Capacity Analysis of the SGH Same Day Admissions Facility

An IE3100R - Systems Design Project

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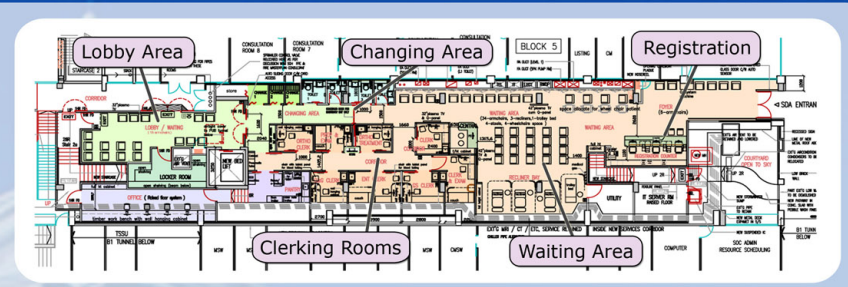
ABSTRACT

Singapore General Hospital (SGH) is designing a Same Day Admissions (SDA) Facility to accommodate SDA patients, who arrive on the actual day of their surgeries, across all disciplines. With the main aim to reap economies of scale by combining pre-surgical procedures in the satellite wards to a common location, we are to analyse the capacity performance of the new facility to ensure optimisation of operations, without compromising on service quality.

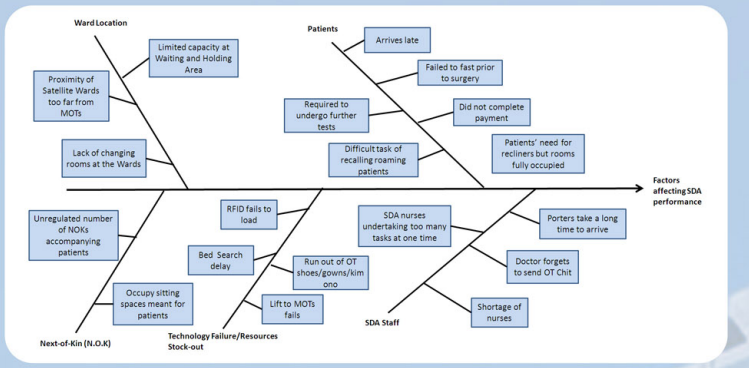
Adopting a step-wise strategy, we are able to accurately simulate the proposed operation of the new Facility and ensure that our model can be made to cater for various scenarios.

FACILITY LAYOUT



PROBLEM DESCRIPTION

As the SDA Facility has no precedence, there is a need to ensure that its operation is within predictable limits, and raise service quality standards by optimising its operating performance.



An Ishikawa diagram will help to identify possible causes that will hamper and delay operations in the new SDA Facility. Our team was then tasked to focus specifically on conducting a capacity analysis of the various waiting areas in the SDA Facility.

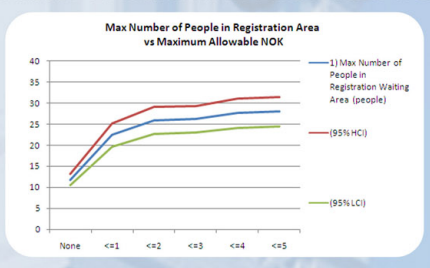
Process Step	Potential Failure Mode	Potential Failure Effect (s)	SEVERITY	Potential Causes	OCCURANCE	Current Controls	DETECTION	RPN	Recommended Actions
Waiting area	Insufficient waiting seats / space	Patient dissatisfaction	7	Delay in previous surgeries	4	None	9	252	Out of scope
			7	Patients bring more than 1 NOK	7	None	5	245	Advise patients to bring only 1 NOK Encourage NOKs to have their meals or wait elsewhere
			7	Patients come too early	5	None	3	105	Communicate clearly to patients that they should not come much earlier than scheduled
			7	SDA did not practice staggered scheduling	6	None	2	84	Secure buy-in from surgeons to stagger patient arrival time

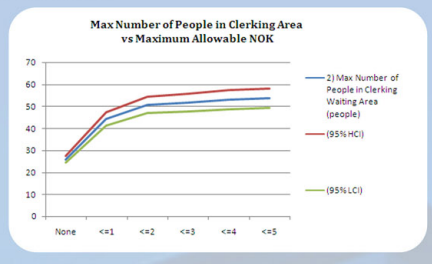
FAILURE MODE & EFFECTS ANALYSIS

A Failure Mode & Effects Analysis (FMEA) was considered to isolate specific factors that contribute towards capacity insufficiency in the Waiting Area of the SDA facility, where cause factors are ranked by their Risk Priority Numbers (RPNs).

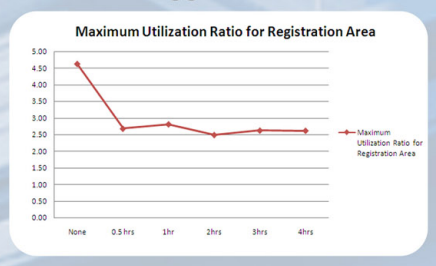
OUTPUT ANALYSIS

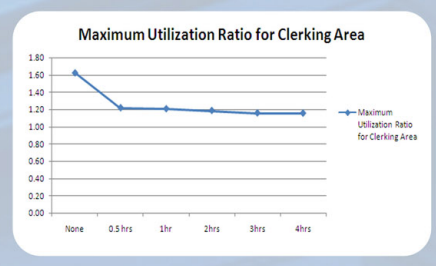
Factor 1: Maximum Allowable Next-Of-Kins





Factor 2: Staggered Arrival Times





Optimal Setting of Factor 1 & 2

NOK	Staggering (hours): None	0.5	1	2	3	4
<= 0	■					
<= 1	■					
<= 2	■			✚		
<= 3	■					
<= 4	■					
<= 5	■◆	◆	◆	◆	◆	◆

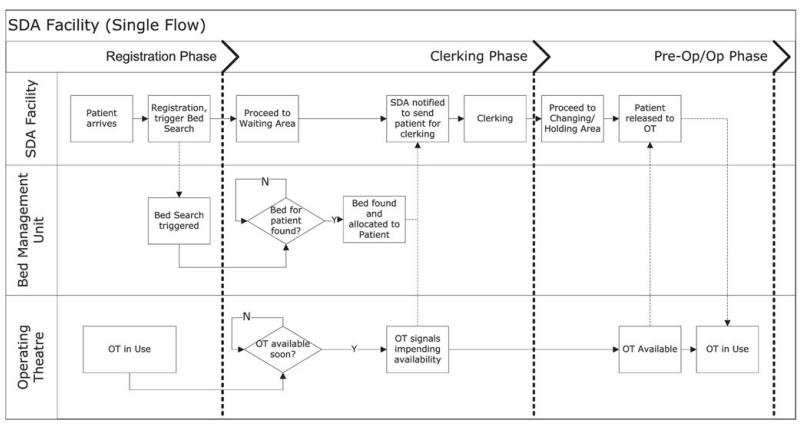
■: Levels of factors analyzed in 7.4.1
◆: Level of factors analyzed in 7.4.2
✚: Optimal setting

Analyzing the combined effects of optimal setting on system performance

Comparative Table	Optimal Setting	Optimal M.NOK	Optimal Staggering
1) Max Number of People in Registration Waiting Area	14.72	25.9	14.93
Maximum Utilization Ratio for Registration Area (Capacity 6)	2.45	4.32	2.49
2) Max Number of People in Clerking Waiting Area	36.93	50.73	39.13
Maximum Utilization Ratio for Clerking Area (Capacity 33)	1.12	1.54	1.19

MODEL CONCEPT

SDA FACILITY PROCESS MAP



Based on the process map, a simulation was developed using AutoMod™, and two scenarios are developed for analysis based on the probability and effectiveness of implementation.

- Maximum Allowable Next-of-Kins (NOKs) per Patient
- Staggered Patient Arrival Times

RECOMMENDATIONS

NEXT-OF-KINS (NOKs)

For the current planned capacities, each patient is advised to bring at most 2 NOKs.

If there are at most 3, 4 or 5 NOKs/patient, the impact on system performance would not be significant (i.e. < 5% deterioration).

Reducing the maximum allowable NOKs to below 2, results in significant improvements in system performance (12%-42%). If there are many scheduled operations, allowing a maximum of 0 or 1 NOK/patient will effectively improve system performance.

STAGGERING ARRIVAL TIMES

All other factors equal, staggering patient arrivals by 2 hours results in the optimum system performance.

Significant improvements of up to 75.11% occur when there is staggering of patient arrivals, as compared to no staggering.

CONCLUSION

Staggering patient arrivals results in a significant improvement of system performance, more than limiting the maximum number of NOKs does.

Therefore, enforcing staggered patient arrivals will be a more effective way of managing patient volume in the SDA Facility.