Hospital Patient Flow Optimization Model
HOSPITAL PATIENT FLOW OPTIMIZATION
Our Dilemma in Making Throughput Decisions in a Complex Hospital System:

“Variation”

1. The volume of arrivals
2. Timing of arrivals (day of week, time of day)
3. Service line specialty of admitting physician
4. Acuity level of patient at time of admission (Requires Med/Surg unit, PCU, or ICU)
5. Bed capacity among nursing units
6. Transfer Center’s distribution of patients
7. The patients’ length of stay on each unit
8. The patients’ movement between nursing units (moves up in acuity, moves down in acuity, or moves to unit of similar acuity)
OBJECTIVES OF STUDY

WHAT IF ANALYSIS

FORECASTING

X Variables (Input):
1. Arrival Volume
2. Arrival by Patient Type
3. Unit LOS
4. Unit # of Beds
5. ??

Y Variables (Output):
1. Hospital Census
2. Nursing Unit Census
3. Percent Beds Occupied
4. ??

CARILIONCLINIC
finding better ways
### Hospital Patient Flow Optimization Model

<table>
<thead>
<tr>
<th>PCU Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit VV 08</td>
</tr>
<tr>
<td>Unit E 07</td>
</tr>
<tr>
<td>Unit M 07FCU</td>
</tr>
<tr>
<td>Unit M 07FCU2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ICU Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit M 08/CU</td>
</tr>
<tr>
<td>Unit M 09/CU</td>
</tr>
<tr>
<td>Unit M 10/CU</td>
</tr>
<tr>
<td>Unit S 06ICU</td>
</tr>
<tr>
<td>Unit S 07ICU</td>
</tr>
</tbody>
</table>
How are PCUs Affected?
Percent Utilization

Location Utilization (Avg. Reps)

- **Scenario 2 - The New Status Quo**
- **Scenario 3 - (Open 7 MPCU2, Close 7s & 8s swings)**
- **Scenario 4 - Expand Capacity (Open 7W)**

- **Unit E 07**
  - 95.70
  - 93.49
  - 92.65
- **Unit W 08**
  - 93.44
  - 93.46
  - 92.05
- **Unit S 09TSU P**
  - 82.73
  - 84.09
  - 83.44
- **Unit M 07PCU**
  - 94.91
  - 94.67
  - 93.29
- **Unit M 08PCU**
  - 94.37
  - 94.15
  - 92.78
- **Unit M 09PCU**
  - 88.14
  - 87.67
  - 83.28

% Utilization

0 10 20 30 40 50 60 70 80 90 100
How are PCUs Affected?

Average Census and Extra Capacity

Scenario 2 – The New Status Quo
Scenario 3 – Open 7MPCU2, Close 7 & 8 Swing Beds
Scenario 4 – Expand Capacity: Open 7W

Key
- **Blue**: Avg Census
- **Red**: Avg Extra Capacity
CONCLUSION

QUESTIONS?
Model Layout

**Hospital Census:** 307
**Med/Surge Census:** 98
**PCU Census:** 161
**ICU Census:** 48
**Percent of Beds Filled:** 83

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**HOSPITAL PATIENT FLOW OPTIMIZATION MODEL**

**PCU Units:**

- Unit W 08: 21
- Unit W 12: 17
- Unit W 09: 17
- Unit W 10: 21

**ICU Units:**

- Unit M 09CU: 8
- Unit M 08CU: 8
- Unit M 09CU: 6
- Unit M 10CU: 9
- Unit M 07CU: 7
- Unit S 08CU: 8

**Med / Surge Units:**

- Unit VV 05: 19
- Unit VV 06: 19
- Unit VV 09: 17
- Unit VV 10: 21
- Unit M 07PCU: 11
- Unit M 07PCU: 11
- Unit M 08CU: 18