**Introduction**

Emergency department (DEM) congestion is associated with increased morbidity and mortality. DEM congestion is a product of patient arrivals, patient complexity, operational processes, and the supply of and demand for inpatient beds.

We analyzed processes affecting DEM congestion and found out that DEM admissions were waiting for an average of 3.15hrs before their transfer to the inpatient ward. In our system, a bed is assigned according to a bed allocation algorithm. The Bed Management Unit (BMU) reserves a suitable bed based on differing priority levels for each admission source (DEM, SDA, Non-SDA Electives & Direct SOC Admissions), and that reservation is acknowledged by the inpatient wards prior to inpatient transfer.

The DEM wait time to admission, defined as wait time from disposition (initiation of bed request) to arrival at final allocated inpatient ward bed, is an institutional key performance indicator tracked by the Ministry of Health.

**Mission Statement**

To reduce the average wait time to admission for DEM patients from 3.15hrs to 2hrs within 1 year.

**Analysis**

All work processes were mapped, and extensive data analysis of >100,000 admission cases from all admission sources was done. These allowed the team a global view of the constraints and challenges involved, and identify opportunities for improvement. Improving DEM congestion and wait time to admission required a broad, multi-faceted hospital-wide approach, focusing on people and processes.

![Diagram of algorithm steps](image)

1. How can we maximize the available supply of beds, with division-level right-siting?
2. How can we reduce the wait time to acknowledgement of final request?
3. How can we transform the allocation process to improve hospital flow?

**Major Initiatives Implemented**

1. **Updating the Legacy Ward Categorization**
   - To maximize the availability of Parent Ward and Preferred Overflow beds, the legacy ward (WD) categorization algorithm was reviewed and updated accordingly with ground feedback. This allowed patients to be right sighted to wards of the same clinical division more readily.

   With more Parent and Preferred Overflow wards available, there was less rejections of BMU allocation requests from the wards, and less overflows to the Non-PREFERRED Overflow wards.

2. **Improving the Bed Allocation Logic through Simulation**
   - Various allocation models were created and simulated to identify the impact of ring-fencing on wait times. The Wait Time Threshold (2H) model achieved the best balance between inpatient right sitting and wait time performance.

   Due to technical limitations, the WTT (2H) model could not be implemented within the window of this project. However, we continued to work to achieve the ideal state assumptions used in the simulation, leading to the initiation of the bed brown search pilot.

**Results**

With the Ward Categorization updated and institution of No-Rejection Policy:

- Overall wait time to acknowledgement of final bed request reduced from an average of 2:19hrs to 1hr.
- Patients with at least 1 rejected bed request decreased from 7% to 4%.
- Wait time to admission improved for patients when BOR was not elevated.

With the subsequent implementation of the "Bed Brown" Pilot:

- Overall BMU rework rate improved from 25% to 13%.
- Wait time to admission improved further for patients, across all BOR levels.
- Overall average DEM wait time to admission reduced from 3:15hrs to 2:35hrs.
- DEM congestion has improved, with the transfer of admitted patients to inpatient wards more evenly spread across the day.

**Future Plans**

- Automation of Bed Management System with enhanced allocation logic.
- Singular control of bed management by BMU instead of current fragmented state.
- Addressing imbalances in specialty bed demand and Primary Ward bed supply.
- Optimizing patient transport from admission sources to inpatient wards.