Basic Process Improvement Methods in Health Care

Summer Intern Orientation, May 2015

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CMS Innovation Healthcare Systems Engineering Center
NSF Center for Health Organization Transformation
Northeastern University, Boston MA

www.HSyE.org
Outline

1. The big 3:
   i. Six sigma (Motorola, GE)
   ii. Lean (Toyota production system)
   iii. PDSA (Plan Do Study Act)

2. Others
   i. Theory of constraints
   ii. others

3. Institute for Healthcare Improvement (IHI)
   i. “Model for Improvement”
   ii. Collaborative improvement
**Mission:** Broad measurable impact on healthcare, nationally, through research, education, and application of industrial and systems engineering

**Partnerships**

**Project Types**

- **Research**
  - Discover
- **Applied**
  - Impact
- **Experiential**
  - Education

**Criteria**

- **“Developing what we don’t know”**
  - 1 - 2 years
- **“Doing what we know”**
  - 3 - 9 months
- **“Teaching others by doing”**
  - 2 - 6 months

**Primary Mechanism**

- NSF Research Center
- CMS Application Center
  - Capstone, Co-ops
  - Summer Interns
Recall (70-20-10 rule)

Industrial and Systems Engineering

1. Methods-based
   - PDSA
   - Six Sigma
   - Lean
   - etc

2. Computer simulation
   - Lean

3. Probability and stochastic models
   - Six Sigma

4. Mathematical optimization
   - etc

Complexity

Simple

Complex

Qualitative

Quantitative

Methods-based

Model-based

90% PhD
Advanced

70% MS

Basic methods

Basic front-line improvement
Lean, Six sigma, PDSA

Systems engineering
Industrial engineering
Operations research
Management science

BS

% of Benefits
1. Basic Improvement Methods

(70% of it)
Process improvement methods

Variety of approaches

80%+ problems

Slightly different tool kits and approaches

Common concepts:
- **Understand** current process
- **Draw picture** of process logic
- **Use data** (before/after)
- **Test** improvement ideas

<table>
<thead>
<tr>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total quality mgmt (TQM)</td>
</tr>
<tr>
<td>Continuous quality improvement</td>
</tr>
<tr>
<td>PDCA / “Model for Improvement”</td>
</tr>
<tr>
<td>Six Sigma</td>
</tr>
<tr>
<td>Lean</td>
</tr>
<tr>
<td>Toyota Production System</td>
</tr>
</tbody>
</table>
## Similar / different focus

<table>
<thead>
<tr>
<th>Approach</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total quality mgmt (TQM)</strong></td>
<td><strong>Management methods</strong> and philosophy for quality improvement</td>
</tr>
<tr>
<td><strong>Continuous quality improvement (CQI)</strong></td>
<td>Variety of <strong>tools</strong> to improve processes</td>
</tr>
<tr>
<td><strong>Statistical process control (SPC)</strong></td>
<td>Study, detection, and reduction of special and common cause <strong>variability</strong></td>
</tr>
<tr>
<td><strong>PDCA / “Model for Improvement” (IHI)</strong></td>
<td>Framework for <strong>testing</strong> improvement ideas, often rapid cycle &amp; collaborative</td>
</tr>
<tr>
<td><strong>Six Sigma</strong></td>
<td><strong>Variance, defect, &amp; error reduction</strong>. Structured implementation process and tools</td>
</tr>
<tr>
<td><strong>Lean / Toyota Production System (TPS)</strong></td>
<td><strong>Simplification</strong>, flow, waste reduction. Just-in-time “pull”, low tech approach</td>
</tr>
<tr>
<td><strong>Others (re-engineering, theory of constraints)</strong></td>
<td>(not used much in healthcare)</td>
</tr>
</tbody>
</table>
Total quality management (TQM)
TQM overview

- Popularized in U.S. industry in 1970-80’s
- “Guru’s”: Deming, Juran, Feigenbaum, Crosby, …
- Appreciation of the system as a whole
- Focus on process quality
- 85% problems due to process (not people)
- Use of statistical methods to understand, monitor, and improve quality
- Adapted into healthcare, 1990’s

“Quality is Job 1”
Common approach & philosophy

• Management’s job is to create a system to improve quality and remove barriers to improvement
• There is no quick fix, no instant pudding, no magic bullet - continuous improvement of process required
• Long-term focus on continuous never-ending often incremental improvements
• Employee involvement in QI as valuable resource
• Engagement of front-line workers in improvement as key process experts (quality improvement circles)
• Use of data and statistical methods to improve quality, not to measure/reward/punish workers
• Study of variation (natural vs. special cause) (SPC)
Transformation through application of the fourteen points

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business and to provide jobs.
2. Adopt a new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item on a long-term relationship of loyalty and trust.
5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership (see point 12). The aim of leadership should be to help people and machines and gadgets to do a better job. Leadership of management is in need of overhaul, as well as leadership of production workers.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity.
11a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.
b. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.
12a. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.
b. Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual merit rating and of management by the numbers.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody’s job.

Diseases that stand in the way of the transformation

1. Lack of constancy of purpose to plan product and service that will have a market and keep the company in business and provide jobs.
2. Emphasis on short-term profits; short term thinking, just the opposite from constancy of purpose to stay in business, fed by fear of unfriendly takeover, and by push from bankers and owners, for dividends.
3. Personal review system, or evaluation of performance, merit rating, annual review, or annual appraisal, by whatever name, for people in management, the effects of which are devastating. Management by objective, on a go, no go basis, without a method for accomplishment of the objective, is the same thing by another name. Management by fear would still be better.
4. Mobility of management, job hopping.
5. Use of visible figures only for management, with little or no consideration of figures that are unknown or unknowable.
6. Excessive medical costs.
7. Excessive costs of warranty, fueled by lawyers that work contingency fees.

SPONSORS OF QUALITY AND PRODUCTIVITY EDUCATION

CONTINUING ENGINEERING EDUCATION PROGRAM
The George Washington University
Washington, D.C. 20052
(202)994-6106 (800)424-9773
Continuous quality improvement (CQI)
Common QI/6σ tools

“Basic 7 Tools”

- Check sheets
- Pareto charts
- Cause-and-effect “fishbone” diagrams
- Process flow charts
- Histograms
- Scatter diagrams
- Run and control charts
Examples

Root Cause Analysis: Patient Restraints

The 5 M's and 5 Why's

Check Sheet: Patient Calls to Answering Service

Reason for Call | Week One | Week Two | Week Three | Week Four
--- | --- | --- | --- | ---
Pain | | | | |
Illness | | | | |
Questions About Postprocedure Instructions | | | | |
Prescription | | | | |
Accident | | | | |

Billling coding error rate

Reasons for Poor Mammogram Image

Critical few
Trivial/vital many (can add up to a lot)
Process flow examples

- Graphical depiction of process logic
- Several common formats (none “right” or “wrong”)
- Useful to understand how process could be improved
- Shared consensus and standardization
How do you make tea?

Making Tea

1. Add water to kettle
2. Turn on burner
3. Wait for water to boil
4. Add tea bag to cup
5. Pour boiling water in cup
6. Milk?
   - NO
   - YES
     - Add milk to cup
     - Remove tea bag and serve
Quality control chart examples

Ventilator-Associated Pneumonia (VAP)

Surgical Site Infections

Scottish Surveillance for Regional MRSA

More later
Six sigma

(a CQI implementation approach)
“Six Sigma” DMAIC basics

• **Focus**: Quality improvement

• Structured approaches, integrated measuring
  
  – **DMAIC**: Improve existing process
  
  – **DFSS**: Design for Six Sigma
  
  – **DMADV**: Define, Measure, Analyze, Design Verify
DMAIC example

- **Define**: Process maps for EBM delivery (AMI, SSI, CHF)
- **Measure**: Baseline element and composite measures
- **Analyze**: Weekly review of 10 random patient charts by change agents and case coordinators. Root cause analysis
- **Improve**: Staff education, order sets, Protocols, check lists
- **Control**: Standardize processes Compliance monitoring

Why Six Sigma?

<table>
<thead>
<tr>
<th>Sigma</th>
<th>Defects per million</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>690,000</td>
<td>30.9%</td>
</tr>
<tr>
<td>2</td>
<td>308,000</td>
<td>62.9%</td>
</tr>
<tr>
<td>3</td>
<td>66,800</td>
<td>93.3%</td>
</tr>
<tr>
<td>4</td>
<td>6,210</td>
<td>99.4%</td>
</tr>
<tr>
<td>5</td>
<td>230</td>
<td>99.98%</td>
</tr>
<tr>
<td>6</td>
<td>3.4</td>
<td>99.9997%</td>
</tr>
<tr>
<td>7</td>
<td>0.019</td>
<td>99.99998%</td>
</tr>
</tbody>
</table>

Comparative Reliability Between Industries
‘Lean’

Toyota production system (TPS)
Lean primer

- Focus: Flow, simplification, reduce waste
- Idea: Simpler processes work better, less error, lower cost, higher safety

**Lean Tools**

- Value stream mapping
- 5S (sort, simplify, standardize...)
- Non-value added time
- Single piece flow
- Quick changeover (SMED)
- Waste elimination
- Error proofing
- Visual controls

**7 Types of Waste**

- Transportation
- Motion
- Waiting
- Inventory
- Over-production
- Over-processing
- Defects
- (Variation)
Examples of non-value added activities

- Approving
- Batching
- Searching
- Walking
- Waiting
“5 S”

Sort
Standardize
Simplify
Set in order
Sustain (Safety)

Seiri
Seiton
Seiso
Seiketsu
Shitsuke
Healthcare examples

“5S”
Visual controls

Toyota

Wristbands

3 Cup System

Barb Averyt, program director of patient safety at Arizona Hospital and Healthcare Association
Cross functional maps
(aka ‘swimming lane’ charts)

Sequential Scheduling Example

X type of Surgery

TIME SPAN

Pre-operative Room
X-rays, ECG, Blood work
Result Evaluation

Ready for surgery?

Operating Room
Surgery

Post-operative Room
Post-operative care
Discharge

Function / Person / Location

Time
Swimming lane example

Figure 11-5. Flowchart of Admission from Emergency Department to Surgical Bed

- 14 handoffs!
  - Delays
  - Errors
  - Incomplete care
Non-value added work (NVA)

Swimming lane diagram – “current state map”
Value stream maps

Current State

Future State

VAT = 110 seconds / 9.5 days

VAT = 128 seconds / 3.2 days
VSM – Appointment scheduling example

- Regional Office
- Triage
- Scheduling
- Patient Check In
- Doctor Appointment
- Transcribe
- Transcription Review

Cycle Time
x.xxx Secs
Production Hrs/Day
x.xxx Hrs
Daily Demand
x.xxx Units
Capacity
x.xxx Units

26 days

32 days
Value-add vs. Non-value-add times

Current State Map – 20 Days Lead-Time

V/A Time = 595 Min
Non V/A = 20 Days

Value Added Time as a % of Total Time in Plant = \[
\frac{595 \text{ Minutes}}{(20 \text{ Day})(24 \text{ Hours/Day})(60 \text{ Minutes/Hour})}
\]
\[
= 2.1\%
\]
Waste - Travel as a form of waste

Before

CQI / Lean projects

New layout

3,215 ft travel distance
98 minutes

375 ft travel distance
14.9 minutes
70 – 85% reduction!
Waste – NVA and travel time (50% NVA)

A 36-Hospital Time and Motion Study: How Do Medical-Surgical Nurses Spend Their Time?

- Documentation: 35%
- Non-nursing practice: 25%
- Foraging, Travel time, Patient escorting
Waste – Spaghetti diagram

- Lean: 7 types of waste
- Travel = waste
- “Visual data”
- Relocate workstations
- 75% travel reduction
- Loss cross-over congestion
Waste - Shingo’s bolt metaphor

- Single minute exchange of die
- Quick changeover and set-up
- Race pit / tire change metaphor

Bolt attachments require 32 complete turns for each bolt or screw to fasten die to a machine.

- Only last turn has value
- No-value add > 80% time

Under-used concept in healthcare. How could we implement SMED?

- OR/clinic room turn over?
- Sterile equipment reprocessing
- Lab diagnostics
- Other?
“Kaizen event”

- aka, Rapid process improvement workshop (RPIW) or Rapid Improvement Event (RIE)
- A way to rapidly do lean

### Kaizen Event Summary Sheet

<table>
<thead>
<tr>
<th>Event Goal (Improvement)</th>
<th>Actual Results</th>
<th>% Improvement</th>
<th>$ Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>$11,150 will be gone</td>
<td>100%</td>
<td>$11,150 will be converted to cash</td>
<td></td>
</tr>
<tr>
<td>$91,000 will be gone at PP</td>
<td>100%</td>
<td>$91,000 converted to cash</td>
<td></td>
</tr>
<tr>
<td>3 wk</td>
<td>50%</td>
<td>$4,000/week vs $10,000/month</td>
<td></td>
</tr>
<tr>
<td>4 times/year / PN</td>
<td></td>
<td>Potential for reduction</td>
<td></td>
</tr>
<tr>
<td>2350 sq ft</td>
<td>7%</td>
<td>$2,600 / year</td>
<td></td>
</tr>
<tr>
<td>22.5</td>
<td>25%</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>66%</td>
<td>$4,640</td>
<td></td>
</tr>
</tbody>
</table>

### Typical Plan for Kaizen

- **Prep**
  - BB and sponsor DEFINE project, select Kaizen leader (usually group leader), ID participants. BB and lead prep training, secure logistics.
- **Mon**
  - (Often start midday,) BB and Kaizen leaders start making decisions. Deliver training if needed. Begin MEASURE by creating/validating process observation.
- **Tues**
  - MEASURE continues until all data collected as soon as possible to identify and verify
- **Wed**
  - By Wed. afternoon should be in IMPROVE (developing criteria, evaluating alternate)
- **Thurs**
  - Finish IMPROVE and move into CON documentation, develop plans for full-scale implementation and monitor made as necessary
- **Fri**
  - Usually by midday, team is prepared to management. Get approval for plans
- **Follow up**
  - BB, Kaizen leader, and process owners full-scale implementation and monitor made as necessary
What it really looks like
A3 storyboard example
PDSA

Institute for Healthcare Improvement

(A way to implement PDSA)
IHI growth & impact: 1986 - present

1986

- Active in over 50 countries and 14,000 organizations worldwide
- *Modern Healthcare*: 3rd (2nd) most important person in health care
- E.F. Hutton of health care
Plan Do Check (Study) Act

**Act**
- What changes are to be made?
- Next cycle?

**Plan**
- Goal
- Questions and predictions (why)
- Plan to carry out the cycle (who, what, where, when)

**Study**
- Analyze the data
- Compare data to predictions
- Summarize what was learned

**Do**
- Carry out the plan
- Document problems and unexpected observations
Basic idea

- Plan (who, when, etc)
- Execute test (‘do’)
- Measures (‘study’)
- Refine, re-test (‘act’)

The Shewhart Cycle:

1. Plan a change or a test aimed at improvement
2. Carry it out (preferably on a small scale)
3. Study the results. What did we learn?
4. Act. Adopt the change, or abandon it, or run through the cycle again, possibly under different environmental conditions.
Planning deliberate tests

PDSA Worksheet for Testing Change

Aim: (overall goal you wish to achieve)

Every goal will require multiple smaller tests of change

<table>
<thead>
<tr>
<th>Describe your first (or next) test of change</th>
<th>Person responsible</th>
<th>When to be done</th>
<th>Where to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Plan

List the tasks needed to set up this test of change

<table>
<thead>
<tr>
<th>Person responsible</th>
<th>When to be done</th>
<th>Where to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Do

Describe what actually happened when you ran the test

Study

Describe the measured results and how they compared to the predictions

Act

Describe what modifications to the plan will be made for the next cycle from what you learned

Institute for Healthcare Improvement
CABG Example

PDSA Worksheet For Testing Design Changes

Aim: (Increase overall CABG condition to $10^{-2}$ within 6 months.) Give appropriate antibiotic within 1 hr before incision.

Every goal will require multiple smaller tests of change

<table>
<thead>
<tr>
<th>Describe your first (or next) test of change</th>
<th>Person Responsible</th>
<th>When to be done</th>
<th>Where to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomorrow, the surgeon will request the antibiotic in the operating room. The anesthesiologist will give it. The nurse will record it. Start with one surgeon and one patient and try it on one day.</td>
<td>Jake</td>
<td>Tuesday</td>
<td>OR</td>
</tr>
</tbody>
</table>

Plan

List the tasks needed to set up this test of change

<table>
<thead>
<tr>
<th>Task</th>
<th>Person Responsible</th>
<th>When to be done</th>
<th>Where to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Set up time to hold discussion with nurse, surgeon, anesthesiologist.</td>
<td>Jake</td>
<td>Tuesday</td>
<td>Holding Area</td>
</tr>
<tr>
<td>2- Hold discussion with nurse, surgeon, anesthesiologist</td>
<td>Jake</td>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>3-Identify patient</td>
<td>Jake</td>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>4-Inform floor/unit not to give antibiotic</td>
<td>Jake</td>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>5-Notify a pharmacist</td>
<td>Jake</td>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>6-Pharmacist will have antibiotic ready</td>
<td>Betty Boop</td>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>7-Set up measurement system (satisfaction survey)</td>
<td>Jake</td>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>8-Set up huddle to occur same day of test</td>
<td>Jake</td>
<td>Tuesday</td>
<td></td>
</tr>
</tbody>
</table>

Predict what will happen when the test is carried out

<table>
<thead>
<tr>
<th>Prediction</th>
<th>Measures to determine if prediction succeeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Will succeed</td>
<td>1-Yes or No</td>
</tr>
<tr>
<td>2-Pharmacist unable to deliver dose on time</td>
<td>2-Yes or No</td>
</tr>
<tr>
<td>3-Anesthesia unable to deliver dose on time</td>
<td>3-Yes or No</td>
</tr>
<tr>
<td>4-Pre selected incorrect antibiotic</td>
<td>4-Yes or No</td>
</tr>
<tr>
<td>5-Dispute on correct antibiotic to administer</td>
<td>5-Decided at huddle</td>
</tr>
</tbody>
</table>

Do

Describe what actually happened when you ran the test

Study

Describe the measured results and how they compared to the predictions

Act

Describe what modifications to the plan will be made for the next cycle from what you learned
Our PDSA planning form

<table>
<thead>
<tr>
<th>PDSA #1</th>
<th>PDSA #2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan</strong> preparation</td>
<td><strong>Plan</strong> preparation</td>
</tr>
<tr>
<td>Baselines:</td>
<td>Baselines:</td>
</tr>
<tr>
<td>Materials:</td>
<td>Materials:</td>
</tr>
<tr>
<td>Schedules:</td>
<td>Schedules:</td>
</tr>
<tr>
<td><strong>Do</strong> execution</td>
<td><strong>Do</strong> execution</td>
</tr>
<tr>
<td>Who:</td>
<td>Who:</td>
</tr>
<tr>
<td>When:</td>
<td>When:</td>
</tr>
<tr>
<td>Duration:</td>
<td>Duration:</td>
</tr>
<tr>
<td><strong>Study</strong> analysis</td>
<td><strong>Study</strong> analysis</td>
</tr>
<tr>
<td>Data</td>
<td>Data</td>
</tr>
<tr>
<td>Qualitative:</td>
<td>Qualitative:</td>
</tr>
<tr>
<td>Quantitative:</td>
<td>Quantitative:</td>
</tr>
<tr>
<td><strong>Act</strong> based on results</td>
<td><strong>Act</strong> based on results</td>
</tr>
<tr>
<td>If successful:</td>
<td>If successful:</td>
</tr>
<tr>
<td>If not:</td>
<td>If not:</td>
</tr>
<tr>
<td>Checklist</td>
<td>Checklist</td>
</tr>
<tr>
<td>□ Achievable ≤ 7 days</td>
<td>□ Achievable ≤ 14 days</td>
</tr>
<tr>
<td>□ Not possible on smaller scale</td>
<td>□ Not possible on smaller scale</td>
</tr>
</tbody>
</table>
“IHI Improvement Model”

• 3 motivating questions
• Repeated PDSA learning cycles
• Rapid cycle testing/learning
• ‘Poor man’s’ scientific method

DATA
Series of tests over time

Aim

Measures

Changes

The New Yorker
TESTING, TESTING
by Atul Gawande
DECEMBER 14, 2009

THE NEW YORKER
TESTING, TESTING
by Atul Gawande
DECEMBER 14, 2009

Atul Gawande
BETTER
A SURGEON'S NOTES ON PROFESSION

Act

Plan

Study

Do

What are we trying to accomplish?

How will we know that a change is an improvement?

What changes can we make that will result in improvement?
# 3 motivating questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are we trying to accomplish?</td>
<td>- Guides and focuses improvement effort.</td>
<td>Reduce surgical site infection rate in OR to (0.05 (10^{-1})) in the next 6 months</td>
</tr>
<tr>
<td></td>
<td>- Includes a specific measurable goal and timeline.</td>
<td></td>
</tr>
<tr>
<td>2. How will we know a design change is an improvement?</td>
<td>- Measures used to test design changes</td>
<td>- SSI rate</td>
</tr>
<tr>
<td></td>
<td>- Outcome, process, &amp; balancing measures</td>
<td>- Percent receiving appropriate prophylaxis</td>
</tr>
<tr>
<td>3. What deliberate designs can we test that may result in improvement?</td>
<td>Use 3-tier model to develop specific ideas</td>
<td>- Antibiotic guidelines (standardization)</td>
</tr>
<tr>
<td></td>
<td>Test using PDSA model</td>
<td>- Reminder system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Etc</td>
</tr>
</tbody>
</table>
Measuring improvement - Run charts

- Visual display of data over time, annotated
- Test if/not changes “result” in improvement
Annotated run chart - Example
Second example
Putting it into practice

• Starting small (smallest 1st test as possible)
• Linked tests over time
• Highly iterative. (Number tests = PI measure)
• Building knowledge, culture, comfort, degree of belief, support, learning
• Testing across contexts, settings, days
• Improvement advisor (IA) coaching role
Small multiple tests - why

• Rapid small tests accelerate learning and improvement
• Start with smallest possible test
  • “one afternoon, one doc, one type of patient, etc”
• Learn what works and what does not
• Learn how to make process robust
  • Test in multiple environments
  • 2nd doc, 2nd shift, 2nd department, weekends, etc
Multiple testing context

Knowledge and Reliability

Hunches, Theories, Ideas

Data

Short and long term process measures

Outcome Measures

Time

Designs That Result in Improvement
Example (appointment access)

**Approach**: Multiple (rapid cycle) tests and refinements of change across a variety of operating conditions

**Hypothesis**: Reduction of appointment types will increase appointment availability

**Cycle 1**: Test a small number of appointment types in 1 department/doc

**Cycle 2**: Revise appointment types/lengths based on learning

**Cycle 3**: Test with multiple doctors/days

**Cycle 4**: Refine, test department-wide

**Cycle 5**: Test robustness in other departments, refine

**Improved appointment access / satisfaction**
Useful quotes / ideas

• ‘All processes are optimally designed to get exactly the results they produce’
• ‘The definition of insanity is doing the same thing and expecting different outcomes’
• ‘All improvement requires change, not all change leads to improvement’
• ‘What can you test by next Tuesday?’
• ‘All failed tests are successes’ (learning)
• ‘Good enough data for learning and improvement’
• ‘Improvement soon vs slow perfection’
“All improvement requires change, but not all changes result in improvement.”

“All improvement is local.”
Balanced PDSA’s = Actual tests

Pitfalls

• PDCA ≠ Please don’t change anything
• Killer syndromes and epidemics: Perpetual meeting syndrome, perpetual analysis syndrome, and perpetual modeling syndrome
Size and duration of tests

<table>
<thead>
<tr>
<th>Size:</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose:</td>
<td>Learning</td>
<td>Evidence</td>
<td>Impact</td>
</tr>
</tbody>
</table>
Degree of belief

Degree of belief that the change will result in improvement

High
Moderate
Low

Developing a change
Testing a change cycle 1, cycle 2, ...
Implementing a change

A successful change
Change still needs further testing
Unsuccessful proposed change
Collaborative improvement approach

Select topic

Expert meeting

Participants (10-100 teams)

Prework

Develop framework, change ideas

Planning group

Disseminate
Guides
Publications
etc.

Support
E-mail Visits
Phone Assessments
Senior Leader Reports Analysis

- Discover new knowledge
- Implement locally

8 – 14 months

(aka, “Break Through Series”, BTS)
**General collaborative approach**

**Pre-work**
- Material development
- Early testing
- Participant enrollment

**Kick off meeting**
- Baselines
- General knowledge
- Tools

**Action period**
- Testing changes and QI methods
- Sharing results, learning, training
- Monthly cycles

**Impact spread**
- Continue
- Disseminate results & tools

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**6 month cycles (phase 1, phase 2, phase 3) – Action oriented**

- General knowledge
- Preliminary “change package”
- Preliminary experiences

- Local implementation
- Build on general knowledge
- Broad impact/spread

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*All improvement requires change... testing testing testing...*
Examples

• Patient safety, Readmissions ($\infty$)
• Flow and delays
• Specialty care access
• Pain management
• Dozens others
100,000 Lives Campaign

• Campaign sense of urgency

• Save 100,000 lives by 6/14/06 (9 am EST)

• Focus on six areas:
  • Adverse drug events (2k)
  • Surgical site infection (8k)
  • Myocardial infarction (10k)
  • Ventilator pneumonia (10k)
  • Central line infection (10k)
  • Rapid response teams (60k)

• Over 3,200 U.S. hospitals participating

• 90% of acute care beds

• Accomplish via ‘bundles’ of proven interventions
recap

Putting it all together
Recap - putting it all together

Specific aims

Run and control charts

Driver diagram

Repeated testing, sharing, and co-learning

S specific
M measurable
A action oriented
R realistic
T timeline
Zen of Improvement Science

1. “Rapid cycle testing” is rapid (1 per week)
2. QI projects < 6 months
3. First focus on adapting known knowledge, then on discovering new improvements
4. Measure and test locally, with near immediate feedback and evaluation
   - Fast manual > slow electronic data
   - ‘Good enough’ > slow perfect data
5. Linked PDSAs (≥ 6 in ≤ 3 months)
Discussion

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