Institute for Healthcare Improvement

A/B Repeating Session

This presenter has nothing to disclose

Introduction to Improvement Science

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Description

Improvement Science- what is it and why should I use it?

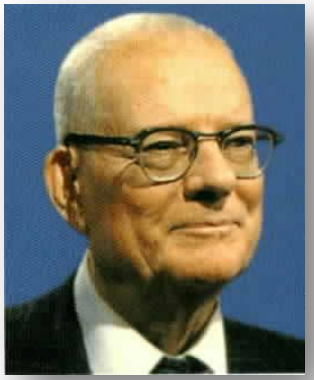
In healthcare we are part of a complex system, which requires us to accept a constantly changing landscape of emerging science, clinical care, patients and families, and multi-disciplinary staff. This complex system achieves what it is designed to achieve and for many indicators, our outcomes are not what we want for our patients. Developing an understanding of improvement theory and its tools has been shown to effectively support change. During this session we will focus on the Model for Improvement and Deming's Theory of Profound Knowledge, while also discussing a model we know well- the Scientific Method.

Objectives

- Describe improvement science and its application in healthcare.
- Illustrate the three key questions of the Model for Improvement by describing an effort in your organization.
- Describe the sequence of improvement and the key tools and methods that can be applied during the QI journey.
- Discuss the scientific method and its comparison to the PDSA (Plan-Do-Study-Act) cycle

Science of Improvement

Quality Theory Influencers....



W. Edwards Deming (1900 -1993)

PDSA Cycle
14 Points
System of Profound Knowledge

Deming's Mentor…

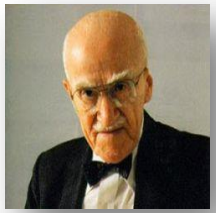
Walter A. Shewhart (1891-1967)

Father of SPC
Shewhart Cycle (1939)
Theory of Variation

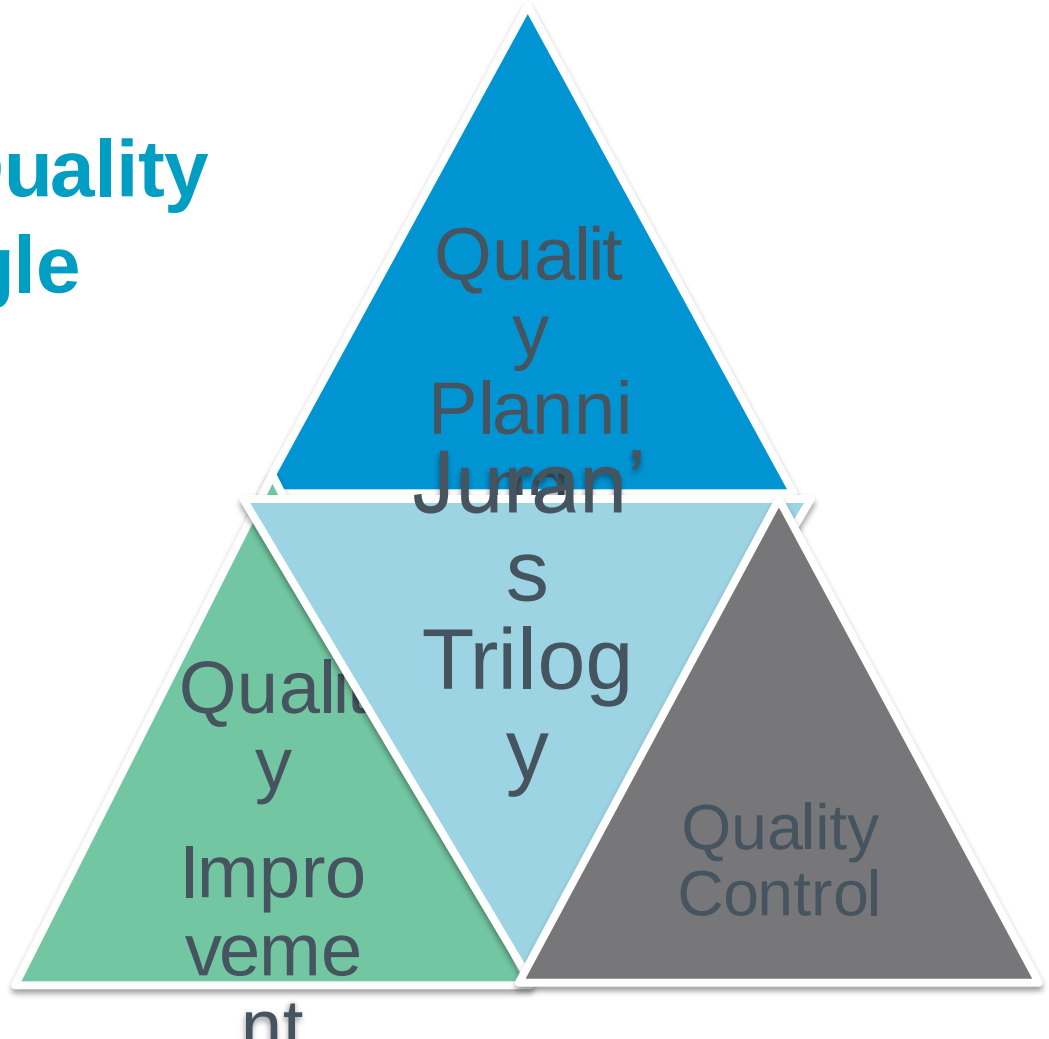
Deming's Peer ....

Joseph M. Juran (1904 -2008)

Pareto Principle (80 -20) (1937)
Juran Trilogy (1986)
(quality planning, quality control, and quality improvement)



The Quality Triangle



QA and QI

- **Quality Assurance**

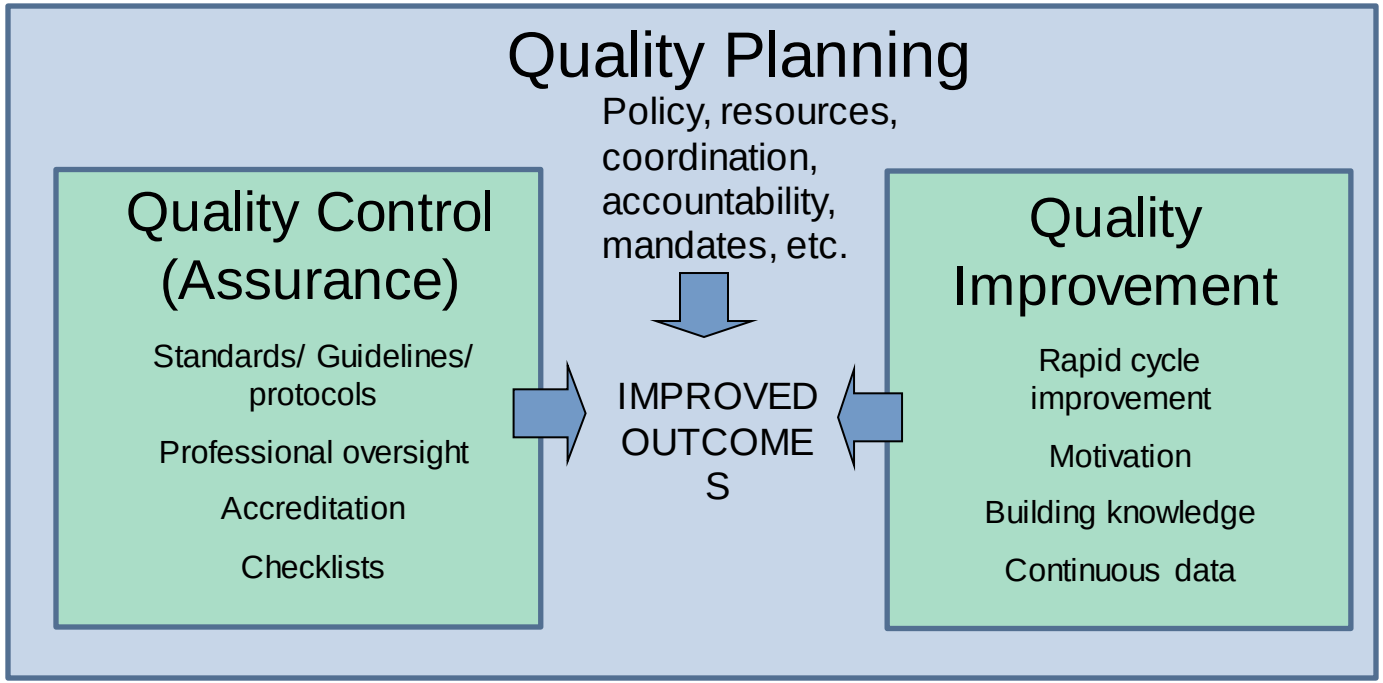
"Implementation of planned and systematic activities in a health system, for fulfilment of quality requirements of a product or a clinical service."

Don Berwick "reliance on inspection to improve"

- **Quality Improvement**
  - Alter how work or activity is done or the makeup of a product
  - Produce visible, positive differences in results relative to historic norms
  - Have a lasting impact

Don Berwick "make things actually better"

Components of quality: structure, quality control and quality improvement



Quick Exercise

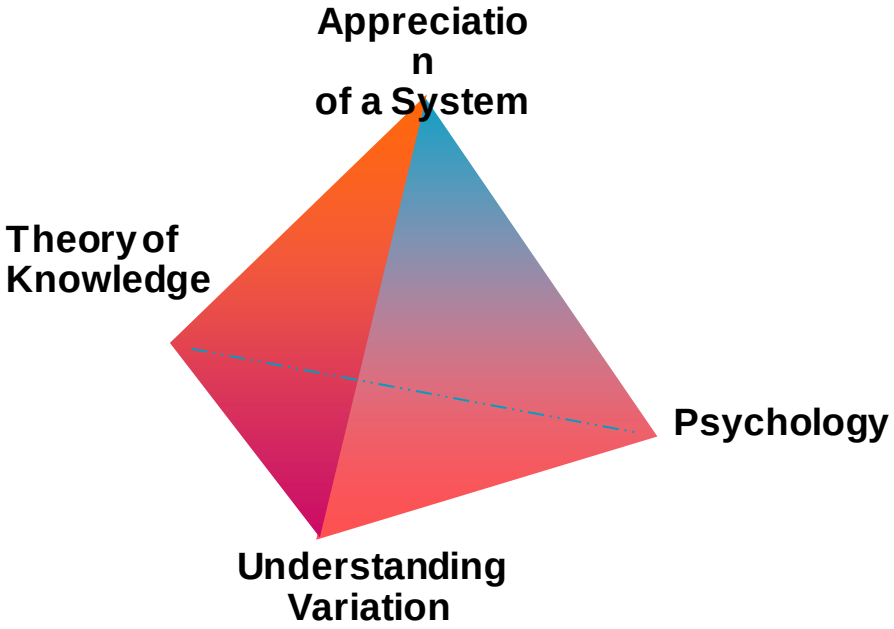
Think of your work: List 8 processes you work with everyday.

When you look at the three elements of the Juran Trilogy, where do we spend most of our time?

– Quality Planning
– Quality Control
– Quality Improvement

Where would you say you spend your time with those processes:
planning, controlling, or improving? Let's collect some data

W. E. Deming's System of Profound Knowledge

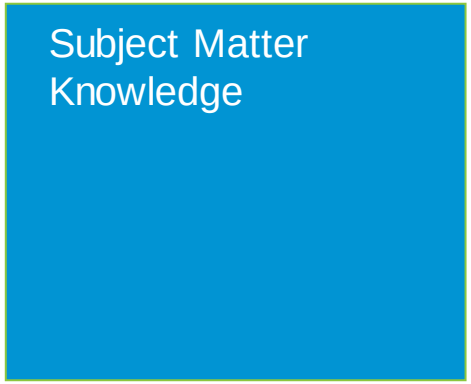


"One need not be eminent in any part of profound knowledge in order to understand it and to apply it. The various segments of the system of profound knowledge cannot be separated. They interact with each other**. For example, knowledge about psychology is incomplete without knowledge of variation."**

Profound - having intellectual depth and insight (Webster)

Deming, W. E. (2000). *The new economics: For industry, government, education* (2nd ed.). Cambridge, Mass.: MIT Press.

Combining Methods & Subject Matter Expertise

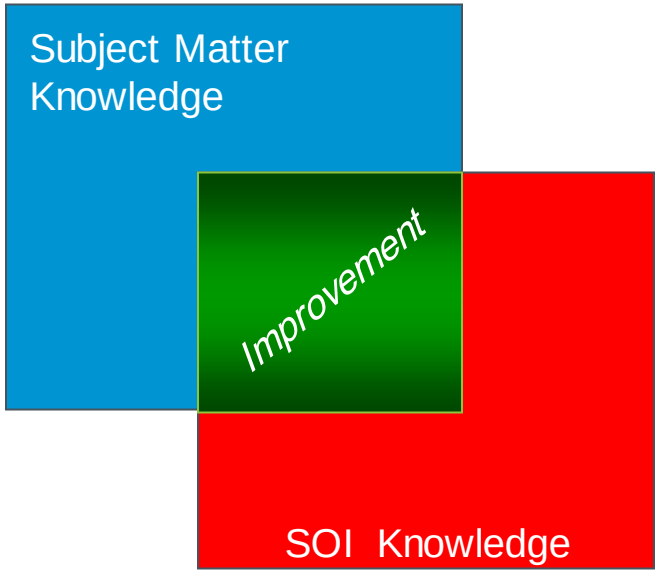


Subject Matter Knowledge:
Knowledge basic to the things we do in life. Professional knowledge.

Science of Improvement:
The interplay of the theories of systems, variation, knowledge, and psychology.

Combining Methods & Subject Matter Expertise

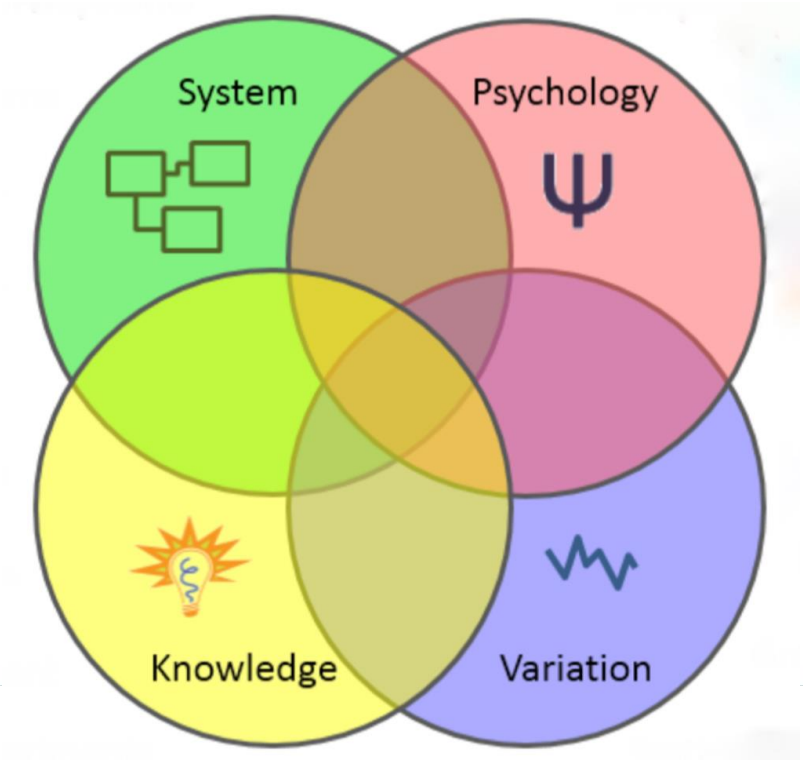
Improvement occurs when we learn how to combine subject matter knowledge and the science of improvement in creative ways to develop effective ideas for change.



Characteristics of the Applied Science of Improvement

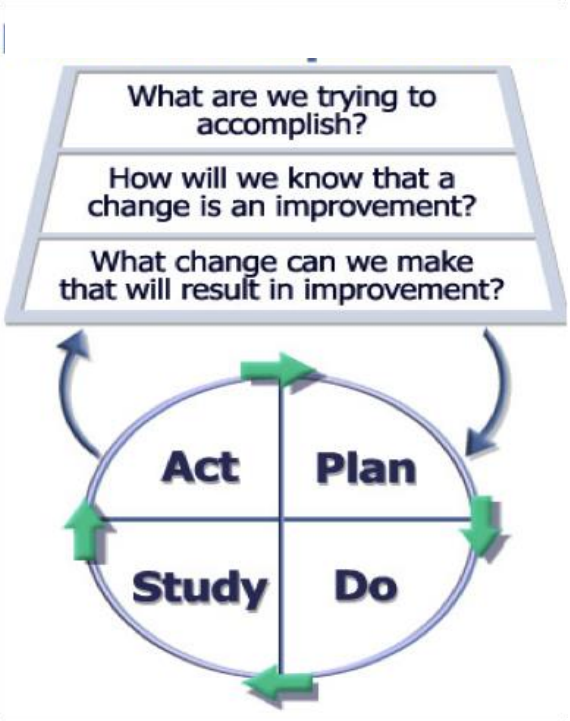
1. Bias toward action learning
2. Focus on prediction of future outcomes
3. Multiple testing cycles before implementation
4. Visual display to learn from data
5. Learning from special and common causes
6. Simple and complex study designs
7. Ongoing interaction of scientists and practitioners

System of Profound Knowledge



Aims, Measures, & Tests of Change

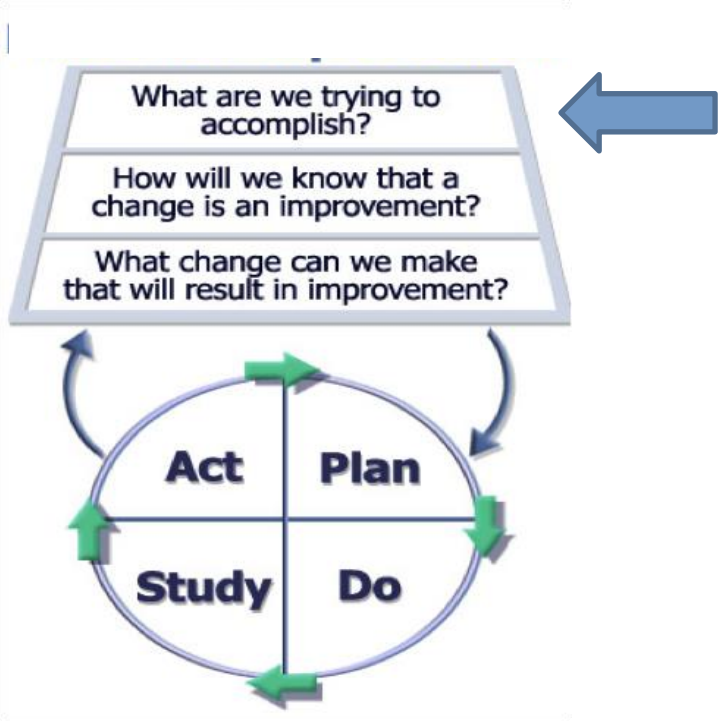
When you combine the 3 questions with the…



PDSA cycle, you get…

…the Model for Improvement

Model for Improvement

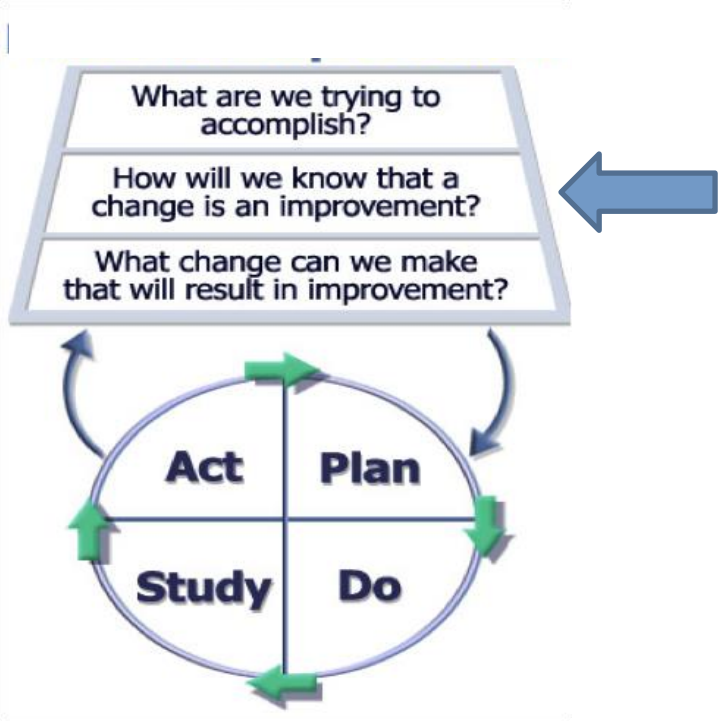


Aim – What are we trying to accomplish?

- An organization will not improve without a clear and firm intention to do so.
- The aim should be **time-specific** and **measurable**; it should also define the **specific population** of patients that will be a

- Example:
  - Reduce adverse drug events (ADEs) in critical care by 75 percent within 1 year.
  - Reduce the average length of stay for Medical ICU patients by 50 percent within 9 months.

Model for Improvement



Why Test Changes?

- To increase the belief that the change will result in improvements in your setting
- To learn how to adapt the change to conditions in your setting
- To evaluate the costs and “side-effects” of changes
- To minimise resistance when spreading the change throughout the organisation

Aim:

Every goal will require multiple smaller tests of change

Describe your first (or next) test of change:	Person responsible	When to be done	Where to be done

Plan

List the tasks needed to set up this test of change	Person responsible	When to be done	Where to be done
		.	

Predict what will happen when the test is carried out	Measures to determine if prediction succeeds

Do

Describe what actually happened when you ran the test

Study

Describe the measured results and how they compared to the predictions

Act

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

Start Small ~ 1:3:5:All

- 1 patient
- 1 day
- 1 admit
- 1 clinician

Move Quickly to Testing Changes

- Year
- Quarter
- Month
- Week
- Day
- Hour

"What tests can we complete by next Tuesday?"

Complete List of 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. Us 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 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 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

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

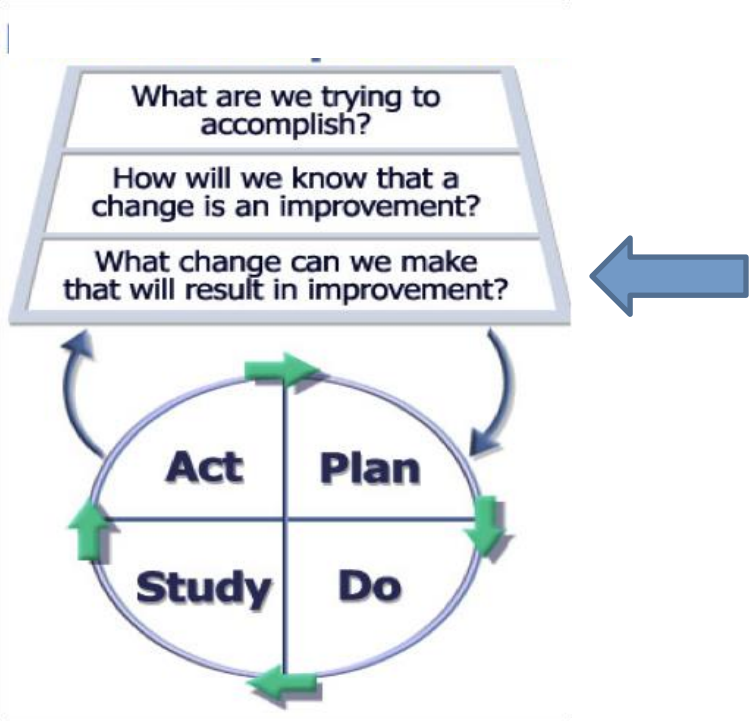
59. Use reminders
60. Use differentiation
61. Use constraints
62. Use affordances

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

Langley, G.J., Nolan, K.M., Nolan, T.W., Norman, C.L., & Provost, L.P. (2009). *The improvement guide: A practical approach to enhancing organizational performance* (2nd Ed.). San Francisco: Jossey-Bass.

Model for Improvement



PDSA Measures
Guide Learning about our testing.

Process Measures
Guide Learning about how our testing is improving reliability of the process.

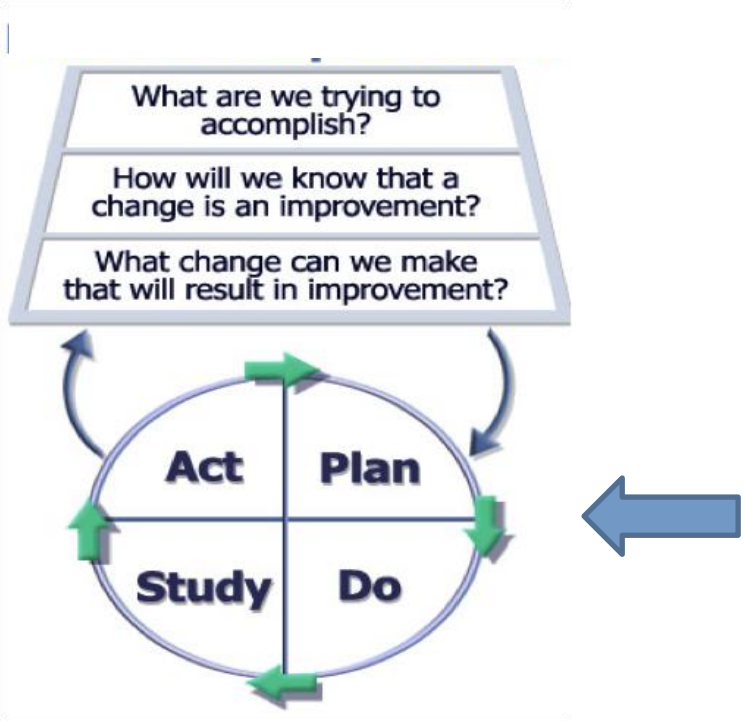
Outcome Measures
Guide Learning about how the reliability of the process is achieving our aim.

Types of Measures	Description	The Surgical Site Infection FOM
Outcome	The voice of the customer or patient. How is the system performing? What is the result?	Surgical Site Infection Rate
Process	The voice of the workings of the process. Are the parts or steps in the system performing as planned.	Percentage of appropriate prophylactic antibiotic selection. Percentage of on time administration of prophylactic antibiotics. Percentage of a safety climate score great than 4.
Balancing	Looking at a system from different directions or dimensions. What happened to the system as we improved the outcome and improvement measures?	Patient satisfaction Cost per case

Tips for Building Effective Measurement Systems

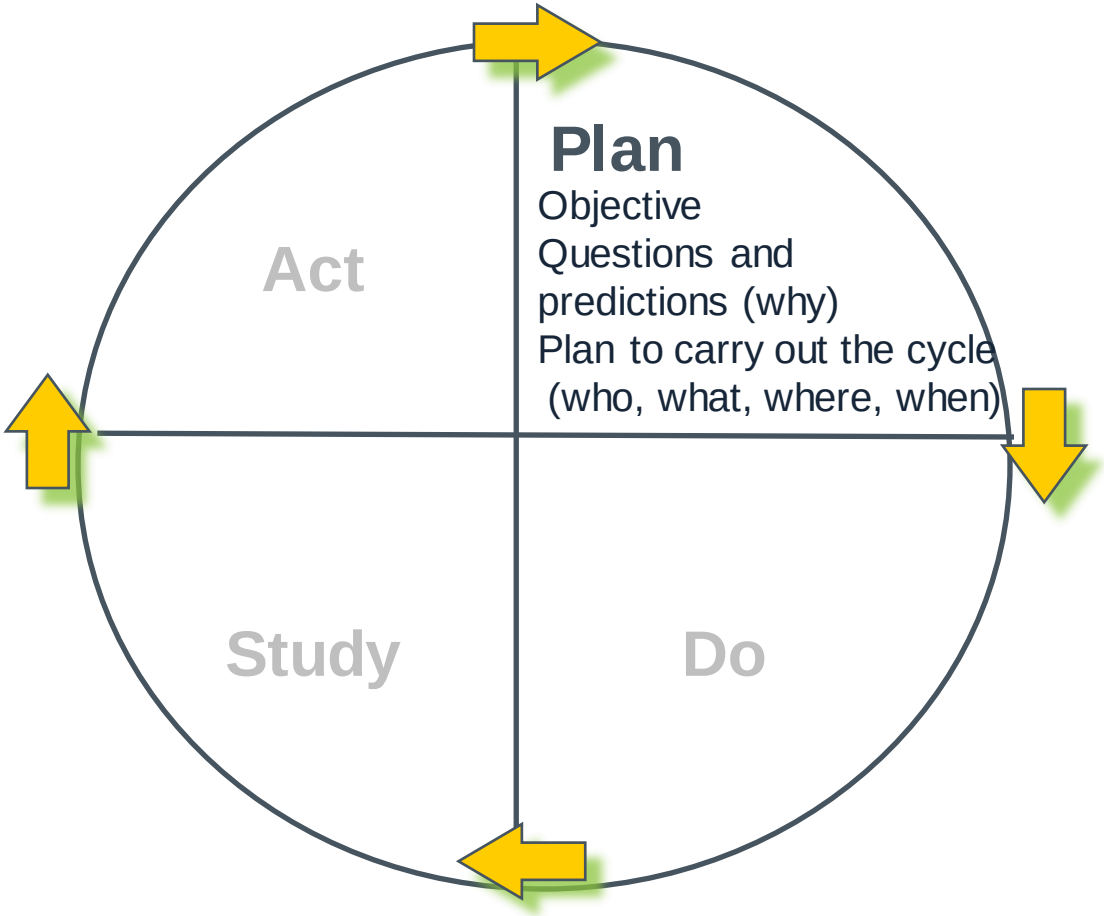
1. Plot data over time.
2. Seek usefulness, not perfection.
3. Be practical – sample when needed.
4. Integrate measurement into the daily routine.
5. Use qualitative and quantitative data.

Model for Improvement

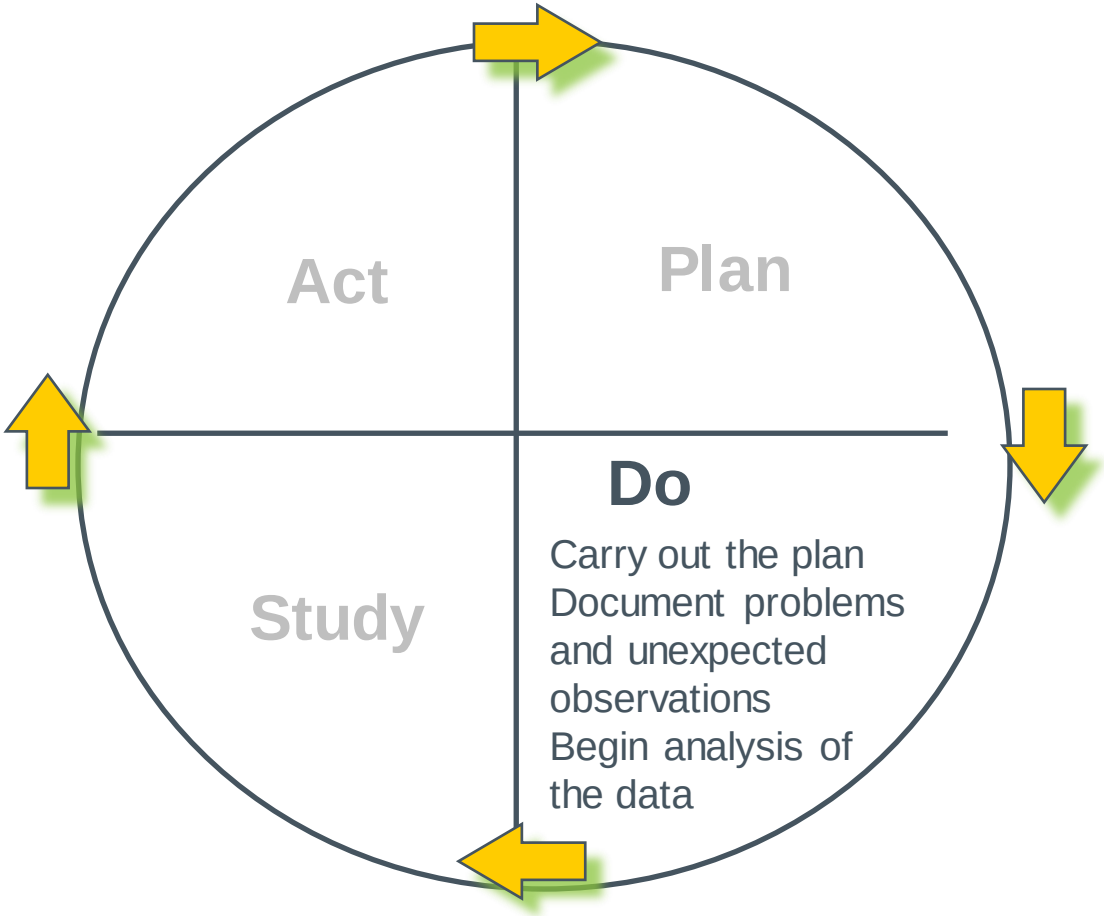


The PDSA Cycle

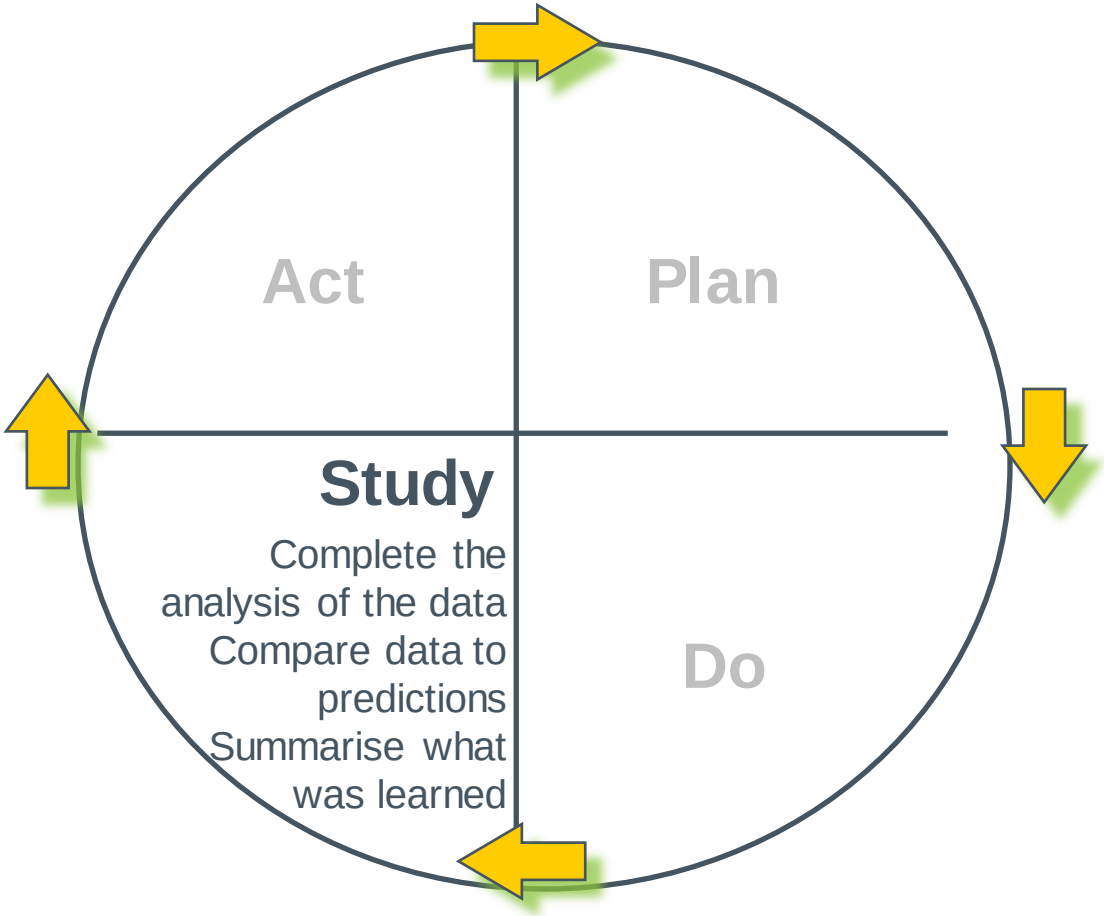
Plan, Do, Study, Act Cycle



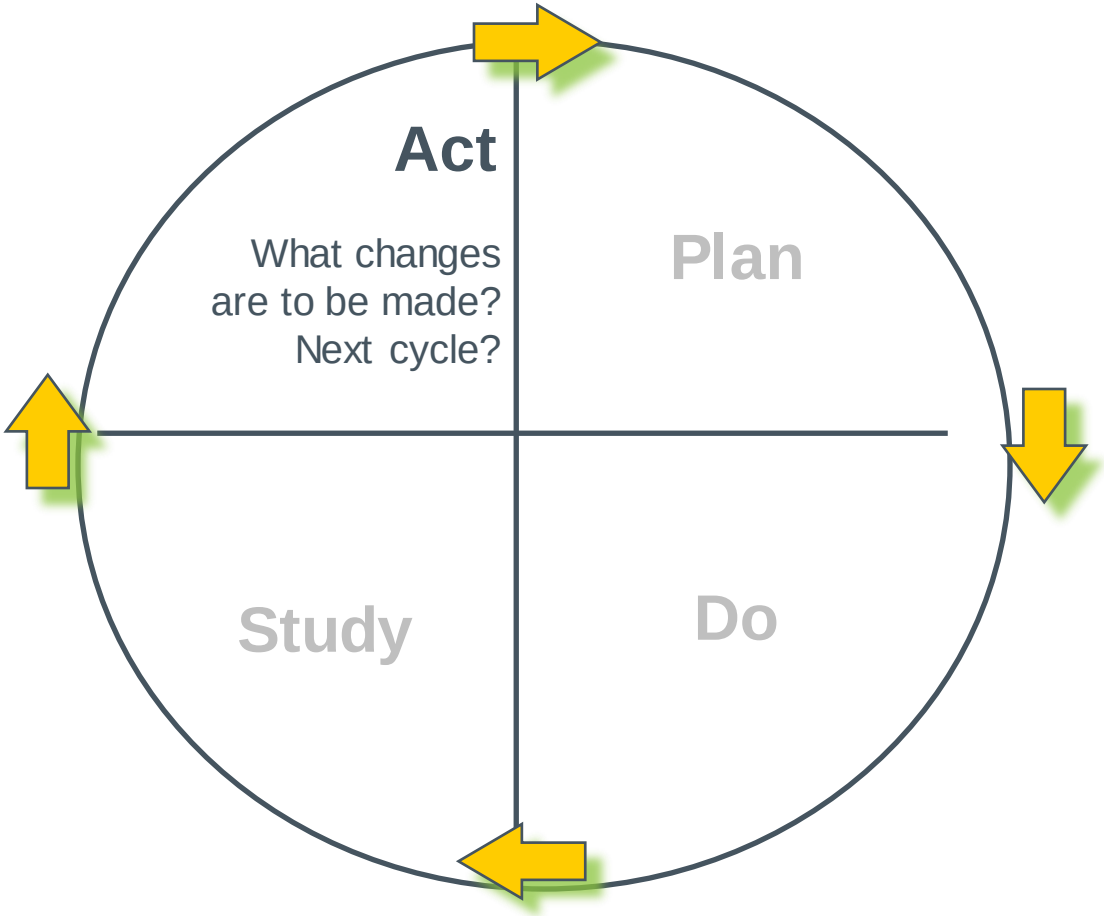
Plan, **Do**, Study, Act Cycle



Plan, Do, **Study,** Act Cycle

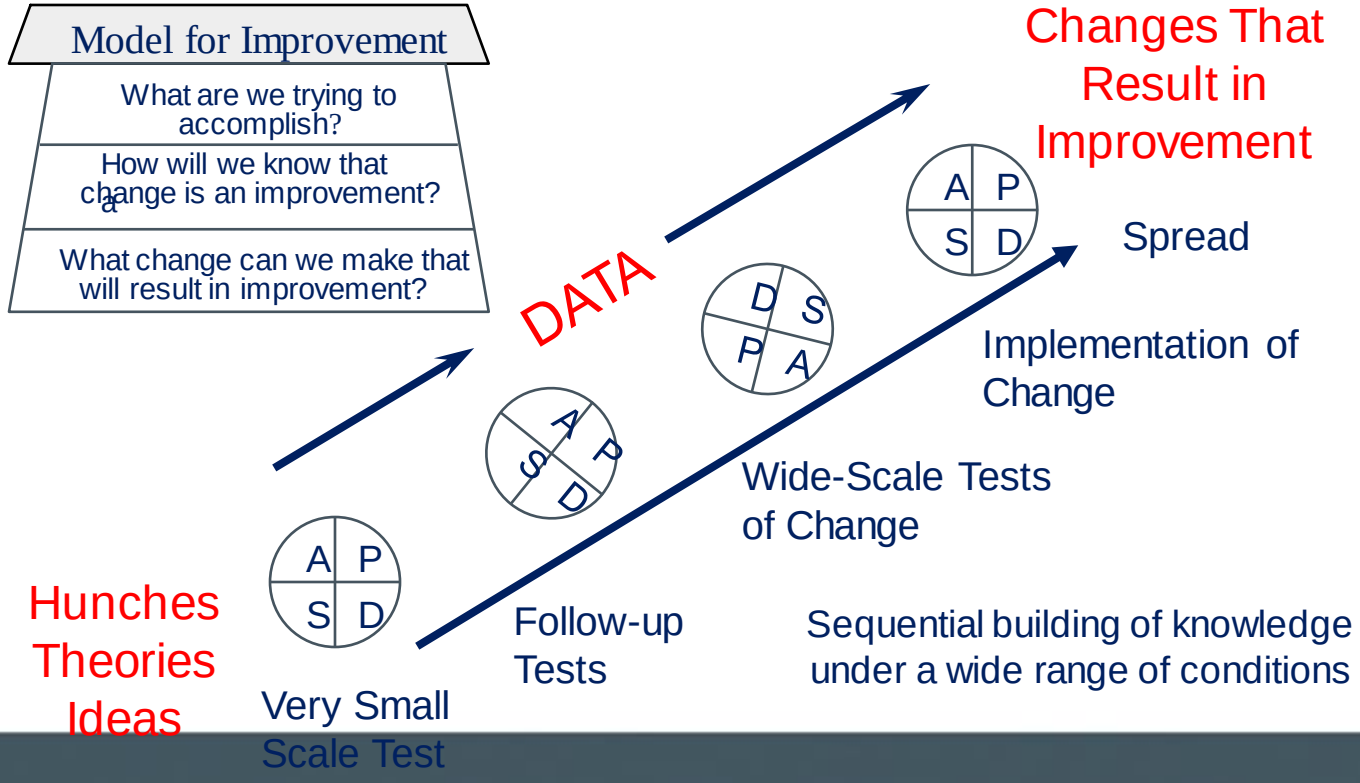


Plan, Do, Study, **Act** Cycle

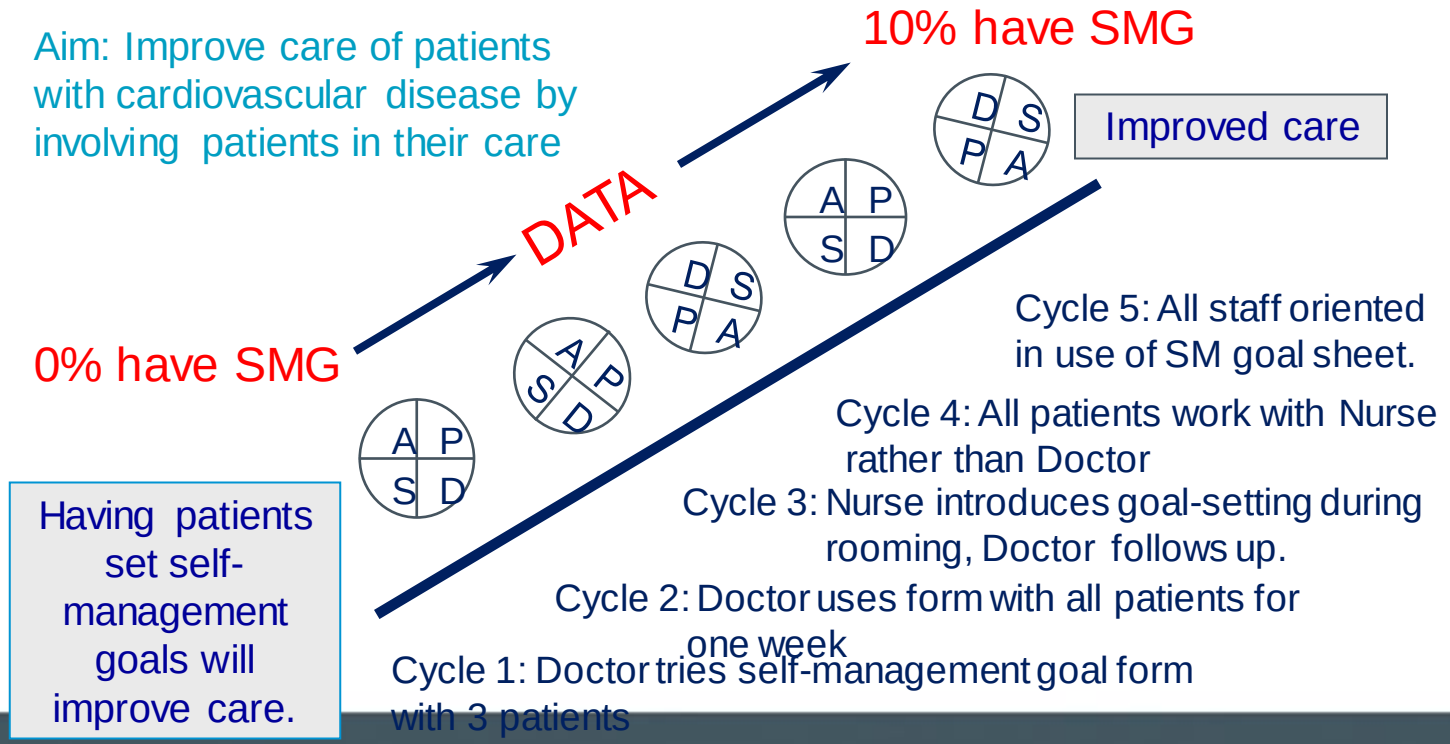


The PDSA Cycle

Repeated Use of the PDSA Cycle

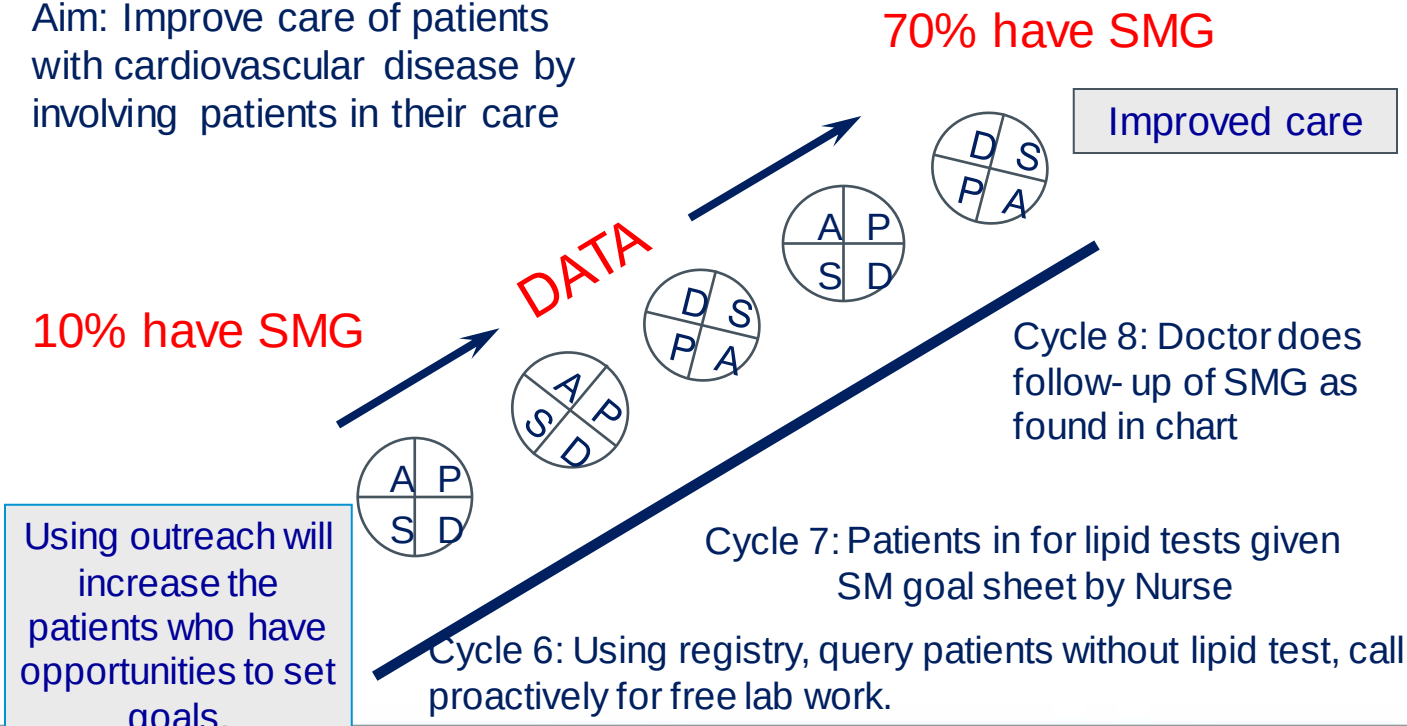


Multiple Cycles of PDSAs (an example)



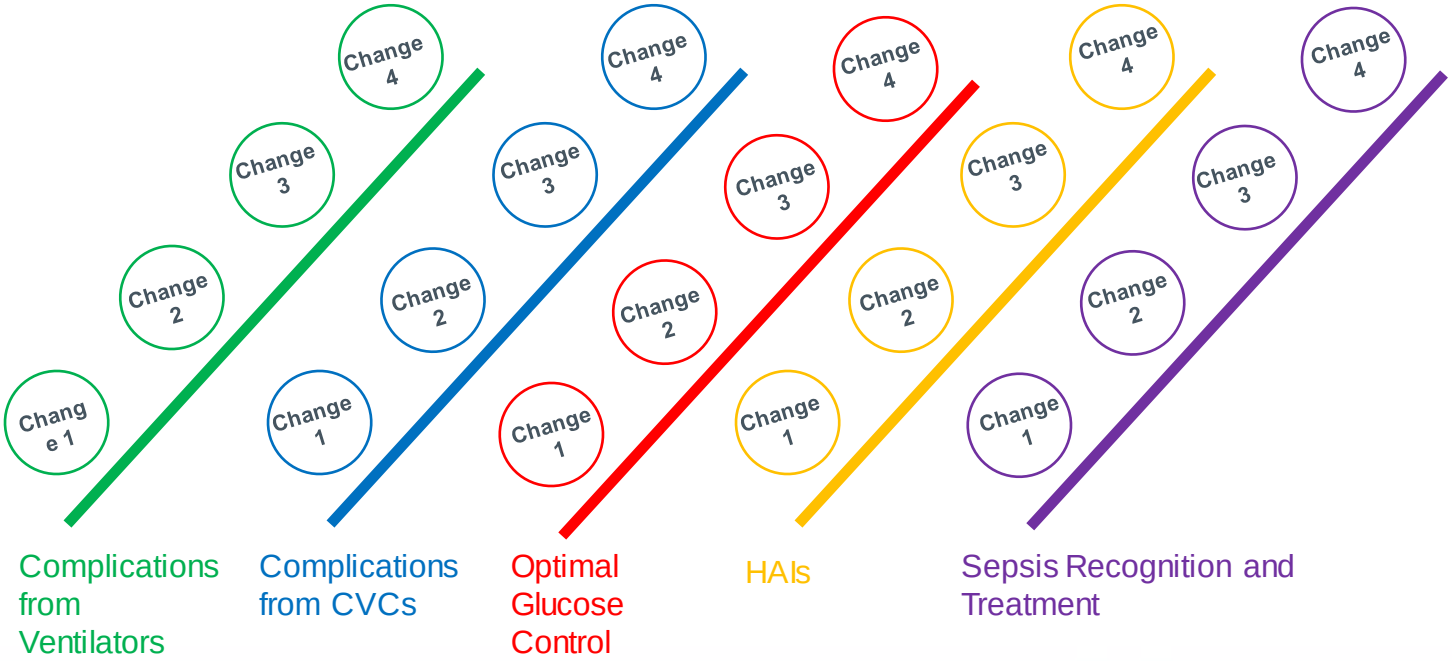
Multiple Cycles of PDSAs (continued)

Aim: Improve care of patients with cardiovascular disease by involving patients in their care



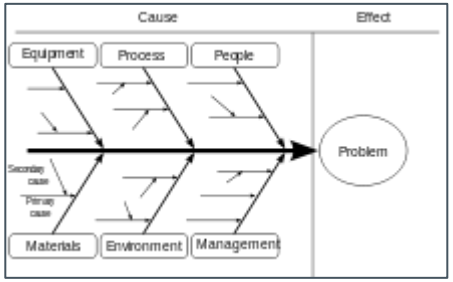
Source: Catahoula Parish CHC, Apr. 2003

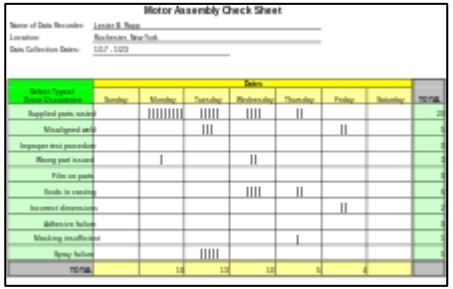
Aim: Provide appropriate, reliable and timely care to critically ill patients using evidence-based therapies in Hospital X, Pilot Site Y, by August 2008

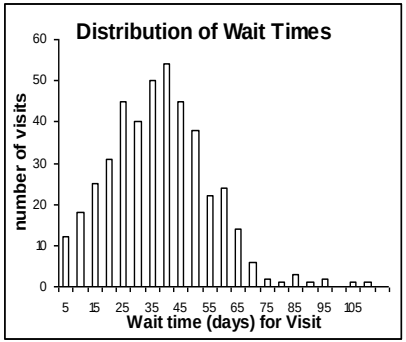


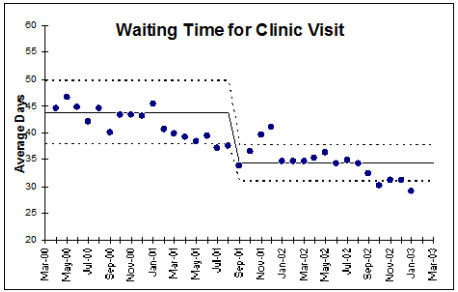
Basic Improvement Tools

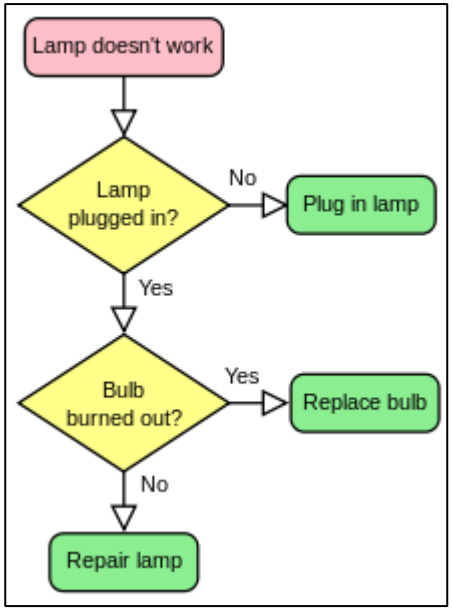
7 Basic Quality Tools

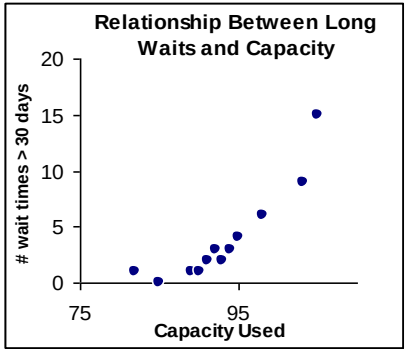


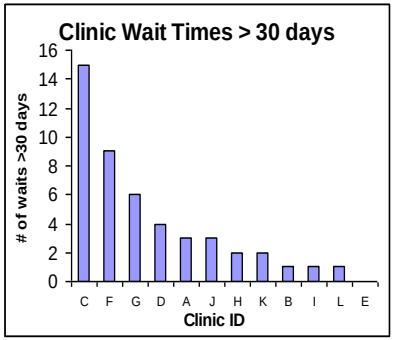












Tools for Today

- Process Mapping
- Check Sheets
- Pareto Charts
- Data over time
- PDSA Cycles

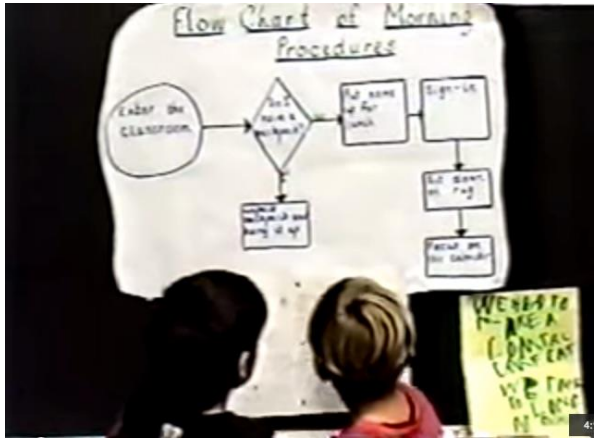
5 Year Old Improvers

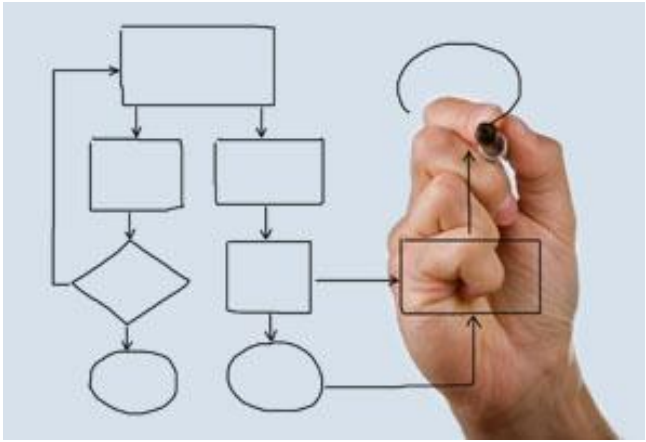
http://youtu.be/iWYIWE7SKcM

What were they trying to accomplish?

- **Aim:** Improve classroom management by 31 October by:
  - 95% of children will remove backpack when entering the room
  - 95% of children will sign in
  - Time from door opened to children sitting on the rug and focused on the calendar will be 5 minutes or less 95% of the time
  - Reduce clean up time to an average of 5 min or less

Flowchart



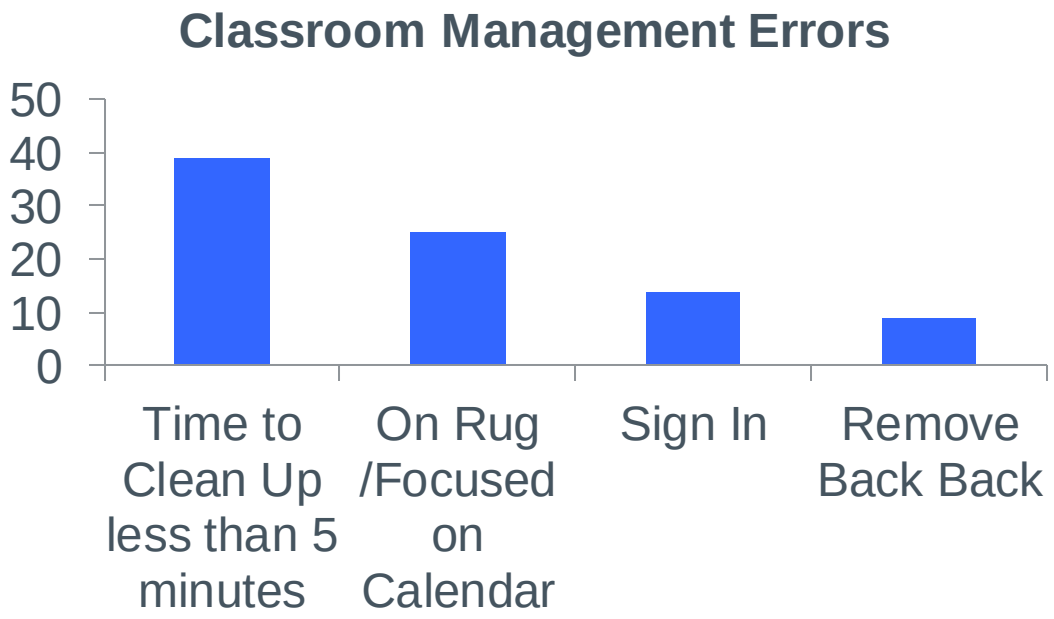


Check Sheet

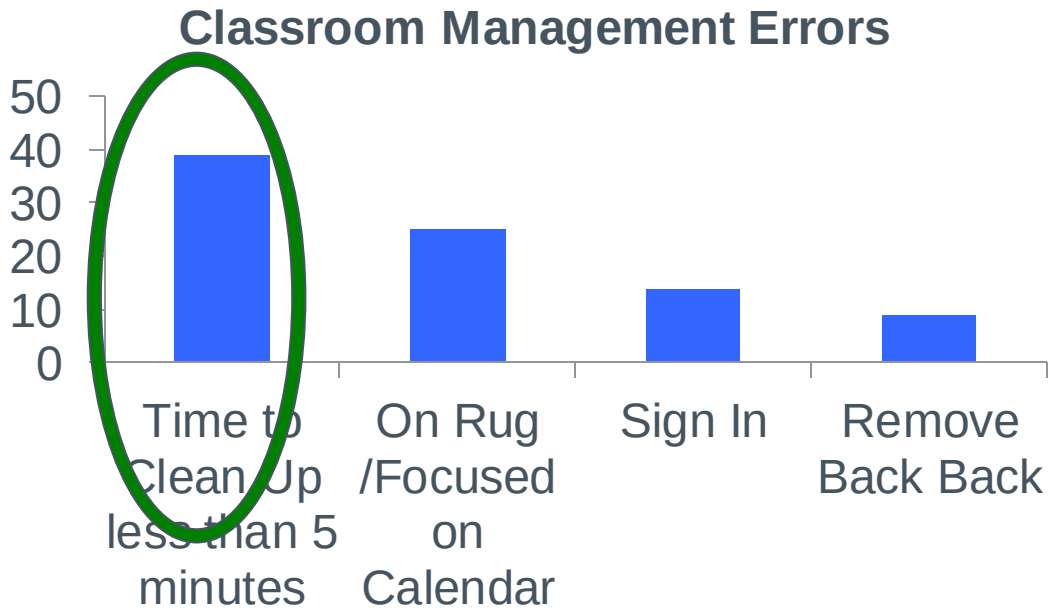
Activities	Monday	Tuesday	Wednesday	Thursday	Friday
Remove Back Back	lll	ll	l	l	ll
Sign In	ll	lll	lll	llll	ll
On Rug /Focused on Calendar	llllI	llllI ll	llllI l	lll	llll
Time to Clean Up less than 5 minutes	llllI llllI	llllI lll	llllI	llllI ll	llllI llll

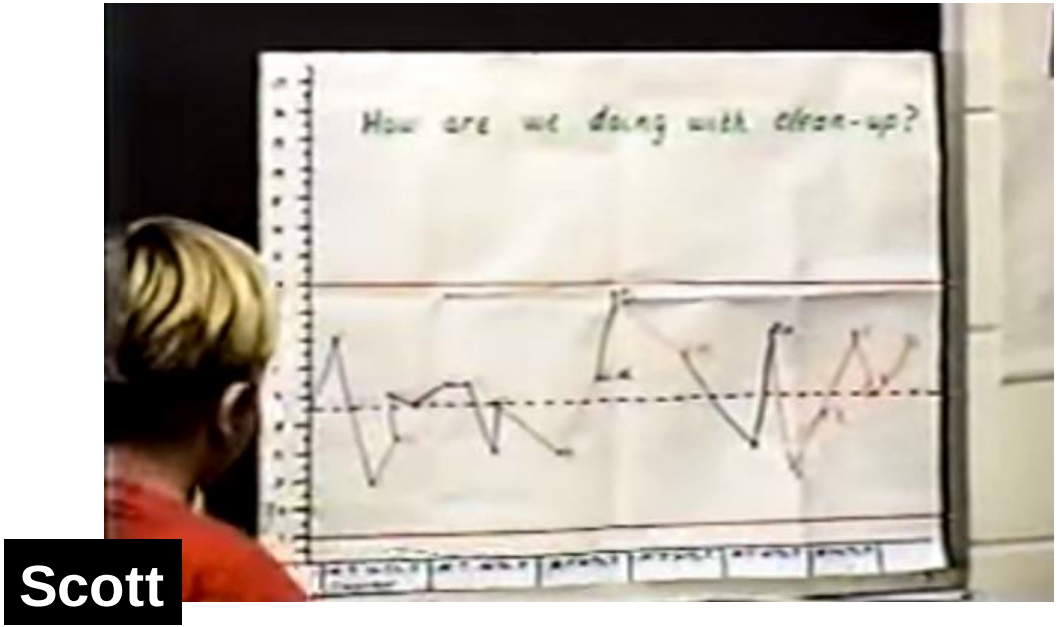
N= 20 kids

Pareto Chart



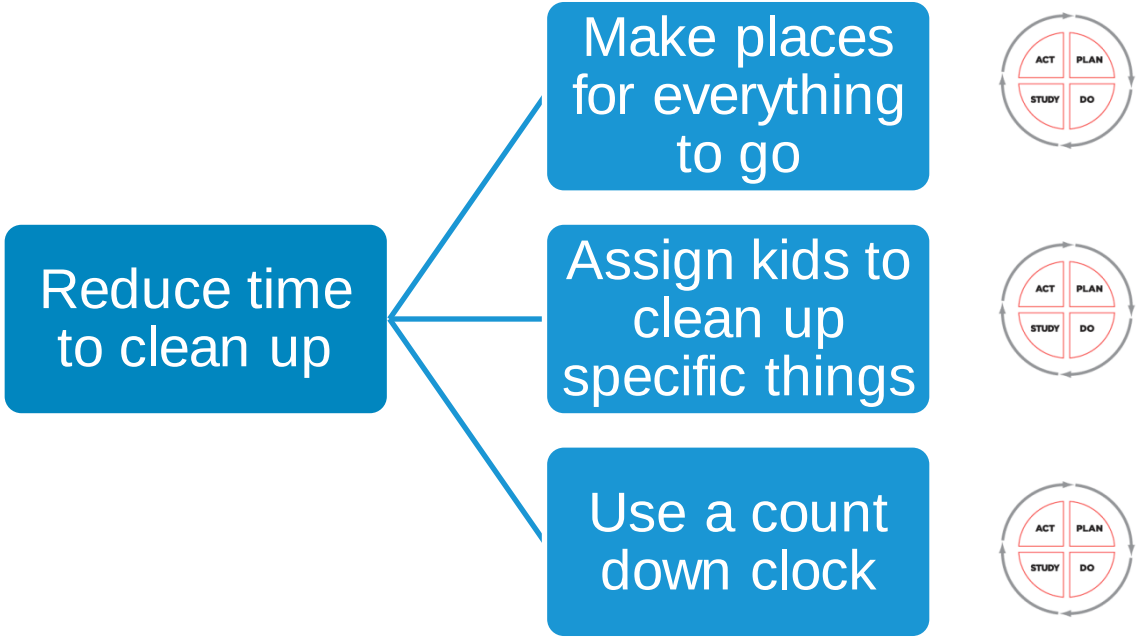
Pareto Chart





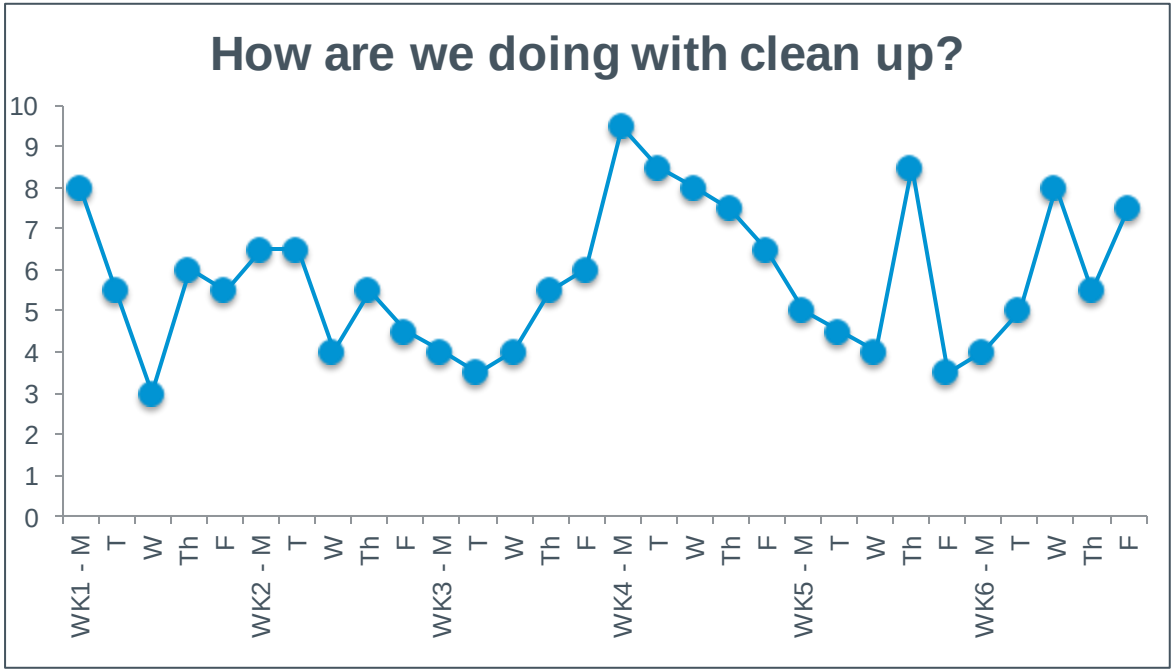
Measures – How will we know a change is an improvement?

Change Ideas: What changes can I make that will result in improvement?



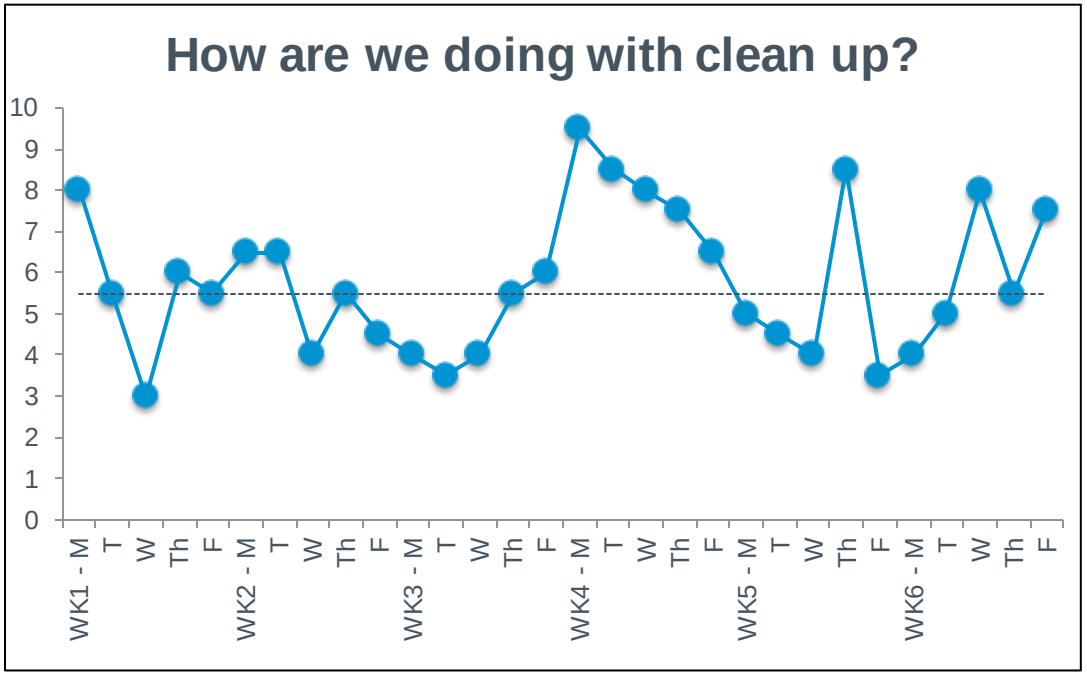
Days	Minutes
WK1 - M	8
T	5.5
W	3
Th	6
F	5.5
WK2 - M	6.5
T	6.5
W	4
Th	5.5
F	4.5
WK3 - M	4
T	3.5
W	4
Th	5.5
F	6
WK4 - M	9.5
T	8.5
W	8
Th	7.5
F	6.5
WK5 - M	5
T	4.5
W	4
Th	8.5
F	3.5
WK6 - M	4
T	5
W	8
Th	5.5
F	7.5

Line Chart



Run Chart

Days	Minutes	Median
WK1 - M	8	5.5
T	5.5	5.5
W	3	5.5
Th	6	5.5
F	5.5	5.5
WK2 - M	6.5	5.5
T	6.5	5.5
W	4	5.5
Th	5.5	5.5
F	4.5	5.5
WK3 - M	4	5.5
T	3.5	5.5
W	4	5.5
Th	5.5	5.5
F	6	5.5
WK4 - M	9.5	5.5
T	8.5	5.5
W	8	5.5
Th	7.5	5.5
F	6.5	5.5
WK5 - M	5	5.5
T	4.5	5.5
W	4	5.5
Th	8.5	5.5
F	3.5	5.5
WK6 - M	4	5.5
T	5	5.5
W	8	5.5
Th	5.5	5.5
F	7.5	5.5



Using Run Charts for Quality Improvement

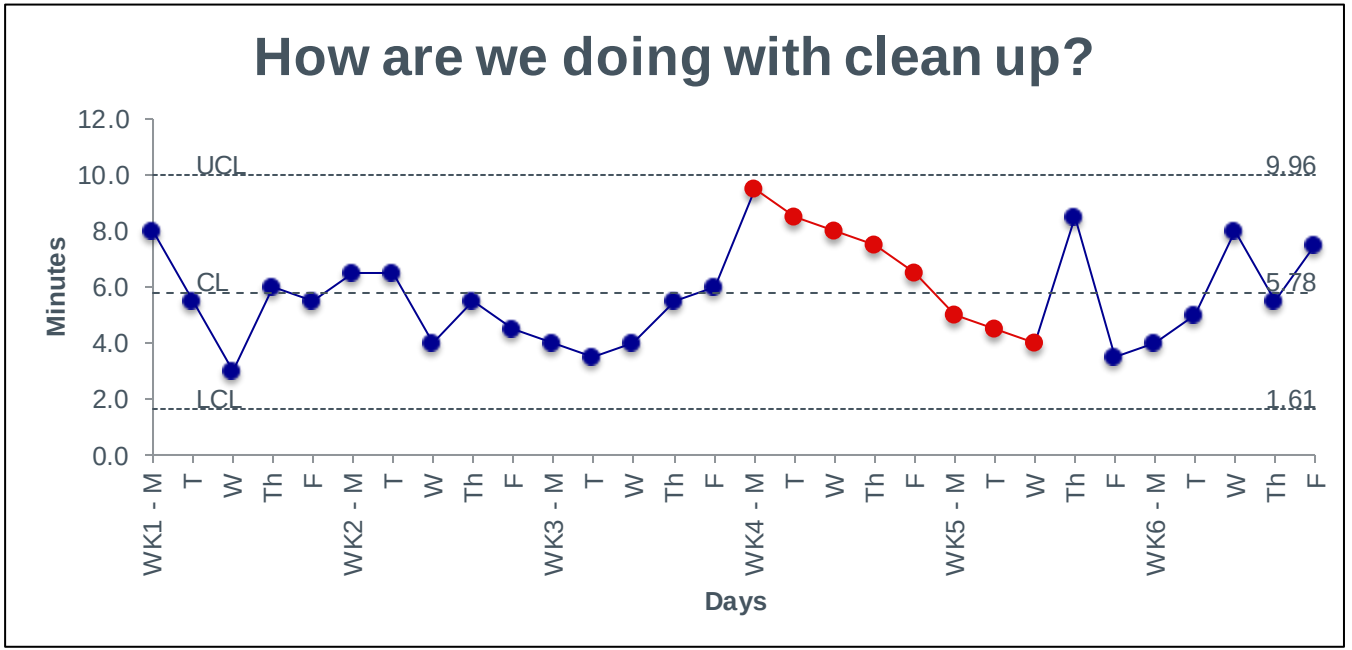
Run charts are used in QI to:

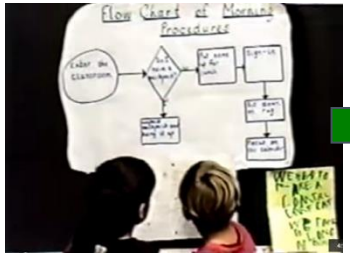
- Identify and assess problems
- Make informed decisions
- Show if a change resulted in improvement and by how much
- Monitor processes over time to see if improvements are maintained
- Communicate the effects of improvement work to others

Data are collected and analyzed at regular time intervals (as opposed to pre/post intervention data)

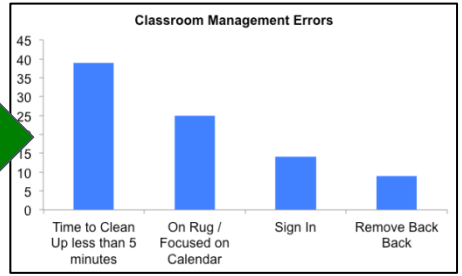
BMJ Qual Saf 2011;**20**:46–51

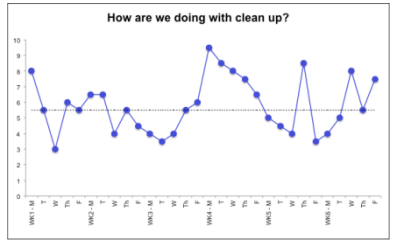
Shewhart Statistical Process Control Chart





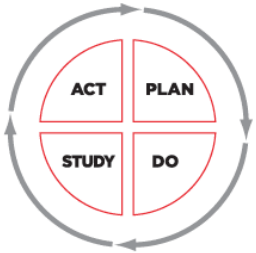
Activities	Monday	Tuesday	Wednesday	Thursday	Friday
Remove Back Back	III	II	I	I	II
Sign In	II	III	III	IIII	II
On Rug / Focused on Calendar	IIIII	IIIII II	IIIII I	III	IIII
Time to Clean Up less than 5 minutes	IIIII IIIII	IIIII III	IIIII	IIIII II	IIIII IIII





Reduce time to clean up

- Make places for everything to go
- Assign kids to clean up specific things
- Use a count down clock



Scientific Method

- The scientific method is a way to ask and answer scientific questions by making observations and doing experiments.
- The steps of the scientific method are to:
  - **Ask a Question**
  - **Do Background Research**
  - **Construct a Hypothesis**
  - **Test Your Hypothesis by Doing an Experiment**
  - **Analyze Your Data and Draw a Conclusion**
  - **Communicate Your Results**

Scientific Method (continued)

- It is important for your experiment to be a fair test. A "fair test" occurs when you change only **one** factor (variable) and keep all other conditions the same.

- While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences.

Spreadable elements

Micro-level

Agree on aim

Clinical bundles

Patients involvement

White boards: patients, staff, quality (measures)

Data used in routine work

Huddles: patients, staff, quality

Tools

Leadership

PDSA

Roles: leader, registrar, clinician..

Meso-level

Department leadership

UKK

NØP

Spors
•Coaching
•Data collection
•Links

Sund Viden

IT infrastructure

Service & tech. department

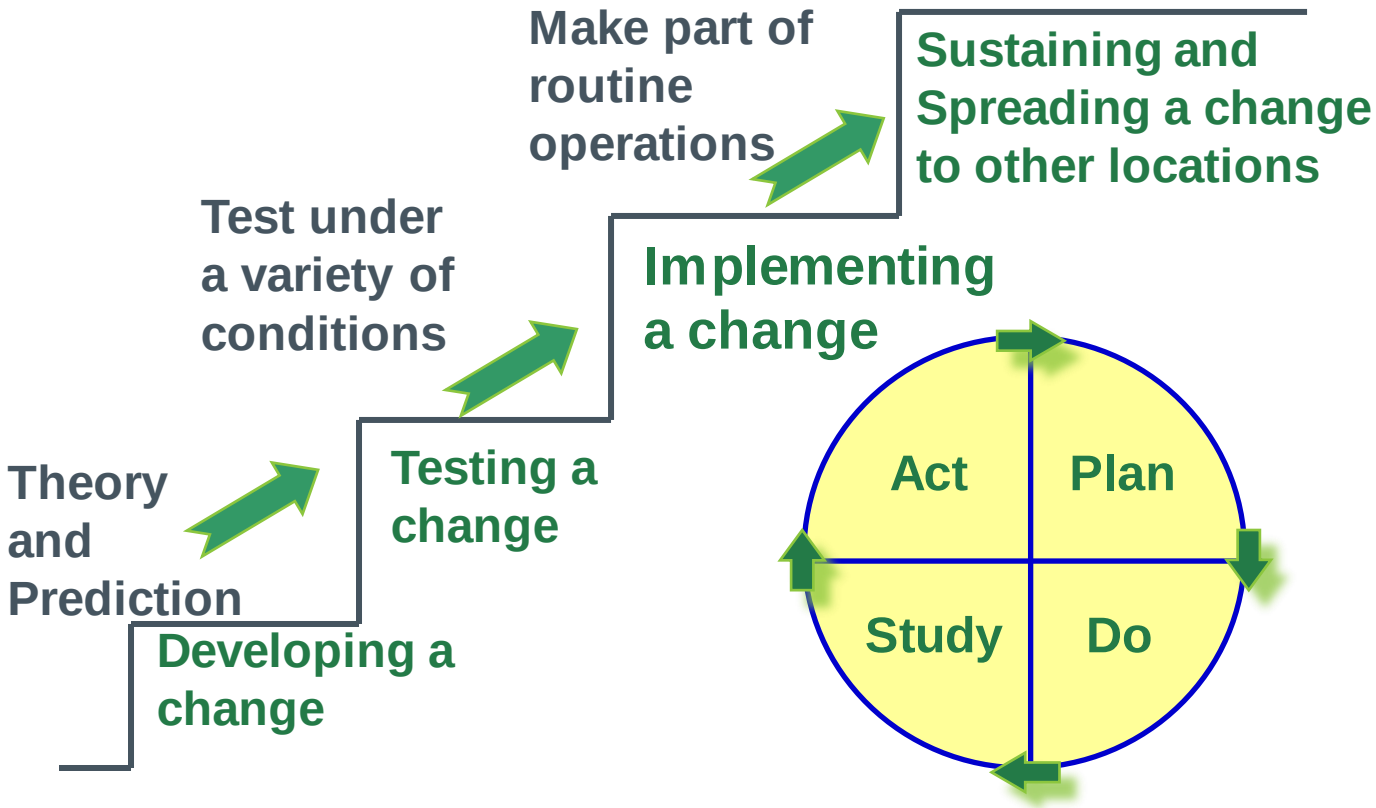
All spors meetings

Patients?

Safety rounds

Tool box IntraNord

The Sequence for Improvement



What Leaders Should Expect of Teams to Reliably Achieve the Safety Goals

- Expect the initial focus of work should be on “getting the process right” with a known connection to an outcome
- Expect the team to take a set of processes to an agreed upon level of reliability within a specified timeline
- Expect the teams to use good design principles in improvement work, not just hard work and vigilance
- Expect teams to develop good designs by using rapid cycle small tests of change
- Expect adequate process structure to sustain the work

What we accomplished

- Described improvement science and its application in healthcare.
- Illustrated the three key questions of the Model for Improvement by describing an effort in your organization.
- Described the sequence of improvement and the key tools and methods that can be applied during the QI journey.
- Discussed the scientific method and its comparison to the PDSA (Plan-Do-Study-Act) cycle

Questions?

Thank you!

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