Strategies to Achieve System-Wide Hospital Flow

Katharine Luther and Pat Rutherford

Or is patient flow somewhat like this reality?

Hospital Flow: Key Learning To-Date

- Most hospitals are engaged in individual projects throughout the hospital to improve efficiencies and flow, but few have hospital-wide oversight systems to manage overall operations and patient flow throughout the hospital; there is a need for system-wide metrics to assess and manage patient flow at the macro level and in microsystems (OR, ED, ICUs, Med/Surg Units).
- Most hospitals are engaged in multiple efforts to improve flow, but few have shown quantitative results (looking for “bright spots”); need to develop design targets for “ideal” hospital operations and flow.
- Few seem to be linking the “shaping demand” concept of decreasing overutilization of hospital services as a concurrent strategy to improve patient flow through the hospital (decreasing readmissions; proactive palliative care; reducing admissions for patient with complex needs; reducing low acuity ED visits).

Hospital Flow: Key Learning To-Date (2)

- There is a definitive need to simplify, standardize and sequence various matching capacity and demand strategies (variability management and daily real-time capacity and demand strategies).
- Current problems of patient flow in hospitals cannot be solved solely by efforts within the walls of the hospital (need partnerships with primary care, specialty practices, mental health services, community-based care settings and resources, SNFs and nursing homes);
- Demonstrating a ROI for the systems moving to value-based payment models (or ACOs) should help to build will for improvement; avoiding capital expenditures is another incentive.
Hospital Flow: Strategies for System Optimization

**Strategies**

1. **Shape the Demand** (reduce bed days; reduce ED visits; smooth elective surgeries and downstream bed utilization)
2. **Match Capacity to Demand** (reduce delays in moving patients to appropriate units throughout hospital; ensure patients are admitted to the appropriate unit)
3. **Redesign the System** (increase throughput; reduce bed days, manage LOS outliers, and reduce delays and waiting times)

**What are your performance goals?**

- Decrease overutilization of hospital services?
  - Reducing delays in treatment, surgery, transfers, discharge, etc.?
  - Decreasing related medical errors and harm to patients?
  - Manage LOS “outliers”?
- Optimize patient placement to insure the right care, in the right place, at the right time?
  - Decrease external diversions?
  - Decrease internal diversions (“off-service” patients)?
- Increase clinician and staff satisfaction with hospital operations?
- Demonstrate a ROI for the hospital or the health system (moving to bundled payment arrangements or ACO)?
  - Is your goal to have a high utilization of your hospital resources (procedures, beds and staff)? What is the right goal?
  - What are the quality and safety balancing measures?
1. Decrease overutilization of hospital services
2. Optimize patient placement to ensure the right care, at the right place, at the right time
3. Increase clinician and staff satisfaction
4. Demonstrate a ROI for the systems moving to bundled payment arrangements

Redesign surgical schedules to improve throughput and to improve smooth flow of patients to downstream ICUs and inpatient units

Separate scheduled and unscheduled flows in the OR

ED efficiency changes to decrease LOS

Decrease LOS in ICUs (timely consults, tests and procedures)

Decrease LOS on Med/Surg Units (case management for patients with complex medical and social needs)

Advance planning for transfers to community-based care settings

Cooperative agreements with rehab facilities, SNFs and nursing homes

1. Proactive advanced illness planning
2. Development of palliative care programs (hospital-based and community-based)
3. Reduce readmissions for high risk populations
4. Extended hours in primary care practices
5. Urgent Care and Retail Clinics
6. Enroll patients in community-based mental health services
7. Pacemakers & ICD’s imaging & treating patients at home
8. Greater use of clinical pathways and evidence-based medicine
9. Care management for vulnerable/high risk patient populations
10. Decrease complications/harm (HAPU, CAUTI, SSI, falls with harm) and subsequent LOS

1. Redesign surgical schedules to create an predictable flow of patients to downstream ICUs and inpatient units

2. Assess seasonal variations and changes in demand patterns and proactively plan for variations
3. Daily flow planning huddles (improve predictions to synchronize admissions, discharges and discharges)
4. Real-time demand and capacity problem-solving (managing constraints and bottlenecks)
5. Planning capacity to meet predicted demand patterns

6. High census protocols to expedite admissions from the ED and manage surgical schedules.

7. Relocate care in ICUs in accordance with patients EOL wishes
8. Relocate care in Med/Surg Units to community-based care settings
9. Relocate low-acuity care in EDs to community-based care settings
10. Decrease demand for hospital beds through delivering appropriate care

11. Redesign the System

Outcomes
Primary Drivers
Secondary Drivers
Specific Change Ideas

- Decrease variation in surgical scheduling
- Shape or Reduce Demand
- Match Capacity and Demand
- Redesign the System

- Reduce variation in surgical scheduling
- Improve efficiencies and throughput in the OR, ED, ICUs and Med/Surg Units
- Relocate care in accordance with patients EOL wishes
- Relocate care in Med/Surg Units to community-based care settings
- Decrease demand for hospital beds through delivering appropriate care
- Decrease demand for hospital beds by reducing hospital-acquired conditions

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Draft Hospital Flow Metrics

**Hospital Macro**
- Occupancy rate (% of staffed beds)
- Readmissions within 1 week of discharge
- Patient experience (HCAHPS measures related to flow)
- Clinical and staff satisfaction related to workload

**Emergency Department**
- ED diversion (# and hours per month)
- Visits per day (or profile by time and day)
- Average length of stay
- Door to provider time
- Patients who “left without being seen”
- “ED Boarders”
- Time from decision to admit to transfer to inpatient unit
- Time from decision to have emergency surgery

**Critical Care Units**
- Number of ICU diversions due to lack of capacity
- Number of “off-service” patients
- Nursing overtime
- Capacity and Demand (Utilization)

**Med/Surg Units**
- Average Length of Stay
- Percent of “outliers” per month (LOS)
- Nursing overtime
- Median discharge time (or discharge profile)

**Operating Rooms**
- Number of emergency cases by day
- Number of scheduled cases by day
- OR utilization
- % room changes from schedule
- Actual – scheduled start times
- Nursing overtime

**Content Theories / Driver Diagram**

1. Redesign surgical schedules to improve throughput and to improve smooth flow of patients to downstream ICUs and inpatient units
2. Separate scheduled and unscheduled flows in the OR
3. ED efficiency changes to decrease LOS
4. Decrease LOS in ICUs (timely consults, tests and procedures)
5. Decrease LOS in Med/Surg Units (case management for patients with complex medical and social needs)
6. Advance planning for transfers to community-based care settings
7. Cooperative agreements with rehab facilities, SNFs and nursing homes
Shape or Reduce Demand

- Relocate care in ICUs in accordance with patients EOL wishes
- Relocate care in Med/Surg Units to community-based care settings
- Relocate low-acuity care in EDs to community-based care settings
- Decrease demand for hospital beds through delivering appropriate care
- Decrease demand for hospital beds by reducing hospital acquired conditions
- Decrease variation in surgical scheduling

Right Care, Right Place, Right Time

Aim: to help hospital systems to successfully relocate:

- 10% of ICU bed days to Med/Surg Units, Palliative Care or Hospice by partnering with patients and family caregivers to proactively make decisions about advanced illness planning;
- 10% of Med/Surg bed days to community-based care settings by reducing avoidable readmissions;
- 10% of ED visits by enrolling patients in Mental Health Services and/or Primary Care, by utilizing EMT services and Urgent/Retail Clinics and by developing RRTs for SNF and LTAC residents
Changing Paradigms to Reduce Readmissions

<table>
<thead>
<tr>
<th>Traditional Focus</th>
<th>Transformational Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate clinical needs</td>
<td>Whole person needs</td>
</tr>
<tr>
<td>Patients</td>
<td>Patient &amp; family members</td>
</tr>
<tr>
<td>LOS &amp; timely discharge</td>
<td>Post-acute care plan for comprehensive needs</td>
</tr>
<tr>
<td>Handoffs</td>
<td>Co-design of “handovers”</td>
</tr>
<tr>
<td>Clinician teaching</td>
<td>Patient &amp; family learning</td>
</tr>
<tr>
<td>Clinical setting teams</td>
<td>Cross-continuum teams</td>
</tr>
</tbody>
</table>
IHI’s Framework: Improving Care Transitions

Transition from Hospital to Home or other Care Setting

Transition to Community Care Settings and Better Models of Care

Supplemental Care for High-Risk Patients

The Transitional Care Model (TCM)

Patient and Family Engagement

Cross-Continuum Team Collaboration

Health Information Exchange and Shared Care Plans

Avoidable Emergency Room Visits

Truven Health Analytics Study Finds Most Emergency Room Visits Made by Privately-Insured Patients Are Avoidable

- 71% of emergency room visits made by patients with employer-sponsored insurance coverage are for causes that do not require immediate attention in the emergency room, or are preventable with proper outpatient care.

- Insurance claims data for over 6.5 million emergency room visits made by commercially insured individuals, under age 65, in calendar year 2010. It found that just 29 percent of patients required immediate attention in the emergency room.

- 24% did not require immediate attention, 41% received care that could have safely been provided in a primary care setting, and 6% received care that would have been preventable or avoidable with proper primary care.

Truven Health Analytics (formerly the healthcare business of Thomson Reuters) J. Roderick, Inc. Brian Erni, 631-584-2200
## Emergency Severity Index (ESI) and Patient Acuity

<table>
<thead>
<tr>
<th>Degree of Acuity</th>
<th>Level of Acuity</th>
<th>Patient Condition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td><strong>LEVEL 1 EMERGENT</strong></td>
<td>Patients in this category require immediate attention with maximal utilization of resources to prevent loss of life, limb, or eyesight.</td>
</tr>
<tr>
<td></td>
<td><strong>LEVEL 2 URGENT</strong></td>
<td>Patients in this category should be seen by a physician because of high risk for rapid deterioration, loss of life, limb, or eyesight if treatment or interventions are delayed.</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td><strong>LEVEL 3 ACUTE</strong></td>
<td>Patients who develop a sudden illness or injury within 24-48 hours. Symptoms and risk factors for serious disease do not indicate a likelihood of rapid deterioration in the near future.</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td><strong>LEVEL 4 ROUTINE</strong></td>
<td>Patients with chronic complaints, medical maintenance, or medical conditions posing no threat to loss of life, limb, or eyesight.</td>
</tr>
<tr>
<td></td>
<td><strong>LEVEL 5 ROUTINE</strong></td>
<td>Patients in this category are currently stable and require no resources such as labs or x-ray.</td>
</tr>
</tbody>
</table>

## Managing and Reducing Variability in Surgical Scheduling

**Natural Variability** (Clinical Variability, Flow Variability, Professional Variability)
- Random
- Can not be eliminated (or even reduced)
- Must be optimally managed

**Artificial Variability**
- Non-random
- Non-predictable (driven by unknown individual priorities)
- Should not be managed, must be identified and eliminated
Match Capacity Demand

Oversight system for hospital-wide operations to optimize patient flow

Flex capacity to meet hourly, daily and seasonal variations in demand

Real-time demand and capacity management processes

Early recognition for high census and surge planning

Oversight Systems for Hospital-Wide Operations to Ensure Optimal Patient Flow

- Clear executive leader accountability and roles and responsibilities for the project leaders
- Make clear connections with strategic priorities
- Forecasting seasonal variations in demand and changes in demand patterns
- Demand/Capacity Management
- Managing Variation
- Identify Constraints and Redesign the System
- Metrics at the Macro and Microsystem levels
- Design targets – what do you want to accomplish
- Create a Learning System within each Project and across all Projects to achieve system-wide improvements in patient flow
Flex Capacity to Meet Seasonal, Day of the Week and Hourly Variations in Demand

- Can you predict a surge in admissions for patients with medical conditions in the winter months?
  - Use seasonal flex units to manage increases in medical patients during the winter months
- Can you anticipate which units need more bed capacity? (clue – which services consistently have a large number of “off-service patients”)
  - Use data analytics to quantify needs of each service
- Do you have a regular surge of activity mid-week with the hospital census regularly reaching >95% occupancy?
  - Smooth elective surgical schedules (particularly for patients who will require ICU care post-op)

Yale University – Bed Huddles
Real-Time Demand and Capacity Management Processes

<table>
<thead>
<tr>
<th>Plan/ Measures</th>
<th>Who manages?</th>
<th>Roles/ responsibilities?</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Daily huddles (8:00am)</td>
<td>• Staffing coordinator, house administrator, case manager</td>
<td>• Units manage discharges, “predicted” 14:00</td>
<td>• What are barriers to 14:00 discharges?</td>
</tr>
<tr>
<td>• Night shift ID’s discharge potentials</td>
<td>• Huddle: - visual list of “capacity” and “demand”</td>
<td>• Managers “allocate” available beds</td>
<td>• How good are predications?</td>
</tr>
<tr>
<td>• Predicts before 14:00 or after</td>
<td>• Also includes: ED admits, transfers in, ORs</td>
<td></td>
<td>• Can prediction accuracy and number of 14:00 discharges improve?</td>
</tr>
<tr>
<td>• Day shift verifies</td>
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<tr>
<td>• Brings discharges and empty beds to 8:00am huddle</td>
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Real-Time Demand and Capacity Management Processes

**Four Steps of Real-Time Demand Capacity Management**

1. Predicting Capacity (Step 1)
2. Predicting Demand (Step 2)
3. Developing a Plan (Step 3)
4. Evaluating the Plan (Step 4)

*Figure 1. The four steps of real-time demand capacity management are depicted.*

Using Real-Time Demand Capacity Management to Improve Hospitalwide Patient Flow; Resar, R; Nolan, K; Kaczynski, M; Jenson, K; The Joint Commission Journal on Quality and Patient Safety; May 2010, Vol 37, No 5
Real-Time Demand and Capacity Management Processes

Sample Unit-Level Real-Time Demand Capacity Management Recording Forms*

<table>
<thead>
<tr>
<th>Available Beds</th>
<th>Predicted DCs by 2:00 a.m.</th>
<th>Prediction Success (yes/no)</th>
<th>Predicted Adms by 2:00 a.m.</th>
<th>Prediction Success (yes/no)</th>
<th>Plan</th>
<th>Success of Plan (yes/no)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td></td>
<td>7</td>
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Figure 3a. In one unit, there was one available bed, with five predicted discharges by 2:00 a.m.

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Figure 3b. In the same unit, seven admissions were predicted by 2:00 a.m.

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Join in at 5 p.m. by 9:00 a.m. to transfer 9lth patient by 10:00 a.m.

* DC, discharge; Adm, admission.

Using Real-Time Demand Capacity Management to Improve Hospitalwide Patient Flow; Resar, R; Nolan, K; Kaczynski, M; Jenson, K; The Joint Commission Journal on Quality and Patient Safety; May 2010, Vol 37, No 5

Early Recognition for High Census and Surge Planning

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<tr>
<td>• Detailed “surge plan”</td>
<td>• Centrally managed – house officer, CNO, CMO</td>
<td>• Clear delineation of responsibilities - managers, residents, hospitalists</td>
<td>• Debrief every activation</td>
</tr>
<tr>
<td>• Clear guidelines for high census and surge implementation (ED saturation, hospital census, OR cancellations)</td>
<td></td>
<td></td>
<td>• Can it be prevented?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Track in run chart over time</td>
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* DC, discharge; Adm, admission.
Redesign the System

- Improve efficiencies and throughput in the OR, ED, ICUs and Med/Surg Units
- Service Line Optimization (frail elders, SNF residents, stroke patients, etc.)
- Reducing unnecessary variations in care and managing LOS “outliers”

Improve Efficiencies and Throughput in the OR, ED, ICUs and Med/Surg Units

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| • Continuously identify and remove delays  
  • Track LOS, delays, barriers to transfer, admission discharge | • Unit leaders  
  • Service line leaders  
  • Managers  
  • Case managers | • Unit, service-line, case manager, hospitalists – daily unit-based huddles to move patients  
  • Track metrics  
  • Identify and resolve issues  
  • Evaluate OR scheduling  
  • Match available capacity to known ED demand | • Identify new delays  
  • Be alert to changing patterns  
  • Implement latest techniques, practices (ex: same day discharges hip/knee replacement) |
# Reducing Unnecessary Variations in Care and Managing LOS “Outliers”

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| • Continuously evaluate care for variation  
• Compare to past performance, external data sources, newest literature and emerging care methods | • Service line and unit managers, case managers, hospitalists, intensivists | • Build into daily work-huddles, care teams  
• Agenda item on standing meetings | • What works?  
• What supports need to be implemented?  
• How is the landscape changing  
• Can you eliminate day of week, seasonal variation? |

## Service Line Optimization (Frail Elders, SNF Residents, Stroke Patients, etc.)

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| • Continuously evaluate data, using age, diagnosis, care needs, unnecessary admissions  
• Identify sub-populations for focused care tracks | • Service line and unit managers, hospitalists, intensivists | • Leaders, improvement experts evaluate, design and test new care paths, models  
• Test, implement and spread | • Track efficacy of new methods  
• Identify additional processes or care groups to evaluate |
Sheffield Teaching Hospitals NHS Trust

**Focused on Geriatric Medicine Service:**
- 33% of medicine patients over 75 with and increasing number over 90 years old; 50% were receiving specialized care/therapy; 50% awaiting discharge coordination
- Analysis of outlier hospital stays revealed multiple points when patients could have been discharged; 66% of frail elders arrived after 6PM and were not seen by geriatrician until the next morning (20% of patients had the diagnosis changed after being seen by the geriatrician)

**Changes:**
- Matched specialist capacity to patient demand
- Developed a Frailty Unit with specialized focus and teams
- Sped up discharge process and patients discharged when medically ready; home assessment for safety and support (saved up to two weeks);
  Continuous improvement teams continuously looking for additional ways to shorten hospital stays

**Key Learning:**
- Use multiple levels of expertise
- Build internal capacity
- Keep focused on patients and data
- Use the power of small scale testing

**Results:**
- 37% increase in patients discharged within one day -- increasing bed availability and improving flow
- No increase in re-admissions and a decrease in mortality.
Memorial Hermann—Texas Medical Center
- 800 beds
- 7 Specialized ICUs (Cardiac, CV Surgery, Medicine, Neuro Trauma, Shock Trauma, Transplant, Burn) - 220 total beds
- 33% uninsured in Houston area

Children’s Memorial Hermann Hospital
- 250 beds - Pediatric ICU, Neonatal ICU - 150 beds
- 85,000 EC visits
- Primary teaching hospital: The University of Texas-Health Science Center-Houston

16-Bed MICU
We need more beds!

Bela Patel, MD and Khalid Almoosa, MD

Reduced EC – ICU admit time
Efficient

Emergency Center

Sepsis Management
Reliable weaning protocol
VAP, CR-BSI bundles
Standardize family meetings

Stabilization
Weaning
Complications
End-of-Life

Ward
Other facility

Timely
Safe
Effective
Safe
Patient-centered

RRT to reduce floor codes

Decreased Length of Stay
We have plenty of beds!

*Thank You!*

- VAP/BSI rates Zero - $54,000/$35,000
- EC- ICU 53% to 75% in 4 hrs
  - Hospital LOS decreased 1.5 days $$$
- Floor codes *decreased* 50%
- End of Life ICU stay – *decreased* 3.3 days
- Mortality *decreased* by 13%, CMI up 15%,
- Occupancy *decreased* from 94.5% to 85.5%
- Monthly admissions from 89.4 to 104.6
- **$5.1** Million saved

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**Current Results**

- Ranked Number 5 in UHC in Mortality
- Ranked Number 10 in UHC overall

*Medicine Service Line*

- Ranked Number 5 in UHC in Sepsis Care
- 30% of patients uninsured
- 80% of admissions from ED
- “Profitable” on Medicare
- UHC – length of stay 1.0 – O/E
### Content Theories / Driver Diagram

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#### Shape or Reduce Demand

- Decrease demand for hospital beds through delivering appropriate care
- Decrease variation in surgical scheduling
- Relocate care in Med/Surg Units to community-based care settings

#### Match Capacity and Demand

- Assess seasonal variations and changes in demand patterns and proactively plan for variations
- Daily flow planning huddles (improve predictions to synchronize admissions, discharges and discharges)
- Real-time demand and capacity problem-solving (managing constraints and bottlenecks)
- Planning capacity to meet predicted demand patterns
- Early recognition for high census and surge planning
- Oversight system for hospital-wide operations to optimize patient flow
- Real-time demand and capacity management processes
- Plan capacity to meet hourly, daily and seasonal variations in demand

#### Redesign the System

- Improve efficiencies and throughput in the OR, ED, ICUs and Med/Surg Units
- Service Line Optimization (frail elders, SNF residents, stroke patients, etc.)
- Reducing unnecessary variations in care and managing LOS "bullets"