2011 Military Health System Conference

Forecasting Capacity in the MHS

Case Study: Capacity Planning in the National Capital Region

*The Quadruple Aim: Working Together, Achieving Success*

Ms. Elisa Kepner and COL Paul Pasquina, M.D.

26 January 2011
**Forecasting Capacity in the MHS: Case Study: Capacity Planning in the National Capital Region**

**Perfoming Organization Name(s) and Address(es)**
Military Health System, 5111 Leesburg Pike, Skyline 5, Falls Church, VA, 22041

**Supplementary Notes**
Presented at the 2011 Military Health System Conference, January 24-27, National Harbor, Maryland
Overview

**Purpose:**
- Discuss innovative ways to manage capacity, increase quality of patient care and improve operations in the Military Health System (MHS).

**Objectives:**
- Define Capacity and its impact on MTF’s
- Explain Decision Dynamics methodology
  - Case study: capacity planning for orthopedics in the National Capital Region.
- Use of Decision Dynamics for operational improvements.
Capacity Definitions

- **Conventional Capacity** (40 hrs/wk): baseline capacity, includes time for vacations, training, research, and residents

- **Contingency Capacity** (60+ hrs/wk): additional surge capacity requirements based on a sustained increase in caseload, usually requires limited time for other time demands

- **Crisis Capacity** (90+ hrs/wk): extreme conditions that require maximum staff utilization for brief periods of time, usually lasting no longer than a few days
Factors Influencing MTF Capacity

- **Facilities/Supplies**
  - Beds (ICU, Inpt)
  - OR’s
  - Rehab Space
  - Housing
  - Logistics/Equipment

- **Staffing:**
  - Providers/Case Manager
  - Lab/Rad/Pharm
  - Admin Support
  - WTU / Support Programs
  - Contracting

- **Complexity of Patients:**
  - Head Trauma
  - SCI
  - Multiple Limb Amputee
  - Burns

- **Other Missions:**
  - Readiness
  - Education
  - Staff Turnover
  - Research
  - Dependent/Retiree Care
  - BRAC
Impact of Capacity Demands

- Budget & Resource Planning
- Staffing Flexibility
- Appropriate Contracts in Place
  - Logistics and Staffing
- Trainee Education / ACGME Accreditation
- Research Productivity
- Staff Burn-out and Attrition
- Patient Safety / Outcomes
- Medical Regulation
Capacity Planning

Why Capacity Planning?

Planning for patient caseload, staffing, equipment, space, and technology.

How many patients can you see?

*It Depends*.....

Why is this so difficult to answer???
Healthcare Capacity Planning

- Traditional Capacity Factors
  - Staff, patient case mix, processes, space, and technology / equipment

  *The more stable each of these factors, the easier it is to forecast capacity*

- Staffing: residents, graduate medical education, and research
- Patient Mix: trauma center
Additional Capacity Factors for the Military

- **Staff:**
  - deployments and permanent change of station (PCS)

- **Patients:**
  - Wounded warriors
  - Recapture

- **Processes:**
  - “Joint” or shared facilities require aligned processes

- **Technology:**
  - Each service and MTF can have different technology solutions
The Two Factors

Complexity
- Composed of many interconnected parts.
  *A complex patient care plan*
- So intricate as to be hard to understand or manage.
  *A complex problem*

Variability
- Capable of being varied or changed.
  *Number of orthopedic surgeons in March*
- A quantity that may assume any given value or set of values.
  *The length of time it takes to perform an amputation*
Operations Planning Options

Originating in military efforts prior to World War II, Operations Research (OR) is an interdisciplinary mathematical science that employs traditional techniques such as statistical analysis, modeling and optimization to arrive at near-optimal solutions to complex operational problems.

Why can’t we solve these problems?
- Ground-up analysis, lost sight of the forest for the trees
- One-time snapshot analysis, no iterations
Decision Dynamics


- Decision Dynamics utilizes traditional operations research theories in innovative ways to solve a wider range of problems.

Complexity Theory focuses on understanding behavior of highly dynamic environments.

- Decision Dynamics is an applied complexity methodology that allows organizations to anticipate potential outcomes and improve the way they manage chaotic systems.
OVERVIEW OF DECISION DYNAMICS METHODOLOGY
**Commander’s Intent**

- Provides clear and concise purpose
- Provides the direction of the operations and the ultimate end state
- Provides focus in the absence of specific orders
- Ultimately drives plans and operations as well as defining acceptable risk
- Guides priorities for analysis
Decision Dynamics Methodology

**Execute Plan / Operations**

- Actual work being done
- Operations: surgeons in the operating room, ICU nursing staff
- Projects: prioritization and execution of activities
- Generates transaction level data
Reports

- Status based on the summation of some of the transactional data
- Reports tend to be periodic and unidirectional
- Questionable requirements for many reports
- Frequently not used to manage operations
Analysis

• Evaluate data and operational processes to determine Blocks and Drivers

• Determine operational capacity based upon Block or “bottleneck”

• Forecast operational thresholds for balanced capacity management
Decision Dynamics Methodology

Execute Plan / Operations

• Utilize Operational Analysis Reports (OARs) to manage capacity and operational improvements through:
  • Regulation of patients
  • Staff caseload / workload balancing
  • Space utilization and planning
  • Target operational improvements
• Document required operational data to track Drivers and Blocks and ensure OARs are updated
Reports

- Periodically create reports with related Blocks and Drivers data in a standard business intelligence tool
Analysis

• Evaluate Blocks and Drivers data to forecast capacity and operational improvements

• Develop OARs to be distributed through Operations
CASE STUDY:
ORTHOPEDIC CAPACITY AT
WRAMC
Analysis Steps

1. Identify Blocks
2. Determine Phases
   - patient length of stay
3. Evaluate Caseload
4. Determine Capacity and Mitigation Strategies
WR AMC Staff * Caseload per Staff Member

**Conventional Capacity**

<table>
<thead>
<tr>
<th></th>
<th>ICU Patients</th>
<th>IP Trauma (Routine)</th>
<th>IP Trauma (Complex)</th>
<th>IP Trauma (Rehab)</th>
<th>OP Trauma (Routine)</th>
<th>OP Trauma (Complex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortho Surgeon</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>35</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>PM&amp;R Physician</td>
<td>25</td>
<td>35</td>
<td>30</td>
<td>16</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>10</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>8</td>
<td>15</td>
<td>12</td>
<td>8</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

* Illustration Example: data for concept discussions only
Step 1: Identify Blocks (cont)
- Staff Constraints -

**WRAMC Staff**

<table>
<thead>
<tr>
<th>Current Staff</th>
<th>ICU Patients</th>
<th>IP Trauma (Routine)</th>
<th>IP Trauma (Complex)</th>
<th>IP Trauma (Rehab)</th>
<th>OP Trauma (Routine)</th>
<th>OP Trauma (Complex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortho Surgeon</td>
<td>6</td>
<td>48</td>
<td>60</td>
<td>54</td>
<td>210</td>
<td>450</td>
</tr>
<tr>
<td>PM&amp;R Physician</td>
<td>3</td>
<td>75</td>
<td>105</td>
<td>90</td>
<td>48</td>
<td>120</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>9</td>
<td>90</td>
<td>180</td>
<td>135</td>
<td>90</td>
<td>144</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>7</td>
<td>56</td>
<td>105</td>
<td>84</td>
<td>56</td>
<td>84</td>
</tr>
</tbody>
</table>

- Initial staff constraints are orthopedic surgeons and occupational therapists.
Step 2: Determine Phases  
- Wounded Warriors Recovery Phases -

- Wounded Warrior Phases include ICU, Inpatient, and Outpatient.
- Patients are distributed by percentage for each phase and by patient category.

<table>
<thead>
<tr>
<th>Type</th>
<th>LoS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU</td>
<td>1.1</td>
<td>n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>LoS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex</td>
<td>1.7</td>
<td>48%</td>
</tr>
<tr>
<td>Routine</td>
<td>1.5</td>
<td>37%</td>
</tr>
<tr>
<td>Rehab</td>
<td>.8</td>
<td>15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>LoS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex</td>
<td>9</td>
<td>63%</td>
</tr>
<tr>
<td>Routine</td>
<td>7</td>
<td>37%</td>
</tr>
</tbody>
</table>

* Illustration Example: data for concept discussions only

2011 MHS Conference
Step 3: Evaluate Caseload
-Arrivals of Wounded Warriors-

Amputees By Month *

* Illustration Example: data for concept discussions only

2011 MHS Conference
## Step 4: Caseload Distribution

### Caseload Across Recovery Phases *

<table>
<thead>
<tr>
<th></th>
<th>ICU Patients</th>
<th>IP Trauma (Routine)</th>
<th>IP Trauma (Complex)</th>
<th>IP Trauma (Rehab)</th>
<th>OP Trauma (Routine)</th>
<th>OP Trauma (Complex)</th>
<th>Total Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortho Surgeon</td>
<td>7%</td>
<td>22%</td>
<td>11%</td>
<td>1%</td>
<td>6%</td>
<td>23%</td>
<td><strong>70%</strong></td>
</tr>
<tr>
<td>PM&amp;R Physician</td>
<td>5%</td>
<td>5%</td>
<td>15%</td>
<td>3%</td>
<td>58%</td>
<td>30%</td>
<td><strong>116%</strong></td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>4%</td>
<td>3%</td>
<td>10%</td>
<td>2%</td>
<td>18%</td>
<td>77%</td>
<td><strong>114%</strong></td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>6%</td>
<td>5%</td>
<td>16%</td>
<td>3%</td>
<td>32%</td>
<td><strong>124%</strong></td>
<td><strong>186%</strong></td>
</tr>
</tbody>
</table>

* Illustration Example: data for concept discussions only
Step 4: Determine Capacity and Mitigation Strategies

- Current caseload: Approximately 12 new amputees per month
- Current patient caseload is almost double the capacity for occupational therapists.

- Mitigation strategies
  - Setting regulation thresholds closer to 6 patients total per month thereby regulating approximately 50% of patients elsewhere.
  - Adding occupational therapists.
  - Move warriors out of the NCR sooner thereby decreasing the demand on occupational therapists.
  - Reallocation of tasks to OT Techs or other staff members.
• Operational Analysis Reports (OARs) are periodically to all levels of management

• Chief of Orthopedic Surgery and Occupational Therapy
  • Reporting period: Weekly OARs
  • Staff workload distribution – determine where staff spends most of their time
  • Identify Block tasks –
    • Determine if other staff can fulfill tasks
    • Determine if non-patient tasks or time demands can be removed or reduced
  • Target for operations improvement efforts
## Step 4: Caseload Distribution

### Caseload Across Recovery Phases *

<table>
<thead>
<tr>
<th>专业</th>
<th>ICU Patients</th>
<th>IP Trauma (Routine)</th>
<th>IP Trauma (Complex)</th>
<th>IP Trauma (Rehab)</th>
<th>OP Trauma (Routine)</th>
<th>OP Trauma (Complex)</th>
<th>Total Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortho Surgeon</td>
<td>7%</td>
<td>22%</td>
<td>11%</td>
<td>1%</td>
<td>6%</td>
<td>23%</td>
<td>70%</td>
</tr>
<tr>
<td>PM&amp;R Physician</td>
<td>5%</td>
<td>5%</td>
<td>15%</td>
<td>3%</td>
<td>58%</td>
<td>30%</td>
<td>116%</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>4%</td>
<td>3%</td>
<td>10%</td>
<td>2%</td>
<td>18%</td>
<td>77%</td>
<td>114%</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>6%</td>
<td>5%</td>
<td>16%</td>
<td>3%</td>
<td>32%</td>
<td>124%</td>
<td>186%</td>
</tr>
</tbody>
</table>

* Illustration Example: data for concept discussions only
Operations - OARs

- **Deputy Commander of Clinical Services**
  - Reporting period: Monthly OARs
  - **Staff utilization trends** – balance staff to caseload
  - **Block changes** – target larger operations improvement efforts
  - **New patient caseload thresholds** – forecast when operations will be at maximum capacity
  - **Align Commanders Intent** – redirect staff activities given surge requirements
Operations - OARs

Commander

- Reporting period: Quarterly OARs
- Patient caseload and staff utilization trends:
  - Understand when MTF is reaching capacity by service or patient category
  - Determine if staff numbers and utilization trend with caseload
- Identity primary Blocks –
  - Determine if MTF wide changes are required
  - Example: improved IT systems
Operations - OARs

Commander

- Distribute Commander’s Intent
  - Higher or lower capacity
  - Recapture targets
  - Education targets
  - Improved care
  - Staff balancing
• Utilize existing BI tools to collect data

• Collect Data on:
  – Patient arrivals
  – Staff availability
  – Space availability
Analysis Steps

- Evaluate staff changes
- Evaluate patient changes
- Evaluate space and equipment changes

- Update Blocks
- Evaluate Caseload
- Determine Thresholds
OPERATIONAL ENHANCEMENTS: USING DECISION DYNAMICS TO IMPROVE QUALITY, LOWER COST, OR IMPROVE TIME
Identify Blocks—Drivers

- Determine process flows to identify Drivers. *

- Utilize Operations Research analysis techniques to determine correlation between Drivers and operational performance factors.

* Detailed in Decision Dynamics Methodology
Determine recommended Courses of Action (COAs) to enhance Drivers

- Test COAs and set target measures of performance (MoP) and expected measures of effectiveness (MoE) for selected COAs
Operations

• Implement recommendations in Operational Analysis Reports (OARs)
Reports

• Utilize existing BI tools to collect data

• Collect Data on:
  – Quality, time, and / or cost measures
  – Measure Driver changes / COA’s by evaluating the MoP’s and MoE’s to determine effectiveness
Analysis

- Determine next level of drivers
- Evaluate cost, time, and quality measures
- Correlate new Drivers
- Determine new COA’s and measures
- Repeat
Other Decision Dynamics Activities

Staff
• Balance staff assignments
• Determine optimal time for activities; i.e. training

Quality
• Ensure patients receive enough time with providers
• Determine quality Drivers and improve; i.e. average years experience of provider team

Space
• Determine probable capacity by service and forecast space requirements