Implementing Research: Lessons Learned from Improving Clinical Performance Measures

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Connecting Research with Patient Care

Introduction

- Objective
  - Enrich the dialogue on implementation science by providing a different perspective
  - Expose QUERI implementers to an empiric model for effecting improvement
- Perspective
  - The Goal: Operationalize Research
  - Implementation science provides guidance
    - But must be adapted for context
  - Brutally pragmatic about the literature
    - Impact, not understanding, is the measure of value

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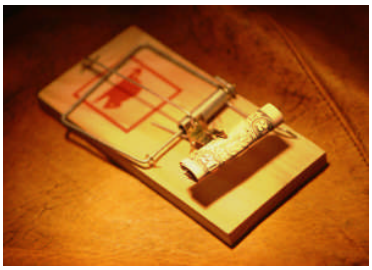
I have built it.
Why did they not come?



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A Story

- A young investigator comes to you
- An Alternate Ending:
- The young investigator volunteers to facilitate implementation
- What do you think is the likelihood of adoption?
- c) Get right on it and have it implemented in 30 days

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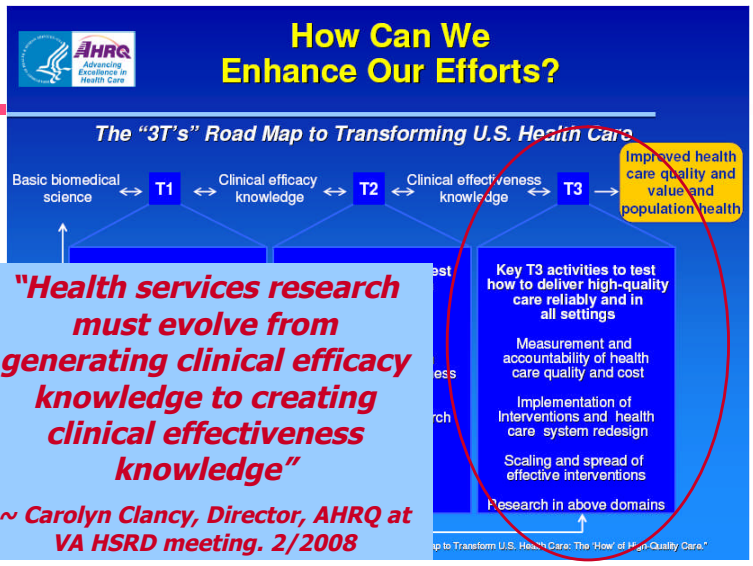

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Dougherty, D. and Conway, P.H. (2008, May). "The '3T's' road map to transform US health care." *Journal of the American Medical Association* 299(19), pp. 2319-2321

Our Hypothesis

- To shorten the implementation interval, clinical investigators must "own" their findings and get into the mud of quality improvement

Lean Concept:

"Gemba" – where the truth can be found;" the place where value is added; the shop floor

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Action Research and Lean Healthcare Change Facilitation

- Action Research*
  - Directed at improving safety, quality, access, etc. ("value")
  - Plan, Act, Observe, Reflect (PAOR)
  - Involvement
    - Vs. "extractive"
  - Goal: achieve change and ***"understanding"***
- Change Facilitation
  - Directed at improving safety, quality, access, etc. ("value")
  - Plan, Do, Study, Act (PDSA)
  - Gemba
    - Vs. "managing"
  - Goal: achieve change and ***"improvement"***

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* Dick, B. (2002) *Action research: action and research* [On Lline]. Available at http://www.scu.edu.au/schools/gcm/ar/arp/aandr.html, accessed 12/7/2008

The Right Stuff: Investigators as Change Facilitators

- Existing attributes
  - Passion for topic (ownership)
  - Data driven (empiric)
  - Analytical (deductive)
  - Hypothesis generation (experimentalist)
  - Project manager
- Skills needed
  - Social Engineering
    - Change facilitation
    - Organizational & group dynamics
  - Process improvement methods (Lean Healthcare)

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Lean Healthcare

- A framework for organizational improvement derived from:
  - Lean (and six sigma)
  - Complexity science
  - Business management theory and practice
  - Organizational development theory and practice

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Lean Healthcare

- Grounded in four <u>useful</u> mental models:
  - Reppening QI Model
  - The Value Improvement "Stool"
  - Rapid Cycle Change PDSA
  - Stacey Complexity Diagram
- With emphasis on practical tools and methods
  - Tailored to the "complexity" of the specific initiative

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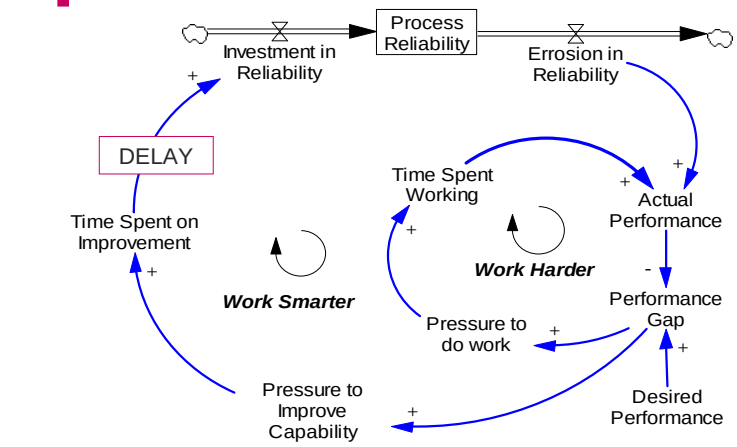
Reppenning QI Model



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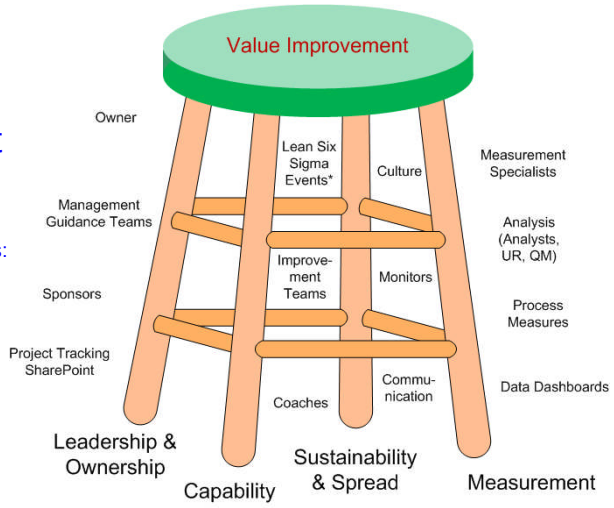
* Repenning, N. and J. Sterman (2001)., *California Management Review*, 43, 4: 64-88

Value = (Safety + Quality + Access + Service) / Cost

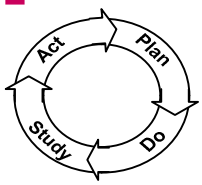
Lean Healthcare Improvement Model

Key enabling elements:
- Microsystems
- √ N
- Structure



*Lean Six SigmaEvents: RCC/PDSA, RPIW, 100 Day Projects

Rapid Cycle Change (RCC) PDSA



Make many small scale, hypothesis driven, testable changes using PDSA

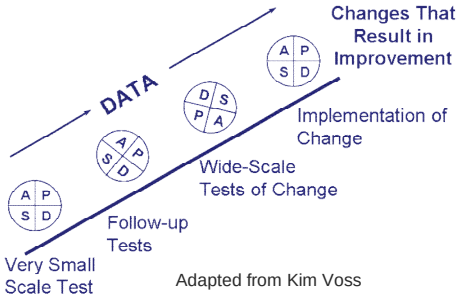
Those that seem to work, test in increasingly larger settings

Plan an improvement

Do – Test the improvement

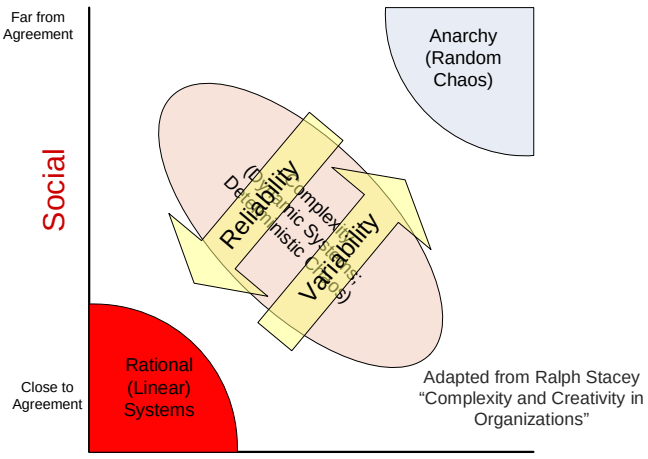
Study the effects by analyzing data

Act upon this information (adopt, adapt, abandon)



The Stacey Matrix: Reliability, Variability & Complexity

The Impact of Variability on System Complexity



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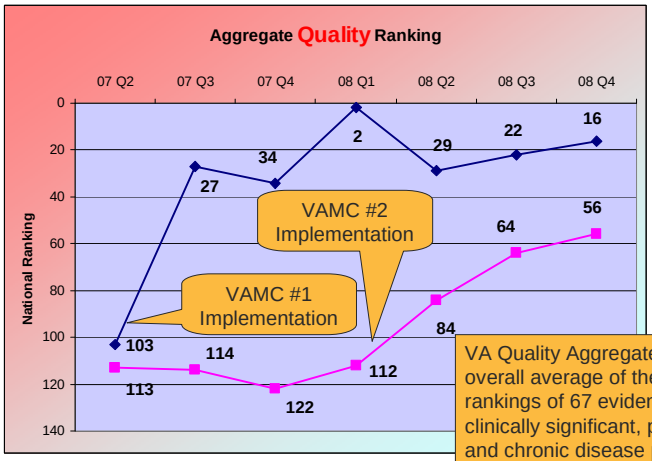
Effectiveness of Lean Healthcare Improvement



VA Quality Aggregate is the overall average of the individual rankings of 67 evidence-based, clinically significant, preventive and chronic disease performance measures (includes HEDIS and ORYX)

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Implementation Outside VA (2005-2007)*

Table 3. Summary of Project Sustainability and Spread Assessment

Project Categories	Sustainability*				Spread*			
	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor
# of Projects	14	11	7	0	12	12	5	3
% of Total Projects	44%	34%	22%	0%	37.5%	37.5%	16%	9%
% of projects sustained >6 months	78%							
% of projects exhibiting spread with limited or no faculty assistance	75%							

* Sustainability and Spread Assessment performed only on projects that were implemented.

*** Woodward-Hagg, H.**, Doebbeling, B , Workman-Germann, J., Flanagan, M., Scachitti, S., Suskovich, D., Corum, C., (2008) Implementation of Systems Redesign: Approaches to Spread and Sustain Adoption, AHRQ Advances in Patient Safety: New Directions and Alternative Approaches

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Challenges to Implementing EBP (and Research)

"To avoid getting stuck in mud, you need to understand its properties"

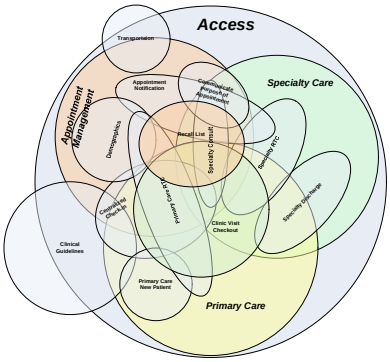
~ NOAA file photo

Challenges: "Complexity"

Research happens in controlled environments

Clinical care happens in complex environments

Access Management



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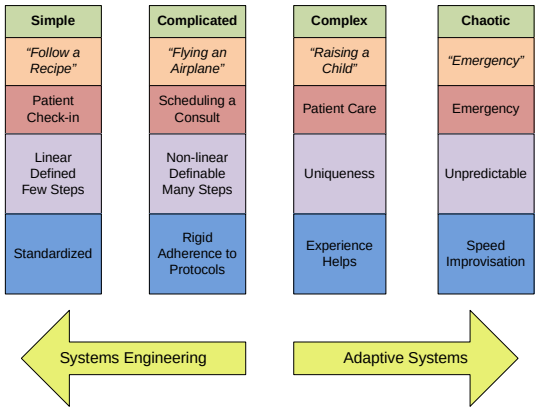
Roudebush VA Medical Center
1/27/2006

Challenges: Process vs. Professionalism

Industry vs. Craft Paradox



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Adapted from Brenda Zimmerman, 2002

Challenges: Diversity of Organizational Perspectives

- Macro
  - Senior leadership
  - Vision and Strategic Direction
- Meso
  - Midlevel managers and supervisors
  - Policies and Procedures
- Micro
  - Frontline staff
  - Processes

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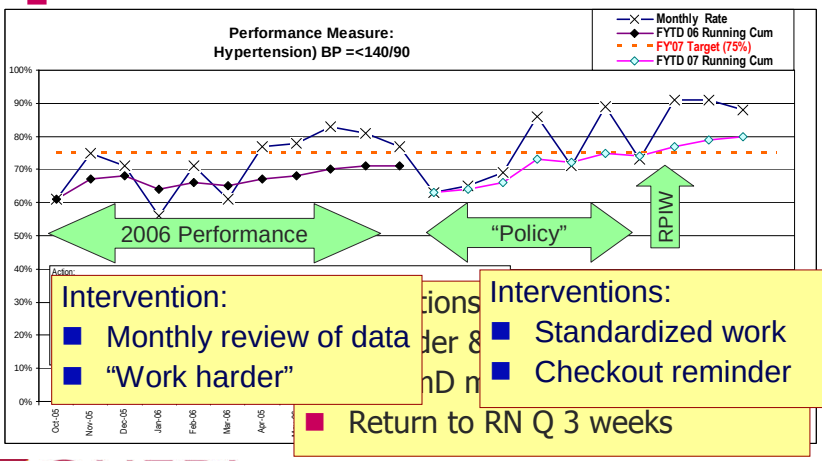
- Nelson, et al Quality by Design

Case Study: Hypertension Policy v. Process



Intervention:
- Monthly review of data
- "Work harder"

Interventions:
- Standardized work
- Checkout reminder

- Return to RN Q 3 weeks

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Case Study: Medication Management

Containment Team Outcome:

10 fold decrease in medication management errors in 2 weeks

Containment Team Discoveries:

Unreliable processes and systems → work arounds

→ Charter an RPIW to look at medication management on **one ward** (microsystem)

→Other wards to adapt / adopt

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The Incubators of Improvement: Clinical Microsystems

"A small group of people that work together to provide care to discrete subgroup of patients"

- Microsystems are the building blocks of hospitals
- It is where:
  - Care is made
  - Quality, safety, reliability, efficiency and innovation is made
  - Staff morale and patient satisfaction is made
- Hospital quality = sum of the quality of its microsystems
- Therefore, the job of every person in each microsystem to:
  - Care for their patients
  - **And,** to improve care

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- Nelson, et al Quality by Design

The Key to Improvement

- Create an organizational culture of "**experimentalists**" that strive continuously, **in their microsystems**, to reduce process ambiguity and workarounds so as to improve safety, effectiveness, patient-centeredness, timeliness, efficiency and equity

"What sets companies like Toyota apart is not their portfolio of existing solutions but their ability to generate new ones repeatedly"
– S. Spears

The Common Ground for Research and Patient Care

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Overcoming the Challenges

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Connecting Research with Patient Care

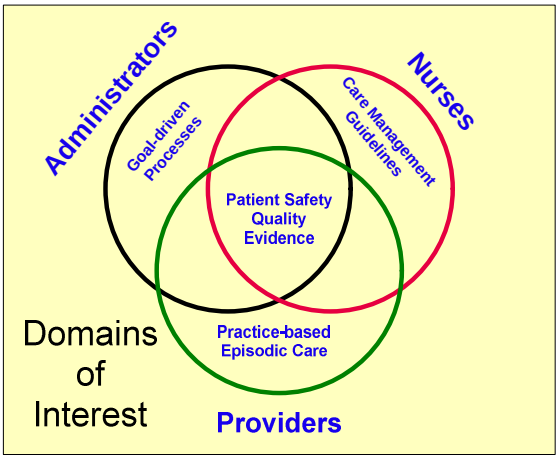
Discover Common Purpose

Patient Safety

Quality*

Evidence

**But what does quality mean?*



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Discover Common Purpose

- Reduce hassles and waste
  - What is waste?
  - How can we tackle it?

"Physicians need time to listen, examine, think, explain, interpret, and comfort (value adding). Activities that take time away are waste. Healthcare organizations need to improve flow and identify and eliminate time stealers." ~ p. 5

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Reinertsen JL, Gosfield AG, Rupp W, Whittington JW. IHI Innovation Series white paper. Cambridge, MA: Institute for Healthcare Improvement; 2007

Lean Basics

- A generic process management philosophy directed at smoothing flow and eliminating waste
  - Although rooted in manufacturing (Toyota), extensively adapted to service industries including healthcare

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Lean Concepts

- Value
  - Value is determined by the "customer" (patients; ordering provider; the person we serve)
- Waste
  - Anything that does not add value from the customer's perspective
- Value stream
  - The actions (and waste) taken to create value

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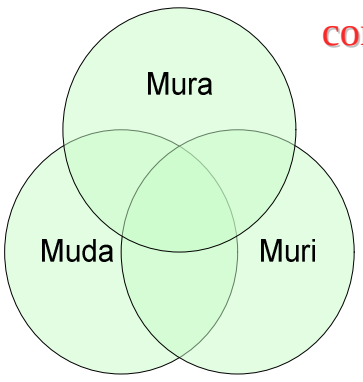
What is Waste?

Non-value adding, resource consuming activities



- Mura – unevenness in demand
- Muri – overburdening people or equipment
- Muda – process steps that do not add value

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Overburdening and Errors

- Nurse overloading leads to 24% of all sentinel events

Eugene Litvak, PhD, IHI MHO Course

- For each patient over optimum patient-to nurse staffing ratio, the 30 day mortality rate increases by 7%

Aiken L.H., et al.: Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. JAMA 288:1987–1993, Oct. 23, 2002.

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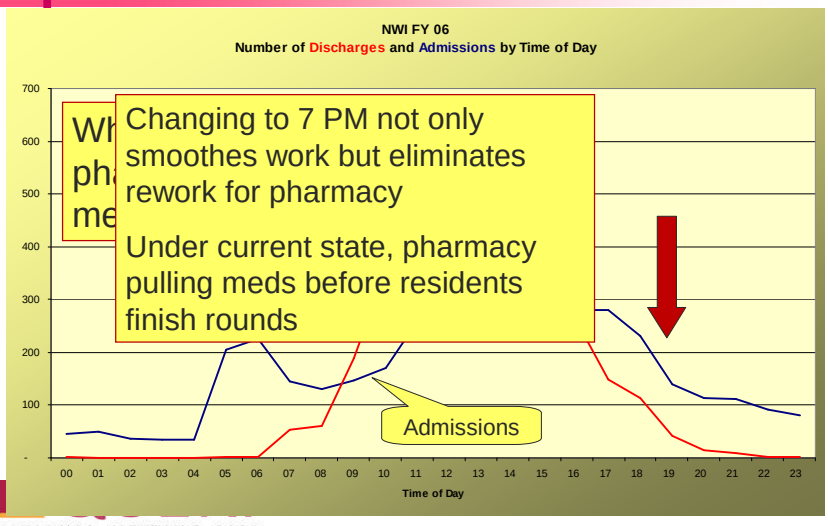
Artificial Overburdening



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Bar Code Medication Administration Bypassing: A Case Study

- Prior Interventions at one VA:
  - Wristband printers replaced
  - Increased number of laptops
  - CAC-BCMA Coordinator created and filled
  - Missed Medication and PRN Reports (autoprint)
  - LR/NS Bolus stocked on floors
  - No more D5W on floors
  - Removed barcodes from patient labels
  - I-Carts
- Problem Persists; Lean Healthcare RPIW Chartered

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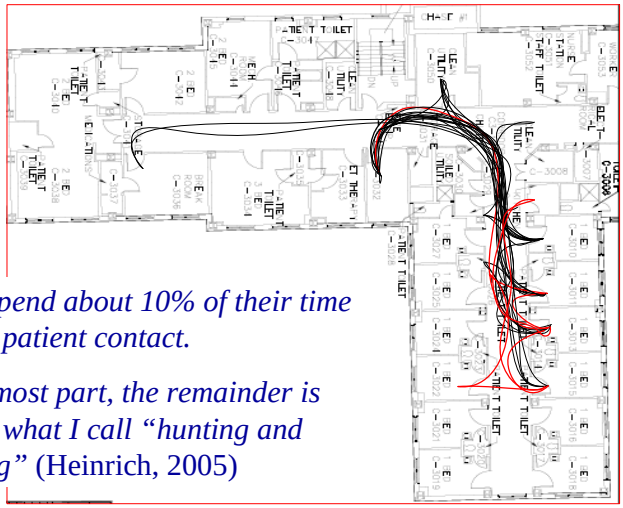
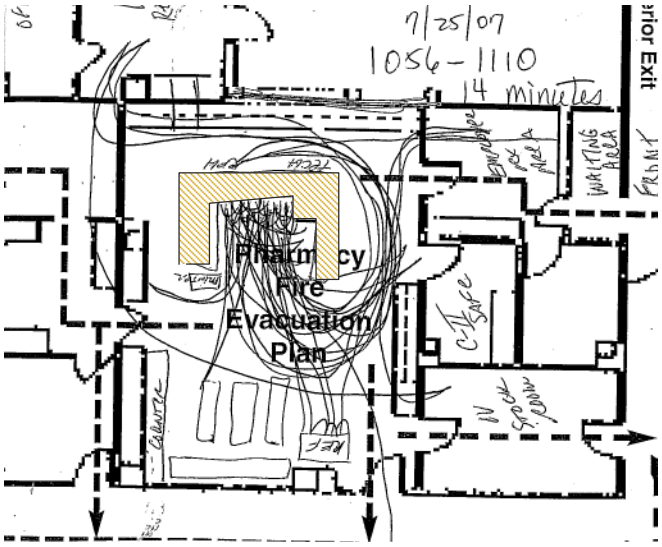
BCMA Bypass Analysis



Nurses spend about 10% of their time in direct patient contact.

For the most part, the remainder is spent on what I call "hunting and gathering" (Heinrich, 2005)

14 minutes in the life of a Pharmacy Tech



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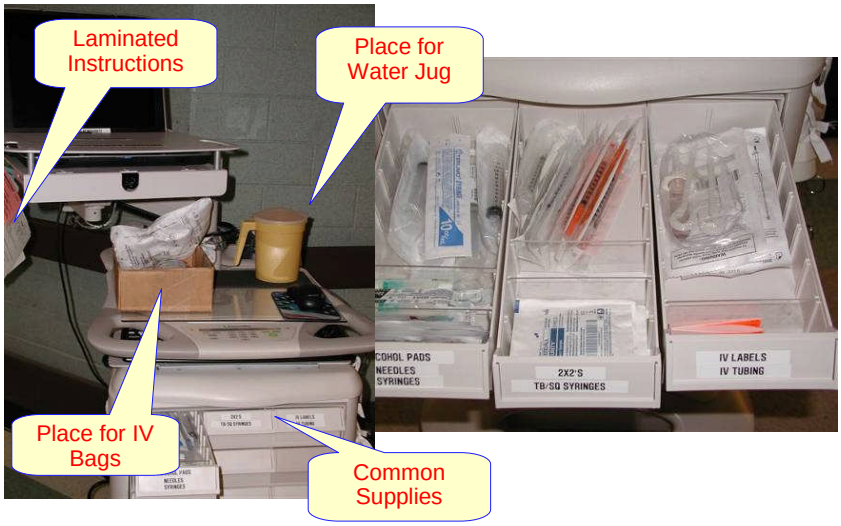
Med/Isolation Carts – Current State

BCMA Cart – Post 5S Mock-up



BCMA Cart – Post 5S

RPIW Baseline / Outcomes Data

	Baseline	Post-RPIW
Distance traveled to pass meds to one patient	181	33
Number of attempts before med pass complete for one patient	3.3	1.0
Totals log-ins per patient med pass	10	3
Total time to pass meds to one patient	18	3

Time saved for other patient care activities = 15 min x 100 ADC x 3 shifts x 365 = **27,375 hours per year (~16 FTE)**

Lean Healthcare: Leadership, Ownership & Structure

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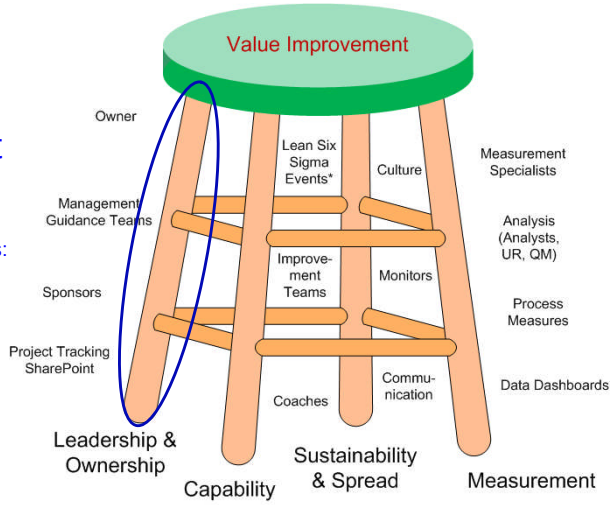
Connecting Research with Patient Care

Value = (Safety + Quality + Access + Service) / Cost

Lean Healthcare Improvement Model

Key enabling elements:
- Microsystems
- √ N
- Structure



*Lean Six SigmaEvents: RCC/PDSA, RPIW, 100 Day Projects

Why Leadership?

"To introduce any new article of food among seamen, let it be ever so much for their good, requires both the example and the authority of the Commander"

-James Cook, 1780

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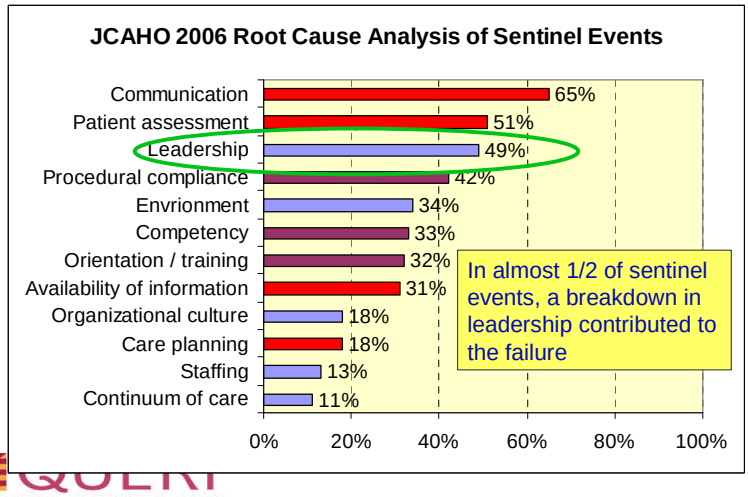
Berwick, JAMA (2003) 289:1969 42

Why Leadership?



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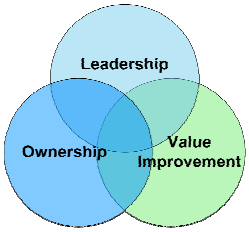
Leadership and Ownership: The NWI Way Leadership Initiative

- We are all leaders
  - North Platte Canteen*
- We are all owners
  - Take ownership for what you do
- We all create value
  - The lens by which all our activities are examined

NWI Way



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* Greene, B "Once Upon a Town" Perennial, 2003

Lean Healthcare Ownership Roles

- Sponsor
  - Senior leader
  - Macro-perspective
- Management Guidance Team (MGT)
  - Mid-level managers
  - Meso-perspective
  - "Policy"
- Owner
  - "Eye on the ball"
  - Micro-perspective
- Improvement Team
  - Understand process
  - "In the mud"
- LH Change Facilitator
  - "In the boat" with the team
  - Help teams see the problem
  - Provides just-in-time training and assistance
- Measurement Specialist
  - Team member
- Administrative Support
  - Team member
- Consultants & Stakeholders
  - Perspective

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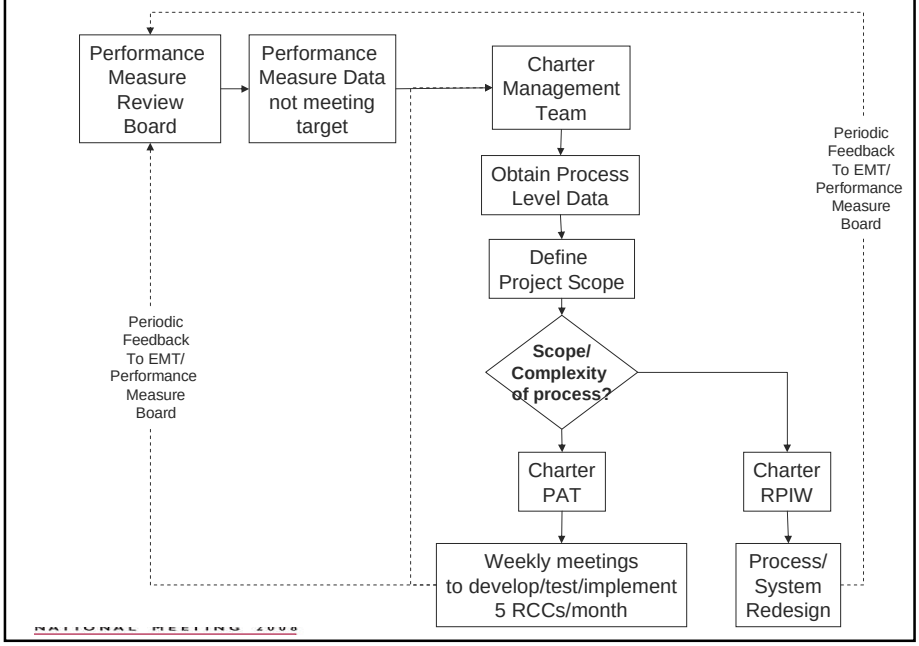
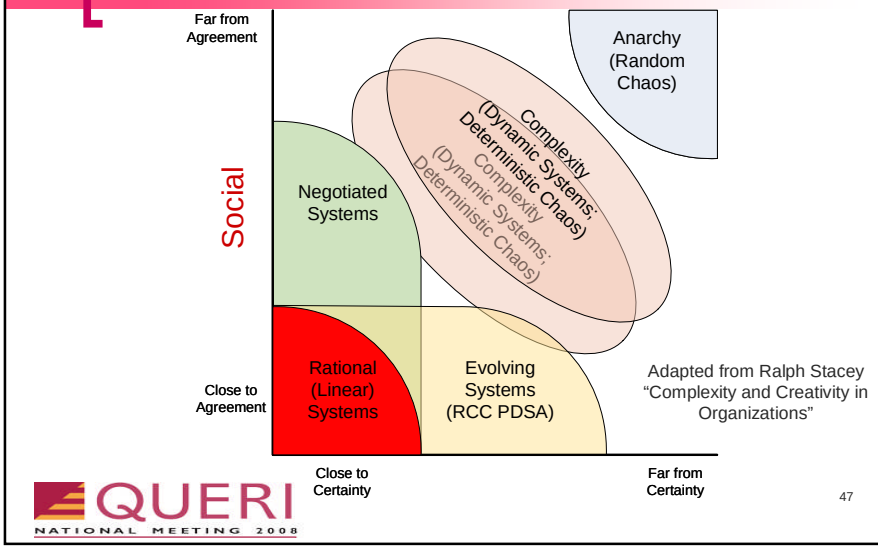
Lean Improvement Cycle

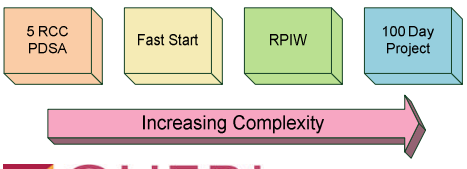


Using Lean Healthcare to Address Complexity



Matching Intensity of Effort to Initiative Complexity

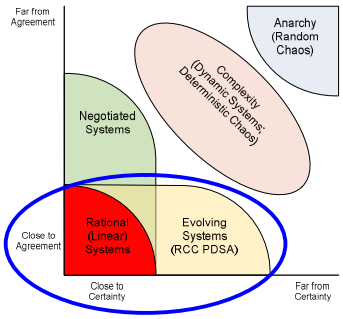
- 5 RCC PDSA
  - Within a clinical microsystem
  - Microsystem is capable
- Fast Start Project
  - Defined charter
  - Little analysis required
  - Motivated team
- Rapid Process Improvement Workshop (RPIW)
  - Defined charter
  - Many RCC PDSA
  - A lot of progress likely in one week
- 100 Day Project
  - Analysis required
  - Ambiguous charter
  - Follows DMAIC



5 RCC PDSA

- 5 RCC PDSA per month
  - Responsibility of Owner, MGT, and Sponsor
  - Indentify 5 improvement ideas to test each month
  - Use small tests of change
  - Test each idea for quantifiable impact
- No charter
  - "Improvement" is charter
- Success depends on
  - Motivated team
  - Capable team

- Use when there is good "agreement" but weak evidence as to best practice



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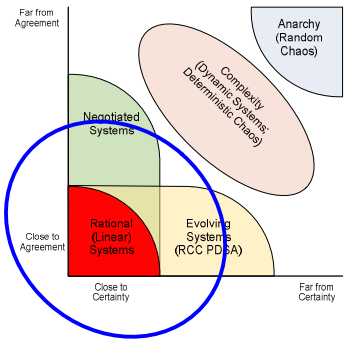
Fast Start Project

- One day "mini-blitz" followed by weekly meetings
  - First day:
    - Process map
    - Isolate problems
    - Identify RCC PDSA
  - Up to 6 weeks
    - Analyze results RCC PDSA
    - Additional RCC PDSA
- Has charter
- Progress tracked at monthly milestone meetings

- Best used for "simple" problems that may require a structured environment for "negotiation"



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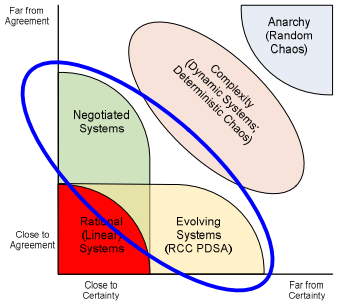
Rapid Process Improvement Workshop (RPIW)

- Weeklong (40 hour) event + 90 day weekly follow-up
  - Combine education and improvement
  - Highly structured
  - Day 1-2 analysis
    - VOC & PD
    - Process map
    - Isolate problems
  - Day 3-5 RCC PDSA
    - 20-30 small tests of change in one week
- Best used for "complicated" but well defined problems



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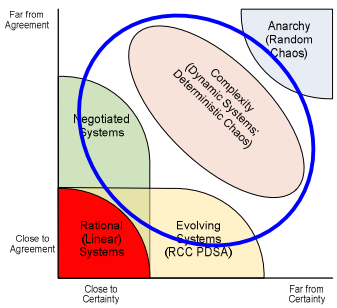
100 Day Project

- Advanced Lean
  - Based on DEDISS cycle
    - Define → Evaluate → Design → Implement → Spread → Sustain
  - 3 hour meetings weekly for 8 weeks followed by 1 hour meetings for 6 weeks
  - Just in time training of team
  - Formal "go / no-go" milestones
  - Often requires value stream mapping
- Use for "complex" problems
  - May spin off other project teams



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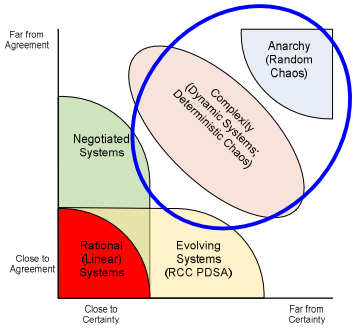
Systems Engineering

- Systems Engineering Project
  - Uses engineering tools to analyze problems and simulate solutions
  - Formal project plan with defined milestones
  - Formal "go / no-go" milestones
  - Solutions often rest on improving human performance (human factors and cognitive engineering)
- Use for "chaotic" problems
  - Separate deterministic from random chaos



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Coaching and Lean Healthcare Change Facilitation

Give a man a fish and he will eat for a day. Teach a man to fish and he will eat for a lifetime. ~Confucius

But to teach, you must get in the boat!!

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Lean Healthcare: Creating Improvement Capability

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Connecting Research with Patient Care

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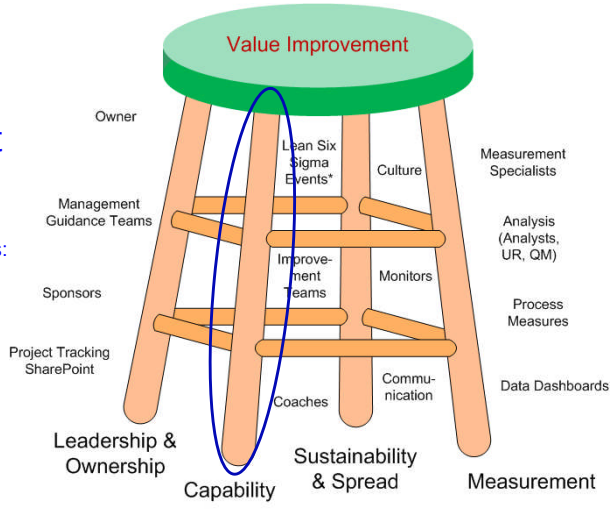
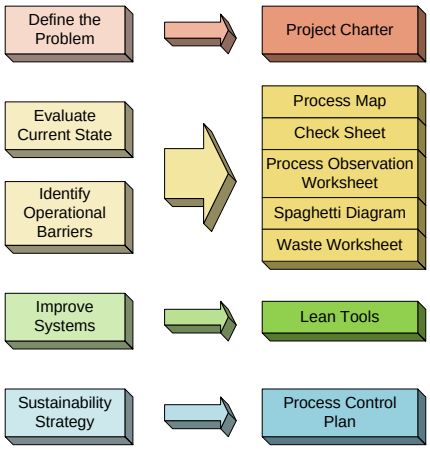
- √ N
- Structure



*Lean Six SigmaEvents: RCC/PDSA, RPIW, 100 Day Projects

Lean Improvement



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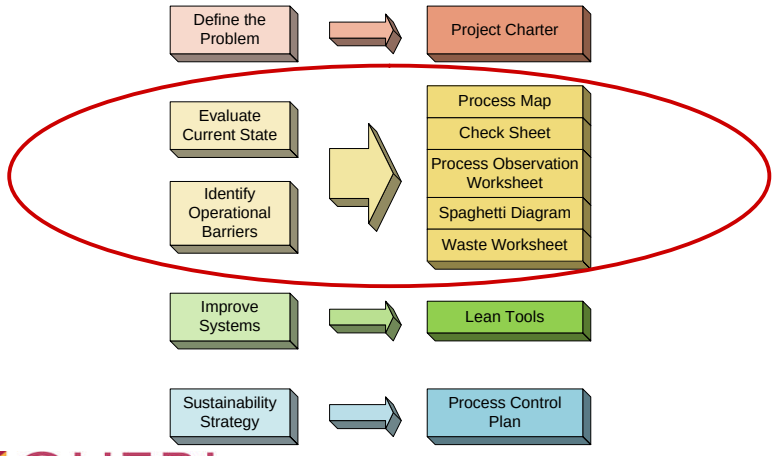
Adapted with permission: LSSHC

Lean Improvement



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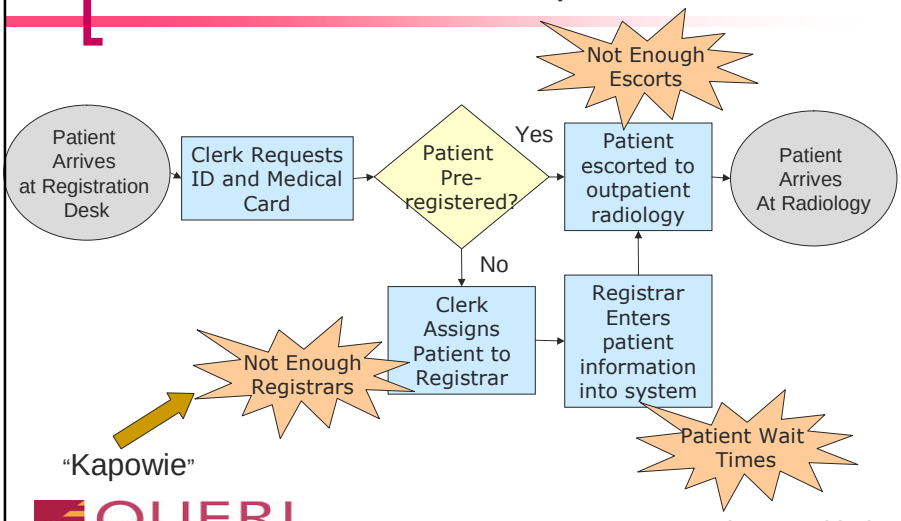
Outpatient Registration Current State Process Map



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Courtesy LSSHC

Process Flow Diagram

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Voice of the Customers

- Select Key Process Customers:
  - Customers that are important to the project success
  - Customers that are not adequately represented within the team membership.

"Customers" are anyone impacted by the process

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By permission: LSSHC

Voice of the Customer Interviews

- What do you like about our services (Strengths)?
- What do you think needs improvement (Weaknesses)?
- What Opportunities do you feel we could take advantage of?
- What could potentially Threaten our success?

Let the Customer Talk - *Listen Carefully* - Record Responses

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By permission: LSSHC

Identify the "Positive Deviants"

- Positive deviants are the successful outliers
  - They are the individuals that get it right when others fail
- Learn from the positive deviants
  - Analyze their success
  - Use their practices to identify process improvements
- Make positive deviant activities visible to others in the group
  - Healthcare workers are "learners"
  - They learn best from peers

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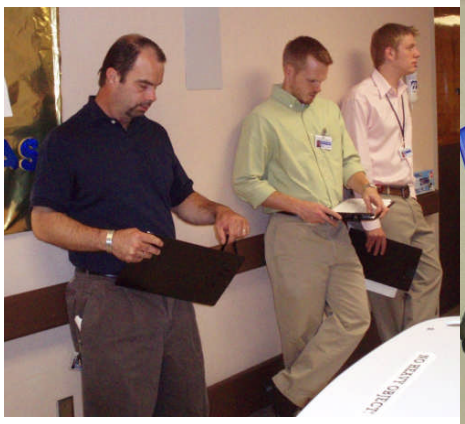
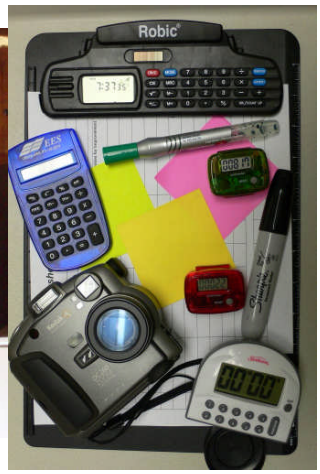
Observe the Process
Gather Process Data





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Process Observation Worksheet Example

Worksheet						
Process:	**Patient check-in**					
Step #	**Description**	**Distance**	**Clock Time**	**Task Time**	**Wait Time**	**Observations**
			0:00			
1	Patient arrives		0:10	0:10		
2	Clerk requests ID		0:13	0:03		
3	Patient registered (Y/N)		N			
3A	Patient sent to HBU	575	0:15	0:02		
3B	HBU registers patient		0:47	0:32	0:20	
4	Appointment (Y/N)	575	N			
4A	Make walk-in appointment		0:50	0:03		
5	Check patient in		0:52	0:02		
6	Patient sent to waiting room	100	0:56	0:04		

Distance traveled In steps

Enter time that step was completed.

Task time calculated later…

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Check-sheet Example

Project Name:	**MRSA**				
Output Metric:	**Handwashing**				
Date / Time	Unit	Room #	Followed handwashing protocol	Reason for Non-compliance	Comment
5/18/2007	5E	124	Yes		
5/18/2007	5E	126	No	Non-cleanser in dispenser	
5/18/2007	5S	148	No	Nurse carrying items; no place to put down	

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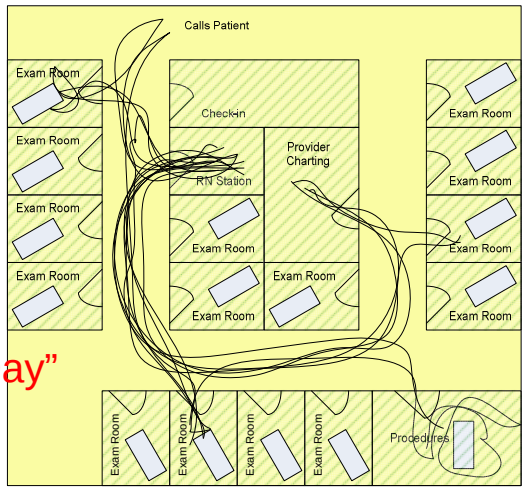
Spaghetti Diagram
Clinic 5 Room Turnover Project



"6+ Miles per Day"

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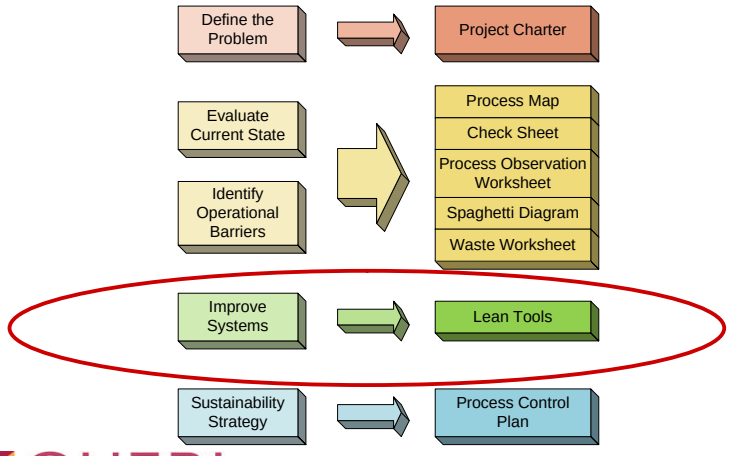
Lean Improvement



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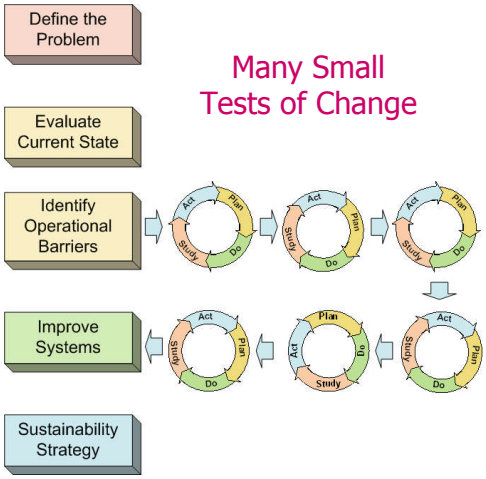
Lean & RCC PDSA



Many Small Tests of Change

Start Small and Evolve to Full Scale

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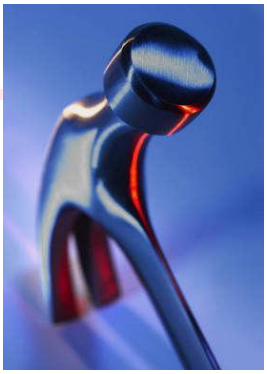
Basic Lean Tools



- Apply Lean Tools to reduce or eliminate waste
  - 5S
  - Visual Controls
  - Visual Workplace rules
  - Workstation Design
  - Setup Reduction

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5S Workplace Organization

- Five "S"
  - Sort
  - Simplify (Set in order)
  - Standardize
  - Sweep (Shine)
  - Sustain (Self Control)
- NOT
  - Scrounge
  - Steal
  - Stash
  - Scramble
  - Search

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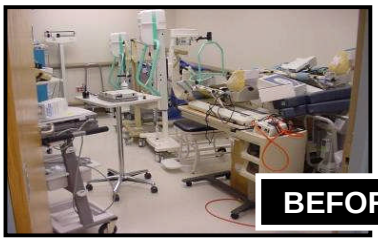
5S Anesthesia "Shadow Board" - Before

From Virginia Mason

5S Anesthesia Shadow Board - After

Pittsburg VA – Equipment Room



BEFORE

IV Pumps
(4)
Always Plugged In

Whiteboard indicates location

AFTER

Benefits

Clean equipment = pathogen vector

Saves frustration, searching

Freed up $20K-worth of unused equipment for use elsewhere

Lean Healthcare: Sustainability and Spread

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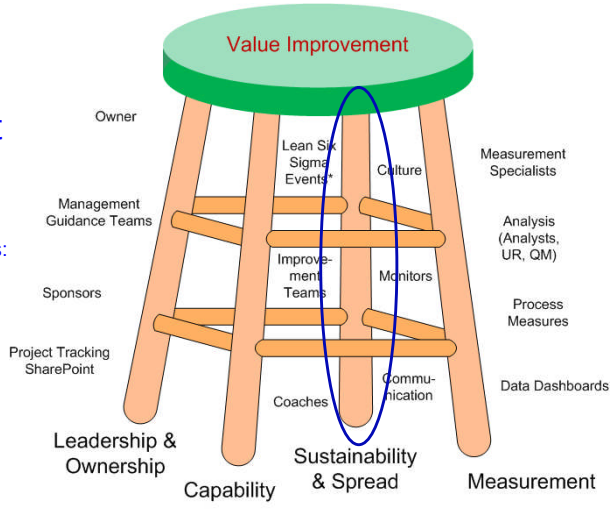
Connecting Research with Patient Care

Value = (Safety + Quality + Access + Service) / Cost

LH Value Improvement Model

Key enabling elements:
- Microsystems
- √ N
- Structure



*Lean Six SigmaEvents: RCC/PDSA, RPIW, 100 Day Projects

Sustainability

"The first rule of sustainability is to align with natural forces, or at least not try to defy them."
~Paul Hawken

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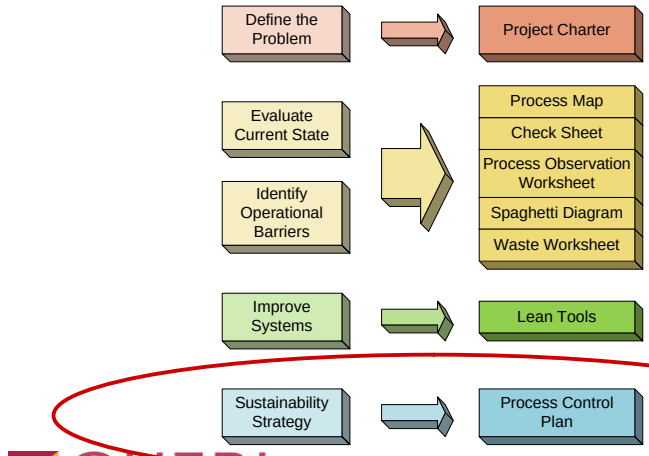
Lean Improvement



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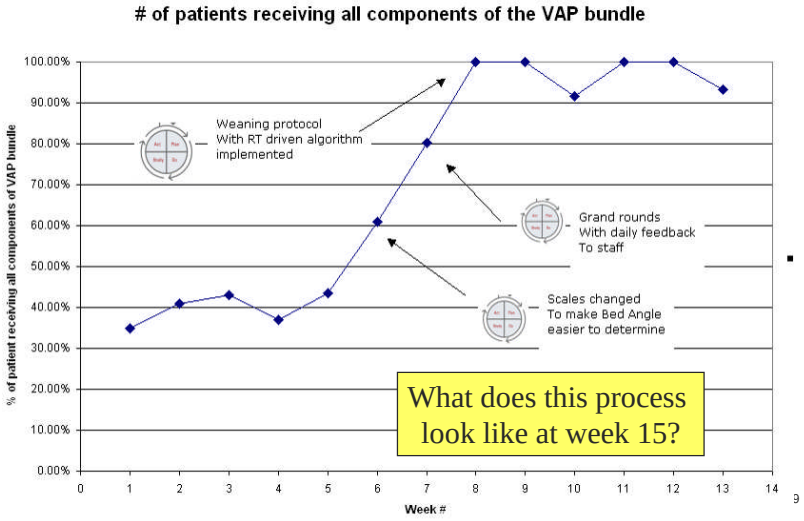
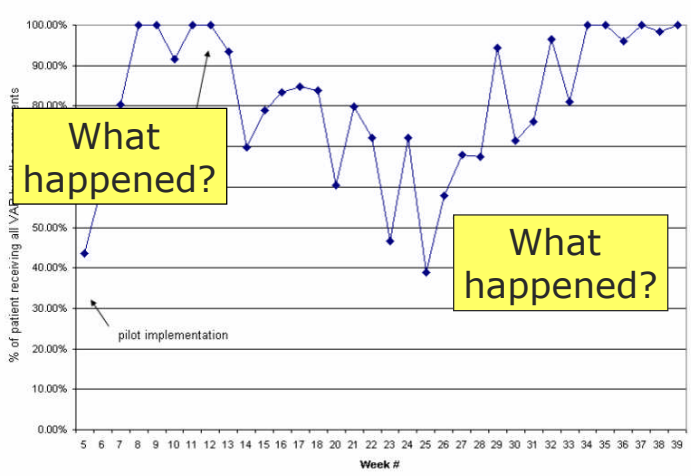
VAP Bundle Implementation

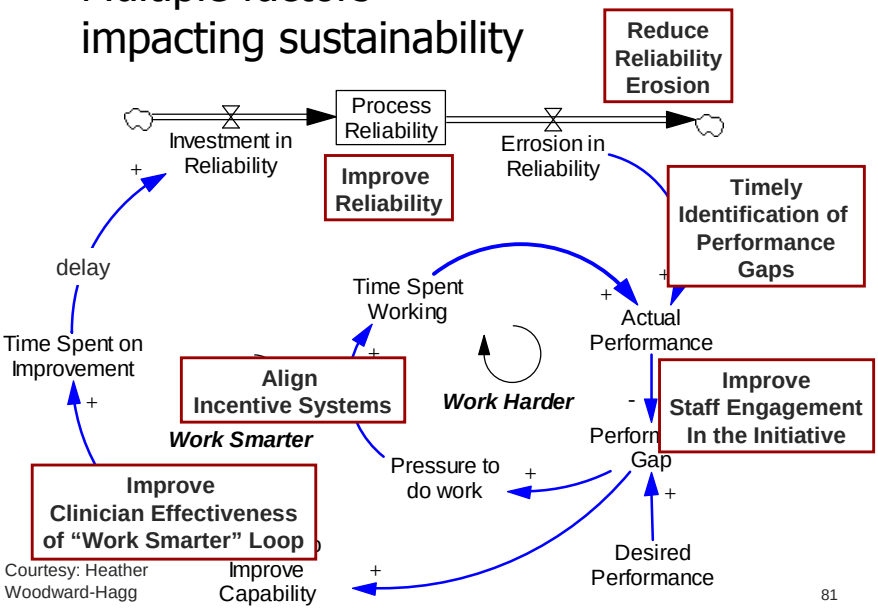


Sustainability



Woodward-Hagg, H., El-Harit, J., Vanni, C., Scott, P., (2007). Application of Lean Six Sigma Techniques to Reduce Workload Impact During Implementation of Patient Care Bundles within Critical Care – A Case Study. *Proceedings of the 2007 American Society for Engineering Education Indiana/Illinois Section Conference*, Indianapolis, IN, March 2007.

Multiple factors impacting sustainability



Courtesy: Heather Woodward-Hagg

81

Spread

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Connecting Research with Patient Care

Berwick's rules for Change in Healthcare

- Find Sound Innovations
- Find and support Innovators
- Invest in Early Adopters
- Make early adopter activity observable
- Trust and enable reinvention
- Create 'slack' for change

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Berwick, JAMA (2003) 289:1969

Factors that Determine Spread (and Sustainability)

- Innovation attributes
  - Relative advantage
  - Compatibility
  - Complexity / Simplicity
  - Trialability
  - Observability
- Communication
  - The "Early Adopter" Opinion Leader

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Berwick, JAMA (2003) 289:1969

Staff Engagement / Communication:

- Don't make changes:
  - Without soliciting staff feedback
  - Without soliciting MGT and sponsor feedback
- Be transparent:
  - Demonstrate mock-ups widely
  - Share data

The team serves those not in the room!!

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Lean Healthcare: Measurement

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Connecting Research with Patient Care

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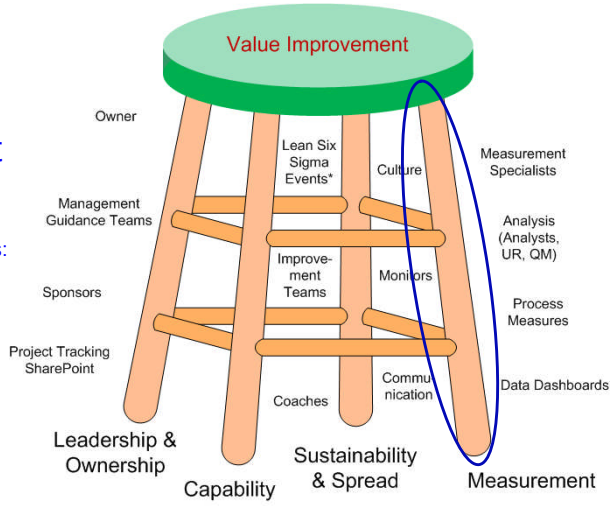
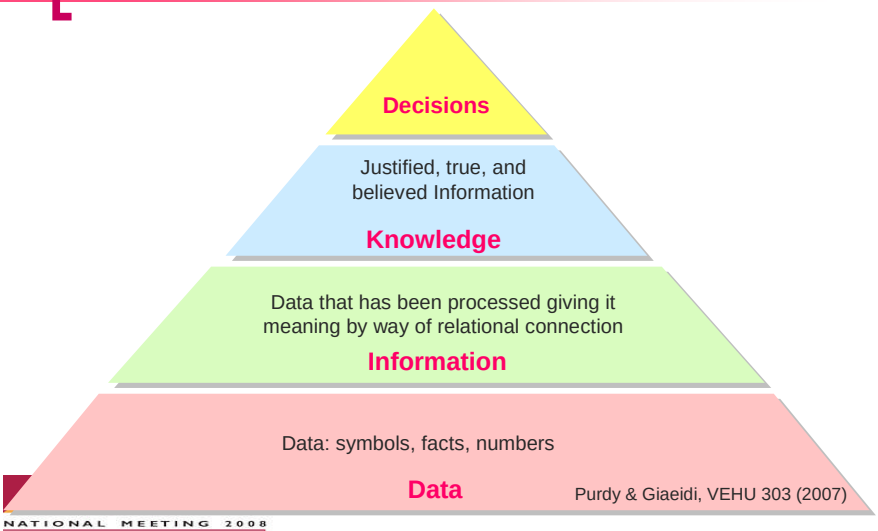


*Lean Six SigmaEvents: RCC/PDSA, RPIW, 100 Day Projects

Information Triangle



Purdy & Giaeidi, VEHU 303 (2007)

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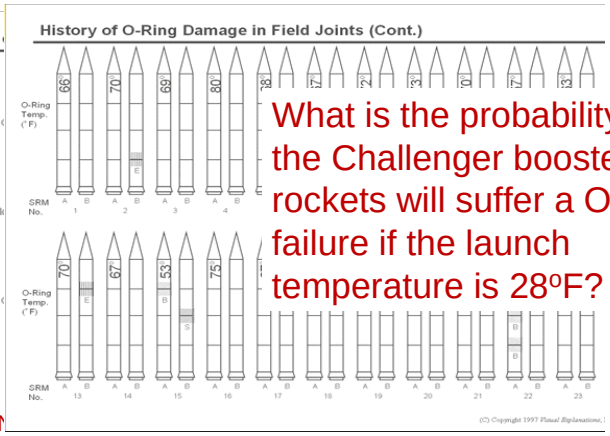
Chartology: What is the data trying to tell us?



What is the probability that the Challenger booster rockets will suffer a O-ring failure if the launch temperature is 28°F?

Data as
to N

From Edward Tufte, Visual Explanations: Images and Quantities, Evidence and Narrative, Graphics Press (February 1997)

Challenger data re-plotted

What is the probability that the Challenger booster rockets will suffer a O-ring failure if the launch temperature is 28°F?

Our Data Challenges:

1) To see the story that the data is trying to tell us

2) To share that story with others in a meaningful way

From Edward Tufte, Visual Explanations: Images and Quantities, Evidence and Narrative, Graphics Press (February 1997)

Case Study: Colon Cancer Screening

- A LSS Fast Start project is chartered to address the medical center's failing Colon Cancer Screening performance measures
- *The medical center does not do screening colonoscopies!!!*

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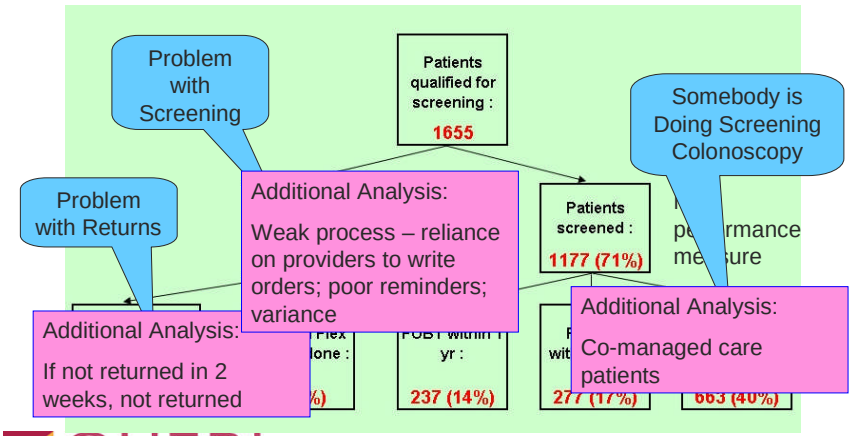
What does the data tell us?



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SR, ACA, ACA2, LSS, IE, LH: What's in a name?

"Potato, potahto, Tomato, tomahto,
Let's call the whole thing off"
~ Louis Armstrong

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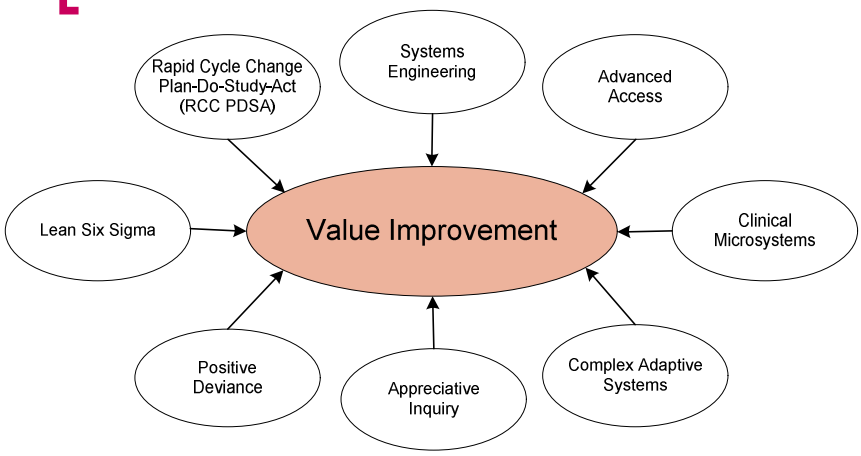
Connecting Research with Patient Care

It's a Toolbox!



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Parting Words

"Courage and perseverance have a magical talisman, before which difficulties disappear and obstacles vanish into air. "
~ John Quincy Adams

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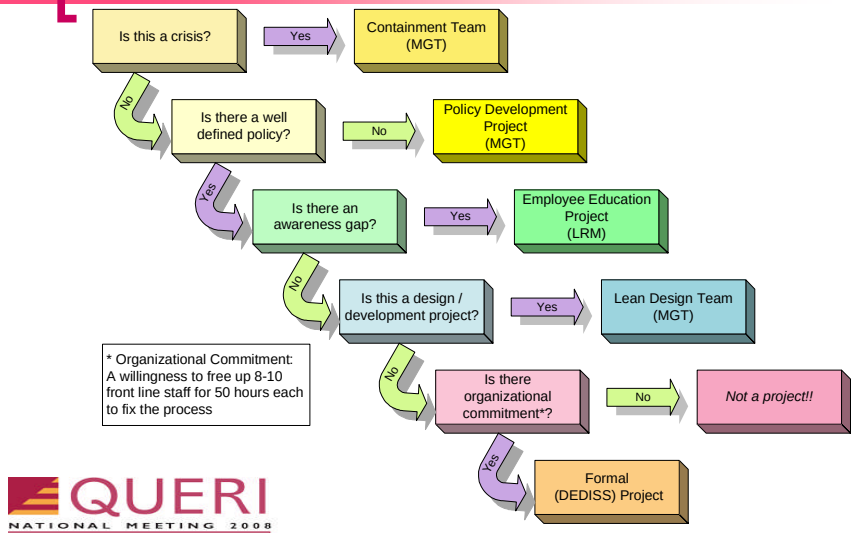
An Emergent Model for Improvement



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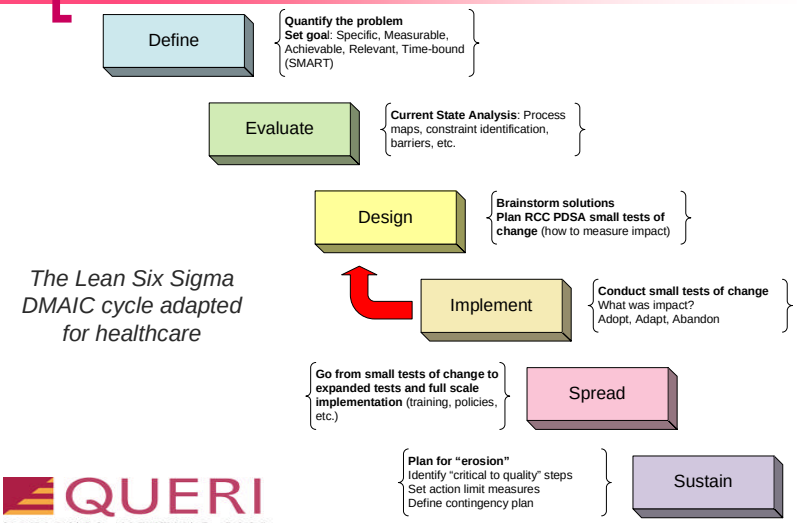
Improvement Life Cycle



The Lean Six Sigma DMAIC cycle adapted for healthcare

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An Improvement Challenge to the Research Community

→ Capability Evolution →

Afferent Activities	***Analytical Activities***	***Effecter Activities***
Predicting Vulnerabilities	Creating Knowledge	Transforming
Anticipating Failures	Generating Information	Engaging
Documenting Problems	Extracting Data	Coaching

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Questions?

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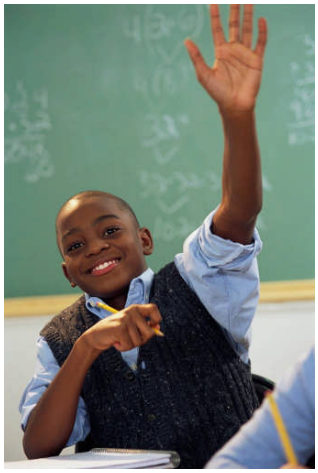

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