Northeastern

Systems Engineering as a Health Care Improvement Strategy

The CMS/CMMI National Demonstration Project – Gathering June 2014

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www.HSyE.org

Center for Medicare & Medicaid INNOVATION
CHOT Center for Health Organization Transformation
Boston HSyE Extension HSEC
NSF
HSyE

Disclosure

The speaker has no financial nor other conflicts of interests to disclose.

other than to ask for your help

Outline

1. Systems engineering as an improvement strategy
2. Range of examples
   - Simple to advanced
   - Micro to macro
3. Applications in your processes?
4. Getting involved

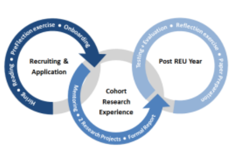
Healthcare Systems Engineering Institute

***Mission*: Broad measureable impact on healthcare, nationally, through research, education, and application of industrial and systems engineering**

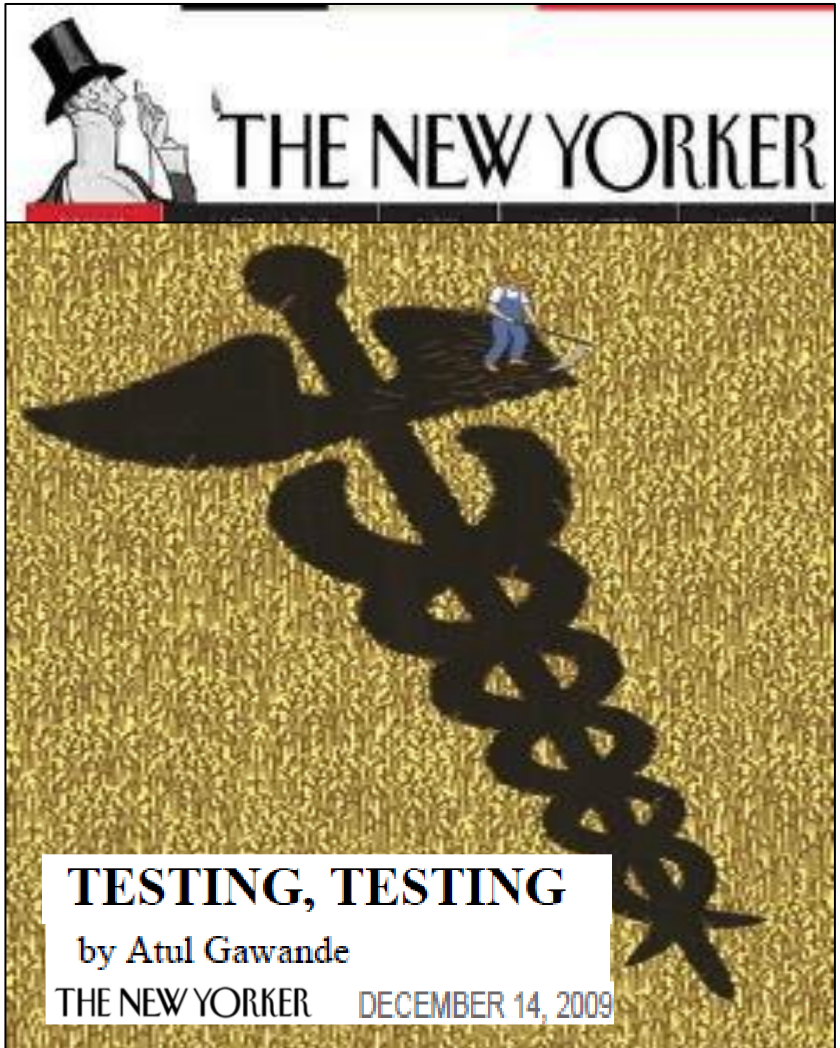
Partnerships

BWH, Dana-Farber, MGH 1811, St. Luke's, Meadows Regional Medical Center, Texas Children's Hospital, Texas Health Resources, Seattle Children's, CHA Health, Northeastern University, Boston Medical Center, MD Anderson Cancer Center, Harvard Vanguard Medical Associates (Atrius Health), Lahey Clinic, StuderGroup, Grady, Lone Star Circle of Care, Siemens, Georgia Trauma Commission, Highmark

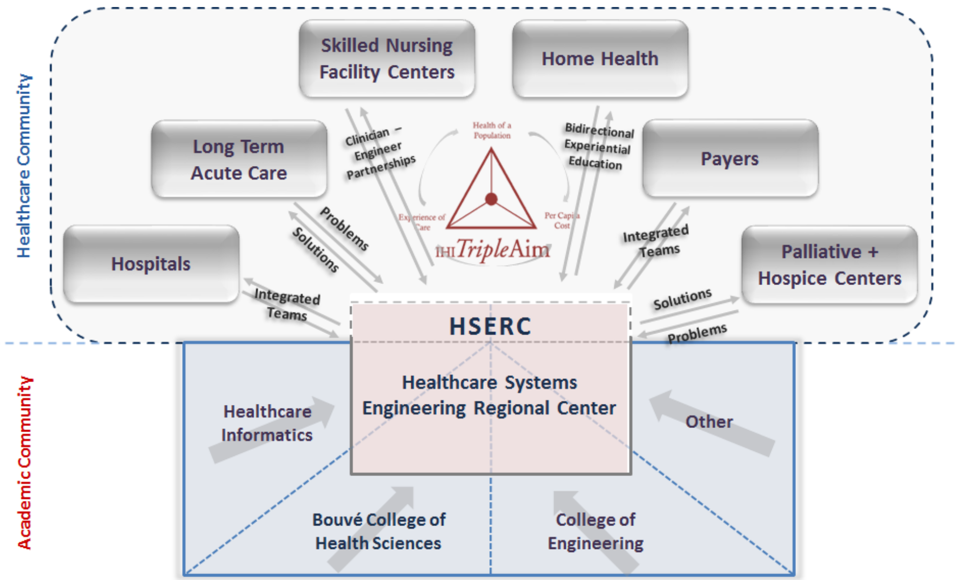
Project Types	Criteria		Primary Mechanism
Research / *Discover*	"Developing what we don't know"	1 - 2 years	CHOT – Center for Health Organization Transformation – **NSF Research Center**
Applied / *Impact*	"Doing what we know"	3 - 9 months	Center for Medicare & Medicaid INNOVATION – **CMS Application Center**
Experiential / *Education*	"Teaching others by doing"	2 - 6 months	Capstone, Co-ops; Summer Interns



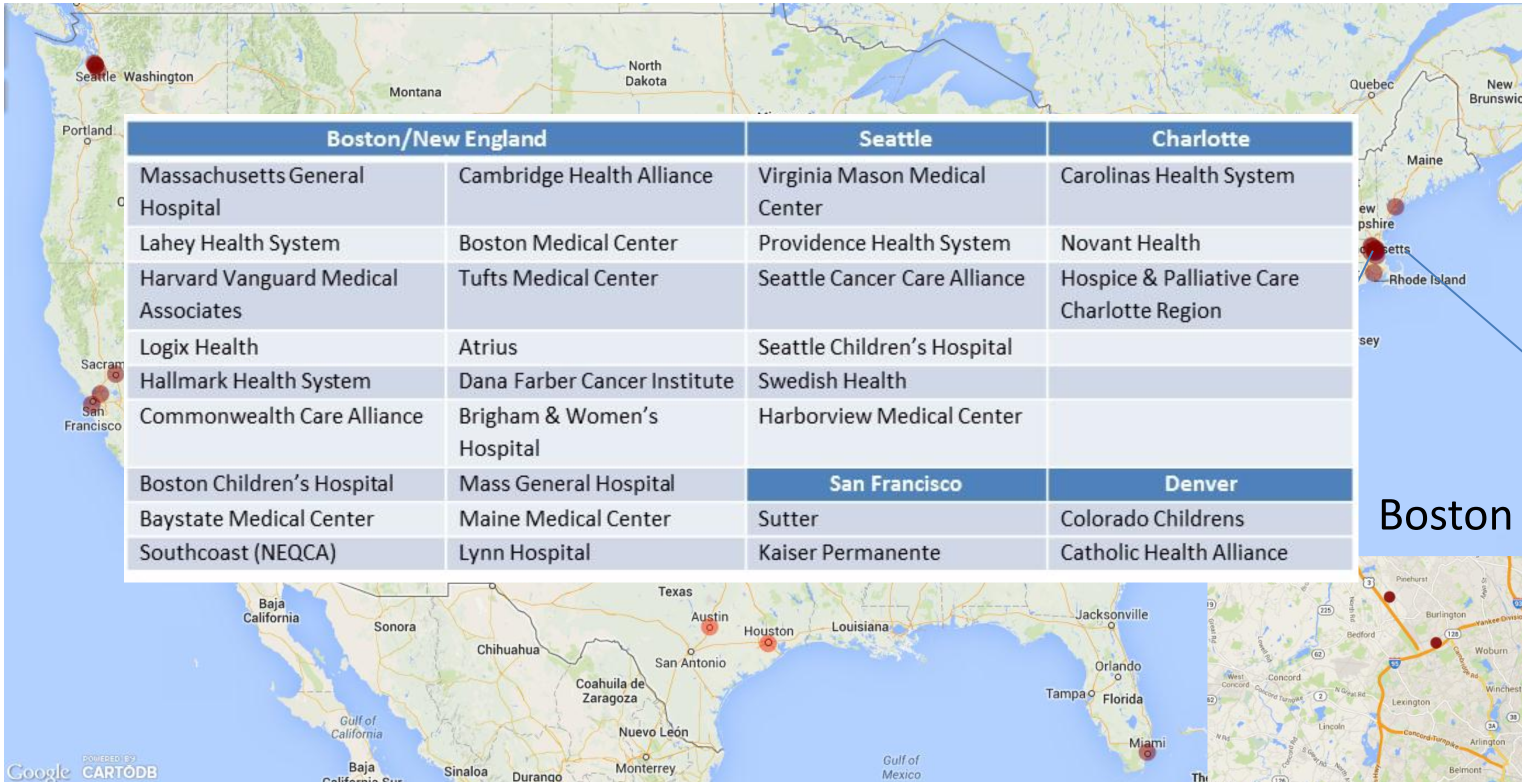
Agricultural extension center model



Center model

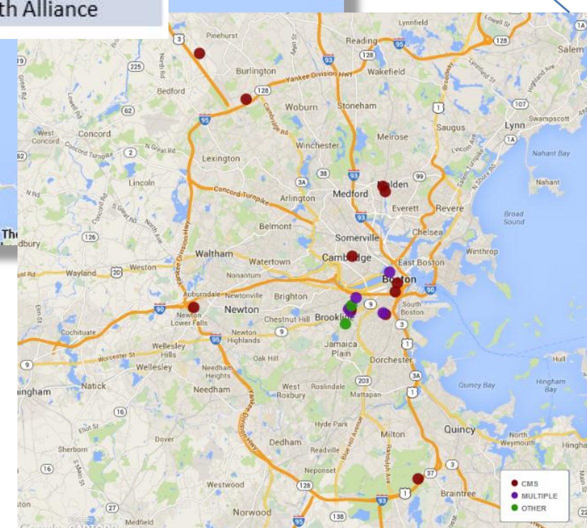


Participating health systems to-date



Boston/New England		Seattle	Charlotte
Massachusetts General Hospital	Cambridge Health Alliance	Virginia Mason Medical Center	Carolinas Health System
Lahey Health System	Boston Medical Center	Providence Health System	Novant Health
Harvard Vanguard Medical Associates	Tufts Medical Center	Seattle Cancer Care Alliance	Hospice & Palliative Care Charlotte Region
Logix Health	Atrius	Seattle Children's Hospital	
Hallmark Health System	Dana Farber Cancer Institute	Swedish Health	
Commonwealth Care Alliance	Brigham & Women's Hospital	Harborview Medical Center	
Boston Children's Hospital	Mass General Hospital	**San Francisco**	**Denver**
Baystate Medical Center	Maine Medical Center	Sutter	Colorado Childrens
Southcoast (NEQCA)	Lynn Hospital	Kaiser Permanente	Catholic Health Alliance

Boston Area



Hubs:

- Boston (primary)
- Seattle, Charlotte (secondary)
- Denver, San Francisco, TX (tertiary)
- …?

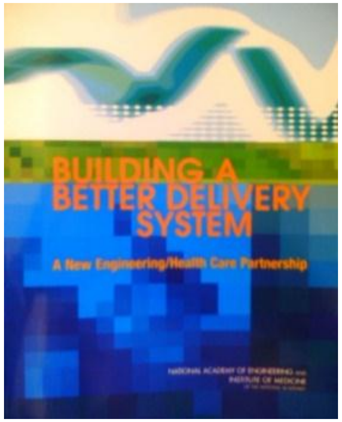
Why? National interest….. but…

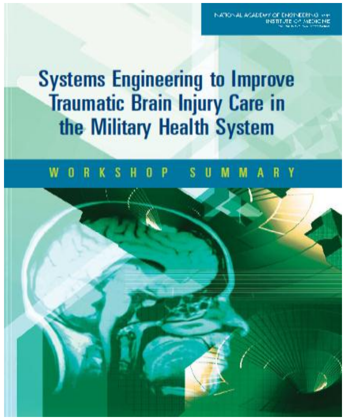
Significant interest (IOM, NAE, AHRQ, NSF, NIH, PCAST, etc)

'Time for science of health care to embrace science of systems engineering... but examples of... impact... are rare' (JAMA, 2012)

'Greater use of (IE) principles... widely used in manufacturing and aviation... small number health care organizations... not widespread in U.S. health care'

Institute of Medicine / NAE reports





Advisory report to Obama (5-29-14)

EXECUTIVE OFFICE OF THE PRESIDENT
PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20502

President Barack Obama
The White House
Washington, DC 20502

Dear Mr. President,

We are pleased to send you this report by your Council of Advisors on Science and Technology, *Better Health Care and Lower Costs: Accelerating Improvement through Systems Engineering*. This report comes at a critical time for the United States. Health-care costs now approach a fifth of the U.S. economy, yet a significant portion of those costs is reportedly "unnecessary" and does not lead to better health or quality of care. Millions more Americans now have health insurance and therefore access to the health care system as a result of the Affordable Care Act (ACA). With expanded access placing greater demands on the health-care system, strategic measures must be taken not only to increase efficiency, but also to improve the quality and affordability of care.

This report, which was informed by the deliberations of a working group comprised of PCAST members and prominent health-care and systems-engineering experts, identifies a comprehensive set of actions for enhancing health care across the Nation through greater use of systems-engineering principles. Systems engineering, widely used in manufacturing and aviation, is an interdisciplinary approach to analyze, design, manage, and measure a complex system in order to improve its efficiency, reliability, productivity, quality, and safety. It has often produced dramatically positive results in the small number of health-care organizations that have incorporated it into their processes. But in spite of excellent examples, systems methods and tools are not yet used on a widespread basis in U.S. health care.

PCAST's recommendations themselves form a system for addressing a set of complementary concerns. The predominant fee-for-service payment system is the primary barrier to greater use of systems methods and tools in health care, as it serves as a major disincentive to more efficient care. First and prerequisite for other kinds of progress, the Nation must accelerate the transition to payment models that pay for value rather than volume. Recognizing that it is hard to improve what cannot be measured, PCAST also calls for accelerated development of the U.S. health-data infrastructure. The value of health data comes from their use; health information technology will play a critical role in system-improvement efforts and enhancing the understanding of the multiple factors that contribute to health outcomes. PCAST also recommends providing technical assistance to health-care providers in applying systems methods, particularly those with limited resources such as the small or loosely networked practices that comprise nearly 60 percent of physicians. Since most individuals live their lives and experience their health outside of the traditional health-care setting, PCAST proposes increasing engagement with communities in improving health-care delivery. Finally, systems-engineering knowhow must be propagated at all levels; PCAST recommends that the United States build a health-care workforce that is equipped with essential-systems engineering competencies that will enable system redesign.

Implementation of these strategies bears potential not only to improve the efficiency of care delivery, but also to improve its quality. PCAST hopes that this report will provide a framework that helps the Administration achieve these aims as it proceeds with ACA implementation. We are grateful for the opportunity to serve you and the Nation in this way.

Sincerely,

John P. Holdren
Co-chair, PCAST

Eric S. Lander
Co-chair, PCAST

Recent calls for proposals

(2 of *n* examples)

NIH **AHRQ**

Department of Health and Human Services

Part 1. Overview Information

Participating Organization(s)	Agency for Healthcare Research and Quality (AHRQ) NOTE: The policies, guidelines, terms, and conditions stated in this announcement may differ from those used by the NIH. Where this Funding Opportunity Announcement (FOA) provides specific written guidance that may differ from the general guidance provided in the grant application form, please follow the instructions given in this FOA. Also note that AHRQ may have different page limits than NIH for the application Research Strategy, which can be found within each individual FOA (see Section IV below). AHRQ Grants Policy and Information to applicants regarding Funding Opportunity Announcement procedures can be found at Funding Opportunity Announcement Guidance.
Components of Participating Organizations	Agency for Healthcare Research and Quality, Center for Quality Improvement and Patient Safety, Patient Safety Portfolio
Funding Opportunity Title	**Patient Safety Learning Laboratories: Innovative Design and Development to Improve Healthcare Delivery Systems (P30)**
Activity Code	P30 Center Core Grants

Despite the eager endorsement about systems thinking by many health care advocates, there has been a scarcity of effort in actually incorporating systems principles, engaging the design and engineering disciplines in patient safety projects, and partnering with progressive sectors of the economy and other hazardous industries to realize new insights, and robust approaches. In 2005, the National Academy of Engineering and the Institute of Medicine drew from the combined talent in the engineering and health care communities to produce a consensus report and collection of papers entitled *Building a Better Delivery System – A New Engineering/Health Care Partnership*. Despite the carefully crafted recommendations and thoughtful papers, its impact has been limited.

Department of Health and Human Ser

Part 1. Overview Information

Participating Organization(s)	National Institutes of Health (NIH)
Components of Participating Organizations	Office of Behavioral and Social Sci National Cancer Institute (NCI) National Heart, Lung, and Blood In National Institute on Aging (NIA) National Institute on Alcohol Abuse National Institute of Biomedical Im *Eunice Kennedy Shriver* National I (NICHD) National Institute of Dental and Cr National Institute of Environmental National Institute of General Medic National Institute of Mental Health National Institute of Nursing Resea
Funding Opportunity Title	**Systems Science an Social Sciences (R01**
Activity Code	R01 Research Project Grant

Systems science methodologies are specific methodological approaches that have been developed to understand connections between a systems structure and its behavior over time. "Systems science methodologies" is an umbrella term to refer to a variety of such methodologies including (but not limited to), agent-based modeling, microsimulation, system dynamics modeling, network analysis, discrete event analysis, Markov modeling, many operations research and engineering methods, and a variety of other modeling and simulation approaches.

Healthcare systems engineering evidence base?

Observation ⇒ Postulation

- Growing use of basic process improvement methods
- Lean, PDSA, Six sigma, Safety, etc
- But what else (other industries)?

- Systems engineering can have significant value
- Basic methods (for all)
  - 'Systems engineering for common man'
- Advanced methods
  - Regional extension center model
- "By what method?"

What matters ⟷ What IE's do

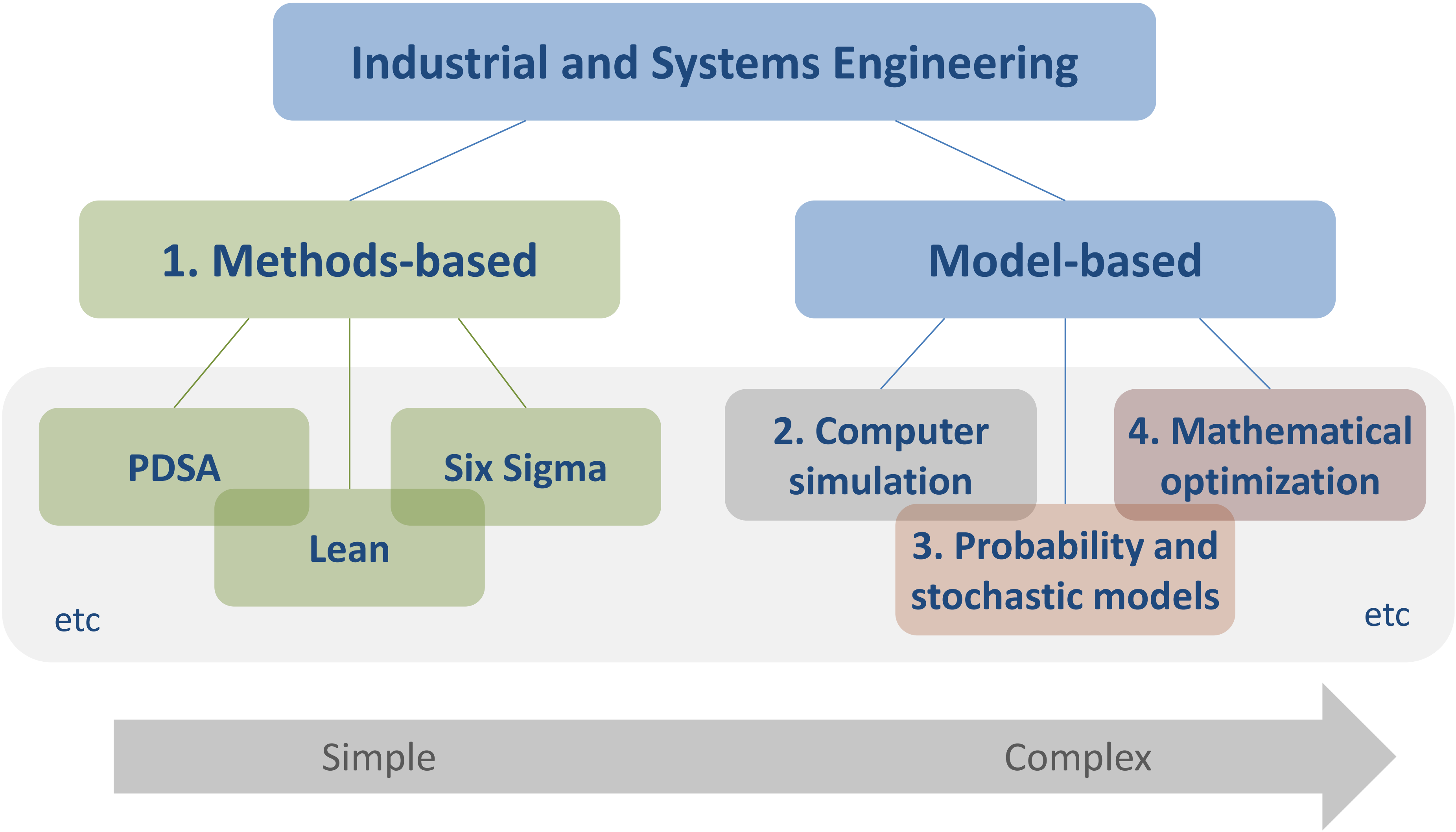
INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

- Safe
- Effective
- Patient centered
- Timely
- Efficient
- Equitable

SyE Common Applications of Systems Engineering

- Flow, waits, delays
- Logistics, capacity
- Quality, lean, six sigma
- Safety, reliability
- Treatment, medical decision making
- Policy

What is systems engineering?



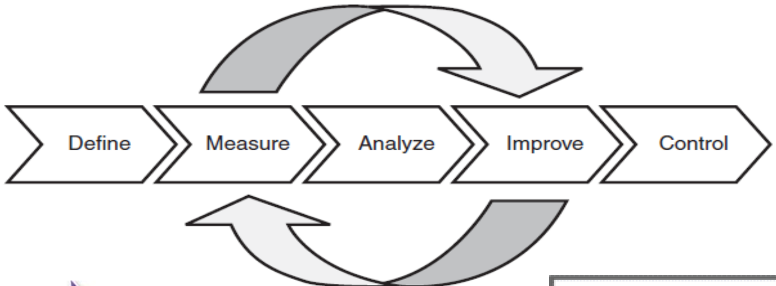
Typical applications

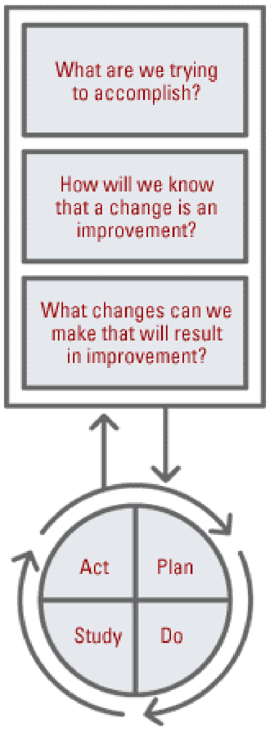
Logistics & efficiency	Patient flow & Access
• Inventory and supply chains • OR scheduling and turn-around • Academic workforce logistics • Regional network design • Real time location systems	• Access, waits and delays • Patient flow simulation • Workflow smoothing • Capacity planning, scheduling, and demand management
Medical decision making	**Quality & patient safety**
• Treatment optimization • Screening and diagnostic tests • Radiation therapy optimization • Patient shared decision support • Palliative and hospice care • Medical alternative evaluation	• Reliable and consistent care • Adverse events reduction • Preventable readmissions • Care continuity • Human factors engineering • Quality/improvement science

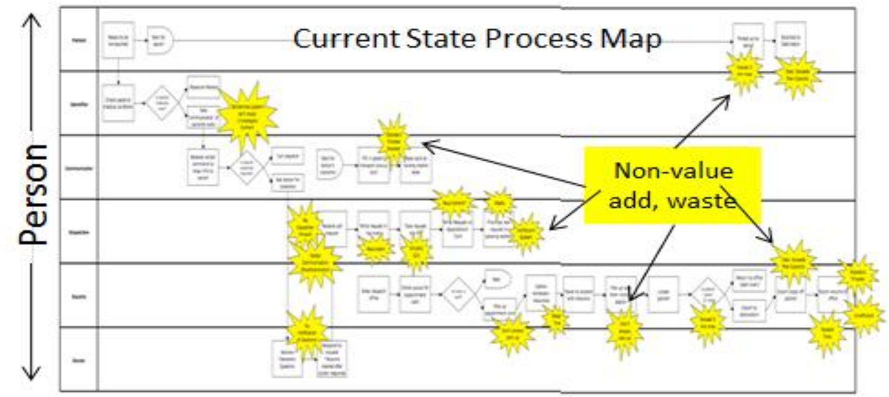
examples

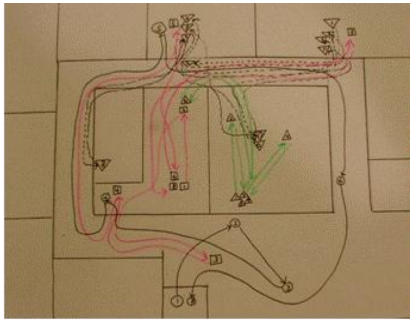
We do a LOT of this…

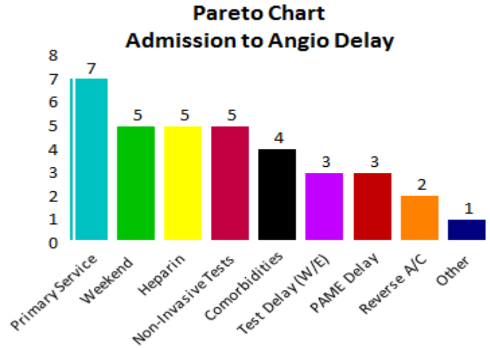
6σ, Lean, CQI, PDSA, …



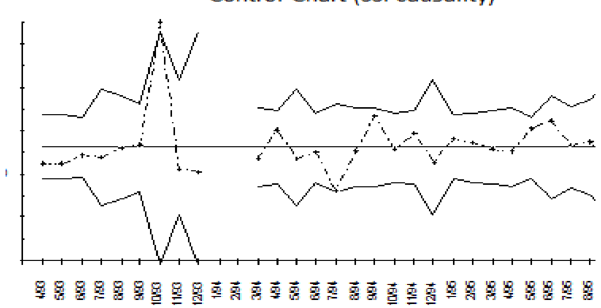


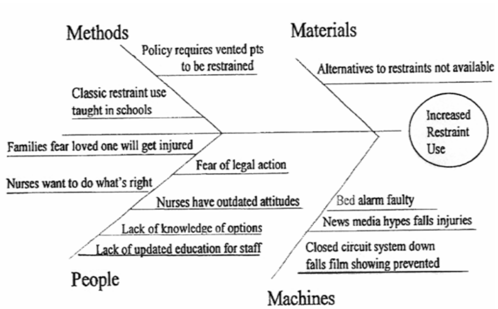


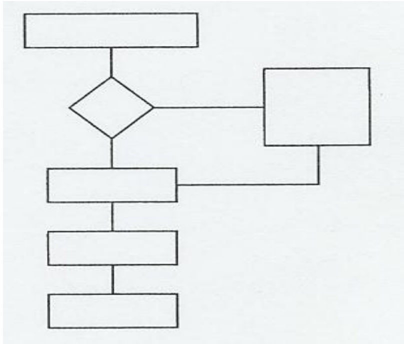




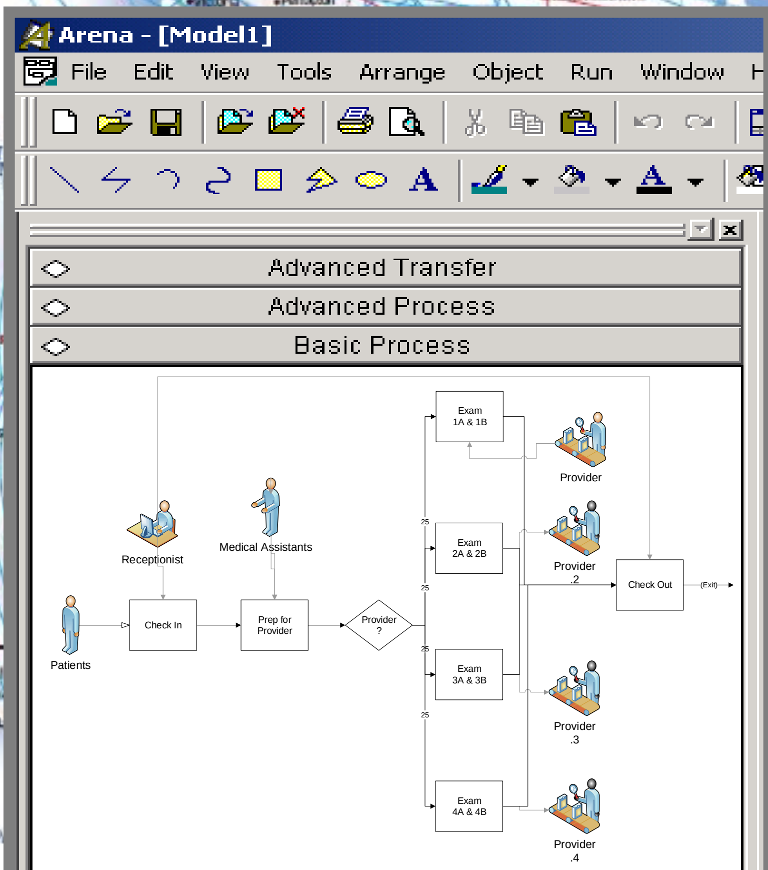
Antibiotic Timing *X-bar* Statistical Process Control Chart (SSI causality)







…and we do a lot of this



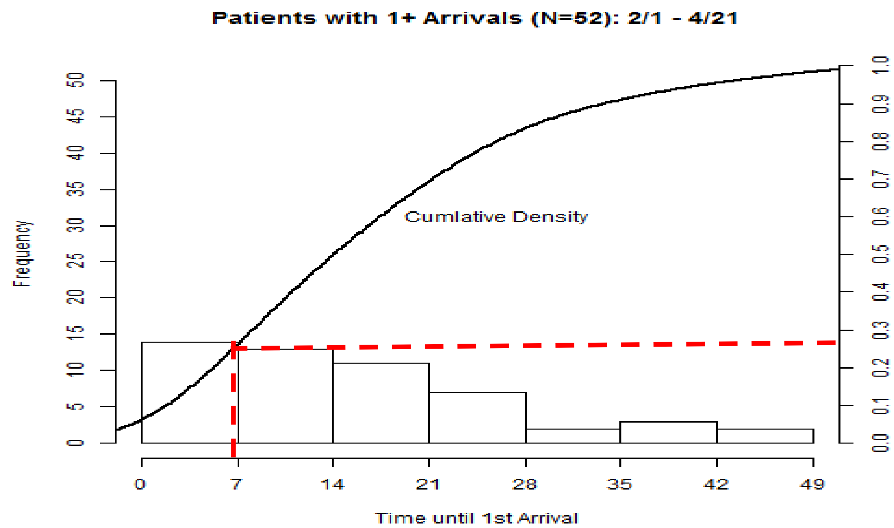
Max Z= $\sum_k \sum_t \sum_r \sum_s w_{kt} * p_{ktrs}$

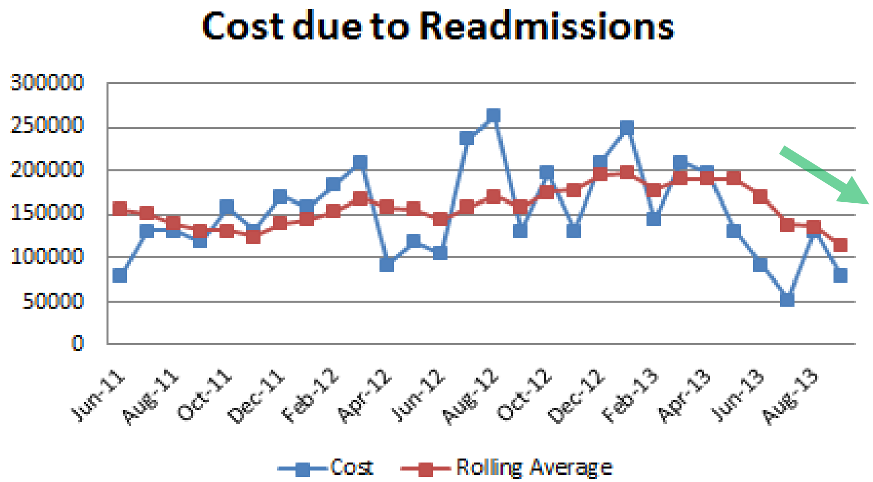
$\sum_t A_{mts} \leq 1$	$\forall\, i, s \text{ and } \forall\, m \in G_i$
$\sum_s A_{mts} = R_{mt}$	$\forall\, i, t \text{ and } \forall\, m \in G_i$
$A_{mts} = 1$	$\forall\, (m,t,s) \in O_i$
$\sum_{n \in D_{imt}} A_{nts} \geq A_{mts}$	$\forall\, i,t,s \text{ and } \forall\, m \in G_i, D_{imt} \neq \emptyset$
$A_{nts} + A_{mts} \leq 1$	$\forall\, i,t,s \text{ and } \forall\, m \in G_i, \forall\, n \in U_{imt}$
$\sum_m A_{mts} \geq C_{it}$	$\forall\, i,t,s \text{ where } m \in G_i$
$\sum_m A_{mts} \geq \sum_k k * p_{ktrs}$	$\forall\, t,r,s \text{ where } m \in Q_r^t$
$\sum_r p_{k_{tr}trs} \geq Goal_t$	$\forall\, t, s$
$A_{mts} \in \{0,1\}$	$\forall\, m,t,s$
$p_{ktrs} \in \{0,1\}$	$\forall\, k,t,r,s$

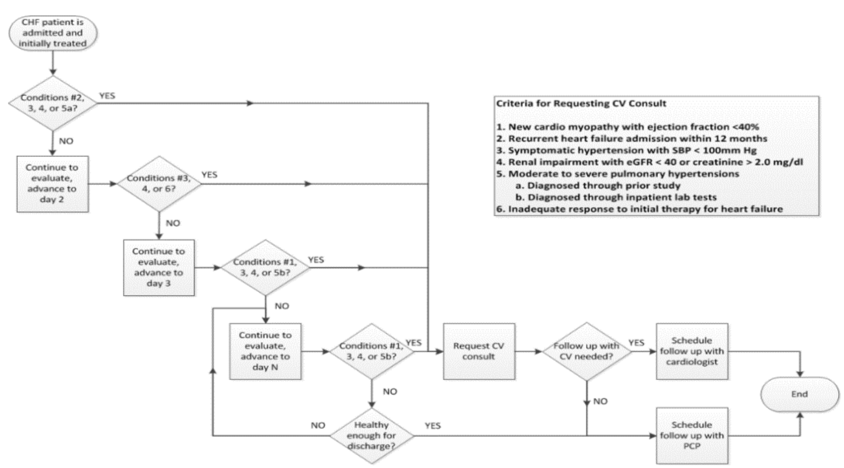
Congestive heart failure readmissions

Aim: Reduce CHF readmission costs 25% by increasing post-discharge follow-up appts ≤ 7 days

Approach: Basic process flow, data analysis, and CQI







Central line ICU infections

Aim

Reduce ICU CLABSI rate and associated costs by 50% within 9 months through implementation of “bundle”

CLABSI Bundle

1. Insertion technique, hand hygiene
2. Low risk site selection
3. Maintenance (sterile)
4. Daily removal assessment

Approach

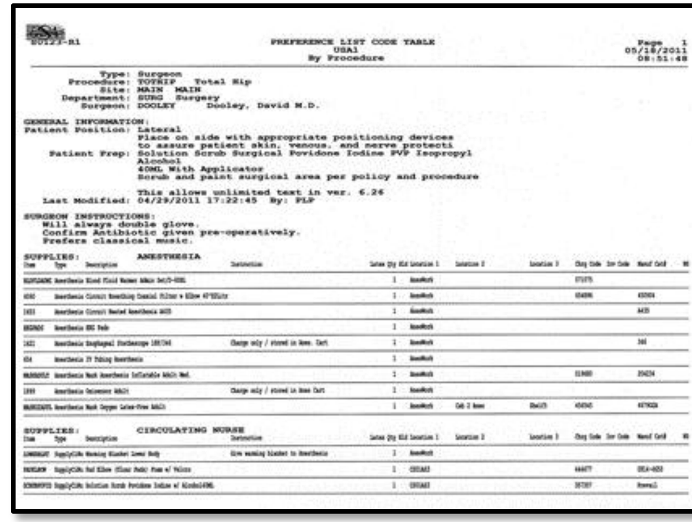
- Process flow analysis
- Bundle implementation via reliability science and human factors models

Reliability tier	Strategies	Measures	
		Process	Outcome
Prevent	• •		•
Detect	•		
Mitigate	• •		
Redesign	•		

Peri-operative inventory

Aim

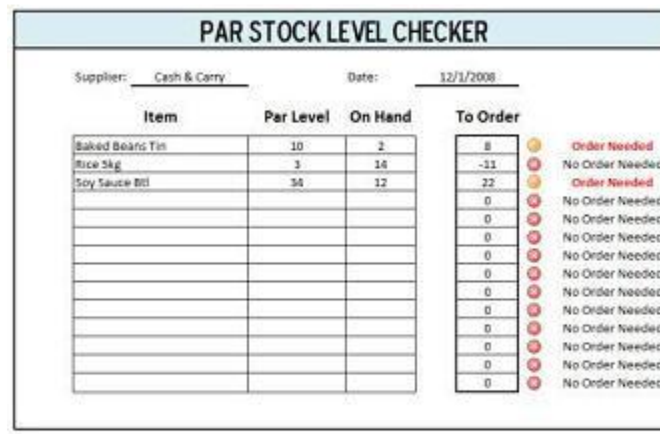
Reduce peri-operative supply costs by 20% via inventory methods, lean concepts, and preference card reduction



```
00123-R1                 PREFERENCE LIST CODE TABLE              Page   1
                                   USA1                     05/18/2011
                               By Procedure                   08:51:48

         Type: Surgeon
    Procedure: TOTHIP   Total Hip
         Site: MAIN   MAIN
   Department: SURG   Surgery
      Surgeon: DOOLEY      Dooley, David M.D.

GENERAL INFORMATION:
Patient Position: Lateral
                  Place on side with appropriate positioning devices
                  to assure patient skin, venous, and nerve protecti
    Patient Prep: Solution Scrub Surgical Povidone Iodine PVP Isopropyl
                  Alcohol
                  40ML With Applicator
                  Scrub and paint surgical area per policy and procedure

                  This allows unlimited text in ver. 6.26
   Last Modified: 04/29/2011 17:22:45   By: PLP

SURGEON INSTRUCTIONS:
   Will always double glove.
   Confirm Antibiotic given pre-operatively.
   Prefers classical music.

SUPPLIES:         ANESTHESIA

SUPPLIES:         CIRCULATING NURSE
```

Approach

- Establish/revise PAR levels for 80% of "A" items
- Standardize & reduce preference cards
- 5S inventory areas



PAR STOCK LEVEL CHECKER

Supplier: Cash & Carry   Date: 12/1/2008

Item	Par Level	On Hand	To Order	
Baked Beans Tin	10	2	8	Order Needed
Rice 5kg	3	14	-11	No Order Needed
Soy Sauce Btl	34	12	22	Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed
			0	No Order Needed

Room utilization/pooling

Aim

Consolidate low utilized patient rooms to eliminate ~$2m/yr overflow space costs by hybrid room pooling

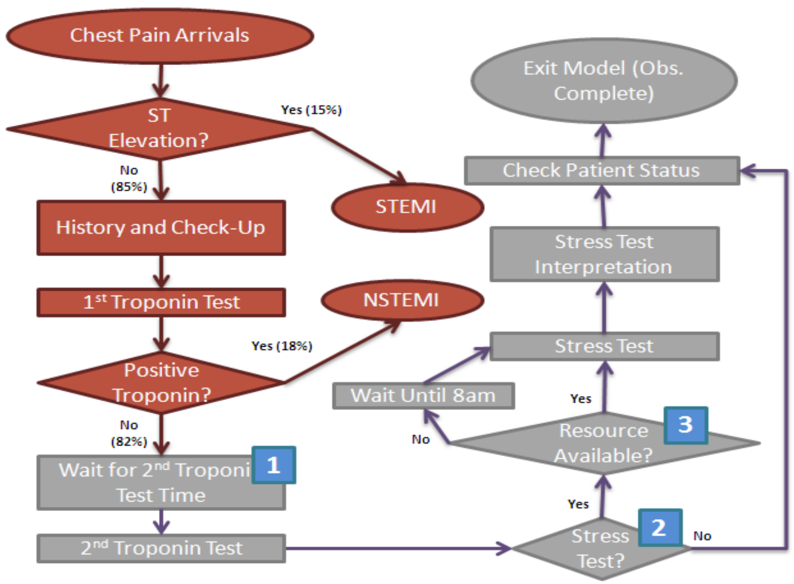
Approach

- Room sharing simulation
- Open availability real-time RTLS tool
- Pareto/CQI of reasons new process not followed

Dept	D Indicator	Apt Time	Arrival Time	Pt Name	Provider	P Indicator	P Count
BOC		10:30 AM	10:29 AM	AAA	NAKHLIS		0
		10:30 AM	10:31 AM	BBB	OVERMOYER		2
		10:30 AM	10:36 AM	CCC	BURSTEIN		2
		11:00 AM	10:33 AM	DDD	GOLSHAN		1
		11:15 AM	10:34 AM	EEE	OVERMOYER		2
SAC		10:30 AM	10:38 AM	FFF	MORGAN		1
		11:00 AM	10:44 AM	GGG	RAUT		1

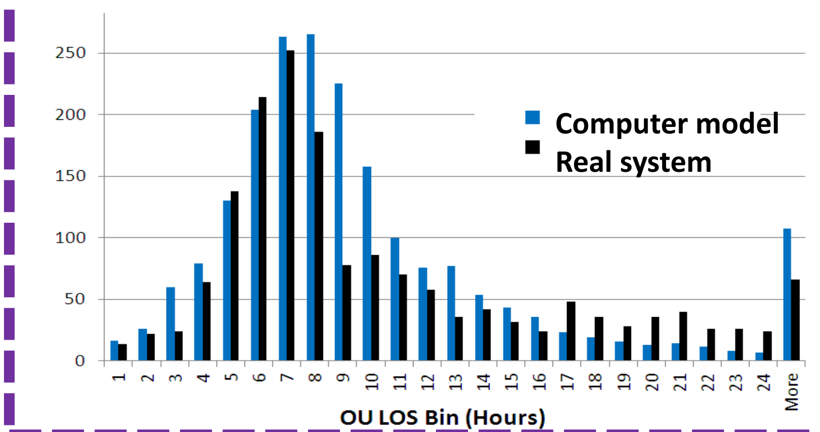
ED Observation Unit

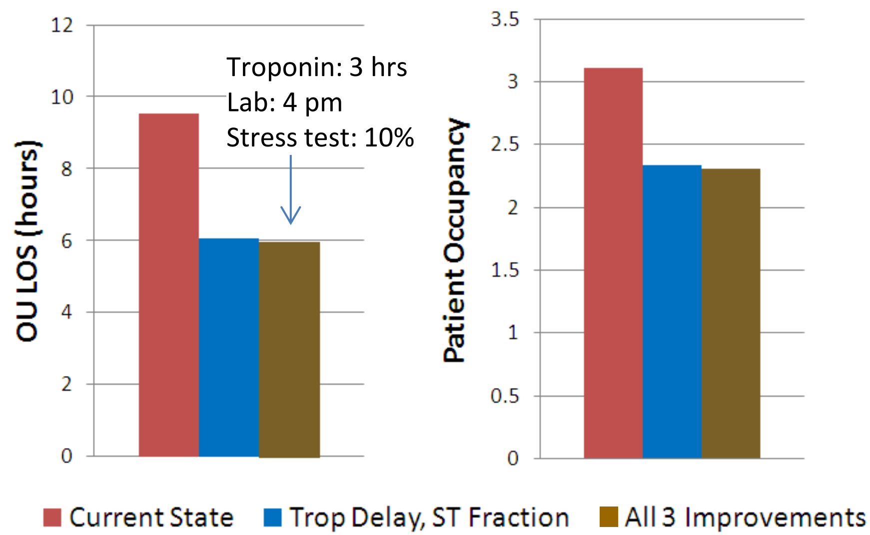
Standard Process Improvement



	CTA	ETT Stress	PET/ CT	SPECT	SPECT/ CT	Stress echo gram
Average wait time	0:09	0:48	11:21	0:31	0:16	2:42
Process ave time	1:35	1:13	1:06	1:31	2:25	1:59
% of all tests	1%	51%	22%	19%	3%	3%

Computer Simulation Analysis





Predictive models

The Weather Channel

Logistics applications

- Patient flow (ED admits)
- System-wide flow
  (bed huddle forecaster)
- ICU or OU bed demand
  (7 day ahead forecast)

Clinical applications

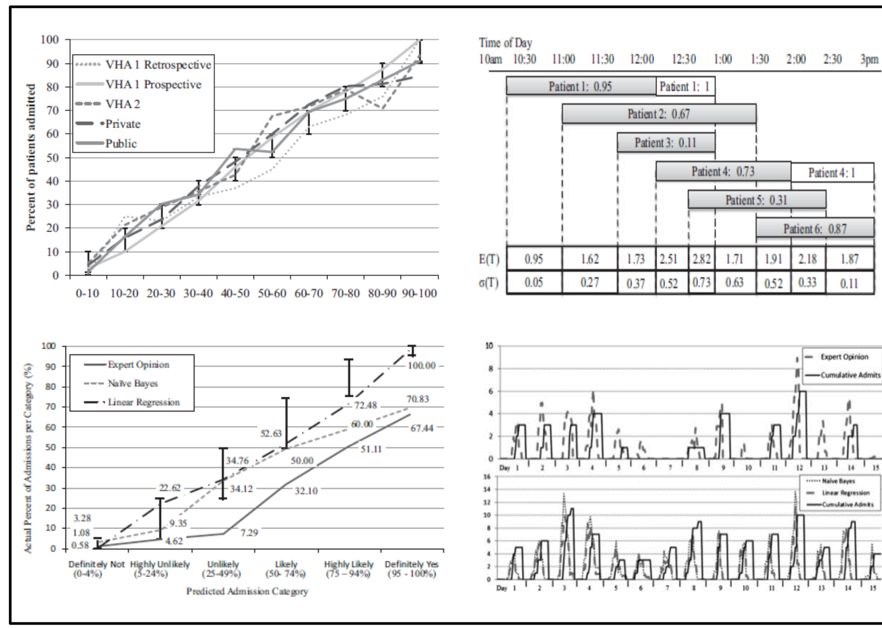
- Patient decline
- High annual total TCC
- Outlier long LOS

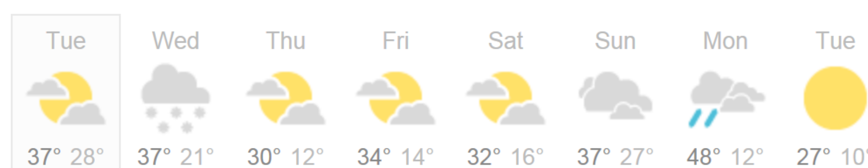
S A E M Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

ORIGINAL RESEARCH CONTRIBUTION

Predicting Emergency Department Inpatient Admissions to Improve Same-day Patient Flow

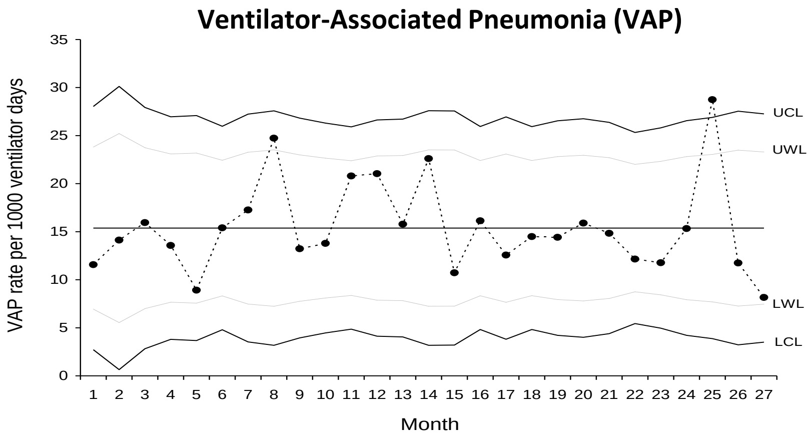
Jordan S. Peck, MS, James C. Benneyan, PhD, Deborah J. Nightingale, PhD, and Stephan A. Gaehde, MD, MPH

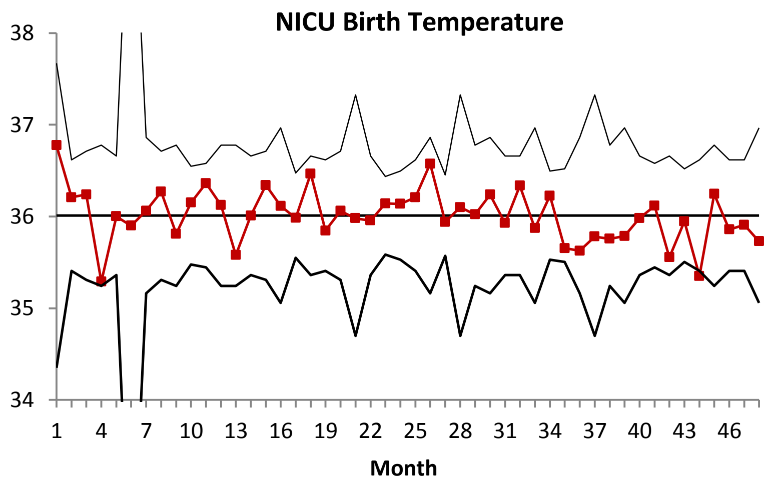




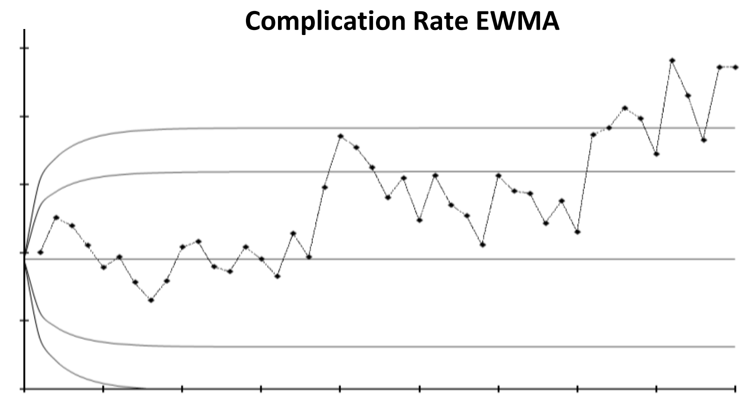
SPC methods

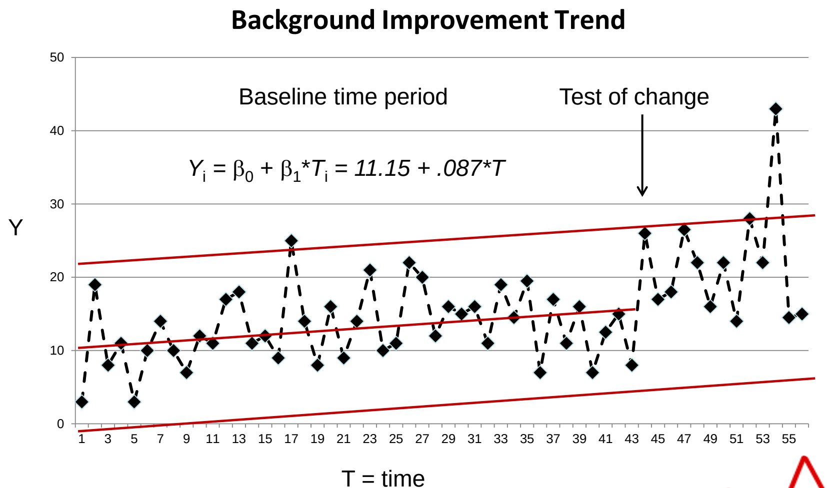
'Simple' Methods





Advanced Methods





Primary care team continuity

Primary care continuity coverage

Po

	FRI
AM	R
	F
	R
	R
PM	F
	R
	F
	R
Total teams	4
	4

Po ... 100%

CHA Malden Family Medicine Clinic Scheduling Model

Objective function

$$Maximize \sum_{n}\sum_{s\_prim}\sum_{w} X_{nsw}$$

Constraints

$$X_{nsw} \le \sum_{i\in n} A_{i1sw} + \sum_{j\in n} B_{j1sw} \quad \forall n,w,s \in s_{prim}$$

$$X_{n1s_{prim}w} = \begin{cases} 1 & \text{if any provider from teamlet } n \text{ is n FMC during session } s \text{ of week } w \\ 0 & \text{otherwise} \end{cases}$$

$$\sum_{t} B_{jtsw} = 1 \quad \forall j,s,w \in FMC_j$$

$$\sum_{j} B_{j1sw} + \sum_{i} A_{i1sw} \ge 7 \quad \forall s \in s_{prim}$$

$$\sum_{j} B_{j1sw} = 3 \quad \forall s \in s_{non}$$

$$\sum_{j=1}^{16} B_{j1sw} \ge 1 \;\forall s \in s_{non}, w$$

$$\sum_{t=2}^{6}\sum_{s_{prim}} B_{jtsw} = 1 \;\forall j,w \in FMC_j$$

$$\sum_{s_{prim}} B_{j11sw} = 1 \;\forall j,w \in FMC_j$$

$$B_{j\,11\,13\,w} = 0 \quad \forall j,w$$

$$\sum_{s_{prim}} B_{j10sw} = 1 \;\forall j,w \in FMC_j$$

$$\sum_{s} B_{j1sw} = 6 \quad \forall j \notin \{chiefs\}, w \in FMC_j$$

$$\sum_{s} B_{j1sw} = 5 \quad \forall j \in \{chiefs\}, w \in FMC_j$$

$$\sum_{s} B_{j1sw} + \sum_{s} B_{j77w} = 6 \quad \forall j,w \in FMC_j$$

$$\sum_{s}\sum_{t=1}^{7} B_{jtsw} + \sum_{s}\sum_{t=9}^{11} B_{jtsw} = 11 \quad \forall j,w \in FMC_j$$

$$B_{j95w} = 1 \;\forall j \in R2$$

$$B_{j98w} = 1 \;\forall j \in R3$$

$$\sum_{w}(B_{j311w} + B_{j34w}) = 9 \;\forall j \in \{1:8R2\}$$

$$\sum_{j}(B_{j311w} + B_{j34w}) = 2 \;\forall w$$

$$\sum_{w}\sum_{s\_prim} B_{j2sw} = 13 \quad \forall j$$

$$\sum_{w} B_{j2\,13\,w} = 0 \quad \forall j$$

$$\sum_{w}\sum_{s\_prim} B_{j2sw} = 13 \quad \forall j$$

$$\sum_{w} B_{j2\,13\,w} = 0 \quad \forall j$$

$$\sum_{w}\sum_{j} B_{j3sw} = 0 \;\forall s \notin \{4,11\}$$

$$3 \le \sum_{w}(B_{j311w} + B_{j34w}) \le 4 \;\forall j \in \{R3\}$$

$$\sum_{j} B_{j47w} = 1 \;\forall w$$

$$\left(\sum_{j} B_{j413w} = 1 \;\forall w\right)$$

$$\sum_{w}\sum_{j} B_{j4sw} = 0 \;\forall s \notin \{4,7\}$$

$$\sum_{w} B_{j47w} + \left(\sum_{w} B_{j413w}\right) = 9 \;\forall j \in \{R2\}$$

$$3 \le \sum_{w} B_{j47w} + \left(\sum_{w} B_{j413w}\right) \le 4 \;\forall j \in \{R3\}$$

$$\sum_{w} B_{j57w} = 2 \;\forall j$$

$$\sum_{j} B_{j57w} = 1 \;\forall w$$

$$\sum_{w}\sum_{j} B_{j5sw} = 0 \;\forall s \notin \{7\}$$

$$\sum_{w}(B_{j62w_{scl}} + B_{j64w} + B_{j610w}) = 12 \;\forall j \in \{R3\}$$

$$\sum_{j=9}^{16} B_{j62w_{scl}} \le 1 \;\forall w_{scl}$$

$$\sum_{j=9}^{16} B_{j64w} \le 1 \;\forall w$$

$$\sum_{j=9}^{16} B_{j610w} \le 1 \;\forall w$$

$$\sum_{w}\sum_{j} B_{j4sw} = 0 \;\forall s \notin \{2,4,10\} \sum_{j} B_{j77w_{scl}} = 1 \;\forall w_{scl}$$

$$\sum_{w}\sum_{j} B_{j7sw} = 0 \;\forall s \notin \{7\}$$

$$2 \le \sum_{w_{scl}} B_{j77w_{scl}} \le 3 \quad \forall j \in \{R2\}$$

$$2 \le \sum_{w_{scl}} B_{j77w_{scl}} \le 3 \quad \forall j \in \{R3\}$$

$$\sum_{j} B_{j86w} = 1 \;\forall w$$

$$\sum_{w}\sum_{j} B_{j8sw} = 0 \;\forall s \notin \{6\}$$

$$3 \le \sum_{w=1}^{52} B_{j86w} \le 4 \quad \forall j \in \{R2\}$$

$$3 \le \sum_{w=1}^{52} B_{j86w} \le 4 \quad \forall j \in \{R3\}$$

$$\sum_{t} B_{jtw1} + \sum_{t} B_{jtw2} + \sum_{t} B_{jtw3} \le 2$$

$$\sum_{t} B_{jtw4} + \sum_{t} B_{jtw5} + \sum_{t} B_{jtw6} \le 2$$

$$B_{j8w6} + B_{j8(w+1)6} + B_{j8(w+2)6} + B_{j8(w+3)6} \le 1 \quad \forall j,w$$

$$B_{j1w1} + B_{j1w2} + B_{j1w3} \le 2 \;\forall j,w$$

$$B_{j1w4} + B_{j1w5} + B_{j1w6} \le 2 \;\forall j,w$$

$$B_{j1w3} + B_{j8w6} \le 1 + y_{1jw} \quad \forall j,w$$

$$B_{j1w9} + B_{j8w6} \le 1 + y_{2jw} \quad \forall j,w$$

$$B_{j1w6} + B_{j1w3} \le 1 + y_{3jw} \quad \forall j,w$$

$$B_{j1w6} + B_{j1w9} \le 1 + y_{4jw} \quad \forall j,w$$

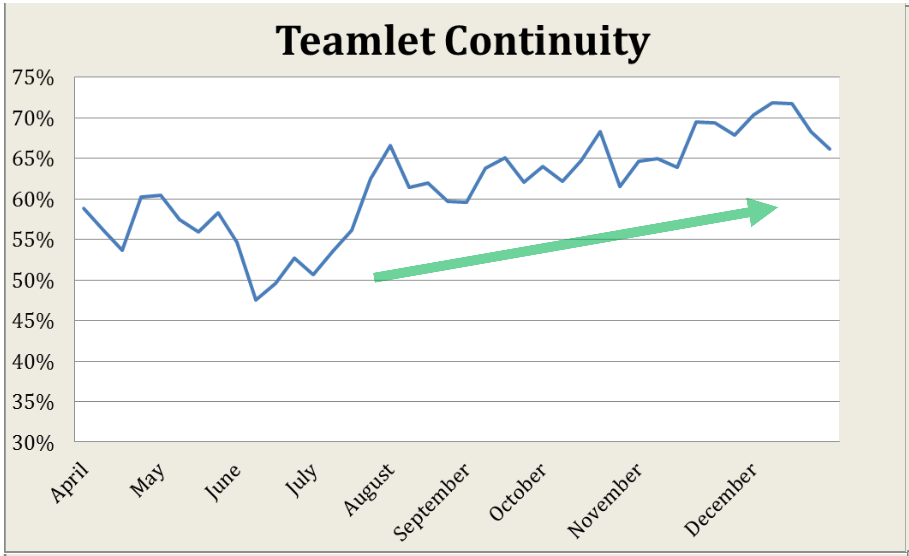
$$B_{j1w3} + B_{j1w6} \le 1 + y_{5jw} \quad \forall j,w$$

$$\sum_{w}\sum_{o=1}^{4} y_{ojw} \le 1 \quad \forall j$$

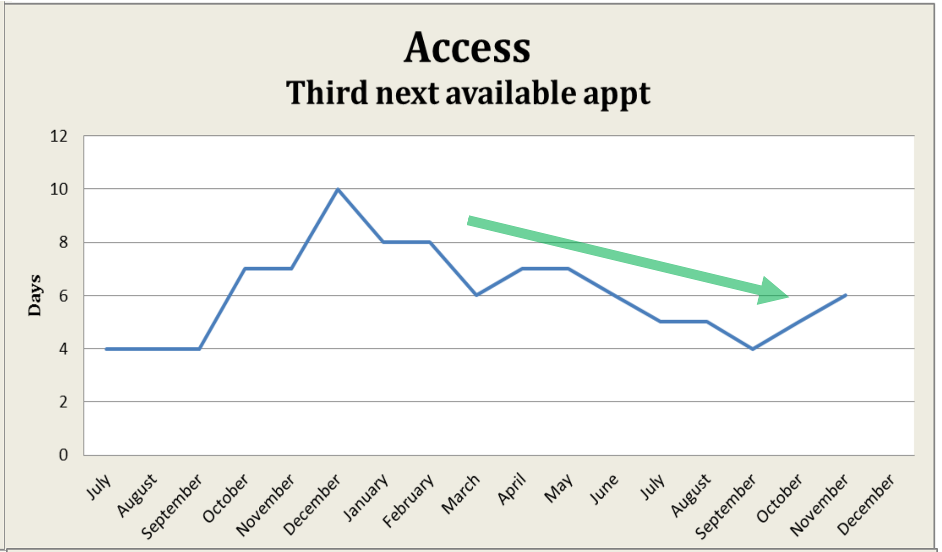
$$\sum_{w} y_{5jw} \le 2 \;\forall j$$

- Better continuity → Better prevention, outcomes, re-visits

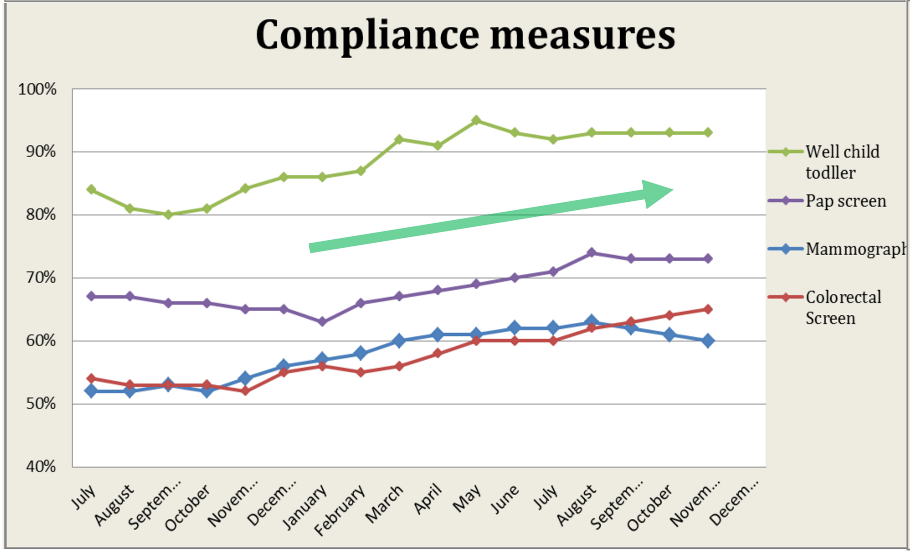
Results



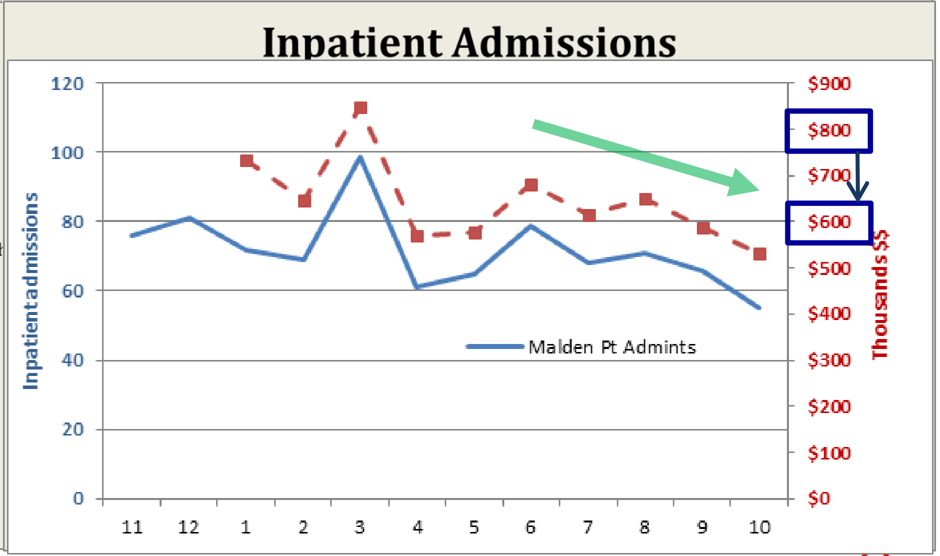
Teamlet Continuity
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
April
May
June
July
August
September
October
November
December



Access
Third next available appt
Days
12
10
8
6
4
2
0
July
August
September
October
November
December
January
February
March
April
May
June
July
August
September
October
November
December



Compliance measures
100%
90%
80%
70%
60%
50%
40%
Well child toddler
Pap screen
Mammograph
Colorectal Screen
July
August
Septem...
October
Novem...
Decem...
January
February
March
April
May
June
July
August
Septem...
October
Novem...
Decem...



Inpatient Admissions
Inpatient admissions
120
100
80
60
40
20
0
Malden Pt Admints
$900
$800
$700
$600
$500
$400
$300
$200
$100
$0
Thousands $$
11
12
1
2
3
4
5
6
7
8
9
10

Summary

1. Industrial and systems engineering under used in health care
2. National CMS large demonstration project
   - Impact, visibility, workforce development
3. Regional extension center as one model
4. Open to any health system
   - How can we help you?
   - How can you help us?

Thank you

www.hsye.org

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Project proposal process

Northeastern University
Healthcare Systems Engineering Institute

HSyE

CMS Triple Aim Project Definition (1-pager)

Project		System		Date	
Lead engineer	☐ CB ☐ JB ☐ VS ☐ SG ☐ BN ☐ AC ☐ SB ☐ KB ☐ ______			☐ Aim statement ☐ Driver diagram ☐ Measure defs.	☐ ≥ 50% baselines ☐ Implement plan ☐ Good standing
Status	☐ Approved ☐ Declined ☐ Further scope				

Project aim statement (Accomplish what, by how much, by when, by what method)	Estimated impact	
	Cost	
	Care	
	Health	

Aim	Process Measures	Outcome Measures
Cost	☐ Standard measure ☐ Baseline runchart ☐ Approved	☐ Standard measure ☐ Baseline runchart ☐ Approved
Care	☐ Standard measure ☐ Baseline runchart ☐ Approved	☐ Standard measure ☐ Baseline runchart ☐ Approved
Health	☐ Standard measure ☐ Baseline runchart ☐ Approved	☐ Standard measure ☐ Baseline runchart ☐ Approved

Approach (key steps, completion dates) ☐ Approved

Implementation plan ☐ Project end date: ______ ☐ Approved

How:
Who:
When:
Where:

Spread potential : ☐ None ☐ Little (1-5 systems) ☐ Many (≥ 12 systems) ☐ Very broad

Timeline:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scope/define/approve (1month)												
Conduct (phase1: ______)												
Conduct (phase2: ______)												
Implement, refine												
Evaluate, finalize docs												

O : Planned ✓ : Completed XX : Project done

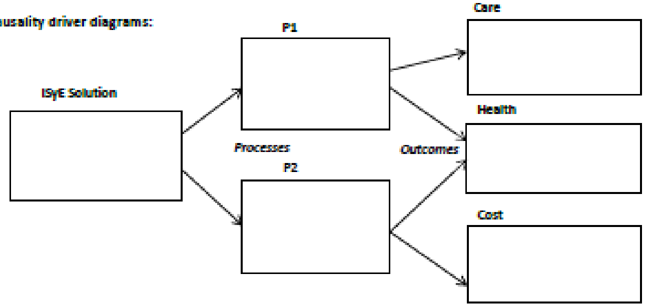
James Benneyan, HSyE Director Date

Northeastern University
Healthcare Systems Engineering Institute

HSyE

Supporting Details – Page 2Supporting Details – Page 2

Causality driver diagrams:



Operational definitions:

Name	Calculation	Name	Calculation

Baseline run charts: (≥50% of measures)