CHALLENGE 1: Automated Hospital Capacity Management

Background

Patient flow through Royal Perth Hospital (RPH) is a complex process consisting of multiple moving parts, with multiple data entry systems and personnel who interact with these systems. Patients may enter through the Emergency Department (ED) and be admitted for urgent surgical care. Others remain outpatients and only require care in the ED. Others still may be planned admissions having been scheduled for elective surgery weeks or months in advance. There are peaks and troughs in patient demand dependent on multiple factors.

As RPH is Western Australia's only Major Trauma centre, if we can:

• predict daily demand for hospital-based services; including emergency department;

• predict case length for elective surgery (and predict the opportunity cost of performing elective procedures in lieu of your emergency demand)

• model what is the true surgical demand from a combination of outpatient clinic surgical referrals, inter-hospital transfers from patients coming to RPH for surgery from other hospitals, and ED patients admitted for urgent surgical care; and

• map workforce allocations to predicted areas of immediate high demand

we can reduce patient wait times and improve their health outcomes, reduce staff fatigue and improve their wellbeing, for the benefit of all Western Australians attending RPH. Without this, managing workloads for our ED and Surgical teams, and providing high quality patient care becomes more challenging as demand for Major Trauma services by the WA community continues to increase.

Challenge

Can we combine existing data sets to predict demand for hospital services by the hour with a focus on surgical demand which includes theatre case length in order for the hospital to ensure they are effectively managing their staff and services to cater for patient needs?

Possible Approaches

The approaches outlined below have been included for information and inspiration only and are by no means prescriptive. Approach the challenge in whatever way you feel will address the problem statement understood by your team.

• Can we predict ED demand by day of the week, month or season?

• Can we predict surgical case length based on a patients condition?

• Can we identify human resource shortfalls (e.g. doctors, nurses) for predicted patient needs?

• What visualisations may be useful for forecasting demand?

• Can the hospital predict the number and type of staff it will need to roster for any given day or time?

• Are there external factors that may impact hospital demand (weather, events, COVID-19 case load) to be taken into account?

Data Available

- Emergency Department Information System (EDIS) – data for patient status and time frames in Emergency Department
- Web based Patient Administration System (WebPAS) – data about the patient journey through the hospital
- Enterprise Bed Management (EBM) – data for hospital bed capacity and patient transfers between hospital wards
- Electronic Booking System – data about surgical procedures
- Theatre Management System (TMS) – data about surgical theatres including time frames of procedures
- Transitional Care Program (TCP) waitlist – data for patients on waitlist for transitional care program
- Rostering Data – data for medical and nursing staff rosters
- Elective Surgery Waitlist – data about elective surgeries and time frames

Additional Resources

The approaches outlined below have been included for information and inspiration only and are by no means prescriptive. Simpler solutions may be just as effective and easier to implement.

https://www.sciencedirect.com/science/article/pii/S2214716021000257

https://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-022-01787-9

https://blog.csiro.au/cutting-emergency-waiting-times/

https://www.csiro.au/en/research/technology-space/data/waiting-times

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7144331/

Domain Expertise

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