

Gaining Control and Predictability of Complex Health Care Systems Through Patient Classification

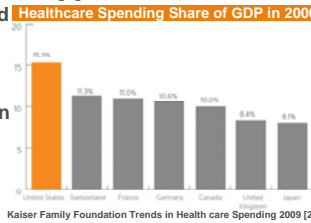
Start date: September 2008
Research Group: Lean Advancement Initiative

Jordan Peck, Ph.D. Student

Thesis advisor: Prof. D. Nightingale
Committee: Prof. S. Graves; Prof. J. Benneyan

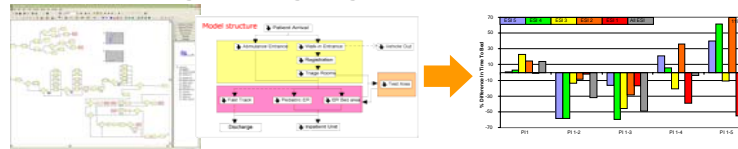
Motivation / Problem / Domain

- “Estimates suggest that as much as \$700 billion a year in healthcare costs do not improve health outcomes.” - Peter Orszag, director of the White House Office of Management and Budget, May 2009 interview with NPR [2].
- Annual provider inefficiency and error is estimated to cost \$75-\$100 Billion [2].
- Access to care is limited due to provider crowding particularly in Emergency Departments [3].
- There is a need for more engineering methods and thinking in healthcare [4].
- Much is known about how to increase quality and efficiency in manufacturing, some methods have carried to health care [5,6].
- A significant tool for reducing waste in manufacturing are takt times [7].



The Research

Complex system design showed a use for a triage classification index that specifically controls patient flow. This index was simulated using discrete event simulation. Results suggest a potential net decrease in patient waiting time between triage and being assigned a bed of almost 50%.



Hypothesis: Patient classification systems can leverage predictable treatment demands to control and improve high volume health treatment unit performance.

Expected Contribution

This research is expected to contribute to two fields:
Health Care Systems:

Health Professionals are beginning to understand how to leverage predictability. This research will provide an example that can be immediately applied to other Emergency Departments and also a process for creating similar tools in other units.

Lean Performance in Service Industries:

Lean and systems optimization tools often fail to deliver the performance benefits seen in classic manufacturing to service industries. This research can offer a new tool for optimization in more complex socio-technical systems.

Acknowledgements

- The Veterans Health Care Administration, VISN1
- The New England Veterans Health Care Engineering Partnership
- The Lean Advancement Initiative
- The Park Center for Complex Systems
- My Advisor and Committee

Literature Review

1. Blendon, R., Altman, D. “Voters and Health Care in the 2006 Election,” New England Journal of Medicine, 355; 18, 2006
2. Kelley, R. “Where can \$700 Billion in waste be cut annually from the U.S. Healthcare System?” White Paper, Thomson Reuters, October 2009
3. Andrus D., Kellermann A., Hintz E., Hackman B., and Weslowski V., (1991) “Emergency departments and crowding in United States teaching hospitals,” Annals of Emergency Medicine 20, 1991 p980-986.
4. Davies, M., Mayo-Smith, M., and Kumar T., “Veterans Health Administration Executive Decision Memo - Optimizing the VHA Framework for Improvement” Veterans Health Administration Department of Systems Redesign, June 2008
5. Womack, J., Jones, D., Roos, D. The Machine That Changed the World, Simon & Schuster, Inc., New York, NY; 1990.
6. Graban, M. Lean Hospitals, Taylor & Francis Group, New York, NY 2009
7. Hopp, W., Spearman, M. Factory Physics, Irwin/McGraw-Hill, New York, NY, 2001

Key Questions

- Can a patient classification system serve the same purpose as takt times? (act as a tool for control and monitoring of a system)
- What are the outcomes of implementing such a system?
- What factors (human, economic, etc.) help or hinder the use of such a system?
- How transferable can such a system be?

Methodology

This research will:

- Apply Complex Systems Design Methods to the Emergency Department to create a potential classification system at triage.
- Test the classification system through discrete event simulation.
- Use Interviews and data mining to create a functional classification system and tool for implementation.
- Use data and interviews to judge effectiveness of classification system.
- Use interviews and data to assess the properties of the classification system that can be transferred to other Emergency Departments.

The Planned Research

- Research will focus on how to best create this classification system and understand larger engineering systems implications of its use.
- A partnership has been formed with the New England Veterans Health Administration.
- Research will begin with preliminary attempts to understand how accurately nurses can predict patient flow and assign classifications at the VA Boston Hospital Emergency Department.
- Based on the results, tools will be created to make this process more efficient and accurate.
- Then a case study at VA Boston will be performed to understand the affects of this system, including data analysis, interviews, and observation.
- Finally studies will be performed to see whether the system is replicable in other VA Hospitals and possibly non-VA Hospitals.



VA Boston, MA



VA Togus, ME
Source: www.va.gov



VA Manchester, NH

Jordan S. Peck
jspeck@mit.edu

