

Project Charter:

LGH Acute Medical and Surgical Beds Optimization

Using simulation to optimize patient flow from acute medical and surgical beds to subacute beds

Nayef Ahmad, Fattane Nadimi, and Rebecca Yao

# Background

Lions Gate Hospital (LGH) has launched a redevelopment project that involves building a new acute care building that will add 200,000 square feet of space to the LGH campus. 108 inpatient beds will be relocated from the current Paul Myers Tower and will mostly be placed in single-occupancy rooms. The redevelopment project is expected to improve the healthcare experience for patients through the use of cutting-edge technology, application of current best practice in resource utilization and service delivery, and alignment with community health services.

Managing the flow of patients through high-acuity medical and surgical units is one of the key goals of the redevelopment project. In particular, the project team is interested in the flow through the following four units:

* 4E – Acute Medicine
* 6E – Surgery
* 6W – Orthopedics
* 7E Neuroscience/NCCU

Once the new building is completed, the beds from these units will be relocated.

According to the current plans for the new building, the fourth, fifth, and sixth floor will house two nursing units per floor and 18 inpatient beds per nursing unit. Two acute surgery units will completely occupy the fourth floor. The fifth floor will be occupied by a neurosciences unit and a “flex” unit with beds that can be used by either medical, surgical, or neurosciences patients. The sixth floor will house two acute medicine units.

# Problem Statement

Meeting the demand for high-acuity medical and surgical units with a fixed number of beds is a major challenge. Our data show that in the current state, there is often excess demand for beds in the 4E, 6E, 6W, and 7E units. This has implications for both the financial performance of the hospital, and for patient experience.

As Table 1 shows, the average census for each of these units between March 1st, 2017 and October 31st, 2017 has been above the level of funded beds. The median time interval between a request for a bed in one of these units and admission into the unit is over 3 hours; 10% of patients wait over 7 hours (Table 2).

Furthermore, analysis conducted in June 2017 showed that approximately 31% of patients in FY 2016/17 who required services in specialized medical units had to spend time in other units due to the lack of available beds.

|  |  |  |  |
| --- | --- | --- | --- |
| **Nursing Unit** | **# of Funded Beds** | **Average # of Patients at 00:00 hrs** | **Maximum # of Patients at 00:00 hrs** |
| 4E | 32 | 33.2 | 35 |
| 7E | 20 | 21.9 | 24 |
| 6E | 24 | 25.5 | 29 |
| 6W | 26 | 27.1 | 30 |

Table 1: Average midnight census and level of funded beds over the period from 2017-03-01 to 2017-10-31

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **4E** | **6E** | **6W** | **7E** |
| *Count of patients* | *1231* | *789* | *549* | *547* |
| Average (hours) | 7.3 | 4.9 | 4.3 | 5.0 |
| *Standard deviation* | 12.0 | 7.3 | 5.9 | 6.7 |
| Median (hours) | 3.9 | 3.2 | 3.0 | 3.2 |
| 90th percentile (hours) | 17.0 | 8.0 | 7.0 | 7.8 |

Table 2: Time interval between bed request in ED and admission into each unit (from 2017-03-01 to 2017-10-31)

# Project Goals

The goal of this project is to address the excess demand for beds in the high-acuity medical and surgical units (4E, 6E, 6W, and 7E), improving patient flow and reducing the need for utilizing over-capacity (OCP) beds to meet demand. The metrics in Tables 1 and 2 indicate the baseline against which results can be evaluated.

# Approach

We will use a simulation model to evaluate several alternative cutoff thresholds for length of stay (LOS) in 4E, 6E, 6W, and 7E in terms of the metrics mentioned above, and other appropriate patient flow metrics.

The clinical procedure under consideration is that once a patient has been in one of these units for longer than the cutoff threshold, they will be transferred to a lower acuity nursing unit or discharged. Moving patients out these units as soon as their acuity has lowered creates capacity for incoming high-acuity patients. This also ensures that healthcare resources will be more effectively utilized by not having low acuity patients in high acuity nursing units.

In reality, patients cannot be considered as independent units—a particular patient's experience depends on how many other patients are in the system and the level of resources they are using. To capture this aspect of the system, we will utilize a discrete-event simulation (DES) model. Estimates from simpler approaches may be highly inaccurate: they ignore both inherent randomness and the interdependencies between all patients in the system.

# Project Scope

On the demand side of the problem, we will be focusing on patient flow metrics: wait times, service times, number of patients waiting, and total number of patients treated. On the supply side, the variables of interest are the number of funded beds and cut-off times at the respective nursing units. In the interests of balancing model complexity with time constraints, we will not consider all possible patient flow pathways.

### In-scope

* 2 sources of in-flow: ED admits and direct admits (and IPS for 6E/W)
* 2 possible out-flows: transfer to other units (i.e., not for 4E, 6E, 6W, 7E) or discharge from hospital

### Out-of-Scope

* Modelling time that patients spend within the ED
* Transfers within 4E, 6E, 6W, and 7E
* Transfers from other nursing units into 4E, 6E, 6W, and 7E (these represent less than 3% of all inflows)
* Including clinical variables into model—includes not limited to: severity of cases (RIW), diagnoses, procedures, CMGs

# Project Deliverables

* Identify a small number of alternative LOS cutoff periods for 4E, 6E, 6W, 7E in the new building along with associated patient flow metrics for each.
* Description of model assumptions, and limitations
* Summary of input data for the model
* DES model used for this evaluation.

# Project Milestones

There are five milestones for this project:

|  |  |  |
| --- | --- | --- |
|  | **Milestone** | **Target Finish Date** |
| 1 | Provisional estimate for length of stay cutoff at 4E | November 10, 2017 |
| 2 | Processing and validation of input data | November 17, 2017 |
| 3 | Initial model with all flow assumptions | December 22, 2017 |
| 4 | Model validation, scenario testing | January 12, 2017 |
| 5 | Final project delivery | February 2, 2017 |

# Risks

Below identifies project risks, likelihood and impact of happening, and trigger point to mitigation strategy.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Risk Description** | **Likelihood** | **Impact** | **Trigger Point** | **Mitigation** |
| Timeline – not meeting the project deadline | Possible | Medium | When a milestone deadline has been missed | Reprioritize and/or offload workload |
| Data accuracy – ED and ADTC data are subject to change with verification processes happening | Probable | Medium | N/A – known issue with current business processes | Using data that is at least one period old |
| Human resources – competing priorities and any absences will remove project members from working on the project | Possible | High | When a milestone deadline has been missed | Reprioritize, offload workload, and/or pull additional resources |
| Scope change | Possible | High | When deliverables do not align with the established scope in this document | Review the ask and recommend to add as after the completion of this project as needed |

### Likelihood definition

|  |  |
| --- | --- |
| **Category** | **Description** |
| Probable | Strong chance of occurring (i.e., ≥90%) |
| Possible | Reasonable chance of occurring (i.e., ≥50% and <90%) |
| Unlikely | Unlikely chance of occurring chance of occurring (i.e., ≥10% and <50%) |
| Rare | Will occur in rare circumstances (i.e., <10%) |

### Impact definition

|  |  |
| --- | --- |
| **Degree** | **Description** |
| High | Impacts the timeliness and/or quality of decision making for patient flow reasons |
| Medium | ??? |
| Low | Doesn’t affect patient flow outcomes |

# Stakeholders

Below are stakeholders that will be making use of the project outcomes.

|  |  |
| --- | --- |
| **Name** | **Stake in Project** |
| Karin Olson | Oversees operations for Coastal Community of Care |
| Salima Harji | Does clinical facilities planning |
| Shannon Chutskoff | Oversees acute services |