Architecting the Healthcare System for Stakeholder Value

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US Health Care Issues

“Simply stated, the US does not have a health care system.”

*William Brody, President of Johns Hopkins University, 2007*

| Access          | 15% of US population is uninsured  
                   | 75% of care delivery is done by groups of five physicians or less |
|-----------------|----------------------------------------------------------------------------------|
| Quality         | 44,000 to 98,000 patient deaths attributed to medical error  
                   | 55% of recommended care is administered to adults |
| Cost            | 16% of GDP spent on health care in 2005  
                   | 30.8% of total health care expenditure is spent on hospitals |

“…the strategies [hospitals] develop and implement to compete have a significant effect on costs, quality, and access to care.”

*(Devers et al. 2003)*
Health Care is a Complex Socio-Technical System
Greater Boston Hospital Case

• Leading multi specialty physician led group practice with national and international recognition (i.e. neuro, liver, heart & vascular, etc)

2006 Highlights

- Emergency Visits: 38,631
- Total Beds: 293
- Total Staff: 4263
- Total Income: $679,454,000
- Total Expenses: $628,525,000
- Operating Income: $50,929,000

Problem Statement

- Emergency Department (ED) struggling to keep up with demand
- Long wait times in the ED and patient leaving without being seen
- ED staff blame inpatient staff and vice versa
- ED staff churn levels significant

What can be done to speed patient flow in the ED?
Where should a process improvement initiative focus?
Emergency Department VSM

http://lean.mit.edu

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Emergency Department Analysis

Description of patient time spent in ED

**Average Total Time Spent in the ED**

- **Patients Not Admitted:** 4.14 hrs
- **Patient Admitted:** 7.85 hrs

Math's Daily

Total Time in ED for Patients Not Admitted, By Acuity

Total Time in ED for Admitted Patients, By Acuity

Average time for each step of the patient process

<table>
<thead>
<tr>
<th>Waiting Time to Be:</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triage</td>
<td>- Patient is triaged</td>
</tr>
<tr>
<td>Registered</td>
<td>- Patient is placed in ED bed</td>
</tr>
<tr>
<td>Given Room</td>
<td>- Patient is seen by nurse</td>
</tr>
<tr>
<td>Seen by Nurse</td>
<td>- Physician is seen by MD</td>
</tr>
<tr>
<td>Seen by Phys</td>
<td>- physician makes disposition</td>
</tr>
</tbody>
</table>

Further work is necessary

Description of patient arrivals and departures

**Patient Arrivals By Hour of Arrival**

- September 2006

**Patient Discharges By Hour of Discharge**

- September 2006

Simulation Modeling

**Simulation patient levels in ED over three days**

- Early Adult
- Adult
Preliminary Findings

Main Findings

- ED average length of stay considered problematic, but non-admitted patients took 4 hours, whereas admitted patients took over 8 hours.
- ED interacted well with some patient wards but not with others.
- ED heroic employee efforts said to be common rather than sporadic.
- ED metrics and strategic goals misaligned with overall hospital (X-Matrix).

Questions For Further Study

- Why was the ED managed as a silo rather than end-to-end?
- Was the varying performance of ED interactions due to the payment model?
- Could it be that different observed EA configurations were directly related to the different observed performance levels?

“The problem of redesign gets harder and the evidence weaker as one moves from the microsystem to the organization.”

Donald Berwick, President of Institute for Healthcare Improvement, 2002
“As Is” Enterprise Architecture

Policy View

Organizational View

Knowledge View

EMERGENCY DEPARTMENT

Knowledge View

SUPPORT (Labs, Pharm, Supplies)

Knowledge View

INTERNAL MED

Knowledge View

FLOORS/WARDS

Knowledge View

SURGERY

Process/Service View

Process/Service View

Process/Service View

Process/Service View

IT View

Knowledge View

T-System

Knowledge View

Health Worker

Medtech

Bed Tracking
"To Be" Enterprise Architecture

Patient In the center of the architecture (Service-centered architecture)

Hospital processes oriented around the patient (Process-centered architecture)

Information Technology connects patient, knowledge, process, organization (IT/knowledge centered)