Patient Flow at C.S. Mott Children’s Hospital
Mark Grum¹, Hassan Abbas², Prof. Amy Cohn¹, Dr. Michelle Macy³, Dr. Allison Cator³
1. Industrial and Operations Engineering, 2. School of Nursing, 3. Emergency Medicine at Mott Children’s Hospital

Motivation
- Emergency departments (ED) and inpatient units (IU) are complex, interacting systems
- Understanding how these systems work or interact can improve patient care
- Goal: Improve quality of care delivery and help patients and their families understand hospital processes
- Approach: Incorporating clinician involvement, collecting data through observations and analyzing our findings

Visualization

Objective:
- Build an interactive map for those involved (patients, doctors, nurses, etc.) in ED and IU processes

Methods:
- Creating this flow chart involved over 100 hours of clinical observations to comprehend the following perspectives:
  - Attending Physicians
  - Resident Physicians
  - Nurses
  - Patients

Implications:
- Educate patients, families, and providers on the following key concepts to facilitate care delivery for all stakeholders

Who is involved in delivering patient care
What these care providers and other personnel do at each step of the process
How the complexity of the system comes together to provide patient-centric care

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Extensions:
- Creating an ED flow map will benefit those involved and help identify key differences between inpatient units and the ED

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Interactive flow map can be found here (click Result tab):
http://jsfiddle.net/Helium_1s2/pfatLwfd/1/embedded/

Predictive Modeling

Objective:
- Create a tool to aid physicians in predicting disposition early to enable better resource planning

Methods:
- Used neural networks and a support vector machine to predict clinical outputs
  - We use 70% of our data for training, 15% for validation, and 15% for testing

<table>
<thead>
<tr>
<th>NN Disposition</th>
<th>NN: 81.74% accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>discharge</td>
<td>83% 17%</td>
</tr>
<tr>
<td>admit</td>
<td>21% 79%</td>
</tr>
<tr>
<td></td>
<td>152 89</td>
</tr>
<tr>
<td>SVM Disposition</td>
<td>SVM: 82.32% accuracy</td>
</tr>
<tr>
<td>discharge</td>
<td>91% 9%</td>
</tr>
<tr>
<td>admit</td>
<td>47% 53%</td>
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<tr>
<td></td>
<td>186 55</td>
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</tbody>
</table>

Results:

Simulation

Objective:
- Determine whether (or not) an observation unit will benefit Mott, and if so, how to operate it

Methods:
- Analyze service level data, using the mean, standard deviation, and probability distribution of arrival waiting times and treatment processes
- Simulate in ProModel and Matlab using our analyzed data to replicate the current state and evaluate the appropriateness of an observation unit

Future Work:
- Compare the benefits and costs to determine if the observation unit would give value to patients, doctors, and nurses
- Fit service and arrival distributions
- Finish coding simulation
- Sensitivity analysis

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