Back to the Basics: Building Essential QI Skills

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Neither presenter has anything to disclose.
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I am a loving daughter, sister and friend to many. I confess that I am a compulsive improver and innovator and nothing excites me more than observing learners and those who choose to put their learning to use and make a better world.
Quick Course Objectives

- Describe the elements of the Model for Improvement and how it helps us improve our Systems of Care.
- Identify the necessary elements to charter an improvement project and develop an aim statement.
- Develop high-leverage change ideas using driver diagrams and other tools.
- Identify a family of measures, including operational definitions, to drive improvement work.
- Develop effective plan-do-study-act cycles that build from small scale testing to implementation.
- Describe the difference between implementation, scale, and spread.
System Thinking and The Model for Improvement
The Problem…

- Sweden’s immediate neighbors all drove on the right.
- Most Swedes drove left-hand drive vehicles, which led to more head-on collisions when driving on the left.
- An incredibly unpopular decision – voted down by citizens for 40 years.
Högertrafikomläggningen - “The right hand traffic diversion”

- Dagen H, or “H day” in Sweden
- All at once, a change from driving on the left to the right.
- Major PR campaign
- Used different color lines to separate traffic.
- New headlights had to be installed in cars.
- All traffic stopped at 4:50. Cars switched sides and resumed driving at 5:00.
- The following Monday, there were 125 accidents, compared to 130-198 on a usual Monday.
What It Takes To Improve

- **Will** to change the current system
  - Strong positive leadership and a realistic appraisal of resources and barriers
- **Ideas** about changes that will improve the system
  - And a theory that links changes to outcomes
- **Execution** of the ideas
  - And a way to distinguish successful from unsuccessful changes
“Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them.”

--Laurence J. Peter
Is life this simple?

(If it was only this simple we would not need QI Teams!)
No, it looks more like this…

There are numerous **direct effects** between the independent variables (the Xs) and the dependent variable (Y).

![Diagram showing direct effects between independent variables and patient assessment score.](#)
In this case, there are numerous **direct** and **indirect effects** between the independent variables and the dependent variable. For example, \(X_1\) and \(X_4\) both have direct effects on \(Y\) plus there is an indirect effect due to the **interaction** of \(X_1\) and \(X_4\) conjointly on \(Y\).
It starts by combining two types of knowledge

**Subject Matter Knowledge:** Knowledge basic to the things we do in life. Professional knowledge. Knowledge of work processes.

**Science of Improvement (SOI) Knowledge:** The interplay of the theories of systems, variation, knowledge, and psychology.
**Improvement:** Learn to combine subject matter knowledge and SOI knowledge in creative ways to develop effective changes for improvement.
What is a system?

An *interdependent* group of:

- People
- Processes
- Items (tools)

...working together toward a *common purpose*.
Components of a System

Structure …

+ Process …

+ Culture* = Outcome

*Added to Donabedian’s original formulation by R. Lloyd and R. Scoville.
Start by Defining the System of Care

- A system has an aim or purpose.
- The network of factors that lead to outcomes of value to stakeholders.
- Factors comprise structures, processes, culture, personnel, geography, and much more.
- A System is Dynamic: it is ‘in motion’ – not static!
- Improving outcomes requires understanding the dynamics of the system.
“The quality of patients’ experience is the ‘north star’ for systems of care.”

–Don Berwick

Unfortunately, many of our healthcare systems do not focus on the patient.
Improving medical care requires system redesign

“Every system is perfectly designed to get the results it gets.” – Paul Batalden

The definition of insanity is doing the same thing over and over and expecting to get a different result.
1. Pick a number from 3 to 9
2. Multiply your number by 9
3. Add 12 to the result from step 2
4. Add the 2 digits together
5. Divide result of step 4 by 3
7. Write down the name of a country that begins with the letter
8. Go to the next letter in the alphabet
9. Write down the name of an animal (but not a bird or insect) that begins with that letter
10. Write down the color of that animal.
Other Key Ideas from System Theory

- Boundary – size or levels.
- Temporal effects – changes may have different impact in short vs. long term.
- Leverage – small changes can produce big effects (ATM example).
- Constraint (or bottleneck) – limits overall performance.
- First vs. Second order change
- Unintended consequences
Different related approaches
Bar-be-que?
The 5 Key Principles for Improvement

1. Knowing why you need to improve.
2. Having a feedback mechanism to know if improvement is happening.
3. Developing an effective change that will result in improvement.
4. Testing a change before attempting to implement.
5. Knowing when and how to make the change permanent.
Now, let’s take a closer look at ... ...the Model for Improvement!
A Model for Learning and Change

When you combine the 3 questions with the PDSA cycle, you get...

Model for Improvement

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

...the Model for Improvement.

What are we trying to accomplish?

A SMART Aim Statement

- **Specific**
- **Measurable**
- **Actionable**
- **Realistic**
- **Time-bound**

“Some is not a number, soon is not a time.”

“To increase the percentage of preterm infants (birth weight of <1250g) with a normal NICU admission temperature from 43% to 75% by January 2013.”
How will we know that change is an improvement?

**Outcome Measures**
- The voice of the customer or patient.
- Reflects the problem you are trying to solve.
- Describes how your system is performing

**Process Measures**
- Steps logically linked to outcome of interest.
- Addresses how key parts of the system is performing.

**Balancing Measures**
- What are the unintended consequences?
- Are there alternate explanations for your improvement in outcome?
What change can we make that will result in improvement?

- Driver Diagram
- Cause and Effect (Fishbone) Diagram
- The Pareto Chart
- Process maps; other QI tools

Ideas of change for PDSA cycles
What is a PDSA Cycle?

Act
- What changes are to be made
- Next cycle

Plan
- Objective
- Questions / Predictions
- Plan to carry out cycle (who, what, where and when)

Study
- Compare Analysis of data
- Compare data to predictions
- Summarise what was learned

Do
- Carry out plan
- Document problems and observations
- Begin analysis

W. Edwards Deming
Why this Model for Improvement?

- Is useful for both process and product improvement.
- Is applicable to all types of organizations.
- Is applicable to all groups and levels in an organization.
- Facilitates the use of teamwork to make improvements.
- Provides a framework for the application of statistical tools and improvement methods.
- Encourages planning to be based on theory.
- Emphasizes and encourages the iterative learning process.
- Provides a way to empower people in the organization to take action.
What are we trying to accomplish?

Establishing your Aim

Jane Taylor
The Model for Learning and Change

Model for Improvement:
- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

Act
Plan
Study
Do

The Improvement Guide, API, 2009
Question #1: What are We Trying to Accomplish?

Aim Statement
“A system is a network of interdependent components working together toward a common aim. Every system must have an aim. Without an aim that is clear to all, there is no system.”

- W. Edwards Deming, *Out of the Crisis*
Aim Statement: Core Elements

1. **Boundaries**: the system to be improved (scope, patient population, processes to address, providers, beginning & end)

2. **Outcome goal**: Specific numerical goals (how good?)

3. **Timeframe**: End date for goal (by when?)

4. **Guidance**: information to guide the team’s effort (sponsor, resources, grants, strategies, un-touchables, barriers)
Aim Statement: Optional Elements

- **Why**: describe the importance or benefit to those we serve
- **For whom**: the customer or those who benefit from the effort
- **How**: general statement of the team’s approach (standardization, use of a bundle, innovation)
- **Baseline performance**: measurement starting point when easily available
Aim Statement: Example #1

Improve patients reporting they got 6+ hours of sleep per night from 30% to 60% on 2 North by March 31, 2017. The team should test a variety of changes, not just those linked to the environment.

- **System:** sleep on 2NB
- **Goal:** 60% of patients report sleeping 6+ hours
- **Timeframe:** within 6 months (by March 31, 2017)
- **Guidance:** plan for spread
Aim Statement: Example #2

In our clinic, we will reduce wait time to see a provider 25% within 3 months and by 50% within 1 year. We will also ensure that our work contributes to a sustainable QI infrastructure to support future projects across all our three clinics.

- **System**: wait time to see a physician
- **Goal**: reduce by 25% and then by 50%
- **Timeframe**: 3 months and then 1 year
- **Guidance**: Build a sustainable QI infrastructure
Aim Statement: How to Construct

- **Involve team:**
  - Engage senior sponsor (no from “on high”)
  - Engage team (no lone rangers)
  - Must include subject matter experts
- **Aim clear and majestic?** Could 5 members of the team describe what you were trying to achieve? Does it catch your breath?
- **Focus on issues that are important or strategic to your organization:**
- **Understand the current state:**
  - Current performance
  - Problem to solve
Aim Statement: Which problem are we trying to solve?

“Quiet at Night”

Sleep

“Night Time Routine”
Aim Statement
Exercise: You Make the Call!
### Aim Statement

<table>
<thead>
<tr>
<th>Aim Statement</th>
<th>Good</th>
<th>Bad</th>
<th>Ugly</th>
</tr>
</thead>
<tbody>
<tr>
<td>We aim to reduce harm and improve patient safety for all of our patients</td>
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<tr>
<td>By September of 2013 we will improve medication reconciliation by 50% and improve checking allergies when prescribing a new medication by 50%.</td>
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<tr>
<td>Our patient satisfaction scores are in the bottom 10% of the national comparative database we use. As directed by senior management, we need to get the score above the 50th percentile by the end of the 4th Q of 2013.</td>
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<tr>
<td>We will reduce all types of hospital acquired infections.</td>
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<tr>
<td>According to the consultant we hired to evaluate our medical home, we need to improve the effectiveness and reliability of preventive care visits and well child visits. The board agrees, so we will work on these issues this year.</td>
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</tr>
<tr>
<td>Our most recent data reveal that on the we only track referrals to mental health 35% of the time. We intend to increase this average to 50% by 9/1/13 and to 75% by 3/31/14.</td>
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</tbody>
</table>

Each table takes an aim; classifies it and rewrites a better aim
Develop Your Aim Statement

1. **The** (name of team)

2. **intends to accomplish:** (This is a general overarching statement describing what you intend to accomplish during the time you work on this process. The process is identified in the statement and words like improve, reduce, and increase are often used). In healthcare, aims describe how care for patients will be better (reduced suffering or improved outcomes).

3. **by** (time frame, i.e., month/year by which you intend to accomplish improvement)

4. **for** (what group are you doing this for – who is the customer?)

5. **because** (the reasons to work on this improvement project)

6. (Optional) Please include any additional **guidance:** (This may include any constraints, changes that are off limits, or other goals you have for the project (e.g., building relationships, engaging partners, building improvement capability).)
What changes can we make that will result in improvement?

Jane Taylor
The Model for Learning and Change

Model for Improvement:

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

Act | Plan
--- | ---
Study | Do

The Improvement Guide, API, 2009
“All improvement will require change, but not all change will result in improvement!”

Reactive vs. Fundamental Changes

Reactive Changes (First Order Changes)
- Return the system or process to prior condition
- Keep the system running
- Solve problems or react

Fundamental Changes (Second Order Changes)
- Create a new system of performance
- Design or redesign some aspect of the system
- Necessary for improvement beyond problems
- Alters the system in a visible, measurable way
- Breakthrough

Source: The Improvement Guide, Chapter 6, p. 116-117
Reactive vs. Fundamental Change

- More flyers
- More training
- More resources
- More rules
- More audits
- Finding failures and removing them

- Process redesign
- Altering approach to be more person-centered
- Standardization
- Hardwiring changes
- Changing boundaries of the system
Ideas for improvement?

Where do they come from?
- Literature
- Evidence
- Experience
- Successful organizations or practitioners that have solved the problem
- Analogous Observation - places where similar problems have been solved

What if we can’t find them?
- Tap into creativity
- Adapt other ideas
- Employ logical thinking: process mapping, flow charting and the like
How might we organize our project on 1 piece of paper?
Driver Diagram: Clear and Simple Visualization

Key Drivers

- Increase the percentage of Hospital Medicine patients with one of 11 common inpatient diagnoses discharged within two hours of meeting medically ready criteria from 42% to 80% by June 30, 2013
- Discharge Criteria Defined
- Frontline Staff Buy-in and Shared Ownership
- Discharge Barrier Identification with Mitigation Plans established
- Team Performance Transparency with Preoccupation with Failure
A picture of best current theory of how to get results

Outcome

Primary Drivers

Secondary Drivers (processes, norms, structures)

Aim:
Expresses stakeholder value!

P. Driver

S. Driver 1

S. Driver 2

S. Driver 3

Change 1

Change 2

Change 3
Example: Improve Restaurant Rating

Increase restaurant ranking from 3 to 4 stars

Outcome

Primary Drivers

Food quality
Price
Ambiance
Service

Secondary Drivers

Preparation
Suppliers
Lighting
Layout
Music
Attire
Approach

Measures:
- Star ranking
- Yelp reviews
- Tips
- Profit (balancing)

Process measure: Tips

- Screen for service in interview
- “At the elbow” coaching
- Monthly service review brainstorming
- Scenario planning
A Theory for Weight Loss

AIM: A New ME!

“Every system is perfectly designed to achieve the results that it gets”

Primary Drivers
- Calories In
  - Limit daily intake
  - Substitute low calorie foods
  - Avoid alcohol

Secondary Drivers
- Calories Out
  - Exercise
  - Fidgeting

Ideas for Process Changes
- Track Calories
- Plan Meals
- Drink H2O Not Soda
- Work out 5 days
- Bike to work
- Hacky Sack in office

“Every system is perfectly designed to achieve the results that it gets”
Remember that Drivers and Processes are Linked!

Improving the reliability, consistency, usability or efficiency of processes is central to improving system outcomes.
And that timing and changes are related!

**AIM:** A New ME!

**Calories In**
- Limit daily intake
  - Track calories
  - Substitute low calorie foods
  - Avoid alcohol
  - Exercise calorie count

**Calories Out**
- Daily calorie count

**Exercise**
- Avg cal/day
- % of opportunities used
- Avg drinks/week

**Fidgeting**
- Calorie count

**Work out 5 days**
- Percent of days on bike
- Hacky Sack in office
- Etc...

**Tracking**
- Running calorie total

**Planning**
- Meals off-plan/week
- Sodas/week

**Drinking**
- H2O Not Soda

**Outcome measures** change more slowly

**Process measures** more sensitive to change

**Primary Drivers**
- Weight
- BMI
- Body Fat
- Waist size

**Secondary Drivers**
- % of opportunities used
- Avg drinks/week

**Ideas for Process Changes**

Source: Richard Scoville & I.H.I.
Theory informs testing and in turn testing refines theory.

1. Gather expertise: expert meeting, literature review, interviews
2. Identify key structures, processes, norms that must change to achieve the aim
3. Illicit change ideas that have worked
4. Experts inform specific aim

Remember:
Best working theory to date and revise as you learn!
Include what is necessary and sufficient
Creates a shared language and mental model

Disclaimer: Probably wrong and definitely incomplete
Tony Bryk, President of the Carnegie Foundation for the Advancement of Teaching
How do we use one in practice?

- Keep front and center to your work (visually)
- Put in pencil, not pen
  - Update your theory as you learn
  - Select regular points to review
- Tie changes and projects to drivers
- Use to track progress
- Share to communicate and engage others
Next, we have an exercise for you.

Aim:

Outcome Measures:
1.
2.
3.

Primary Drivers

Secondary Drivers

Changes
Driver Diagram: Exercise – 15 min total

- Use templates to sketch out a driver diagram for something you are interested in improving.
- Spend about 10 minutes working on this exercise, then share and compare with your neighbors.
- Tips: concrete aim with goals? PD and SC as concepts without direction (increase, decrease, reduce, etc)? Changes stated as verbs or actions? Changes testable ideas?
Changes: Three Approaches

1. Understanding of processes and systems of work
2. Creative thinking
3. Adapting known good ideas
Generating Change Ideas
An Understanding of Processes and Systems of Work
Check-in

1. Forget to give patient form
2. Forget to collect form from patient
3. Form is too long and patient doesn’t have time to complete

Process forms

1. Forms not processed until after patient leaves
2. Form takes too long to process and is not done before visit
3. Miss suicidality in forms

Room patient

1. Form output not added to patient chart
2. Risk of suicidality not noted in chart

Take vitals

Conduct visit

1. Behavioral health results not available to provider
2. Provider forgets to look at screening
3. Provider not able to address results (time) health needs

Next steps and check-out

1. Patient forgets to mention referral at check-out
2. No one available for warm hand-off
3. Patient not comfortable making appointment
4. No BH appointments
Creative Thinking

- Creativity implies having thoughts that are outside the normal pattern.

- What can you do to generate “new” thoughts?

- How do we “provoke” new thinking?
Lateral Thinking of Edward de Bono

“Provocation has everything to do with experiments in the mind.”
Edward de Bono
Creativity exercises that may move mindsets

- Random word; reversal, exaggeration, wishful thinking, distortion
- List all words you associate with that word:
- Generate as many ideas as you can about how this word could spark an idea about improvement for your project
  - (Idea)
  - (Idea)
  - (Idea)
Changes: Three Approaches

1. Understanding of processes and systems of work
2. Creative thinking
3. Adapting known good ideas
Using change concepts

Change concept = A general notion or approach found to be helpful in developing specific change ideas that result in improvement

See:
- *The Improvement Guide*, page 132, for a list of 72 change concepts; Appendix A provides detail on each
- IHI Improvement App
Change Concepts

**Eliminate Waste**
1. Eliminate things that are not used
2. Eliminate multiple entry
3. Reduce or eliminate overkill
4. Reduce controls on the system
5. Recycle or reuse
6. Use substitution
7. Reduce classifications
8. Remove intermediaries
9. Match the amount to the need
10. Use Sampling
11. Change targets or set points

**Improve Work Flow**
12. Synchronize
13. Schedule into multiple processes
14. Minimize handoffs
15. Move steps in the process close together
16. Find and remove bottlenecks
17. Use automation
18. Smooth workflow
19. Do tasks in parallel
20. Consider people as in the same system
21. Use multiple processing units
22. Adjust to peak demand

**Optimize Inventory**
23. Match inventory to predicted demand
24. Use pull systems
25. Reduce choice of features
26. Reduce multiple brands of the same item

**Change the Work Environment**
27. Give people access to information
28. Use proper measurements
29. Take care of basics
30. Reduce de-motivating aspects of pay system
31. Conduct training
32. Implement cross-training
33. Invest more resources in improvement
34. Focus on core process and purpose
35. Share risks
36. Emphasize natural and logical consequences
37. Develop alliances/cooperative relationships

**Enhance the Producer/customer relationship**
38. Listen to customers
39. Coach customer to use product/service
40. Focus on the outcome to a customer
41. Use a coordinator
42. Reach agreement on expectations
43. Outsource for “Free”
44. Optimize level of inspection
45. Work with suppliers

**Manage Variation**
51. Standardization (Create a Formal Process)
52. Stop tampering
53. Develop operation definitions
54. Improve predictions
55. Develop contingency plans
56. Sort product into grades
57. Desensitize
58. Exploit variation

**Design Systems to avoid mistakes**
59. Use reminders
60. Use differentiation
61. Use constraints
62. Use affordances

**Focus on the product or service**
63. Mass customize
64. Offer product/service anytime
65. Offer product/service anyplace
66. Emphasize intangibles
67. Influence or take advantage of fashion trends
68. Reduce the number of components
69. Disguise defects or problems
70. Differentiate product using quality dimensions

**Manage Time**
46. Reduce setup or startup time
47. Set up timing to use discounts
48. Optimize maintenance
49. Extend specialist’s time
50. Reduce wait time
Improvement App – Home Screen
Give people access to information

Change Concept

Change Idea

- Provide two-way “Open Notes” access
- Patients own their own medical record
- Use teachback for patients that are going to be discharged
- Communicate what you are doing each step of the way
What I saw?

- Support staff wellness & resilience
- Reward & recognize staff

Theme, Concept, or Core Question

- Support staff wellness & resilience
- Reward & recognize staff

How might I...?

- Keep boxes of Umbrellas ready for rainy days
- Work on a staff discount at the local grocery store
- Provide a gym stipend
- Offer meditation spaces
- “Thank you” stickers
- Offer dry cleaning service through a vendor
- Ask the CEO to send notes of appreciation
- Start an “employee of the month” club
- Start each meeting with a five minute stretch
Generate new ideas

Prioritize new ideas

Test new ideas

Implement new ideas
Tools to Prioritize Change Ideas

Tool #1: Multi-voting

<table>
<thead>
<tr>
<th>Idea</th>
<th>Multi-Vote</th>
<th>Individual Rank Ordering</th>
<th>Total RD Score</th>
<th>Final Ranking</th>
<th>SD comments</th>
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<tbody>
<tr>
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# Responses (80% Red)

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<td>General Noise</td>
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<td>Bathroom</td>
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<td>Interruption/e-mails</td>
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<td>Delays in Bashing</td>
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<tr>
<td>Response/Note</td>
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</table>
Pareto Analysis

• A graphical display of the most important factors contributing to a problem

• Based on the Pareto principle: 80% of the effects come from 20% of the causes
## Prioritization Matrix

1. List the ideas in the row, and the criteria for selection in the columns
2. Rate each idea on a scale of 1-5 (1 being low confidence and 5 being high confidence) for each criterion
3. Analyze which idea has the highest confidence

<table>
<thead>
<tr>
<th>Idea</th>
<th>Can be accomplished in 90 days?</th>
<th>There’s will to fix this problem?</th>
<th>Is within our control?</th>
<th>Is a sponsor for this work?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea 1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Idea 2</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Idea 3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Tool 4: Effort-Impact Grids

- Sort ideas based on high or low effort and high or low importance
- Use quadrants to prioritize change ideas
The impact/effort matrix

HIGH IMPACT

- Talk to patients/families about sleep
- Develop individualized sleep goals as part of care plans
- Explain realistic expectations to patients/families
- Address all patient/family worries and concerns

LOW IMPACT

- Keep patients awake/stimulated during day
- Respond to call lights during day
- Change location of nurses station
- Reduce noises from equipment and facilities
- Provide access to real time information
- Access to mindfulness tools, e.g. meditation, journals, etc.
- Use a standard protocol for nighttime (with individualized exceptions based on preferences)
- Explain realistic expectations to patients/families

HARD

EASY
Developing Ideas for Change

Discussion Questions:

- What specific change concepts and related ideas will achieve the Aim?
- What theories and predictions can you make about how these change concepts and ideas will cause improvement?
- Use Force Filed Analysis to evaluate the ideas (see Appendix D for details)

<table>
<thead>
<tr>
<th>Change Concept</th>
<th>Specific Ideas to Test</th>
<th>Theories and Predictions as to how or why this idea will achieve the Aim</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measures and Analysis – Part I
The Model for Learning and Change

When you combine the 3 questions with the...

PDSA cycle, you get...

...the Model for Improvement.

The Improvement Guide, API, 2009
Question #2: How Will We Know that a Change is an Improvement?

“You can’t fatten a cow by weighing it”
- Palestinian Proverb

Improvement is NOT just about measurement!

However, without measurement you will never be able to know the answer to question #2 in the MFI.
“I have no data yet. It is a capital mistake to theorise before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts.”


(Courtesy of Dr. Imran Aurangzeb, FCCP, Sutter Health)
# The Three Faces of Performance Measurement

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Improvement</th>
<th>Accountability</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aim</strong></td>
<td>Improvement of care (efficiency &amp; effectiveness)</td>
<td>Comparison, choice, reassurance, motivation for change</td>
<td>New knowledge (efficacy)</td>
</tr>
<tr>
<td><strong>Methods:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Test Observability</td>
<td>Test observable</td>
<td>No test, evaluate current performance</td>
<td>Test blinded or controlled</td>
</tr>
<tr>
<td>• Bias</td>
<td>Accept consistent bias</td>
<td>Measure and adjust to reduce bias</td>
<td>Design to eliminate bias</td>
</tr>
<tr>
<td>• Sample Size</td>
<td>“Just enough” data, small sequential samples</td>
<td>Obtain 100% of available, relevant data</td>
<td>“Just in case” data</td>
</tr>
<tr>
<td>• Flexibility of Hypothesis</td>
<td>Flexible hypotheses, changes as learning takes place</td>
<td>No hypothesis</td>
<td>Fixed hypothesis (null hypothesis)</td>
</tr>
<tr>
<td>• Testing Strategy</td>
<td>Sequential tests</td>
<td>No tests</td>
<td>One large test</td>
</tr>
<tr>
<td>• Determining if a change is an improvement</td>
<td>Run charts or Shewhart control charts (statistical process control)</td>
<td>No change focus (maybe compute a percent change or rank order the results)</td>
<td>Hypothesis, statistical tests (t-test, F-test, chi square), p-values</td>
</tr>
<tr>
<td>• Confidentiality of the data</td>
<td>Data used only by those involved with improvement</td>
<td>Data available for public consumption and review</td>
<td>Research subjects’ identities protected</td>
</tr>
</tbody>
</table>

### Methods:

- **Test Observability**
  - Test observable
  - No test, evaluate current performance

- **Bias**
  - Accept consistent bias
  - Measure and adjust to reduce bias
  - Design to eliminate bias

- **Sample Size**
  - “Just enough” data, small sequential samples
  - Obtain 100% of available, relevant data
  - “Just in case” data

- **Flexibility of Hypothesis**
  - Flexible hypotheses, changes as learning takes place
  - No hypothesis

- **Testing Strategy**
  - Sequential tests
  - No tests
  - One large test

- **Determining if a change is an improvement**
  - Run charts or Shewhart control charts (statistical process control)
  - No change focus (maybe compute a percent change or rank order the results)
  - Hypothesis, statistical tests (t-test, F-test, chi square), p-values

- **Confidentiality of the data**
  - Data used only by those involved with improvement
  - Data available for public consumption and review
  - Research subjects’ identities protected
Measurement is central to the team’s ability to improve!

- The purpose of measurement in QI work is for *learning not judgment*!
- All measures have limitations, but the limitations do not negate their value for learning.
- You need a balanced set of 3-8 measures reported daily, weekly or monthly to determine if the process has improved, stayed the same or become worse.
- These measures should be linked to the team’s Aim.
- Measures should be used to guide improvement and test changes.
- Measures should be integrated into the team’s daily routine and make use of existing databases.
- Data should be plotted over time on annotate graphs.
- Focus on the Vital Few!
Milestones in the Quality Measurement Journey

AIM (Why are you measuring?)
- Concept
- Measure
- Operational Definitions
- Data Collection Plan
- Data Collection
- Analysis

Milestones in the Quality Measurement Journey

AIM (Why are you measuring?)
- Concept
- Measure
- Operational Definitions
- Data Collection Plan
- Data Collection
- Analysis
- Action

- Vision
- End Result
- Ideal State
These are NOT measures!

Reduce wait times
*Improve patient satisfaction*
Expand market share
*Be more efficient*
Increase health and well-being
*Reduce waste*
Improve our financial situation
*Reduce inpatient discharge delays*
Enhance Patient education
*Deliver safe services*

They are part of...

- Vision
- End Result
- Ideal State
Every concept can have many measures!


<table>
<thead>
<tr>
<th>Concept</th>
<th>Potential Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>• Number of days to the next 2\textsuperscript{nd} appointment</td>
</tr>
<tr>
<td></td>
<td>• Percent of add-ons who can be seen today</td>
</tr>
<tr>
<td></td>
<td>• Number of walk-in appointments</td>
</tr>
<tr>
<td></td>
<td>• The number of minutes a caller is on hold before talking to a staff person</td>
</tr>
<tr>
<td></td>
<td>• Number of phone calls requesting an appointment this week</td>
</tr>
<tr>
<td>Wait Time</td>
<td>• Wait time from check-in to discharge</td>
</tr>
<tr>
<td></td>
<td>• Wait time from check-in to seeing doctor</td>
</tr>
<tr>
<td></td>
<td>• Time spent with doctor</td>
</tr>
<tr>
<td></td>
<td>• Time it takes to have follow-up work done in the office (labs, x-ray, ultra-sound, etc.)</td>
</tr>
<tr>
<td>Management of Diabetes Patients</td>
<td>• Percent of diabetes patients with appropriate eye and foot exams done during an office visit</td>
</tr>
<tr>
<td></td>
<td>• Percent of all diabetes patients in glucose control</td>
</tr>
<tr>
<td></td>
<td>• Percent of patients engaged in self-management goals</td>
</tr>
</tbody>
</table>
Three Types of Measures

- **Outcome Measures**: Voice of the customer or patient. How is the system performing? What is the result?

- **Process Measures**: Voice of the workings of the system. Are the parts/steps in the system performing as planned?

- **Balancing Measures**: Looking at a system from different directions/dimensions. What happened to the system as we improved the outcome and process measures (e.g. unanticipated consequences, other factors influencing outcome)?
# Potential Set of Measures for CLABSIs

<table>
<thead>
<tr>
<th>Topic</th>
<th>Outcome Measures</th>
<th>Process Measures</th>
<th>Balancing Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in central line associated blood stream infections</td>
<td>CLABSIs per 1000 central line days by unit</td>
<td>Compliance with central line insertion checklist</td>
<td>Need for central lines to be replaced</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hand hygiene rate</td>
<td>Cost of hand hygiene supplies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance with hub scrub with each central line access</td>
<td>Infiltrates for PIV usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance with early central line removal</td>
<td></td>
</tr>
</tbody>
</table>
Milestones in the Quality Measurement Journey

AIM (Why are you measuring?)
Concept
Measure

Operational Definitions
Data Collection Plan
Data Collection
Analysis

The Importance of Operational Definitions

If data collected differently by different people, or differently each time collected, it makes it hard to know whether changes in the data are due to the changes tested or from inconsistencies in data collection.
An Operational Definition...

... is a description, in quantifiable terms, of what to measure and the steps to follow to measure it consistently.

- It gives communicable meaning to a concept
- Is clear and unambiguous
- Specifies measurement methods and equipment
- Identifies criteria
Components of Operational Definition

Developing an operational definition requires agreement on two things:

1. A method of measurement
   - Which device? (clock, wristwatch, stopwatch?)
   - To what degree of precision (nearest hour, 5 minutes, minute, second?)
   - For time based measurements, what are the start and end points

2. A set of criteria for judgment
   - What is “late”, “error”, “a fall”? 
   - What counts as an adverse event, like a CLABSI?
What does it mean to “go wireless”?

I think it was a mistake to go wireless.
What is a goal?
The whole ball or half of the ball?
How do you define the following healthcare concepts?

- Medication error
- Co-morbid conditions
- Teenage pregnancy
- Cancer waiting times
- Health inequalities
- Asthma admissions
- Childhood obesity
- Patient education
- Health and wellbeing
- Adding life to years and years to life
- Children’s palliative care
- Safe services
- Smoking cessation
- Urgent care
- Complete history & physical
- Delayed discharges
- End of life care
- Falls (with/without injuries)
- Childhood immunizations
- Complete maternity service
- Patient engagement
- Moving services closer to home
- Successful breastfeeding
- Ambulatory care
- Access to health in deprived areas
- Diagnostics in the community
- Productive community services
- Vascular inequalities
- Breakthrough priorities
- Surgery start time
Example: Medication Error Operational Definition

<table>
<thead>
<tr>
<th>Measure Name:</th>
<th>Percent of medication errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerator:</td>
<td>Number of outpatient medication orders with one or more errors. An error is defined as: wrong med, wrong dose, wrong route or wrong patient.</td>
</tr>
<tr>
<td>Denominator:</td>
<td>Number of outpatient medication orders received by the family practice clinic pharmacy.</td>
</tr>
</tbody>
</table>

Data Collection:
- This measure applies to all patients seen at the clinic
- The data will be stratified by type of order (new versus refill) and patient age
- The data will be tracked daily and grouped by week
- The data will be pulled from the pharmacy computer and the CPOE systems
- Initially all medication orders will be reviewed. A stratified proportional random sample will be considered once the variation in the process is fully understood and the volume of orders is analyzed.
Operational Definition for measuring a Banana!


2. Measure your banana using the definition, and write down the result and keep it secret!

3. Pass your definition and banana to another table. They will use your definition to measure.

4. Compare results as a group.

© Richard Scoville & I.H.I.
Conclusions: Developing Operational Definitions

1. *Operational definitions are not universal truths!*

2. *Operational definitions require agreement on terms, measurement methods and decision criteria.*

3. *Operational definitions need to be reviewed periodically to make sure everyone is still using the same definitions and that the conditions surrounding each measure have not changed.*
Measures and Analysis – Part II
Milestones in the Quality Measurement Journey

AIM (Why are you measuring?)

Concept

Measure

Operational Definitions

Data Collection Plan

Data Collection

Analysis

ACTION

Key Aspects of Data Collection

• Stratification
• Sampling Methods
• Frequency of Data Collection
• Duration of Data Collection

Key Data Collection Strategies: Stratification

- Separation & classification of data according to predetermined categories
- Designed to discover patterns in the data
- For example, are there differences by shift, time of day, day of week, severity of patients, age, gender or type of procedure?
- Consider stratification **BEFORE** you collect the data
Common Stratification Levels

- Age
- Day of week
- Time of day or Shift
- Stat vs routine orders
- Severity of patients

Gender
- Co-morbid conditions
- Facility or service area
- Units within a facility
- Socio-economic status
Key Data Collection Strategies: Sampling Methods

Probability Sampling Methods

• Simple random sampling
• Stratified random sampling
• Stratified proportional random sampling
• Systematic sampling
• Cluster sampling

Non-probability Sampling Methods

• Convenience sampling
• Quota sampling
• Judgment sampling

How often and for how long do you need to collect data?

• **Frequency** – the period of time in which you collect data (i.e., how often will you dip into the process to see the variation that exists?)
  • Moment by moment (continuous monitoring)?
  • Every hour?
  • Every day? Once a week? Once a month?

• **Duration** – how long you need to continue collecting data
  • Do you collect data on an on-going basis and not end until the measure is always at the specified target or goal?
  • Do you conduct periodic audits?
  • Do you just collect data at a single point in time to “check the pulse of the process”

• Do you need to pull a sample or do you take every occurrence of the data (i.e., collect data for the total population)
Conclusions:
Data Collection

- Seek useful measures not perfection
- **Think about stratification**
- Use sampling (when appropriate)
- **Integrate measurement into daily routine**
- Collect qualitative and quantitative data
- **Plot data over time**
Milestones in the Quality Measurement Journey

AIM (Why are you measuring?)
Concept
Measure
Operational Definitions
Data Collection Plan
Data Collection

Analysis

You have data. Now what do you do with it?
“If I had to reduce my message for management to just a few words, I’d say it all had to do with reducing variation.”

W. Edwards Deming
The Problem!

Aggregated data presented in tabular formats or with summary statistics, will not help you measure the impact of process improvement efforts.

Aggregated data can only lead to judgment, not to improvement.
A phenomenon will be said to be controlled when, through the use of past experience, we can predict, at least within limits, how the phenomenon may be expected to vary in the future.

W. Shewhart.

*Economic Control of Quality of Manufactured Product*, 1931

Dr. Walter A Shewhart

W. Shewhart. *Economic Control of Quality of Manufactured Product*, 1931
“What is the variation in one system over time?”

Walter A. Shewhart - early 1920’s, Bell Laboratories

Every process displays variation:

**Controlled variation**
- stable, consistent pattern of variation
- “chance”, constant causes

**Special cause variation**
- “assignable”
- pattern changes over time
Types of Variation

**Common Cause Variation**
- Is inherent in the design of the process
- Is due to regular, natural or ordinary causes
- Affects all the outcomes of a process
- Results in a “stable” process that is predictable
- Also known as random or unassignable variation

**Special Cause Variation**
- Is due to irregular or unnatural causes that are not inherent in the design of the process
- Affect some, but not necessarily all aspects of the process
- Results in an “unstable” process that is not predictable
- Also known as non-random or assignable variation
Common Cause Variation
(random variation)

- Points equally likely above or below center line
- There will be a high data point and a low, but this is expected
- No trends or shifts or other patterns

Courtesy of Richard Scoville, PhD, IHI Improvement Advisor
Two Types of Special Causes

**Unintentional**
When the system is out of control and unstable due to unexpected forces

**Intentional**
When we’re trying to change the system

Courtesy of Richard Scoville, PhD, IHI Improvement Advisor
Common Cause Variation does not mean “Good Variation.” It only means that the process is stable and predictable. For example, if a patient’s systolic blood pressure averaged around 165 and was usually between 160 and 170 mmHg, this might be stable and predictable but completely unacceptable.

Similarly, Special Cause Variation should not be viewed as “Bad Variation.” You could have a special cause variation that represents a very good result (e.g., a low turnaround time), which you would want to emulate. Special Cause Variation merely means that the process is unstable and therefore unpredictable.
2 Questions …

1. Is the process **stable**?
   If so, it is **predictable**.

2. Is the process **capable**?

The chart will tell you if the process is stable and therefore, predictable.

You have to decide if the current performance of the process is capable of meeting the target or goal you have set!
Finally, find examples that work for your discipline!

Random Variation

Normal Sinus Rhythm (a.k.a. Random Variation)

Non-Random Variation

Ventricular Fibrillation (a.k.a. Non-Random Variation)

Appreciation is extended to Dr. Douglas Brosnan, JD, MD, Vice Chair, Department of Emergency Medicine, Sutter Roseville Inpatient EHR Physician Champion for providing the example of normal sinus rhythm versus ventricular fibrillation.
If you don’t understand the variation that lives in your data, you will be tempted to ...

- Deny the data (It doesn’t fit my view of reality!)
- See trends where there are no trends
- Try to explain natural variation as special events
- Blame and give credit to people for things over which they have no control
- Distort the process that produced the data
- Kill the messenger!
Leaders understand the different ways that variation is viewed.

They explain changes in terms of common causes and special causes.

They use graphical methods to learn from data and expect others to consider variation in their decisions and actions.

They understand the concept of stable and unstable processes and the potential losses due to tampering.

Capability of a process or system is understood before changes are attempted.
Do you understand variation statistically?

**STATIC VIEW**
- Descriptive Statistics
- Mean, Median & Mode
- Minimum/Maximum/Range
- Standard Deviation
- Bar graphs/Pie charts

**DYNAMIC VIEW**
- Run Chart
- Control Chart
  - (plot data over time)
- Statistical Process Control (SPC)
How do we analyze variation for quality improvement?

Run and Control Charts are the best tools to determine if our improvement strategies have had the desired effect.
Three Uses of Statistical Process Control Charts

1. Make process performance visible

2. Determine if a change is an improvement

3. Determine if we are holding the gains
Run Chart

- Graphical display of data plotted in some type of order. Also has been called a time series or a trend chart.

FIGURE 3.1 Run Chart Example
Why Use A Run Chart?

Before and After Test
Change made between week 7 and week 8

Delay Time (hrs)

Before Change
(measure on Week 4)

After Change
(measure on week 11)

Case 1

Why Use A Run Chart?
Evidence that change tested result in an improvement?
Case 2: Random Variation

Case 3: Headed down before change. Where begin?

Case 4: Change did not hold

Case 5: Improvement: before change (between week 4 & 5)

Case 6: Week 4 not typical of process
We Can Learn a Lot with a Simple Tool…

What do you observe here? What would your question be?

**FIGURE 3.2 Run Chart Leading to Questions**

- **Goal = 95**
- **Median = 84**

- Percent
- Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov
How do we analyze a Run Chart

“How will I know what the Run Chart is trying to tell me?”

It is actually quite easy:

1. Determine the number of runs.
2. Then apply the 4 basic run chart rules decide if your data reflect random or non-random variation.
First, you need to determine the number of Runs

**What is a Run?**
- One or more consecutive data points on the same side of the Median
- Do not include data points that fall on the Median

How do we count the number of runs?

- Draw a circle around each run and count the number of circles you have drawn
- Count the number of times the sequence of data points crosses the Median and add “1”
Run Chart: Medical Waste

Determine the number of runs on this chart

Point Number
Pounds of Red Bag Waste
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00

Median=4.610

Points on the Median
(don’t count these when counting the number of runs)
Run Chart: Medical Waste

Determine the number of runs on this chart

14 runs
Run Chart Rules for Non-Random Patterns

**Rule 1:**
- **A Shift:** 6 or more

**Rule 2:**
- **A Trend:** 5 or more

**Rule 3:**
- **Too many or too few runs**

**Rule 4:**
- **An astronomical data point**

Run Chart: Medical Waste

Apply the Run Chart Rules

14 runs

Points on the Median
(don’t count these when counting the number of runs)
Rule #3: Too few or too many runs

Use this table by first calculating the number of "useful observations" in your data set. This is done by subtracting the number of data points on the median from the total number of data points. Then, find this number in the first column. The lower number of runs is found in the second column. The upper number of runs can be found in the third column. If the number of runs in your data falls below the lower limit or above the upper limit then this is a signal of a special cause.

<table>
<thead>
<tr>
<th># of Useful Observations</th>
<th>Lower Number of Runs</th>
<th>Upper Number of Runs</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
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<tr>
<td>16</td>
<td>5</td>
<td>13</td>
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<td>18</td>
</tr>
<tr>
<td>26</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>27</td>
<td><strong>10</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

Two data points on the median = 27 useful observations

So, for 27 useful observations we should have between 10 and 19 runs

| 28 | 10 | 20 |
| 29 | 10 | 20 |
| 30 | 11 | 21 |

Why are Shewhart Charts preferred over Run Charts?

Because Control Charts…

1. Are more sensitive than run charts
   - A run chart cannot detect special causes that are due to point-to-point variation (median versus the mean)
   - Tests for detecting special causes can be used with control charts

2. Have the added feature of control limits, which allow us to determine if the process is stable (common cause variation) or not stable (special cause variation).

3. Can be used to define process capability.

4. Allow us to more accurately predict process behavior and future performance.
Elements of a Shewhart Chart

- Measure
- Time
- Number of Complaints

- UCL = 44.855
- CL = 29.250
- LCL = 13.645

An indication of a special cause

X (Mean)

(Upper Control Limit)

(Lower Control Limit)
The choice of a Shewhart Chart depends on the Type of Data you have collected

**Variables Data**

**Attributes Data**

**Defectives**
(occurrences plus non-occurrences)

*Nonconforming Units*

**Defects**
(occurrences only)

*Nonconformities*
There Are 5 Basic Shewhart Charts

**Variables Charts**

- $\bar{X}$ & S chart  
  (average & SD chart)

- XmR chart  
  (individuals & moving range chart)

**Attributes Charts**

- p-chart  
  (proportion or percent of defectives)

- c-chart  
  (number of defects)

- u-chart  
  (defect rate)
The Shewhart Chart Decision Tree

5 Rules for Determining a Special Cause in Control Charts

1. **A single point** outside the control limits
2. **A run of eight** or more points in a row above or below the center line
3. **Six** consecutive points in a row increasing (trend up) or decreasing (trend down)
4. **Two out of three consecutive points** near a control limit (outer one third of chart)
5. **Fifteen consecutive points** in a row near the center line (inner one third of the chart)
FIGURE 4.5 Rules for Determining a Special Cause

1. A single point outside the control limits.

2. A run of eight or more points in a row above (or below) the centerline.

3. Six consecutive points increasing (trend up) or decreasing (trend down).

4. Two out of three consecutive points near (outer one-third) a control limit.

5. Fifteen consecutive points close (inner one-third of the chart) to the centerline.
“Special Cause” in Run vs. Control Charts

<table>
<thead>
<tr>
<th>Rule</th>
<th>Run Charts</th>
<th>Control Charts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consecutive increasing or decreasing points</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Number of points on the same side of the center line.</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Astronomical point</td>
<td>One “unusual” point</td>
<td>One outside the UCL or LCL</td>
</tr>
<tr>
<td>Points around the center line</td>
<td>Too few or too many crossings of center line</td>
<td>15 around the inner third</td>
</tr>
<tr>
<td>2 out of 3 in the outer third</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Center line</td>
<td>Median</td>
<td>Mean</td>
</tr>
<tr>
<td>Control Limits</td>
<td>No</td>
<td>Yes (+/- 3 ~SD)</td>
</tr>
</tbody>
</table>
Your next move...

...to gain more knowledge about Shewhart Charts (a.k.a. control charts)
PDSA Testing
PDSA

P  Please
D  Do
S  Something
A  Anything!
The PDSA Cycle

Now, let’s review the PDSA part of the MFI and tests of change

The Deming Wheel

1. Design the product (with appropriate tests).
2. Make it; test it in the production line and in the laboratory.
3. Sell the product.
4. Test the product in service, through market research. Find out what user think about it and why the nonusers have not bought it.

Deming’s Sketch of the Shewhart Cycle - 1985

Walter Shewhart (1891 – 1967)

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.
The PDSA Cycle for Learning and Improvement
(a practical application of the scientific method)

**Plan**
- Objective
- Questions & predictions
- Plan to carry out: Who? When? How? Where?

**Do**
- Carry out plan
- Document problems
- Begin data analysis

**Study**
- Complete data analysis
- Compare to predictions
- Summarize

**Act**
- Ready to implement?
- Try something else?
- Next cycle

**What will happen if we try something different?**

**Did it work?**

**Let’s try it!**

**What’s next?**
You actually do PDSAs every day!
Plan, Do, Study, Act Cycle
Plan, Do, Study, Act Cycle

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

Do

Study

Act
Chorioamnionitis PDSA –
Objectives and Questions to be answered

MODEL FOR IMPROVEMENT  DATE __5/22/14__
Objective for this PDSA Cycle: To continue testing the admission of an infant for r/o sepsis due to maternal chorio to well baby during the day.

Is this cycle used to develop, test, or implement a change? Test a change
What question(s) do we want to answer on this PDSA cycle?

1. Will there be a delay in the placement of an IV and administration of antibiotics?
2. Will there be a delay in drawing blood work and ordering medications?
3. Will there be any barriers to the infant receiving every 3 hour vital signs by the couplet nurse and be reevaluated at 6 hours of life by the medical staff?
4. Will there be any new barriers or issues discovered as we scale up (moving from a test of 1 to a test of 5)
Plan:

Plan to answer questions: Who, What, When, Where

Starting on May 28, between the hours of 8am to 4pm we will admit the next 5 babies born to mothers with Chorioamnionitis to the well baby nursery for sepsis workup and antibiotics administration.

- Infant may stay with mother skin to skin for 1 hour if stable.
- Labor floor nurse to contact silver 8 nurse (nursery or couplet as appropriate) to alert her that she is bringing this baby to the nursery.
- Silver 8 nurse to contact ICN charge nurse to alert her of the admission.
- ICN charge nurse to determine resource for IV placement and alert the medical team from the ICN to arrive to draw blood (resident or FLC).
- Intern in the well baby nursery will place admission orders and orders for blood work and antibiotics.
- Intern in the well baby nursery will complete admission paperwork and admit the baby with the well baby attending of the day.
- Couplet nurse on silver 8 will perform vital signs every 3 hours for the first 12 hours of life (x4 sets) and alert the medical staff if there are abnormalities.
- A member of the medical team (intern with supervision by the well baby attending) will reevaluate the baby at approximately 6 hours after admission for stability. If this occurs after change of shift, the need a timing of this evaluation will be communicated to the nighttime ICN team and be performed by the overnight resident with fellow supervision.
Chorioamnionitis PDSA – Plan and Predictions

Plan for collection of data: Who, What, When, Where

There will be a data collection form to be completed by the nursery nurse documenting time of birth, time baby arrives in the nursery, time of IV placement and time of antibiotic administration. There will also be a check box to indicate whether or not vital signs were done q3h and an additional evaluation of the baby was done at 6 hours. This form can be left with the baby’s crib for ease of documentation. Forms to be collected on all 5 patients separately.

Predictions (for questions above based on plan):

1. The placement of the IV will happen within 30 minutes of admission to the nursery.

2. The blood drawing and ordering of medications will occur within 30 minutes of admission to the nursery, unless there was a competing patient need in the ICN/delivery room.

3. Vital signs will be documented every three hours and the resident will reevaluate the baby at 6 hours after admission.

4. We anticipate finding additional challenges when we start to scale this up including forgetting to do 3 hour vital signs and 6 hour medical check. Furthermore, we anticipate that if these cross shifts to night time, this will represent an additional opportunity for missing these items.
Data Collection Form

Infant Name: ____________________ Date: ____________________

Time of birth: ____________________ Time of day: ____________________

Time of admission to silver 8 nursery: ____________________

If not within 90 minutes of birth, were there identified reasons: ____________________

Time of IV placement: ____________________

If not within 30 minutes of admission, were there specific reasons for the delay: ____________________

Time of antibiotic administration: ____________________

If not within 30 minutes of admission, were there specific reasons for the delay: ____________________

Were vital signs documented every 3 hours? Yes [ ] No [ ]

If not, what were the barriers identified? ____________________

Was there documentation that the baby was reevaluated 6 hours later by the medical team? Yes [ ] No [ ]

If not, what were the barriers identified? ____________________
Plan, **Do**, Study, Act Cycle

- **Plan**
  - Carry out the plan
  - Document problems and unexpected observations
  - Begin analysis of the data

- **Do**
- **Act**
- **Study**
Chorioamnionitis PDSA – Do it!

Do:

*Carry out the change or test; Collect data and begin analysis.*

The test of change was carried out with 5 consecutive babies (born during the day) over the first 2 weeks of June. Data collection sheets were completed for these infants. The infants were all transferred from the labor floor to the silverstein 8 nursery where an IV was placed, blood was drawn, and antibiotics were ordered and administered. The time for each of these steps was documented. We also assessed the frequency of vital sign documentation and evaluation by the medical staff.
Plan, Do, **Study**, Act Cycle

- **Study**
  - Complete the analysis of the data
  - Compare data to predictions
  - Summarise what was learned

- **Act**
- **Plan**
- **Do**
Chorio – Study it! What did we learn?

Study:
Complete analysis of data;

3 babies in the first week and 2 babies in the second week of June were treated in the well-baby nursery for their sepsis evaluation. 3 of the 5 babies were born outside of the window of 8am to 4pm. In two cases, there was a delay in bringing the baby up from the labor floor due to a lack of understanding that the labor floor nurse was supposed to initiate this. The process actually seemed to work better for the babies that were born at night (one baby had antibiotics started within 2 hours!). In one situation, the delay in care was due to the time it took to place the IV. Personnel did what they were otherwise expected to do (well-baby and ICN nursing and physician staff).

Compare the data to your predictions and summarize the learning

<table>
<thead>
<tr>
<th>Question</th>
<th>Prediction</th>
<th>Actual Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay in IV and Abx?</td>
<td>Placement of IV within 30 minutes</td>
<td>One delay in IV. Two delays in baby being brought up from labor floor. On average, antibiotics were started within 3 hours.</td>
</tr>
<tr>
<td>Delay in blood work and ordering medications?</td>
<td>Blood drawing and orders within 30 minutes</td>
<td>Completed on time</td>
</tr>
<tr>
<td>Barriers to q3h vital signs and 6 hr evaluation?</td>
<td>No barriers</td>
<td>Some babies did not get q3h vital signs and 6 hour check. Barriers were people forgetting they had to do it.</td>
</tr>
<tr>
<td>New barriers due to scale from 1 to 5 babies?</td>
<td>Yes there will be additional challenges – forgetting to do vital signs and 6hr check. Will be worse at night</td>
<td>Communication with labor floor about initiating transfer was a problem. Also, lack of understanding that this was only supposed to happen during the day.</td>
</tr>
</tbody>
</table>
Plan, Do, Study, **Act** Cycle

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

- **Do**

- **Study**

- **Act**
Chorioamnionitis – Act?
What to do next?

Act:
Are we ready to make a change? Plan for the next cycle

- Reinforce communication between well baby nursery and labor floor about practice change and everyone’s role.
- Expand pilot to include more babies during the day.
- Introduce reminders about q3h vital sign checks and 6 hour medical evaluation.
- May be able to move to nights and weekends more quickly than we anticipated.
On the basis of what is learned from any cycle, a change might be:

- Implemented as is (adopt)
- Dropped (abandon)
- Modified (adapt)
- Increased in scope (expand)
- Test under other conditions

![Figure 4.1. Elements of the PDSA Cycle.](image-url)
Repeated Use of the PDSA Cycle

1) What are we trying to accomplish?
2) How will we know that a change is an improvement?
3) What change can we make that will result in improvement?

Sequential building of knowledge under a wide range of conditions
Using a PDSA ramp to test change – Chorio

- Admit one chorio baby to well-baby.
- Expand to 5 patients during the day.
- All babies between 8 and 5 during the week.
- Include all patients including those on Family Med service.
- Include babies born on nights and weekends.

Theories, hunches, & best practices

Evidence & Data

Very small scale test

Learning and improvement

Wide-scale tests of change

Test new conditions

Follow-up tests

Breakthrough Results
All improvement requires change, but not all change is an improvement!
Aim: To increase the spin time of your coin.
Test: Best technique, best surface, best conditions. Make iterative spin tests to determine best combination of conditions to get results.

- Appoint a spinner
- Appoint a timekeeper
- Appoint a recorder
- Document PDSAs on worksheet
- Plot the time of each spin onto the run chart
- Complete 10 cycles or more! *(15 min)*
# PDSAs to Increase Spin Time

<table>
<thead>
<tr>
<th>#</th>
<th>Plan</th>
<th>Do</th>
<th>Study</th>
<th>Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
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<td>7</td>
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<td>8</td>
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<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Data Collection on a Run Chart

![Run Chart](chart.png)
The Sequence of Improvement requires PDSAs

Developing a change

Testing a change

Implementing a change

Make part of routine operations

Sustaining improvements and spreading changes to other locations

Theory and Prediction

Test under a variety of conditions

Data are used throughout the sequence
To Be Considered a Real Test

- Test was planned, including a plan for collecting data
- Plan was carried out and data were collected
- Time was set aside to analyze data and study the results
- Action was based on what was learned
Guidance for Testing a Change Concept

- A test of change should answer a specific question!
- A test of change requires a **theory** and a **prediction**!
- Start testing on a small scale (1 patient, 1 day, 1 admit, 1 physician)
- Collect **data over time** (by hour, day week or month)
- Build knowledge **sequentially** with multiple PDSA cycles for each idea.
- Include a **wide range of conditions** in the sequence of tests.
- Document your tests with a PDSA form
- Set aside time to **analyze the data** from the PDSA test, **study the results** and use the insights to **guide the team’s actions**.
- Don’t confuse a **task** with a **test**!
### How big of a test of change?

<table>
<thead>
<tr>
<th>Current Situation</th>
<th>Resistant</th>
<th>Indifferent</th>
<th>Ready</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Confidence that current change idea will lead to Improvement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of failure large</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
</tr>
<tr>
<td>Cost of failure small</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
<td></td>
</tr>
<tr>
<td><strong>High Confidence that current change idea will lead to Improvement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of failure large</td>
<td>Very Small Scale Test</td>
<td>Small Scale Test</td>
<td>Large Scale Test</td>
</tr>
<tr>
<td>Cost of failure small</td>
<td>Small Scale Test</td>
<td>Large Scale Test</td>
<td>Implement</td>
</tr>
</tbody>
</table>

- **Resistant**:
  - Low Confidence: Very Small Scale Test
  - High Confidence: Small Scale Test
- **Indifferent**:
  - Low Confidence: Very Small Scale Test
  - High Confidence: Small Scale Test
- **Ready**:
  - Low Confidence: Very Small Scale Test
  - High Confidence: Large Scale Test
Failed Test…Now What?

Be sure to distinguish the reason:
- Change was not executed properly
- Change was executed, but not effective (wrong idea)

If the prediction was wrong it was not a failure!
- Change was executed but did not result in improvement.
- Local improvement was small and did not impact the entire process of interest.
- In either case, we’ve improved our understanding of the system and learned!
The Value of “Failed” Tests

“I did not fail one thousand times; I found one thousand ways how not to make a light bulb.”

Thomas Edison
Working in Parallel on Multiple Change Ideas or Drivers

- Skin to Skin
- Rooming in
- Feeding cues
- Alt feeding methods/supplementation
Implementing, Sustaining, and Spread
Questions to improve impact

- How do we move from testing to making the change permanent? (Implementation)
- How do we hold the gains from improvement over time? (Sustainability)
- How do we improve more quickly across a system?
  - How do we engage individuals to adopt changes identified elsewhere? (Spread)
  - How do we build the infrastructure to allow adoption of changes in different contexts? (Scale-up).
  - How do we expose or provoke system barriers (Scale-up)
The sequence of improvement

- Developing a change
- Testing a change
- Implementing a change
- Make part of routine operations
- Test under a variety of conditions
- Sustaining improvements and spreading changes to other locations

Data are used throughout the sequence.
Creating a new system

Old way: Sequential Approach

Improvement → Hold Gains → Results at Scale

New way: Parallel Approach

Improvement → Hold Gains → Design for Scale → Get Results at Scale
**Improvement Sequence: Definitions**

- **Test** – Try and adapt ideas to learn what works in your system
- **Implement** – Make a change a permanent part of the day to day operation of the system
- **Sustain** – Hold the gains of improvement
- **Spread** – Have individuals *adopt* the changes
- **Scale-up** – Overcoming the *structural issues* that arise during spread

Improving Long-Term Impact

- Human Reaction to Change
- Technical Aspects of Change
- Nature of the Change
Implementation

How do we move from testing to making the change permanent?
<table>
<thead>
<tr>
<th>Expectation for...</th>
<th>Testing</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>20 – 25%</td>
<td>~5%</td>
</tr>
<tr>
<td>Surprises (i.e., variance from predictions)</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Number of people affected</td>
<td>Few</td>
<td>Many</td>
</tr>
<tr>
<td>Resistance</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Redesign of existing processes (e.g., job descriptions)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>New resources needed</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Time needed to run PDSA</td>
<td>Fast</td>
<td>Slow</td>
</tr>
</tbody>
</table>
How big of a test of change?

<table>
<thead>
<tr>
<th>Current Situation</th>
<th>Resistant</th>
<th>Indifferent</th>
<th>Ready</th>
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<tr>
<td>Low Confidence that current change idea will lead to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement</td>
<td></td>
<td></td>
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<td>Cost of failure large</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
</tr>
<tr>
<td>Cost of failure small</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
<td></td>
</tr>
<tr>
<td>High Confidence that current change idea will lead to</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Improvement</td>
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<td></td>
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<td>Cost of failure large</td>
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<td></td>
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<tr>
<td>Cost of failure small</td>
<td>Very Small Scale Test</td>
<td>Small Scale Test</td>
<td>Large Scale Test</td>
</tr>
<tr>
<td>Cost of failure small</td>
<td>Small Scale Test</td>
<td>Large Scale Test</td>
<td>Implement</td>
</tr>
</tbody>
</table>
Pre-requisites to Implementation

- Change tested under a variety of conditions
- Data over time available to show changes leads to improvement
- Champions of change identified in key stakeholder groups
- Process owner identified and engaged
- Impact on workload assessed
Technical strategies for implementation

- Continue to use PDSA cycles
- Three approaches when planning PDSA’s
  1. “Just do it”
  2. Parallel approach
  3. Sequential approach
     a) One at a time with all staff
     b) All at one time with selected staff
Expectation for implementation

![Graph showing Unreconciled Meds over time with a downward trend and a learning curve indicated. The vertical axis represents the measure, and the horizontal axis represents the months from Sept. 12 to Jun. 14. The graph shows a decrease in Unreconciled Meds with a dip in Aug. 13, followed by a gradual decline.](image)

Lower is better.
Sustainability – Holding the Gains

How do we hold the gains from improvement over time?
Think of a time in your experience when an improvement was implemented. Are the gains from that change still there?

– If yes, what was done that resulted in the gains being held?
– If no, why did the gains fail to be held? What got in the way?
Technical Aspects

- Measurement
- Ownership
- Communication and Training
- Hardwiring and Standardization
- Assessment of Workload
Figure 1. The Relationship of Quality Improvement and Quality Control
Measurement: Quality control

SC Costs with Control Limits

SC Costs as % of Total Costs

Old system

New system

Not holding gain;
Things getting worse
Act to correct

Do we have the data (process and outcome)?
Do we look at it?
Do we know what to do?
### Ownership

**Figure 2. Architecture of a High-Performance Management System**

<table>
<thead>
<tr>
<th>Quality Control (Operations)</th>
<th>Quality Improvement (System Change)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key Tasks</strong></td>
<td><strong>Key Tasks</strong></td>
</tr>
<tr>
<td>- Define core values</td>
<td>- Monitor environment, anticipate change</td>
</tr>
<tr>
<td>- Articulate principles</td>
<td>- Quality planning</td>
</tr>
<tr>
<td>- Obtain and deploy resources</td>
<td>- Set strategic direction</td>
</tr>
<tr>
<td>- Monitor “Big Dole”</td>
<td>- Commission and drive system-wide initiatives</td>
</tr>
<tr>
<td>- Frequent frontline</td>
<td>- Consistent messaging</td>
</tr>
<tr>
<td>observation</td>
<td>- Celebrate improvement</td>
</tr>
<tr>
<td><strong>Data for Control</strong></td>
<td><strong>Data for Improvement</strong></td>
</tr>
<tr>
<td>- “Big Dole” system</td>
<td>- Aggregated system process and outcomes metrics</td>
</tr>
<tr>
<td>metrics, process and</td>
<td>- T2, system QI project status and metrics</td>
</tr>
<tr>
<td>outcomes metrics</td>
<td>- Population, organization impact</td>
</tr>
<tr>
<td>- Reports to external</td>
<td>- Negotiate T2 strategic goals</td>
</tr>
<tr>
<td>stakeholders</td>
<td>- Launch, prioritize system QI initiatives</td>
</tr>
<tr>
<td><strong>Guidance</strong></td>
<td><strong>Aims Alignment</strong></td>
</tr>
<tr>
<td>- Coaching (all tiers)</td>
<td>- Tier 3 Executive, VP</td>
</tr>
<tr>
<td>in workplace</td>
<td>- T2, system QI project status and metrics</td>
</tr>
<tr>
<td>- Monitor T3 standard work</td>
<td>- Population, organization impact</td>
</tr>
<tr>
<td>- Coaching T1 on standard</td>
<td>- Negotiate T1 goals</td>
</tr>
<tr>
<td>work</td>
<td>- Launch, prioritize T2 projects</td>
</tr>
<tr>
<td>- Monitor staff, process</td>
<td>- Tier 2 Dept. Manager, Director</td>
</tr>
<tr>
<td>capability</td>
<td>- Conduct root cause analysis</td>
</tr>
<tr>
<td>- Monitor T1 standard work</td>
<td>- Quality planning</td>
</tr>
<tr>
<td>- Tier 2</td>
<td>- Commission and drive system-wide initiatives</td>
</tr>
<tr>
<td><strong>Unit Manager</strong></td>
<td>- Lead interdepartmental projects</td>
</tr>
<tr>
<td><strong>Data for Improvement</strong></td>
<td><strong>Aims Alignment</strong></td>
</tr>
<tr>
<td>- Coordinate with</td>
<td>- Tier 1 Unit Manager</td>
</tr>
<tr>
<td>improvement specialists:</td>
<td>- T1 project status and metrics</td>
</tr>
<tr>
<td>to surface problems,</td>
<td>- Staff QI capacity</td>
</tr>
<tr>
<td>best practices</td>
<td>- Negotiate T1 goals</td>
</tr>
<tr>
<td>- Lead T1 QI projects</td>
<td>- Launch, prioritize T1 projects</td>
</tr>
<tr>
<td>- Lead root cause analysis</td>
<td>- Tier 1 Unit Manager</td>
</tr>
<tr>
<td>- Lead daily PDSA</td>
<td>- T1 project status and metrics</td>
</tr>
<tr>
<td><strong>Charge Nurse, Frontline</strong></td>
<td><strong>Aims Alignment</strong></td>
</tr>
<tr>
<td>Staff</td>
<td>- Negotiate unit goals</td>
</tr>
<tr>
<td>- Undertake simple process</td>
<td>- Launch, prioritize unit-level QI projects</td>
</tr>
<tr>
<td>fixes (“See-Solve”)</td>
<td><strong>Patient Care Interface</strong></td>
</tr>
<tr>
<td>- Identify problems for</td>
<td><strong>Patients and Families</strong></td>
</tr>
<tr>
<td>improvement</td>
<td>- Participation in QI teams for aligned improvement</td>
</tr>
<tr>
<td>- Engage in PDSA</td>
<td>- Identify process problems, offer suggestions</td>
</tr>
<tr>
<td>- Participate in QI</td>
<td>- Stories and observations</td>
</tr>
<tr>
<td>teams for aligned</td>
<td>- Patients and families shape aims for improvement</td>
</tr>
<tr>
<td>improvement</td>
<td></td>
</tr>
</tbody>
</table>
Communication and training

- Awareness to decision (communication)
- Decision to action:
  - Peer-to-peer
  - “At the elbow” or mentoring
  - Ongoing technical support or hotline
  - Learning + Action
  - Address mindsets + technicalities
- Consider training for existing and new employees (e.g., onboarding)

More soon!
Training: How matters

What do adults retain after three months?

- Lecture-based training (e.g., presentations, videos, demonstrations, discussions) = 10%
- Learn by doing (e.g., role plays, simulations, case studies) = 65%
- Practice what was learned in the workplace = ~100%

IBM research; Whitmore, “Coaching for Performance.”
Hardwiring the change

- Make it easy to do the right thing and hard to do the wrong thing

- Sample methods:
  - Standardization and accountability for following standard work
  - Documentation
  - Remove “old way”
  - Reduce reliance on human memory (affordances, defaults)
  - Tend to resources: forms, equipment, etc.
# Managing sustainability

## 4 Hour Project

### SUSTAINABILITY PLAN

<table>
<thead>
<tr>
<th>Process Description</th>
<th>Core Team Members</th>
<th>Date First Completed</th>
<th>Process Owner</th>
<th>Date (latest revision)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment and management of patients discharged from ED</td>
<td>Executive Director of Process Owner</td>
<td>7/21/2011</td>
<td>8/13/2012</td>
<td></td>
</tr>
</tbody>
</table>

## Control Plan

<table>
<thead>
<tr>
<th>Types of measure</th>
<th>Operational Definition</th>
<th>How is the data taken</th>
<th>Who is accountable for the data</th>
<th>How is the data measured</th>
<th>Who is accountable for the measurement</th>
<th>How is the data reported</th>
<th>Who produces the report</th>
<th>Who receives the report</th>
<th>What is the target for the measure</th>
<th>Who is accountable for meeting the target</th>
<th>When do I take action</th>
<th>What actions do I take</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Hour KPI performance</td>
<td>The percentage of patients discharged from the ED with a length of stay of less than 4 hours</td>
<td>Crystal report from Symphony</td>
<td>Bruce Garbutt</td>
<td>Crystal report from Symphony</td>
<td>Bruce Garbutt</td>
<td>ED Scorecard</td>
<td>Bruce Garbutt</td>
<td>ED Leadership Group (Melinda Truedale, Steve Razes, Karen Clark, Liz Virtue)</td>
<td>&gt; 80%</td>
<td>ED Leadership Group, Bruce Garbutt</td>
<td>&lt; 80%</td>
<td>Review of more detailed ED performance data to identify delays</td>
<td>Performance during May - July 2013 maintained at 70 - 80%, 60 - 70% August 2013, most recent measure 70% (week ending 1/8/13)</td>
</tr>
<tr>
<td>Fast Track - patient numbers and 4 hour performance</td>
<td>Number of patients managed through Fast Track per week and the percentage discharged within 4 hours</td>
<td>Crystal report from Symphony</td>
<td>Bruce Garbutt</td>
<td>Crystal report from Symphony</td>
<td>Bruce Garbutt</td>
<td>ED Scorecard</td>
<td>Bruce Garbutt</td>
<td>ED Leadership Group (Melinda Truedale, Steve Razes, Karen Clark, Liz Virtue)</td>
<td>100 patients per week, 4 Hour KPI &gt; 60%</td>
<td>ED Leadership Group, Bruce Garbutt</td>
<td>&lt; 75 patients per week, 4 hour KPI &lt; 80%</td>
<td>Audit of patients being managed through Fast Track, and potentialized patients in Emergency stream</td>
<td>Continued good performance: 90 - 110 patients per week, 4 hour KPI performance 80 - 100%</td>
</tr>
</tbody>
</table>
| 3rd quartile process time for patients discharged from ED | 3rd quartile process time for waiting time, assessment time, and length of stay for patients discharged from the ED | Crystal report from Symphony | Bruce Garbutt | Crystal report from Symphony | Bruce Garbutt | ED Scorecard | Bruce Garbutt | ED Leadership Group (Melinda Truedale, Steve Razes, Karen Clark, Liz Virtue) | Wait 30 minutes, Assess 150, LOS 240 | ED Leadership Group, Bruce Garbutt | Wait 30 minutes, Assess 50, LOS 240 | Review more detailed ED performance figures/weight, review staffing issues/allocation | Waiting time 105 - 135 minutes (originally 150 - 160 minutes), Assessment time 135 - 150 minutes (improved from 140 - 170 minutes), ED LOS 230 - 275 minutes (originally 315 minutes) | Short Stay utilisation to }
Spread and Scale-up

*How do we improve more quickly across a system?*
Your Project

- **Spread**: Having individuals adopt the changes

- **Scale-up**: Overcoming the structural issues that arise during spread
Technical Aspects

- Spread and scale-up aim
- Plans
  - Workplan
  - Communication
  - Measurement for uptake of changes and the outcomes
- Project manager (25 – 50% FTE for high complexity)
- Infrastructure
## Process Measure

<table>
<thead>
<tr>
<th>Site</th>
<th>Exec Walks</th>
<th>Unit Briefings</th>
<th>HFE Briefings</th>
<th>FMEA</th>
<th>Reconciliation</th>
<th>Hazard Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Coumadin</td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>PCAs</td>
</tr>
<tr>
<td>3</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>Plan</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>X</td>
<td>X</td>
<td>Plan</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>X</td>
<td>X</td>
<td>Plan</td>
<td>Plan</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>Plan</td>
<td>Lovenox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Heparin</td>
</tr>
<tr>
<td>7</td>
<td>X</td>
<td>Plan</td>
<td></td>
<td>Plan</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>X</td>
<td>Plan</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*X = At least one unit implementing the change*
Small Multiples: Overall System and 22 Clinics

Average Waiting Times: All Primary Care Clinics in System

The graphs for each clinic are called small multiples. They are designed for a quick visual comparison of the data from each clinic. The graphs are all presented on the same waiting time scale (0 to 100 days) and time scale (4/00 - 12/00).
The Scale-up Framework

Best Practice exists
New Scale-up Idea

Set-up → Build Scalable Unit → Test Scale-Up → Go to Full-Scale

Leadership, communication, social networks, culture of urgency and persistence

Learning systems, data systems, infrastructure for scale-up, human capacity for scale-up, capability for scale-up, sustainability

Phases of Scale-up
Adoption Mechanisms
Support Systems
## Scale-up framework

<table>
<thead>
<tr>
<th>Change Areas</th>
<th>5</th>
<th>25</th>
<th>125</th>
<th>625</th>
<th>3125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking What Matters</td>
<td>Physician asks at primary care visit</td>
<td>PA asks during vital signs</td>
<td>Pre-visit planning</td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td>Documenting What Matters</td>
<td>Pen and paper</td>
<td>Standardized form</td>
<td>Whiteboard</td>
<td>EHR</td>
<td>???</td>
</tr>
<tr>
<td>Sharing What Matters</td>
<td>Physician head</td>
<td>Form in record</td>
<td>Care team meeting</td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td>Updating What Matters</td>
<td>N/A</td>
<td>N/A</td>
<td>Pre-visit planning</td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td>Learning System</td>
<td>N/A</td>
<td>Team Meeting</td>
<td>Champion</td>
<td>Database</td>
<td>???</td>
</tr>
</tbody>
</table>
## Scale-up framework

<table>
<thead>
<tr>
<th>Change Areas</th>
<th>5</th>
<th>25</th>
<th>125</th>
<th>625</th>
<th>3125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

.
Improving Long-Term Impact

Human Reaction to Change

Technical Aspects of Change

Nature of the Change
Attributes of an idea that facilitate adoption

- Relative Advantage
- Simple
- Trialable
- Compatible
- Observable

Relative Advantage

Simple

Trialable

Compatible

Observable

Most influential in rate of spread

## Worksheet: Assess the Readiness of an Idea for Rapid Spread

**Change/Improvement/Intervention:** ________________________________________

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Score (1 – 5)</th>
<th>Actions to Take</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage (i.e., how strong is the evidence that the change is better than the old way)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatibility with current system (i.e., how well does it fit the current structure, values, and practices)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simplicity of the change (i.e., how easy is the change to adopt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testability (i.e., can people try it)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observability (i.e., can people see it before trying it)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard core, soft periphery (i.e., to what extent can individuals customize to their context)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Improving Long-Term Impact

- Human Reaction to Change
- Technical Aspects of Change
- Nature of the Change
Human reaction to change

- How people react to change - differently
- The message: why and how
- The messenger
- Other levers
- What if people still won’t change
How people react to change

- **Resistance**: an emotional or behavioral response to real or imagined threats to the work routine
- **Apathy**: feeling or showing little or no interest
- **Compliance**: publicly acting in accord with social pressure while privately disagreeing
- **Conformance**: a change in behavior or belief as a result of real or imagined group pressure
- **Commitment**: the state of being bound emotionally or intellectually to a course of action
The message: why

- What motivates you doesn’t motivate employees (~20% across dimensions)
- Motivations differ. Customize the message
  - Company
  - Society
  - Customer
  - Personal gain
  - Working team
The message: why (example)

- **Company:** survive the new payment environment.
- **Society:** Team-based care is the future of health care—better health at lower cost. This is vital given that health care is too much of the GDP and chronic conditions are continuing to rise.
- **Customer:** Team-based care creates better outcomes for our patients.
- **Personal gain:** go home on time without home-work
- **Working team:** care will be coordinated with greater communication, and problem solving
The message: as leaders you will

- Create dissatisfaction with current state
- Relentlessly communicate direction
- Express excessive faith in success
- Empathize with anxiety
- Make it personal:
  - Logistical implications of change (e.g., where will I sit)
  - Clear message on what I will be doing differently
  - How will this make my job easier?
Create a burning platform
The message: how

Raise Awareness

- General Publications
  - Flyers
  - Newsletters
  - Videos
  - Articles
  - Posters

- Personal Touch
  - Letters
  - Cards
  - Postcards

- Interactive Activities
  - Telephone
  - Email

Shape Behavior

- Public Events
  - Fairs
  - Conferences
  - Exhibitions
  - Meetings

- Peer-to-Peer
  - Communities of practice
  - Shadowing
  - Visits
  - Mentoring

Adapted from Sarah W. Fraser
The messengers

- Include influencers/opinion leaders
- To identify opinion leaders:
  - Testing teams should be front and center
  - Understand the nature of networks
Adopter Categories

- Innovators: 2.5%
- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
- Traditionalists: 16%

Source: Rogers, 1995
Adopter Categories

“Early adopters have the greatest degree of opinion leadership in most social systems.” (Rogers)

Source: Rogers, 1995
Leverage the recognition economy

## Fully Committed List

**Fully Committed List Criteria:**
1. The community has completed a Registry Week or uses a similar method of knowing everyone by name, AID.
2. The community has reported every month for at least the past three months, even if they have not housed anyone.

### 2.5% Club

<table>
<thead>
<tr>
<th>Atlanta, GA</th>
<th>Maricopa County, AZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltimore, MD</td>
<td>Memphis, TN</td>
</tr>
<tr>
<td>Bellflower, CA</td>
<td>Monroe, LA</td>
</tr>
<tr>
<td>Bergen County, NJ</td>
<td>Nashville, TN</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>New Orleans, LA</td>
</tr>
<tr>
<td>Bridgeport, CT</td>
<td>New York, NY</td>
</tr>
<tr>
<td>Central Louisiana - Alexandria, LA</td>
<td>North Hollywood/Sun Valley, CA</td>
</tr>
<tr>
<td>Central Mississippi, MS</td>
<td>Oklahoma City, OK</td>
</tr>
<tr>
<td>Charlotte, NC</td>
<td>Philadelphia, PA</td>
</tr>
<tr>
<td>Chesapeake, VA</td>
<td>Pinellas County, FL</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>Pittsburgh, PA</td>
</tr>
<tr>
<td>Delaware</td>
<td>Portland, OR</td>
</tr>
<tr>
<td>Denver, CO</td>
<td>Portsmouth, VA</td>
</tr>
<tr>
<td>Erie County, NY</td>
<td>Prince William County, VA</td>
</tr>
<tr>
<td>Forsyth County, NC</td>
<td>Richmond, VA</td>
</tr>
<tr>
<td>Fresno, CA</td>
<td>Salt Lake County, UT</td>
</tr>
<tr>
<td>Glendale, CA</td>
<td>San Francisco, CA</td>
</tr>
<tr>
<td>Houston, TX</td>
<td>Santa Monica, CA</td>
</tr>
<tr>
<td>Indianapolis, IN</td>
<td>Shreveport, LA</td>
</tr>
<tr>
<td>Jacksonville, FL</td>
<td>Suburban Cook County, IL</td>
</tr>
<tr>
<td>Kansas City, MO</td>
<td>Tallahassee, FL</td>
</tr>
<tr>
<td>Kern County, CA</td>
<td>Treasure Coast, FL</td>
</tr>
<tr>
<td>Lafayette, LA</td>
<td>Tulsa, OK</td>
</tr>
<tr>
<td>Lake Charles/SW Louisiana, LA</td>
<td>Whittier, CA</td>
</tr>
</tbody>
</table>

*These communities have been housing at least 2.5% of their homeless and vulnerable population for 3 consecutive months. They are also on the Fully Committed List.*
What if people still won’t change?
The Science of Improvement is grounded in Deming’s System of Profound Knowledge

“Dr. Edwards Deming gave us a body of knowledge with "the foreboding name “a System of Profound Knowledge.” “Profound” denotes the deep insight that this knowledge provided into how to make changes that will result in improvement in a variety of settings.

“System” denotes the emphasis on the interaction of the components rather than on the components themselves.”

"The system of profound knowledge provides a lens. It provides a new map of theory by which to understand and optimize our organizations."
(Deming, Out of the Crisis)

It provides a theory of management.
What *insights* might be obtained by looking through the Lens of Profound Knowledge?

**Appreciation for a System**
- Interdependence, dynamism of the parts
- The world is not deterministic
- Direct, indirect and interactive variables
- The system must have an aim
- The whole is greater than sum of the parts

**Theory of Knowledge**
- What theories drive the system?
- Can we predict?
- Learning from theory and experience
- Operational definitions (what does a concept mean?)
- PDSAs for learning and improvement

**Human Behavior**
- Interaction between people
- Intrinsic versus extrinsic motivation
- Beliefs, values & assumptions
- What is the Will to change?

**Understanding Variation**
- Variation is to be expected!
- Common or special causes of variation
- Data for judgment or improvement?
- Ranking, tampering & performance management
- Potential sampling errors
What have we learned today?
Systems Thinking and MFI

- The Importance of Will, Ideas, and Execution
- The Messiness of Life
- Systems are the interrelationship of People, Processes, and Tools.
- The Lens of Profound Knowledge balances the important aspects of system change.
- The Model For Improvement is an iterative framework for solving problems in healthcare.
Aim Statements

- Aim statements provide the team with a shared understanding of the scope and scale of the project.
- Aim statements should include:
  - the system/boundaries
  - how much?
  - by when
  - any guidance
- If at all possible, make your AIM statements about outcomes your patient cares about.
- The Charter and aim are living breathing documents.
Change Ideas

There are three ways to generate change ideas:
- View system or process
- Creativity
- Learn from others

Driver diagrams:
- Provides a theory about how you think your systems works or changes you can make to influence the outcomes you care about.
- You can “hang” your measures on your driver diagram.

There are may tools to prioritize change ideas once you have a number of ideas.
Measures and Operational Definitions

- It is how you know change is resulting in improvement!
- A balanced set of measures.
- Data collection and display depends on why you are collecting data.
  - Data for improvement is about learning not judgment.
- Build data collection into your daily work.
- Clear operational definitions ensures you are getting quality data.
- QI data should be analyzed in run or control charts.
- Understanding variation – common vs. special cause – allows for appropriate interpretation.
**PDSA Cycle**

- An iterative tool for learning and accumulating knowledge.
- Start small and build degree of belief by testing in increasing scale and under varying conditions.
- PDSA cycles can and should be used for developing, testing, implementing and spreading changes.
- PDSA “ramps” are used to address changes for each driver.
- The value of failed tests cannot be underestimated!
Implementation and Spread

- Make sure you are really ready for implementation and use PDSA cycles. Implementation is not the time for failure!

- Sustainability requires:
  - Measurement
  - Ownership
  - Communication and training
  - Hardwiring the change
  - Assessment of workload

- As you spread, consider:
  - The technical infrastructure issues
  - Adoption or human side of change

- Aligning with senior leadership and strategic goals for the organization is essential.
What questions do you have?
Thank you!
Good luck with your Quality Journey!