



Improving ED Operations through Discrete Events Simulation – A Preliminary Study on Critical Care Patients

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A. Background

Long waiting times in emergency department (ED) not only affect patients' perceived quality of care but also increase ED crowding resulting in adverse patients' outcomes.

As one of Singapore's largest acute tertiary hospital and national referral centre, SGH handles a very high patient flow daily.

The patient volume is growing fast over the years, with an ever-changing patient mix. This has posed tremendous pressure on SGH ED's operations and infrastructure.

POTENTIAL LONG TERM SOLUTIONS



Hiring more clinical staff

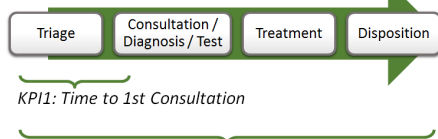


Expand/ Build new ED facilities

SHORT TO MEDIUM TERM SOLUTIONS

Optimization of ED processes and more efficient use of existing ED resources to improve two ED KPIs:

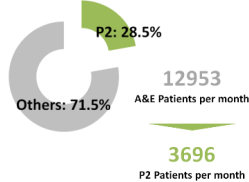
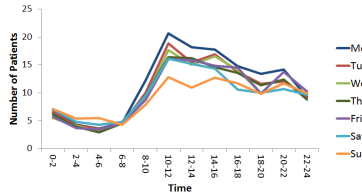
PROCESS FLOW AND KPIs IDENTIFICATION



FOCUS ON P2 PATIENTS

- P2 patients are for those casualties who have serious injuries but are not life threatening
- P2 patients are sent to Critical Care Area (CCA) immediately

Arrival Rate of P2 patients (per 2 hour)



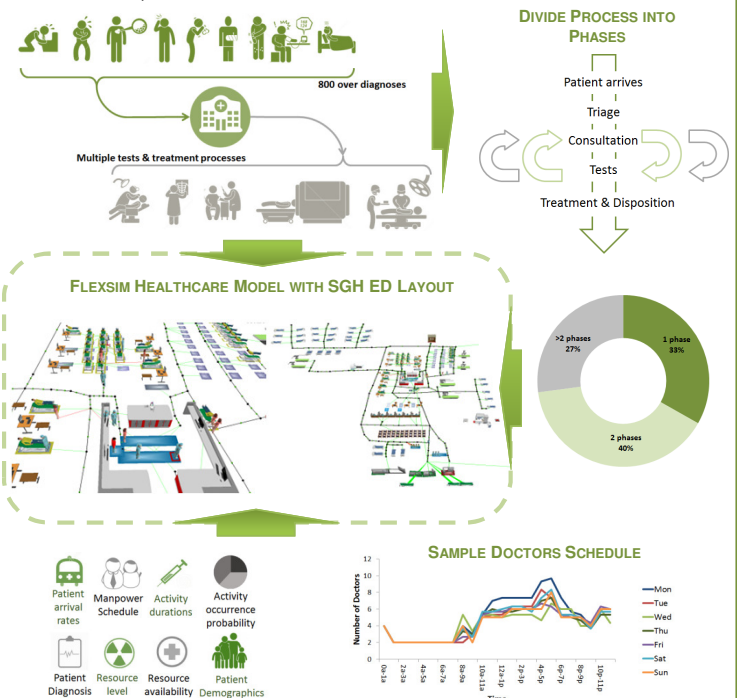
B. Aims

- To develop a data-driven DES model with to-scale layout of the current ED system;
- To propose recommendations for the improvement of ED processes for critical patients

C. Methods

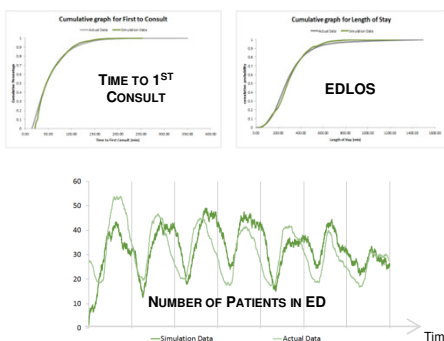
A discrete events simulation (DES) model was developed based on the FlexSim Healthcare Simulation Platform. (Flexsim Software Products) .

Continuous retrospective data over the period from 1 Jan 2013 till 30 June 2013 was used in the model development.



D. Results

MODEL VALIDATION

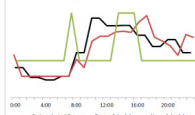


KEY PROCESS IMPROVEMENT STRATEGIES

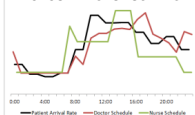
NURSE RESCHEDULING

Uneven utilization of nurses. Very low utilization during the non-peak hours; high utilization during the peak hours

EXISTING NURSE SCHEDULE



PROPOSED NURSE SCHEDULE

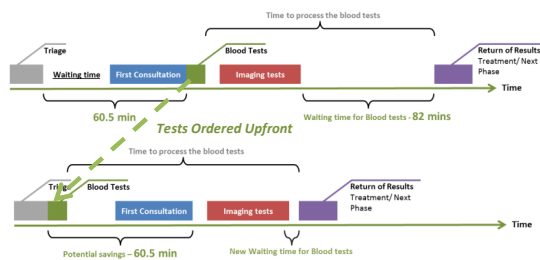


DEPLOYMENT OF SCRIBES

Doctors spend a huge amount of time on documentation which could be done by scribes with less medical training.

- Assumption: 20% or 40% of documentation time reduction
- Scribes reduce time by 17.3% to 43.4% (Vancouver Clinic , 2012)

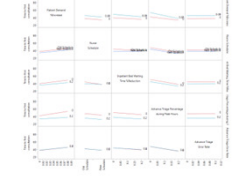
SENIOR DOCTORS AT TRIAGE – ADVANCED ORDERING OF TESTS



COMBINING STRATEGIES VIA DESIGN OF EXPERIMENTS (DOE)

- DOE was conducted to evaluate main and 2nd order interaction effects on EDLOS and Time to 1st Consultation.
- Pareto analysis shows the three solution having the most impact on the system

EFFECTS PLOTS FOR TIME TO 1ST CONSULT



E. Conclusion

DES serves as a versatile platform to model system complexities inherent in the SGH Emergency Department for the evaluation of process optimization strategies to improve the key performance indicators of ED Length of Stay and Waiting Time to First Consultation. The team is planning a trial implementation of the proposed strategies to evaluate the actual benefits.

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