fish bone analysis*** of the factors that affect the long wait lists at OCH and the lack of beds thereof.
- ***Identify causal-relationship*** between those factors & the reasons that they occur, the scenarios, contingencies and options available to us.



- ***Collate historical data*** to support our hypothesis.
- ***Analyse the extent*** to which the factors contribute to demand and supply variations of beds.
- ***Spot trends*** and mathematical consistencies.
- Establish findings into a ***mathematical relationship***. Using historical rate, create a mathematical relationship to estimate the bed availability.
- ***Estimate the variables*** (dropout rates) using historical data and trend.
- ***Test formula*** to check variation & predictive power by varying the dropout rates to mitigate risk of under and over estimation.
- ***Stacking admission*** - with better predictive power, plan for more admissions taking into accounts potential dropout rates along the way for each of the factors

Result

- Bed Occupancy Rate (BOR) increased significantly due to better prediction of the bed availability.



- SCH is able to maximize its beds to ease the bed crunch at its co-located Acute Hospital partners.

Conclusion

Today, with adequate demand for its beds, SCH is able to consistently achieved over 90% BOR to assist their co-located Acute Hospitals during their bed crunch situations.