I’m not certain what makes a book a “classic”, but I am sure this book is one. It is, overall, the most useful text I know for the student of the modern approach to system improvement. .... Feb 2009

Donald M. Berwick, MD, MPP
Former President and CEO, IHI
Former Administrator, CMS
You will be able to:

- Explain the structure of the Model for Improvement to faculty and collaborative participants
- Explain the four steps of the PDSA Cycle to faculty and collaborative participants
- **Use** the Model for Improvement to accelerate the rate of improvement for your projects

Note BTS College Extranet has resources related to MFI and to exercises used to experience it (under Exercises folder)
Key Elements of Breakthrough Improvement

- **Will** to do what it takes to change to a new system
- **Ideas** on which to base the design of the new system
- **Execution** of the ideas
Fundamental Questions for Improvement

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

Source: Improvement Guide, p.5
The PDSA Cycle
Four Steps: Plan, Do, Study, Act

Also known as:
• Shewhart Cycle
• Deming Cycle
• Learning and Improvement Cycle

Source: Improvement Guide, p 24
IHI Breakthrough Series (6 to 18 Months Time Frame)

Select Topic (Develop Mission)

Expert Meeting

Develop Framework & Changes

Planning Group

Prework

Participants (10-100 Teams)

LS 1 → LS 2 → LS 3

AP1 → AP2 → AP3*

Dissemination
Publications, Congress, etc.

Holding the Gains

Supports

Email
Phone Conferences
Extranet
Visits
Assessments
Sponsors
Monthly Team Reports

*AP3 — continue reporting data as needed to document success

LS – Learning Session
AP – Action Period

SAID

SAID

SAID

SAID
During the Collaborative Teams
Use the PDSA Cycle for:

- Helping to answer the first two questions
  - aim, measures

- Developing a change

- Testing a change

- Implementing a change

BTS Focus

Source: Improvement Guide, p 6
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?

Source: Improvement Guide, p 24
Repeated Use of the Cycle

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?

Changes That Result in Improvement

Hunches
Theories
Ideas

Source: Improvement Guide, p 103
Repeated Use of the PDSA Cycle

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?

Very Small Scale Test
Follow-up Tests
Wide-Scale Tests of Change
Implementation of Change
Changes That Result in Improvement

DATA

Reduction of medication harm by 50%
-Med Harm rate per admission
-% patients who are harmed
-FMEA Score

Change Pkg.
-med reconciliation
-high hazard meds
-med ordering
-etc.

Leadership
Hunches
Theories
Ideas

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 PDSA Cycle for Learning and Improvement

**Plan**
- Objective
- Questions and predictions (Why?)
- Plan to carry out the cycle (who, what, where, when)
- Plan for Data collection

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

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

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

Source: Improvement Guide p. 97
Removing Razors: First PDSA: Miami Valley

- **Objective:** Replace the practice of pre-op shaving with the use of clippers *(test with one patient)*

- **Questions:** Can we get cooperation from surgeon and O.R. staff? Are there any barriers? What are staff/physician perceptions about hair on incision site?

- **Predictions:** There will be a learning curve. There will be mixed acceptance and resistance.

- **PLAN:** On October 27 one surgeon will be asked by a team member (a clinical nurse manager in surgical service) to use clippers on one surgery patient instead of having that patient shaved. Collection of data will be via direct observation by that team member.
Removing Razors: First PDSA: Miami Valley (Cont.)

- **DO:** Dr. M. was asked to use clippers on his patient instead of shaving. At first he said no, but after being told that it was a Class 1A recommendation, he agreed to try it. Not only did he comply, but he used clippers on two of his cases and instructed staff to never place another blade on his case cart.

- **STUDY:** There was full cooperation in this first test of change after some initial resistance. One barrier noted for enlarging change was a lack of supplies. In this test, there were no negative perceptions related to using clippers noted.

- **ACT:** Additional clippers are being ordered and are expected to arrive in about a week. Six other clinical nurse managers will get training in anticipation of conducting another PDSA that includes six other surgeons after the clippers arrive. A learning board is also being constructed.
A PDSA Cycle

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

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

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

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

**P:** Ask one doctor to use clippers instead of razor with 1 patient

**A:** Clippers ordered. Another PDSA with 6 other surgeons planned

**S:** Was some resistance as predicted. Lack of supplies unexpected barrier.

**D:** Dr. M used clippers on 2 patients. Was pleased. Told staff not to put razor on his cart again!
Objective for this PDSA Cycle:

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

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

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

Predictions (for questions above based on plan):

Do:
Carry out the change or test; Collect data and begin analysis.
Multiple Cycles to Implement Each Component of the ICIC Chronic Care Model

Component: Decision Support
Chinatown, Asthma BTS

Will a flow sheet be useful for asthma patients?

Use of Flow sheet V.4 by all physicians and nurses

Cycle 1: Gather sample flow sheets. Try V.1 with two patients
Cycle 2: Try V.2 by two providers for a few days
Cycle 3: Two week trial of V.3, review meetings
Cycle 4: Trial of V.4 by all providers
Cycle 5: Implement use of V.4, do peer review of documentation and use
Some Hands-On with PDSA: Learning the Sequence

1. What are we trying to accomplish?

We found a new technology represented by a sequence that can help our organization improve health care. We want to discover the rule (or theory) that generated this sequence.

Each improvement team should run tests to determine the rule. When they are sure that they have the rule (based on enough tests), then implement the technology in their organization.
2. How will we know that a change is an improvement?

1. Correct predictions of results of tests

2. A statement of the correct rule upon implementation
Learning the Sequence

3. What changes can we make that will result in improvement?

1. Each team can test one sequence on each cycle. Write down the specific sequence (example) being tested. The seminar leader will classify as either conforming or nonconforming.

2. Run as many cycles as required until you are sure you know the rule. Keep track of the number of cycles, and whether the example test sequence was conforming or nonconforming to the rule.

3. When testing cycles are complete, wait until all teams are done to report the implementation cycle (state the rule).
Plan

Objective - test another sequence.
Predictions - will test sequence be correct?

Plan - write down next sequence.

Carry out the plan.
Show test sequence to instructor.
Record confirming or nonconforming.

Study

Compare data to predictions
Summarize what was learned.
Update the team’s theory(s).
What is our degree of belief in our theory?

Act

Are we ready to implement the change?
What examples should we test on the next cycle?

Do

Carry out the plan.
Show test sequence to instructor.
Record confirming or nonconforming.

What examples should we test on the next cycle?

What is our degree of belief in our theory?

Are we ready to implement the change?

PDSA Cycle for Learning the Sequence
<table>
<thead>
<tr>
<th>Cycle</th>
<th>Sequence</th>
<th>Prediction (work / fail?)</th>
<th>Sequenced Worked</th>
<th>Sequence Failed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,4,6</td>
<td>Work</td>
<td>x</td>
<td></td>
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<tr>
<td>2</td>
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</table>
Why Test? Perioperative Safety: Removing Razors from OR “Nike Style”

Feedback from two teams:

- One unanticipated problem that we ran into by moving too quickly to replace the razors was we did not consider how adept staff would be at handling the clippers. We actually had skin abrasion using clippers (underarm, flesh not pulled taut most likely explanation) because there was insufficient training in how to use them. There was also some confusion about how to sterilize the equipment between patients (which parts were immersible, what to throw away, etc.) We’ve had to backtrack to address these issues. The nurse managers on our team are working to ensure our staff feel comfortable using the clippers.

- Our challenge has been with some of the surgeons and the "hair"...we have used the sticky mitts and or 3-4 inch tape to pick up the hair in the OR room.
Speeding Up Testing….

- Plan multiple cycles for a test of a change
- Think a couple of cycles ahead
- Initially, scale down size of test (# of patients, clinicians, locations)
- Test with volunteers
- Do not try to get buy-in or consensus for test cycles
- Be innovative to make test feasible
- Collect useful data during each test
- In latter cycles, test over a wide range of conditions
What cycle can we complete by next Tuesday?

Willing to compromise on scope, size, rigor, and sophistication, but the cycle must be completed by Tuesday.
Examples

- Some nice examples of PDSA cycles
Beta Blocker Use First PDSA:

- **Objective**--Testing form for screening for Beta Blocker use
- **PLAN:**
  Question: Can RN effectively and efficiently screen patients for eligibility for perioperative beta blocker usage using the recently developed form?
  Prediction: RN will find some areas to improve
  Plan: use 1 RN to test the form on 3 patients on 10/28
  Data Collection Plan: get qualitative feedback from the RN
- **DO:** one RN could only test form on 2 patients--only 2 who were in our test group arrived for PAT screening
- **STUDY**--Form seemed simple to use and RN had no suggestions for changing it
- **ACT**-Expand use of the form to two nurses, to use all day on 10/29 and follow up with any suggestions they have.
**Project:** Reducing SSI  
**Cycle #:** A1  
**Date:** 28 Oct 2005

**Objective:** Objective(s) for this PDSA Cycle: Test new procedure for administering prophylactic antibiotics: Pre-op nurse will hang pre-op antibiotic; Circulator will start infusion after “checking in” patient.

### PLAN

<table>
<thead>
<tr>
<th>Questions</th>
<th>Predictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Will pre-op nurse remember to hang antibiotic without turning it on</td>
<td>1. Yes, but circulators will resent the new process because they don’t think it’s ‘their job.”</td>
</tr>
<tr>
<td>2. Will antibiotic be started within 60-minute window prior to incision?</td>
<td>2. Antibiotic will be started with 60 minutes of incision</td>
</tr>
</tbody>
</table>

**What data will be collected during this time?** (Forms to be used): Staff feedback will be collected by the OR Manager and/or Supervisor. Chart will be reviewed immediately to find timing and documentation of antibiotic and to determine whether it was started within 60 minutes of incision.

**What:** Educate rationale and new process, obtain staff feedback

**When:** October 28

**Where:** One to three patients prior to joint replacement surgery
**DO the Action Plan**

**What went wrong? What happened that was not part of the plan?**  
We planned to test the new procedure in three cases; however, two patients had vancomycin so we were unable to test the change. We did test the new procedure in one patient prior to TKR.

**STUDY**

Complete analysis of data. Summarize what was learned include results of predictions.

1. The pre-op nurse remembered to hang the antibiotic and the circulator voiced no complaints.

2. Ancef was started at 1143 and incision time was 1227 so antibiotic was initiated within the 60-minute window.

3. The circulator remembered to start and document the infusion and the anesthesiologist did not interfere.

**ACT**

**What decisions were made from what was learned?**  
Based on the initial test, the new procedure is working well.

**What will be the next cycle?**  
We plan to test again tomorrow on two TJR patients of a different orthopedic surgeon.
Pre-Procedural Briefing First PDSA

Objective for this PDSA Cycle: Improve team performance and documentation of pre-procedural briefing of the Perioperative patient in the pilot population.

PLAN: Conduct pre-procedural briefing before an operative or invasive procedure (CRM checklist).

Questions: Will the use of a pre-procedural brief prior to procedure heighten situational awareness and enhance communication of team members resulting in the prevention of wrong patient, wrong site surgery?

Predictions: Resistance to change, breaking old habits of staff, heighten situational awareness, collaboration, teamwork verses individuality and it will stand the test of time.

Plan for change or test: Who, What, When, Where

Who: Dr. N (General Surgeon), Dr. M (General Surgery Resident), Dr. A (Anesthesiologist), J.D (Operating Room Nurse), RT (Surgical Technologist), PW (Surgical Technologist), SL (Surgical Technology Student).

What: Utilize CRM checklist

When: 28OCT (Tuesday)

Where: With one patient from pilot population

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

Feedback will be collected by OR Nurse through discussion with each member of surgical team.
DO: Used the pre-procedural briefing prior to commencing an operative or invasive procedure (CRM checklist), with one surgery patient on 28.

STUDY: Overall the pre-procedural briefing had a positive effect on situational awareness and communication among all team members. The General Surgeon and the General Surgeon Resident found that the pre-procedural briefing was essential. The General Surgeon suggests that prompting by the OR Nurse is important to ensure completion of the checklist. The Surgical Scrub Tech and student agreed that the pre-procedural briefing was important and took minimal time to perform. Additionally, step nine of the checklist is vital for final verification.

ACT: Plan for the next cycle is to test again tomorrow with another surgeon and another patient.
SSI Antibiotics First PDSA

Objective for this PDSA Cycle: Test new procedure for administering prophylactic antibiotics: Pre-op nurse will hang pre-op antibiotic; Circulator will start infusion after “checking in” patient.

PLAN: Questions:
1. Will pre-op nurse remember to hang antibiotic without turning it on?
2. Will circulator remember to start infusion?
3. Will antibiotic be started within 60-minute window prior to incision?
4. Will circulator remember to document antibiotic?
5. Will circulators resent taking on this job?
6. Will Anesthesia interfere with process?

Predictions:
1. Pre-op nurse will remember to hang, but not start antibiotic.
2. Circulator will remember to start the infusion
3. Antibiotic will be started within 60 minutes of incision
4. Circulator will document start
5. Circulators will resent the new process because they don’t think it’s “their job.”
6. Anesthesiologist may interfere with new process.

Plan for change or test: Who, What, When, Where:
Who: One pre-op nurse, one circulator, one surgeon
What: Educate rationale and new process, obtain staff feedback
When: October 28
Where: One to three patients prior to joint replacement surgery

Plan for collection of data: Who, What, When, Where:
Staff feedback will be collected by the OR Manager and/or Supervisor. Chart will be reviewed immediately to find timing and documentation of antibiotic and to determine whether it was started within 60 minutes of incision.
SSI Antibiotics First PDSA: (Cont.)

- **DO:** We planned to test the new procedure in three cases; however, two patients had vancomycin so we were unable to test the change. We did test the new procedure in one patient prior to TKR.

- **STUDY:** (1) The pre-op nurse remembered to hang the antibiotic and the (2) circulator remembered to start and document the infusion. (3 and 4) Ancef was started at 1143 and incision time was 1227 so antibiotic was initiated within the 60-minute window and documented. (5) The circulator voiced no complaints and (6) the anesthesiologist did not interfere.

- **ACT:** Based on the initial test, the new procedure is working well. We plan to test again tomorrow on two TJR patients of a different orthopedic surgeon. By the beginning of next week, we will test with larger pilot population (general surgery and orthopedic) as cases are available. We will continue to get feedback from the staff to evaluate their perception of the new process. We will involve PACU nurses in compiling data on antibiotic start time and incision time so we’ll know immediately if antibiotics are started within the 60-minute time frame. If a case fails to make it within that time frame, we’ll investigate further to find out why and determine if we need to modify our process in any way.
MODEL FOR IMPROVEMENT  

**DATE:** March 31, 2008

**Objective for this PDSA Cycle:**
To test the standardized script for having patients identify their primary care provider

---

**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. What will the reaction of patients be to the question?
2. How much time does the question add to the check-in process?
3. What barriers will be identified?
4. Will PLs be able to deliver the script effectively?

---

**Plan:**

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

During the week of March 31 through April 3, the standardized script will be tested in primary care (IFM, La Crosse and Onalaska) by 2 PLs in each location. For the first 25 patients in each department Tuesday and Wednesday, PLs will ask patients at their appointment check-in to identify their PCP using the scripted verbiage. (*Who do you see for your yearly or routine exam?*) Betsy will work with Barb R and clinical managers to identify PLs and to run the test.
Plan for collection of data: Who, What, When, Where

Data collection variables:

1) Is every patient asked the question in the same way? (y/n)
2) Cycle time (mm:ss)
3) Patient response: appropriate; inappropriate; refuse; na
4) Barriers or issues: List as comments

Data collection sheet will be created by Betsy and each PL will collect data concurrently as they’re checking in patients. Data will be collected for every patient during the timeframe of the test. Data collection sheet will be sent to Betsy at the end of the test and she will analyze.

Predictions (for questions above based on plan):

Question 1

☐ Most of the patients will be able to respond to the question appropriately (FM, Peds, GYN, IM provider).
☐ A minority of the patients will respond to the question inappropriately (Medical or surgical specialty provider).
☐ A minority of the patients will refuse to respond

Question 2

☐ From asking to keying in the response less than 90 seconds (entire check in currently takes ~3 minutes).

Question 3

☐ Time may be an issue.
☐ PLs may resort to old script since this is new.
☐ PLs may encounter upset or frustrated patients.

Question 4

☐ A majority of the PLs will be able to do so.
Do:
*Carry out the change or test; Collect data and begin analysis.*

- We did need to add random observations by clinical managers and PLs just to make sure they were delivering the script as specified.
- Some patients were simply not able to answer the question or it just wasn’t appropriate (palliative care, developmentally disable, hard of hearing).
- Length of time was frequently estimated since it was just part of the flow.

| Total Patients | N=50
|----------------|---------
| Asked: 45/50 (90%) | Not Asked: 5/50 (10%) |

| Patient Responses | N=45
|------------------|---------
| Appropriate: 32/45 (71%) | Inappropriate: 11/45 (25%) |
| Refused: 2/50 (4%) |

<table>
<thead>
<tr>
<th>Length of time:</th>
<th>Median: 1 minute</th>
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</thead>
<tbody>
<tr>
<td>NA: 4</td>
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</table>

<table>
<thead>
<tr>
<th>Issues:</th>
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<tbody>
<tr>
<td>Cancer patients</td>
</tr>
<tr>
<td>Developmentally disabled, hard of hearing, nursing home.</td>
</tr>
<tr>
<td>See ‘clinic’ not a particular provider.</td>
</tr>
</tbody>
</table>
Study:
Complete analysis of data;

Compare the data to your predictions and summarize the learning

Question 1: All of the patients asked to identify their PCP responded and with the exception of patients being treated for cancer currently or in the past identified an appropriate PCP. PLs were able to effectively coach patients when this issue came up.

Question 2: Since the question was already being asked by some, not all, of the PLs the additional time it took to check-in a patient did not increase. On average it took 1 minute out of the total check-in process.

Question 3: PLs did not identify many new issues. For the most part, there were few barriers since this question was being addressed, just not in a standardized way. One item that arose had to do with patients who see the ‘clinic’ for their primary care, not anyone in particular. We will have to determine how to identify the PCP for patients such as this.

Question 4: Per observation by Barb Ramsey and clinical manager and documentation by PLs, the script was delivered effectively by PLs.

Overall, the script was easy to deliver by the PLs, did not add significant time to the check-in process and was easy to understand by the patients. We may need to modify the script slightly to plan for other patient responses and test, but in general it was successful.

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

- Script was successful in these primary care locations. Script will be updated to accommodate patients responding that they see the ‘clinic’ and retested in IM and FM La Crosse, Onalaska and the regions.
- Script will be tested in specialty departments.
Director Track

- How we use the technical content (charter, change package and measurement)
- Preparing teams, material and faculty for the collaborative
- Guiding (tracking progress, milestone reviews) and closing a collaborative
- Problem solving and planning your collaborative
IA Track Content at BTSC

- IA role in expert meeting
- IA role with Charter and with pre-work
- How do we draft Change Package?
- How do we get started developing a measurement system?
- Science of Improvement and the theory behind the BTS model (Deming’s system of profound knowledge)
- Key improvement principles guiding IA work
- Relationship of research and improvement efforts
- Developing effective graphs to display measures
  1. Specify a balanced set of measures for all improvement efforts
  2. Choose the appropriate statistics to plot
  3. Conserve measurement resources through sampling and integration into daily work
  4. Why plot key measures in time order?
  5. How often to plot data throughout the improvement effort
  6. Develop excellent visual displays of the measures