

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

There is a redevelopment project in progress at the Lions Gate Hospital (LGH) to build a new acute care building to replace the decommissioned Activation Building. The new six-story building will add 200,000 square feet of space to the LGH campus to house 108 inpatient beds. The 108 inpatient beds will come from the current Paul Myers Tower and will be placed into mostly single occupancy rooms.

Once the new building is completed, the beds from 4E – Acute Medicine, 6E – Surgical/SCOUT, 6W – Orthopedics, and 7E Neuroscience/NCCU will be transferred over. 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 flex unit that can be used by medical, surgical, and neurosciences patients. The sixth floor will house two acute medicine units. For more details see Figure 1.



Figure 1: Proposed future bed map

There are many benefits to the proposed layout of the new building. The new model includes private rooms for increased patient comfort and infection control, as well as better utilization to reduce the number of off-service beds. Alignment with community health services will improve patient transitions in and out of hospital, and telemedicine will further enhance our ability to support patients in the communities where they live.

# Problem Statement

Currently there is mismatch between the number of funded high-acuity medical and surgical beds in 4E, 6E, 6W, and 7E and demand for those beds. This problem can be validated by looking at the number of patients staying at each of those units compared against the number of funded beds. As well, looking at the time it takes for patients to be admitted to a bed from the time of bed request in the Emergency Department.

### Number of funded beds versus number of patients at midnight

The table below captures census data between March 1, 2017 and October 31, 2017.

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

The census data is showing that on average, there are one to two patients more than the number of funded beds for each of the nursing unit.

### Wait time for bed in emergency

The table below shows descriptive statistics on the time (in minutes) it takes patients to be transferred to a bed in the nursing unit from the time of bed request in the Emergency Department.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **4E** | **6E** | **6W** | **7E** |
| Count of patients | 1231 | 789 | 549 | 547 |
| Average | 438 | 291 | 256 | 300 |
| Standard deviation | 720 | 436 | 354 | 402 |
| Median | 236 | 190 | 180 | 194 |
| 90th percentile | 1020 | 482 | 417 | 469 |
| Minimum | 4 | 0 | 0 | 12 |
| Maximum | 13959 | 4239 | 4522 | 3766 |

At the 90th percentile, the wait time is 17.0 hours for patients admitted into 4E, 8.0 hours for 6E, 5.2 hours for 6W, and 7.8 hours for 7E.

# Project Goals

The goal of this project is to adjust patient flow so that an equilibrium can be reached between the number of high-acuity medical and surgical patients flowing into the 4E, 6E, 6W, and 7E and the number of funded beds at 4E, 6E, 6W, and 7E.

### Approach

We will be using simulation to evaluate different lengths of stay for patients at 4E, 6E, 6W, and 7E before being transferred to a lower acuity nursing unit. Moving patients out of 4E, 6E, 6W, and 7E as soon as their acuity has lowered creates capacity for incoming high-acuity patients. As well, health care resources will be more effectively utilized—that is, not having low acuity patients in a high acuity nursing unit.

In reality, patients cannot be considered as independent units—a particular patient's experience depends on how many other patients are in the system, level of resources they are using, etc. To capture this, we need a discrete-event simulation (DES) model. Estimates from simpler approaches may be 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-scope

* 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.
* 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
* Description of model assumptions, and limitations
* Summary of input data for the model
* DES model used for this evaluation.

### Out-of-Scope

* Modelling within-ED time
* Transfers within 4E, 6E, 6W, and 7E
* Transfers from other nursing units into 4E, 6E, 6W, and 7E
* Including clinical variables into model—includes not limited to: severity of cases (RIW), diagnoses, procedures, CMGs

# 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 1, 2017 |
| 4 | Model validation, scenario testing | December 15, 2017 |
| 5 | Final project delivery | December 22, 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 |