These presenters have nothing to disclose.

Milestones in the Quality Measurement Journey

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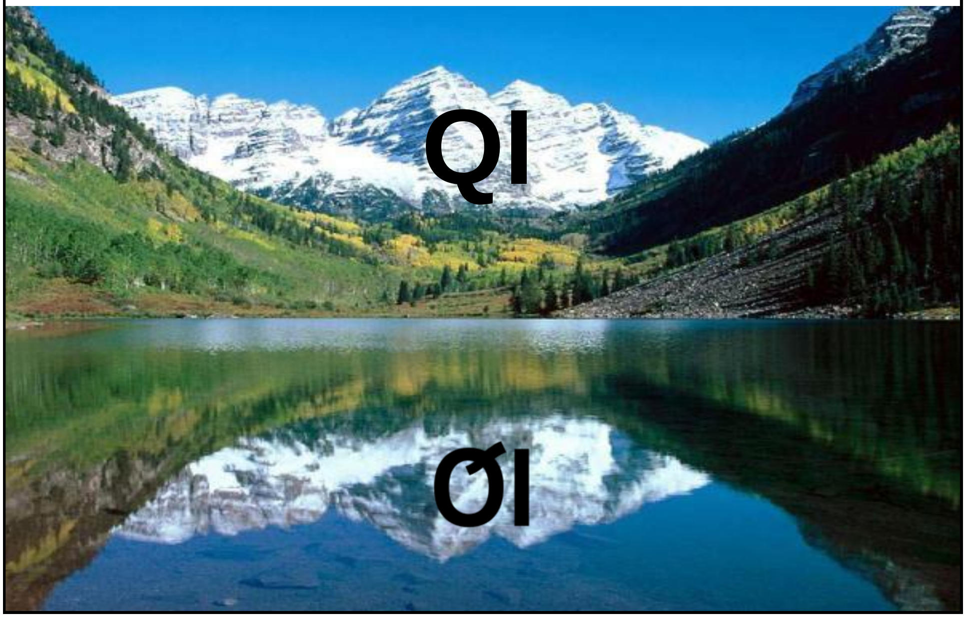
Day 2
September 10, 2015

Objectives

At the end of this session, participants will be able to:

- Develop useful operational definitions for your measures
- Develop data collection strategies for your improvement project
- Explain variables and attributes data
- Create and interpret run charts in order to use data to guide improvement
- Identify the differences between run and control charts
- Understand variation conceptually and statistically
- Identify 5 rules for detecting special cause
- Create graphs with substance and integrity

Morning Reflection



Reflection Questions

Question 1: What is one thing you learned about the Science of Improvement that you did not know?

Question 2: What is one thing about the Science of Improvement that you need to study further?

Today's Topics

- **Assessing your Measurement Skills & Knowledge**
- **Why are you measuring?**
- **Milestones in the Quality Measurement Journey**
  - Selecting measures
  - Building Operational Definitions
  - Data collection strategies and methods
- **Understanding Variation** (conceptually and statistically)
- **Run Chart construction and interpretation**
- **Linking measurement to improvement strategies**

Exercise
Measurement Self-Assessment

This self-assessment is designed to help quality facilitators and improvement team members gain a better understanding of where they personally stand with respect to the milestones in the Quality Measurement Journey (QMJ). What would your reaction be if you had to explain why is it preferable to plot data over time rather than using aggregated statistics and tests of significance? Can you construct a run chart or help a team decide which measure is more appropriate for their project?

You may not be asked to do all of the things listed below today or even next week. But, if you are facilitating a QI team or expect to be able to demonstrate improvement , sooner or later these questions will be posed. How will you deal with them?

The place to start is to be honest with yourself and see how much you know about concepts and methods related to the QMJ. Once you have had this period of self-reflection, you will be ready to develop a learning plan for yourself and those on your improvement team.

Source: R. Lloyd, *Quality Health Care: A Guide to Developing and Using Indicators*. Jones & Bartlett Publishers, 2004: 301-304.

Exercise
Measurement Self-Assessment

Use the following Response Scale.
Select the one response which best captures your opinion.

1. I'd definitely have to call in an outside expert to explain and apply this topic/method.
2. I'm not sure I could apply this appropriately to a project.
3. I am familiar with this topic but would have to study it further before applying it to a project.
4. I have knowledge about this topic, could apply it to a project but would not want to be asked to teach it to others.
5. I consider myself an expert in this area, could apply it easily to a project and could teach this topic/method to others.

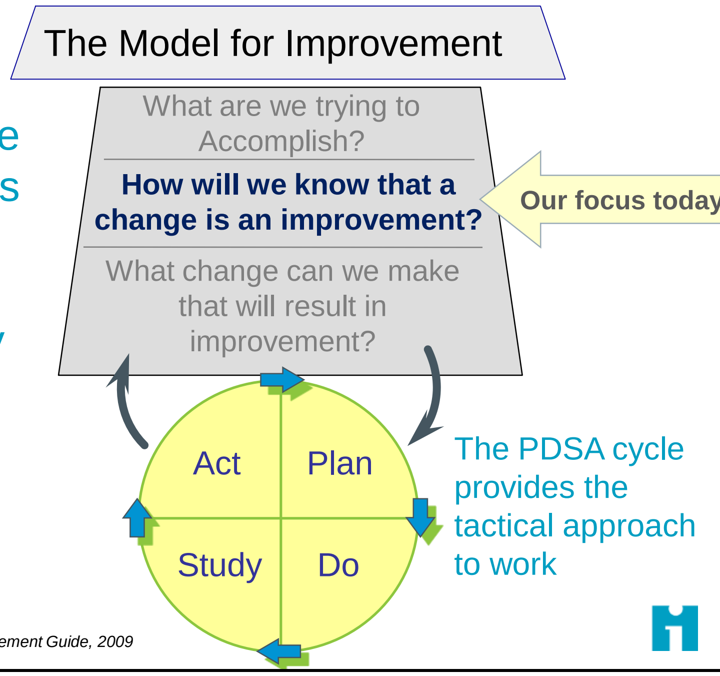
Source: R. Lloyd, *Quality Health Care: A Guide to Developing and Using Indicators*. Jones & Bartlett Publishers, 2004: 301-304.

Worksheet #1: Measurement Self-Assessment

Source: R. Lloyd, Quality Health Care: A Guide to Developing and Using Indicators. Jones & Bartlett Publishers, 2004: 301-304.

Measurement Topic or Skill	Response Scale				
	1	2	3	4	5
1. Help people in my organization understand where and how measurement fits into our quality journey					
2. Facilitate the development of clear Aim Statements					
3. Move teams from concepts to specific quantifiable measures					
4. Building clear and unambiguous operational definitions for our measures					
5. Develop data collection plans (including stratification and sampling strategies)					
6. Explain why plotting data over time (dynamic display) is preferable to using aggregated data and summary statistics (static display)					
7.Explain the differences between random and non-random variation					
8. Construct run charts (including locating the median)					
9. Explain the reasoning behind the run chart rules					
10. Interpret run charts by applying the run chart rules					
11. Explain the various types of control charts and how they differ from run charts					
12. Construct the various types of control charts					
13. Explain the control chart rules for special causes and interpret control charts					
14. Help teams link measurement to their improvement efforts					

The three questions provide the strategy



The PDSA cycle provides the tactical approach to work

Source:
Langley, et al. *The Improvement Guide, 2009*

How will we know that a change is an improvement?

1. By *understanding* the variation that lives within your data

2. By making good management *decisions* on this variation (i.e., don't overreact to a special cause and don't think that random movement of your data up and down is a signal of improvement).

Remember the Old Way, New Way?

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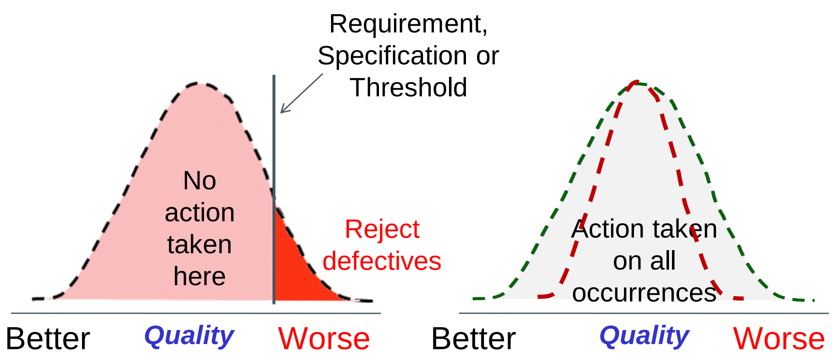


Old Way
(Quality Assurance)

New Way
(Quality Improvement)

Source: Robert Lloyd, Ph.D.

Why are you measuring?

Research?

Judgment?

Improvement?

The answer to this question will guide your entire quality measurement journey!

"Health Care Economics and Quality"

by Robert Brook, et. al. *Journal of the American Medical Association vol. 276, no. 6, (1996): 476-480.*

Three approaches to research:

1. Research for Efficacy
(experimental and quasi-experimental designs/clinical trials, p-values)

2. Research for Efficiency

3. Research for Effectiveness

$\left.\begin{array}{l}\text{2. Research for Efficiency}\\ \text{3. Research for Effectiveness}\end{array}\right\}$ Quality Improvement Research

"The Three Faces of Performance Measurement: Improvement, Accountability and Research"

by
Lief Solberg, Gordon Mosser and Sharon McDonald
Journal on Quality Improvement vol. 23, no. 3, (March 1997), 135-147.

"We are increasingly realizing not only how critical measurement is to the quality improvement we seek but also how <u>counterproductive</u> it can be to mix measurement for accountability or research with measurement for improvement."

The Three Faces of Performance Measurement

Aspect	Improvement	Accountability (Judgment)	Research
Aim	Improvement of care **(efficiency & effectiveness)**	Comparison, choice, reassurance, motivation for change	New knowledge **(efficacy)**
Methods: • Test Observability	Test observable	No test, evaluate current performance	Test blinded or controlled
• 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	Fixed hypothesis (null hypothesis)
• Testing Strategy	Sequential tests	No tests	One large test
• Determining if a change is an improvement	**Analytic Statistics (statistical process control)** Run & Control charts	No change focus (maybe compute a percent change or rank order the results)	**Enumerative Statistics** (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

Example of Data for Judgement

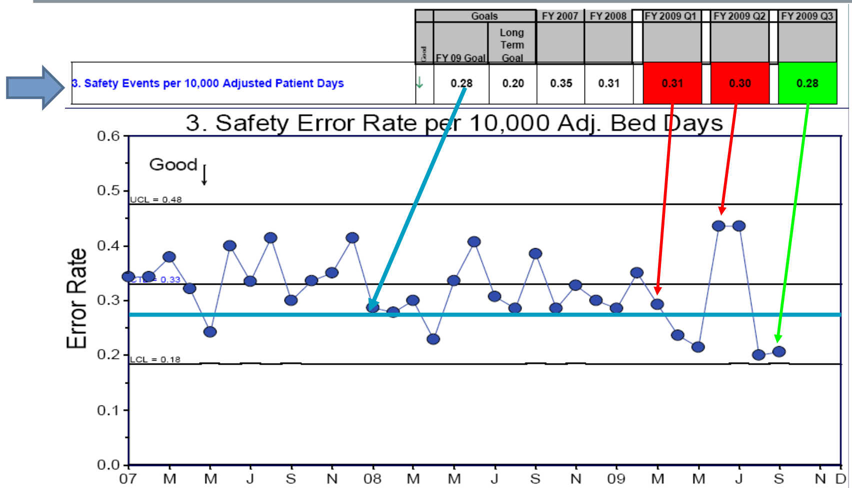
Legend for Status of Goals (Based on Annual Goal)
- Goal Met (GREEN)
- Goal 75% Met (YELLOW)
- Goal Not Met (RED)

FY 2009 Hospital System-Level Measures

	Good	Goals: FY 09 Goal	Goals: Long Term Goal	FY 2007	FY 2008	FY 2009 Q1	FY 2009 Q2	FY 2009 Q3
Patient Perspective								
1. Overall Satisfaction Rating: Percent Who Would Recommend (Includes inpatient, outpatient, ED, and Home Health)	↑	60%	80%	37.98%	48.98%	57.19%	56.25%	51.69%
2. Wait for 3rd Next Available Appointment: Percent of Areas with appointment available in less than or equal to 7 business days (n=43)	↑	65%	100%	53.5%	51.2%	54.3%	61.20%	65.1%
Patient Safety								
3. Safety Events per 10,000 Adjusted Patient Days	↓	0.28	0.20	0.35	0.31	0.31	0.30	0.28
4. Percent Mortality	↓	3.50	3.00	4.00	4.00	3.48	3.50	3.42
5.Total Infections per 1000 Patient Days	↓	2	0	3.37	4.33	4.39	2.56	1.95
Clinical								
6. Percent Unplanned Readmissions	↓	3.5%	1.5%	6.1%	4.8%	4.6%	4.1%	3.5%
7. Percent of Eligible Patients Receiving Perfect Care--Evidence Based Care (Inpatient and ED)	↑	95%	100%	46%	74.1%	88.0%	91.7%	88.7%
Employee Perspective								
8. Percent Voluntary Employee Turnover	↓	5.80%	5.20%	5.20%	6.38%	6.10%	6.33%	6.30%
9. Employee Satisfaction: Average Rating Using 1-5 Scale (5 Best Possible)	↑	4.00	4.25	3.90	3.80	3.96	3.95	3.95
Operational Performance								
10. Percent Occupancy	↑	88.0%	90.0%	81.3%	84.0%	91.3%	85.6%	87.2%
11. Average Length of Stay	↓	4.30	3.80	5.20	4.90	4.60	4.70	4.30
12. Physician Satisfaction: Average Rating Using 1-5 Scale (5 Best Possible)	↑	4.00	4.25	3.80	3.84	3.96	3.80	3.87
Community Perspective								
13. Percent of Budget Allocated to Non-recompensed Care		7.00%	7.00%	5.91	7.00%	6.90%	6.93%	7.00%
14. Percent of Budget Spent on Community Health Promotion Programs		0.30%	0.30%	0.32%	0.29%	0.28%	0.31%	0.29%
Financial Perspective								
15. Operating Margin-Percent	↑	1.2%	1.5%	-0.5%	0.7%	0.9%	0.4%	0.7%
16. Monthly Revenue (Million)-change so shows red--but sp cause good related to occupancy	↑	20.0	20.6	17.6	16.9	17.5	18.3	19.2

Source: Provost, Murray & Britto (2010)

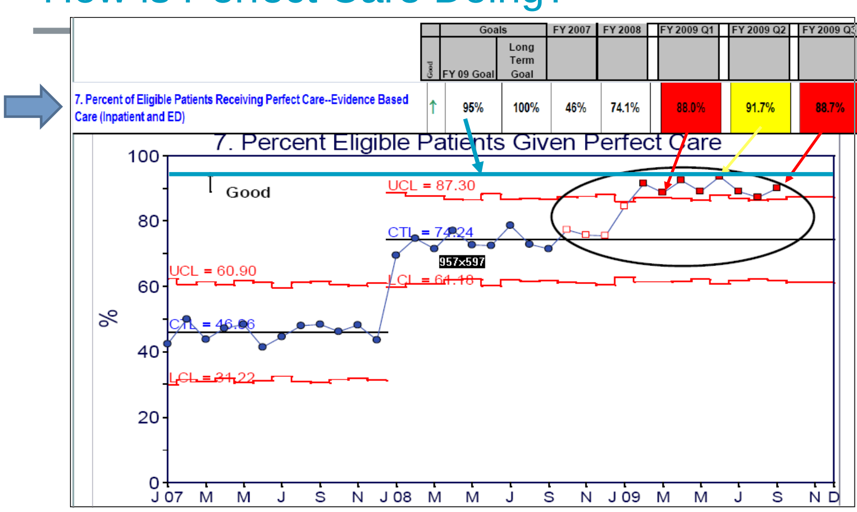
How Is Error Rate Doing?



Source: Provost, Murray & Britto (2010)

Slide #18

How is Perfect Care Doing?



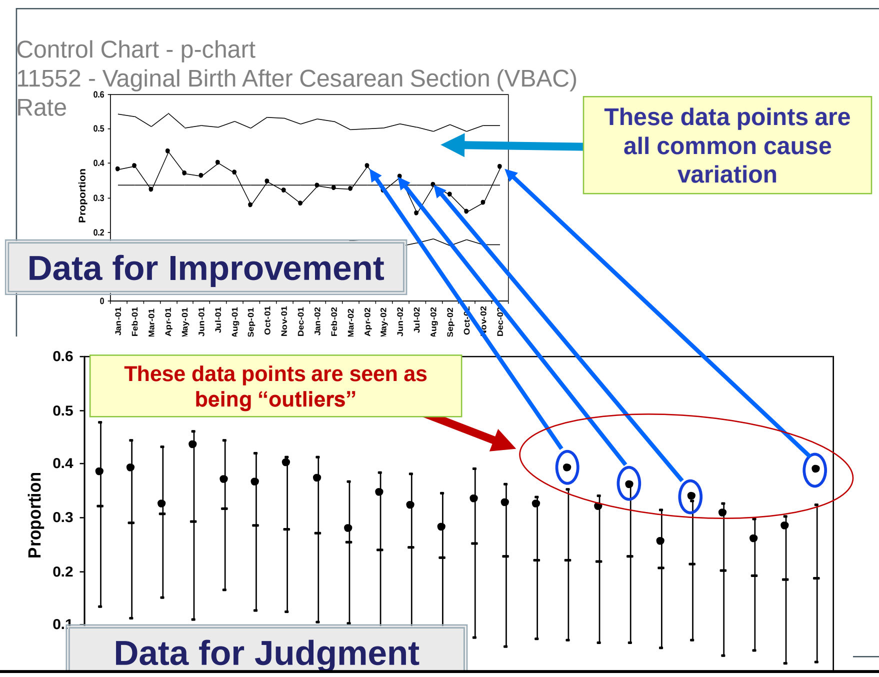
Source: Provost, Murray & Britto (2010)

20-20 Hindsight

"Managing a process on the basis of monthly (or quarterly) averages is like trying to drive a car by looking in the rear view mirror."

D. Wheeler
Understanding Variation, 1993.

The way you present data also makes a difference!



“Dashboard” for Judgement

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ICN Quality Dashboard

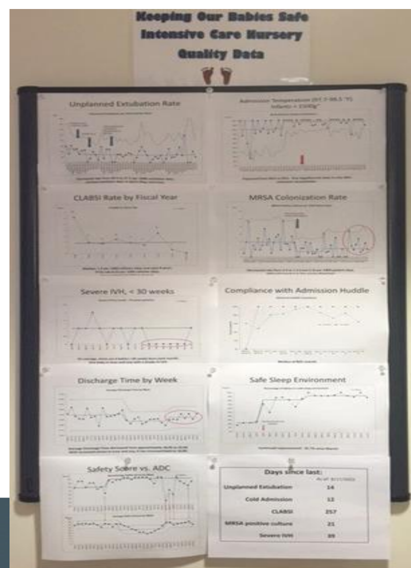
Measure	FY14 Goal	FY13	FY12	FY14 YTD	July 2013		August 2013		September 2013		October 2013		November 2013		December 2013	
					#	Rate/%	#	Rate/%	#	Rate/%	#	Rate/%	#	Rate/%	#	Rate/%
Reducing Unnecessary Variations in Care																
Unplanned Extubations	18	24.46	39.1	22.18	6	32.43	0	0.00	2	18.18	2	43.48	1	58.82	2	42.55
SCM order correct																
Bedside card correct																
Shift change tube check																
Multi-disciplinary review of x-rays																
Normothermmic Admission Temperature (< 1500g; 97.7-99.5 deg F)	95%	91.04%	78.57%	94.12%	10	100.00%	6	100.00%	7	100.00%	9	100.00%	8	87.50%	9	88.89%
Use of IRR checklist																
Use of wrap, mattress, and head wrap																
Temperature check q15 minutes																
CLABSI	1.2	1.37	1.8	3.40	0	0	0	0	1	4.1	0	0	0	0	1	6.4
Hand Hygeine	90%	81.88%	91%	89.23%	31	86.67%	40	87.50%	68	86.76%	63	84.13%	78	94.87%	55	94.34%
Hub Scrub																
Non-central line blood stream infections		5		7	1		2		0		1		0		0	
VAP/tracheitis		6		9	3		1		1		0		0		0	
UTI		3		1	1		0		0		0		0		0	
Meningitis		1		0	0		0		0		0		0		0	
Viral Infection		2		0	0		0		0		0		0		0	
Skin Cellulitis/Abscess/HEENT		7		6	0		3		0		0		0		1	
MRSA colonization	2.0	2.6	4.30	1.67	1	0.82	1	0.95	2	1.95	0	0.00	0	0.00	6	6.10
Necrotizing Enterocolitis	4	5	7	5	1		1		0		1		1		0	
Standard Feeding Regimen																
Initiation of breast feeding < 1500g	98%	96%	94%	98%	7	100%	5	100%	7	100%	10	100%	7	86%	7	100%
Breast milk production at one month																
Medication Errors	60	77	N/A	40	6		2		1		0		3		6	
Transitions in Care/Coordination of Care and Accountability for Perfect Care																
SBC appointment follow-up compliance	92%	88%	79.2%	85.0%	13	61.5%	9	100.0%	8	87.5%	15	86.7%	9	88.9%	6	66.7%
Newborn Nursery Handoff Communication	90%	65.5%	71.2%	52.2%	23	52.2%										
Parent Satisfaction - Q20 "overall care"		98.1%		96.4%	N/A		29	93.1%	14	100.0%	8	100.0%	NA		7	95.20%

Measure	January 2014		February 2014		March 2014		April 2014		May 2014		June 2014	
	#	Rate/%	#	Rate/%	#	Rate/%	#	Rate/%	#	Rate/%	#	Rate/%
Unplanned Extubations	1	27.78	0	0.00	1	12.35	3	21.58	3	15.08	4	27.03
SCM order correct												
Bedside card correct												
Shift change tube check												
Multi-disciplinary review of x-rays												
Normothermmic Admission Temperature (< 1500g; 97.7-99.5 deg F)	7	100.00%	11	100.00%	9	88.89%	12	91.67%	11	81.82%	3	100.00%
Use of IRR checklist												
Use of wrap, mattress, and head wrap												
Temperature check q15 minutes												
CLABSI	0	0	0	0	0	0	3	14.2	0	0	3	13.1
Hand Hygeine	89	93.26%	41	97.44%	55	90.57%	65	88.71%	54	86.54%	97	82.29%
Hub Scrub												
Non-central line blood stream infections	1		0		0		2		0		0	
VAP/tracheitis	0		0		0		3		1		0	
UTI	0		0		0		0		0		0	
Meningitis	0		0		0		0		0		0	
Viral Infection	0		0		0		0		0		0	
Skin Cellulitis/Abscess/HEENT	0		0		0		2		0		0	
MRSA colonization	1	1.19	1	1.38	3	3.07	0	0.00	5	5.00	0	0.00
Necrotizing Enterocolitis	0		0		0		0		0		1	
Standard Feeding Regimen												
Initiation of breast feeding < 1500g	7	100%	10	100%	8	100%	11	91%	9	100%	4	100%
Breast milk production at one month												
Medication Errors	2		5		3		5		5		2	
SBC appointment follow-up compliance	15	86.7%	9	88.9%	6	83.3%	9	100.0%	8	87.5%	13	84.6%
Newborn Nursery Handoff Communication												
Parent Satisfaction - Q20 "overall care"	6	100.0%	7	100.0%	8	91.7%	6	100.0%	11	93.9%	6	100.0%

As of: 8/18/14

Displaying Data for Improvement

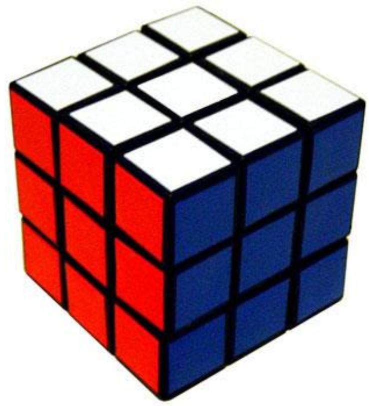
- **Quality “Ticker”**
  - Days since last adverse event
  - Updated daily
- **Control Charts for active projects**
- **Quality and Safety News**
  - Congratulations
  - Thanks
  - Upcoming initiatives
- **Quality data included in monthly provider and weekly nursing email communication.**



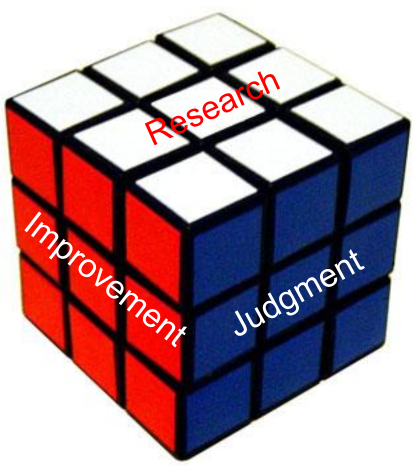
So, how do you view the Three Faces of Performance Measurement?

Or,

As a…



Relating the Three Faces of Performance Measurement to your work



The three faces of performance measurement should not be seen as mutually exclusive silos. This is not an either/or situation.

All three areas must be understood as a system. Individuals need to build skills in all three areas.

Organizations need **translators** who and be able to speak the language of each approach.

The problem is that individuals identify with one of the approaches and dismiss the value of the other two.

Here are a few key points to consider…

- Limits to traditional statistical methods are not well known and often minimized.
- Improvement methods are powerful and rigorous, yet frequently misunderstood and under-applied in healthcare settings.
- The purpose, context and questions you are trying to answer should always dictate the measures and methods used.

An interesting perspective…

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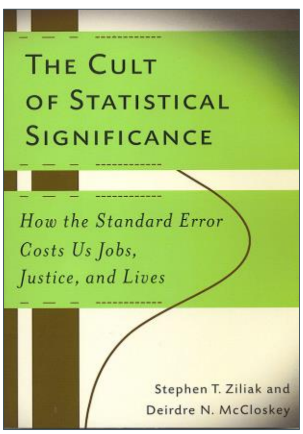


This book shows, field by field, how "statistical significance," a technique that dominates many sciences, has been a huge mistake.

The authors find that researchers in a broad spectrum of fields, from agronomy to zoology, employ "testing" that doesn't test and "estimating" that doesn't estimate.

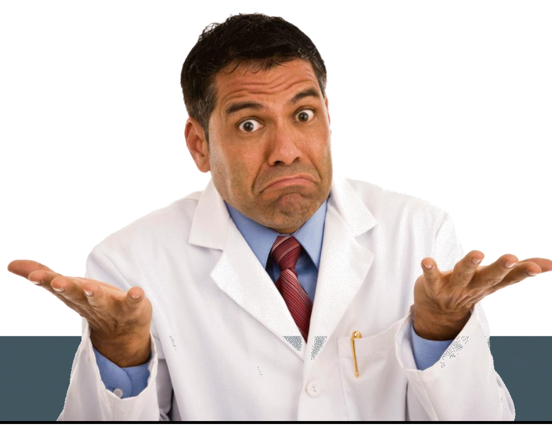
This book shows how wide the disaster is and how bad fit is for advancing science. Finally, it traces the problem to its historical, sociological and philosophical roots.

Dialogue:
Why are you measuring?

- How much of your institution's energy is aimed at improvement, accountability and/or research?
- Does one form of performance measurement dominate your journey?
- Do you think the three approaches can be integrated or are they in fact separate and distinct silos?
- How many "translators" exist within your institution? Are people being developed for this role?

So, the Question of the Day is…

How can we design a set of measures that will guide our improvement work and show meaningful results *without wasting everyone's time*?



Milestones in the Quality Measurement Journey

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- AIM* (How good? By when?)
  - Concept
    - Measure
      - Operational Definitions
        - Data Collection Plan
          - Data Collection
            - Analysis → ACTION

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

The Quality Measurement Journey

- **AIM** – reduce patient falls by 37% by the end of the year
- Concept – reduce patient falls
- Measures – Inpatient falls rate (falls per 1000 patient days)
- Operational Definitions - # falls/inpatient days
- Data Collection Plan – monthly; no sampling; all IP units
- Data Collection – unit submits data to Quality Improvement Dept. for analysis
- Analysis – control chart → ACTION

Milestones in the Quality Measurement Journey

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AIM* (How good? By when?)

Concept

Measure

Operational Definitions

Data Collection Plan

Data Collection

Analysis → ACTION

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

Moving from a Concept to Measure

"Hmmmm…how do I move from a concept to an actual measure?

Every concept can have MANY measures. Which one is most appropriate?

Every concept can have many measures

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett, 2004.*

Concept	Potential Measures
Physical Health	Weight change during admission Body Mass Index Q Risk (diabetic & CV risk assessments) Smoking status Exercise tolerance
Patient Falls	Percent of patients who fell Fall rate per 1000 patient days Number of falls Days between a fall
Service User Satisfaction	Satisfaction score during/after contact with service Number of complaints/compliments Friends and Family Test Content of suggestions

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A classic approach to developing measures

Dr. Avedis Donabedian
(1919-2000)

S + P = O

Structure + Process = Outcomes

Source: Donabedian, A. *Explorations in Quality Assessment and Monitoring. Volume I: The Definition of Quality and Approaches To Its Assessment.* Ann Arbor, MI, Health Administration Press, 1980.

Three Types of Measures

- **Outcome Measures:** Voice of the service user/staff member/customer. How is the system performing? What is the result?
- **Process Measures:** Voice of the workings of the system. Are the parts or 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 Improvement in the Accident & Emergency (A&E)

Topic	Outcome Measures	Process Measures	Balancing Measures
Improve waiting time and service user satisfaction with Mental Health Liaison Team in the local A&E	Total Length of Stay in the A&E Patient Satisfaction Scores	Time to registration Patient / staff comments on flow % patient receiving discharge materials Availability of antibiotics	Volumes % Leaving without being seen Staff satisfaction - A&E psychiatry team - Inpatient unit colleagues - A&E colleagues Cost

Balancing Measures: Looking at the System from Different Dimensions

- Outcome (quality, time)
- Transaction (volume, no. of pa...
- Productivity (cycl... capacity, d...
- ...s)
- ...efulness)
- ...tion (surveys, customer complaints)
- S... satisfaction

Balancing Measures help you capture Unintended Consequences

Building a Cascading System of Measures

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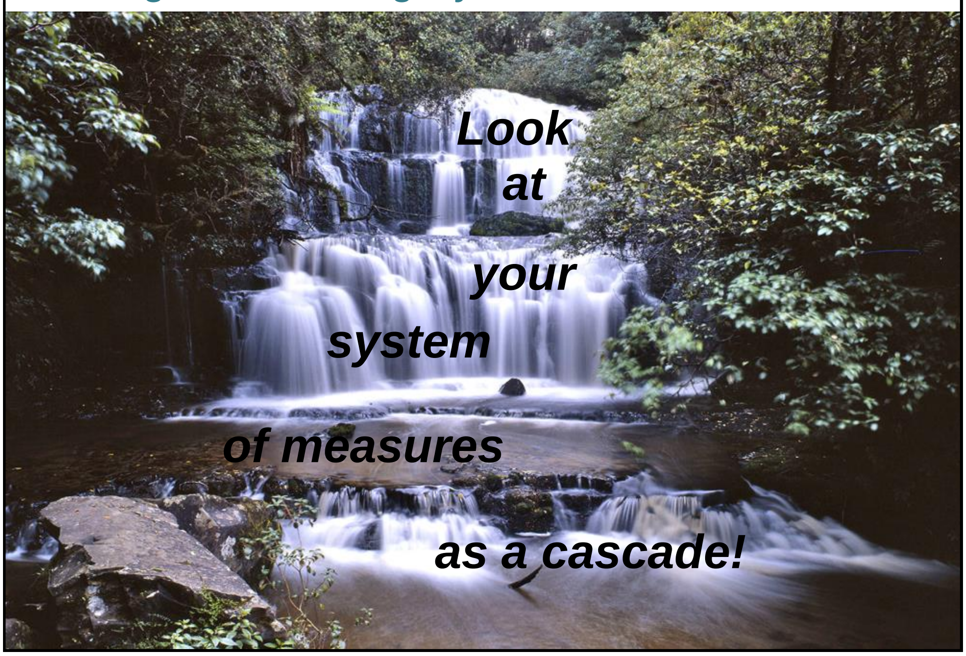
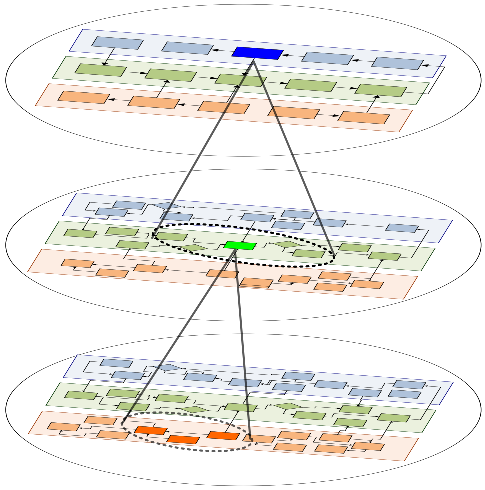


At what level are you measuring?

System or Hospital — Macrosystems
e.g. division, facility, region

Nursing Division — Mesosystems
e.g. clinical dept, patholoIgy, IT

Frontline Nursing Units — Microsystems
e.g. unit, clinic, surgical team



Which way do your measures flow?

The key question, however, is do you fully understand your measurement system and which aspects of the system you want to improve?

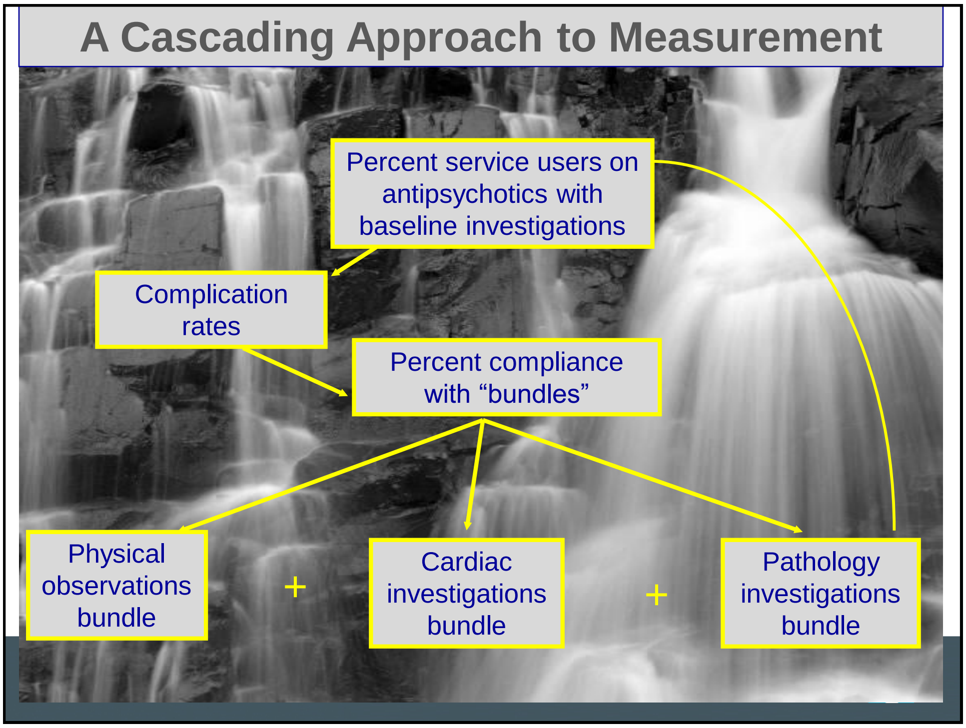
If you do start drilling down from the…

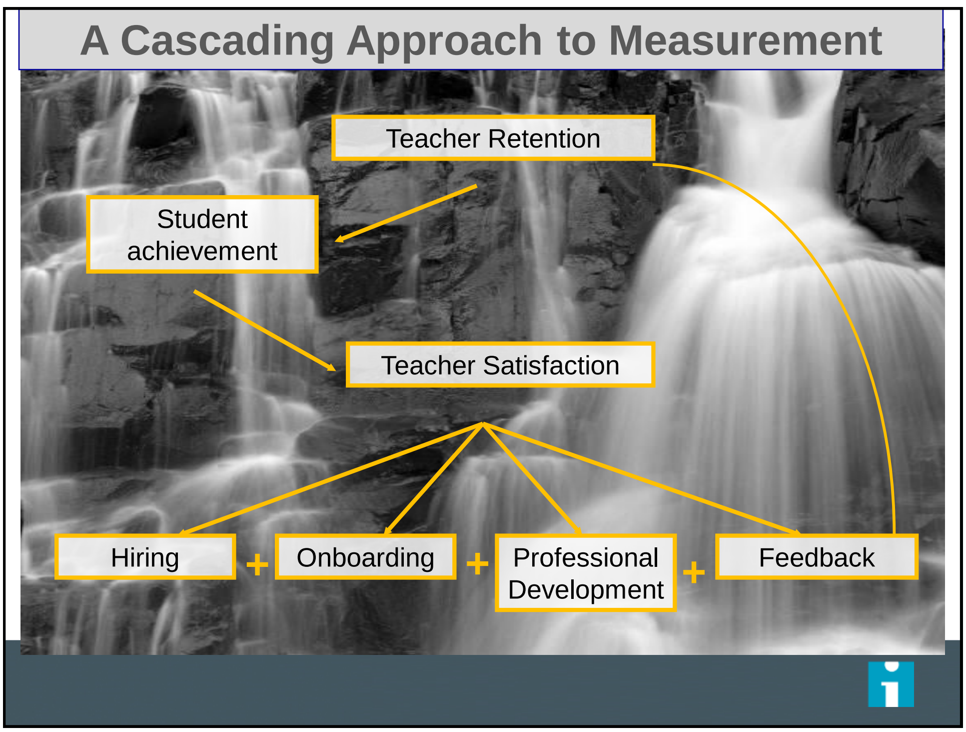
Macro

Meso

Micro levels…

…then make sure there are ways to elevate local (micro level) measures and the local learning back up to the macro level.


A Cascading Approach to Measurement
Percent service users on antipsychotics with baseline investigations
Complication rates
Percent compliance with "bundles"
Physical observations bundle
+
Cardiac investigations bundle
+
Pathology investigations bundle

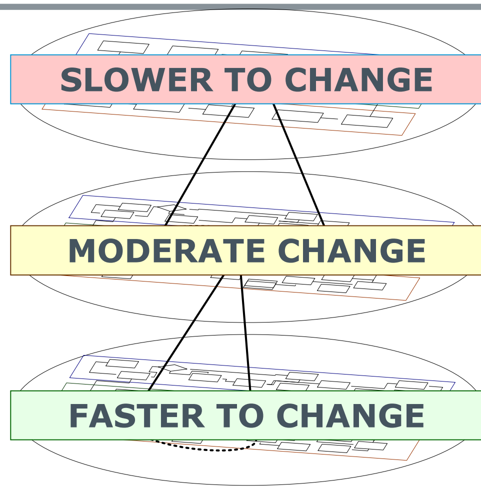

A Cascading Approach to Measurement
Teacher Retention
Student achievement
Teacher Satisfaction
Hiring
+
Onboarding
+
Professional Development
+
Feedback

Don’t Ignore the Pace of Work & Change

Macro Level
(Outcomes)

Meso Level
(Outcomes and Processes)

Micro Level
(Processes)

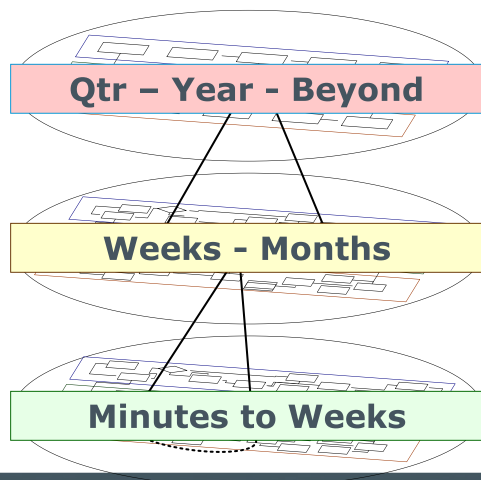


The Planning Horizon

Macro Level
(Outcomes)

Meso Level
(Outcomes and Processes)

Micro Level
(Processes)



Milestones in the Quality Measurement Journey

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AIM* (How good? By when?)

Concept

Measure

Operational Definitions

Data Collection Plan

Data Collection

Analysis → ACTION

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

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**

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

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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?

Failure to develop a clear Operational Definition often leads to confusion and misunderstanding

How do you define these concepts?

A "fair tax"   A "tax loophole"

A "good vacation"   A "great movie"

Rural, Urban or Suburban

The "rich"   The "poor"   The "middle class"

"Jump start" the economy

"Global Warming"

What does it mean to “go wireless”?

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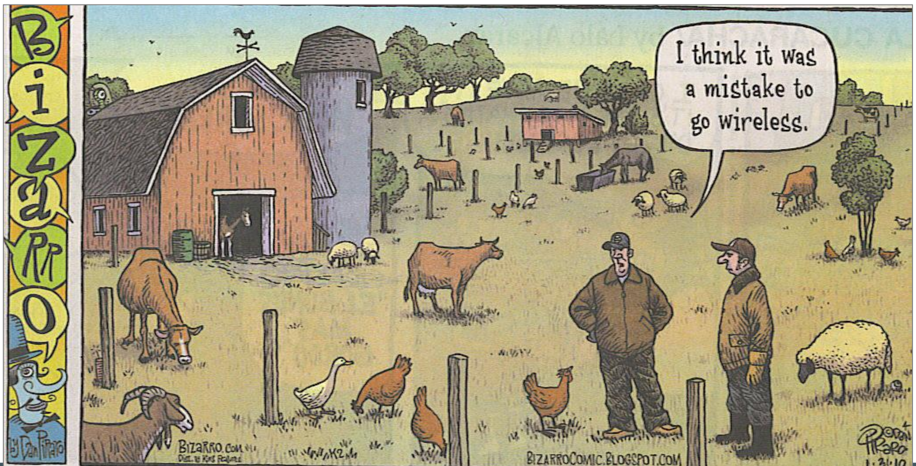
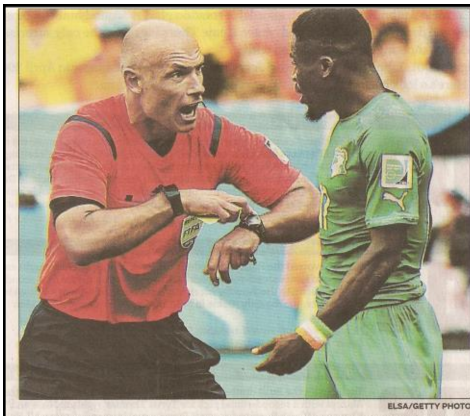


What is a goal?

The whole ball or half the ball?



ELSA/GETTY PHOTO

Referee Howard Webb points to his watch and speaks to Serge Aurier of the Ivory Coast during a match last week. If Aurier is like many people, he's confused about stoppage time.

Know the time?

Only ref can solve mystery of when a match will end; is that baffling and silly or traditional and thrilling?

BY PHILIP HERSH | Tribune reporter

When John Brooks scored the goal that would give the United States a 2-1 victory over Ghana in its World Cup opener Monday, his teammates knew the end was near.

Exactly how near was the question.

Because there was no scoreboard clock in the Natal, Brazil, stadium, several U.S. players said after the match they had no idea exactly how much time was left when Brooks scored, which was in the 86th of the scheduled 90 minutes of regulation time.

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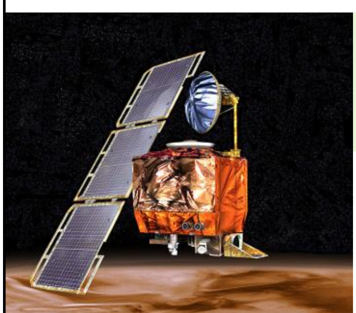
World Cup Update!

What is the operational definition of *"the end of the match*?



September 23, 1999
An expensive operational definition problem!

NASA lost a **$125 million** Mars orbiter because one engineering team used metric units (newton-seconds) to guide the spacecraft while the builder (Lockheed Martin) used pounds-second to calibrate the maneuvering operations of the craft.

Information failed to transfer between the *Mars Climate Orbiter* spacecraft team at Lockheed Martin in Colorado and the mission navigation team in California. The confusion caused the orbiter to encounter Mars on a trajectory that brought it too close to the planet, causing it to pass through the upper atmosphere and disintegrate.

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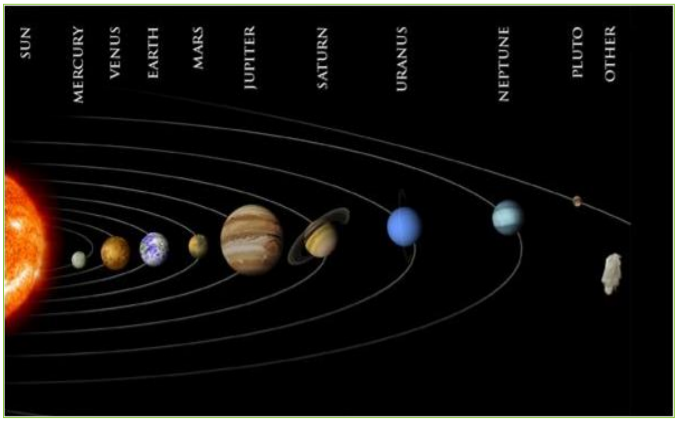
Traditionally we had…



…the 9 planet operational definition of the solar system.

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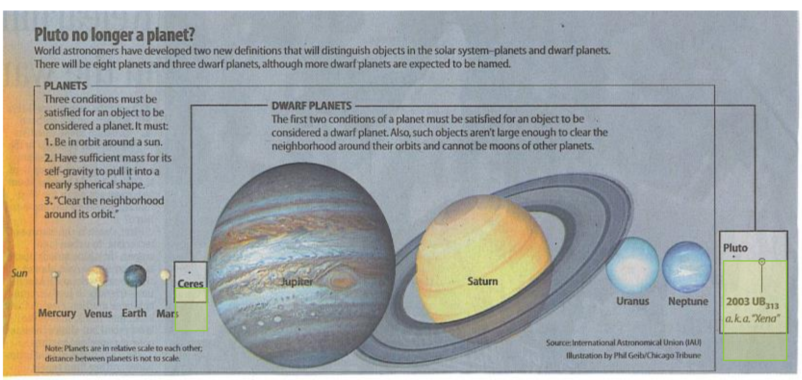
But, in 2006 the 8 planet operational definition emerged!



NOTE: On February 18, 1930 Mr. Clyde Tombaugh of Streator, Illinois discovered the planet Pluto. In 2006 the however, the International Astronomical Union reclassified Pluto as a "dwarf planet."

Percival Lowell

Clyde Tombaugh

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The **<u>Operational Definition of a Planet</u>** includes three criteria:

1. **It must orbit the sun,**
2. **It must be more or less round,**
3. **It must "clear the neighborhood" around its orbit.**

<u>Pluto meets the first two, but falls short of the third,</u> crossing the orbit of Neptune and those of other objects in the Kuiper belt where Pluto is located.

<u>July 14, 2015</u>
New Horizons spacecraft, which has traveled more than 9 years and 3+ billion miles, took this photo of Pluto at the moment of its closest approach at 0749 EDT. It is the most detailed image of Pluto ever sent to Earth.

Percival Lowell and Clyde Tombaugh would be very proud even though the revised operational definition demoted Pluto to a dwarf planet.

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

Measure Name: **Percent of medication errors**

Numerator: Number of outpatient medication orders with one or more errors. An error is defined as: wrong med, wrong dose, wrong route or wrong patient.

Denominator: Number of outpatient medication orders received by the family practice clinic pharmacy.

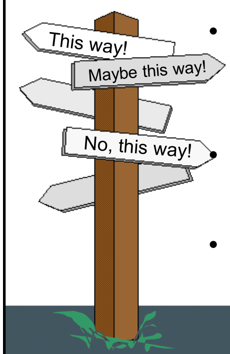
Data Collection:

- 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.

Exercise: Operational Definitions

1. Create a step-by-step operational definition to capture the concept of "banana size" — Think recipe (step-by-step specific instructions).
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.

Exercise
Building an Operational Definition



- Select **one measure** that you currently track or one that you expect to start tracking in the near future.
- Write a clear operational definition for this measure.
- If you gave the definition of your measure to another person would they know precisely what you are attempting to measure?
- Are you clear about the measurement steps required to obtain data?
- Use Page 1 of the ***Operational Definition Worksheet*** to record your responses (next page).

Operational Definition Worksheet©

TOPIC FOR IMPROVEMENT:____

Date: __________________ **Contact person**: ____

MEASURE NAME (The measure name should be something that is quantifiable, e.g., a count, a percent, a rate, a score, an index or composite measure, days between an event or successful cases between a case that does not meet criteria for being successful.)

OPERATIONAL DEFINITION
Define the specific components of this measure. Specify the numerator and denominator if it is a percent or a rate. If it is an average, identify the calculation for deriving the average. Include any special equipment needed to capture the data. If it is a score (such as a patient satisfaction score) describe how the score is derived. When a measure reflects concepts such as accuracy, complete, timely, or an error, describe the criteria to be used to determine "accuracy."

Page 1 of 2

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett, 2004.*

Operational Definition Worksheet©

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett, 2004.*

DATA COLLECTION PLAN

Who is responsible for actually collecting the data?

How often will the data be collected? (e.g., hourly, daily, weekly or monthly?)

What are the data sources (be specific)?

What is to be included or excluded (e.g., only inpatients are to be included in this measure or only stat lab requests should be tracked).

How will these data be collected?

Manually ______ From a log ______ From an automated system

BASELINE MEASUREMENT

What is the actual baseline number? ____

What time period was used to collect the baseline? _________________________________

TARGET(S) OR GOAL(S) FOR THIS MEASURE

Do you have target(s) or goal(s) for this measure?
Yes ___ No ___

Specify the **External** target(s) or Goal(s) (specify the number, rate or volume, etc., as well as the source of the target/goal.)

Specify the **Internal** target(s) or Goal(s) (specify the number, rate or volume, etc., as well as the source of the target/goal.)

Page 2 of 2

Dashboard Summary Worksheet©

Name of team:________________________________ Date: _____________

Measure Name (Be sure to indicate if it is a count, percent, rate, days between, etc.)	***Operational Definition*** (Define the measure in very specific terms. Provide the numerator and the denominator if a percentage or rate. Be as clear and unambiguous as possible)	***Data Collection Plan*** (How will the data be collected? Who will do it? Frequency? Duration? What is to be excluded?)

See Worksheet Packet

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett, 2004.*

Dashboard Summary Worksheet©

Name of team: Ward 20 Medication Reconciliation Team   Date: 1 August 2015

Measure Name (Be sure to indicate if it is a count, percent, rate, days between, etc.)	***Operational Definition*** (Define the measure in very specific terms. Provide the numerator and the denominator if a percentage or rate. Be as clear and unambiguous as possible)	***Data Collection Plan*** (How will the data be collected? Who will do it? Frequency? Duration? What is to be excluded?)
Percent of inpatient medication orders with an error	***Numerator***: Number of inpatient medication orders with one or more errors ***Denominator***: Number of inpatient medication orders received by the pharmacy	• This measure applies to all inpatient units • The data will be stratified by shift and by type of order (stat versus routine) • 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.

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett, 2004.*

Milestones in the Quality Measurement Journey

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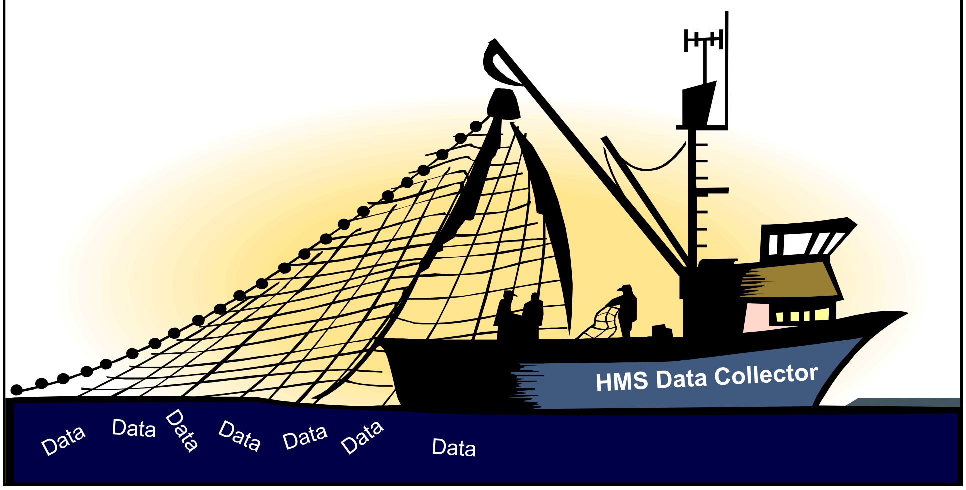
Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

Now that you have selected and defined your measures, it is time to head out, cast your net and actually gather some data!

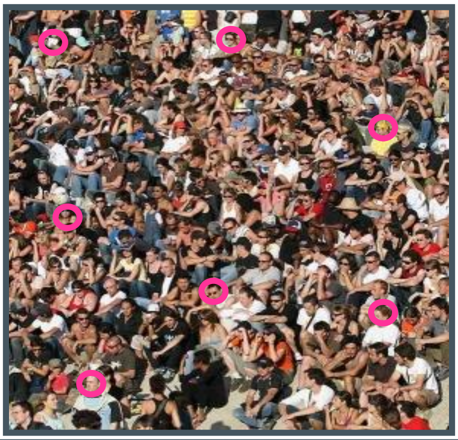


Key Data Collection Strategies

Stratification

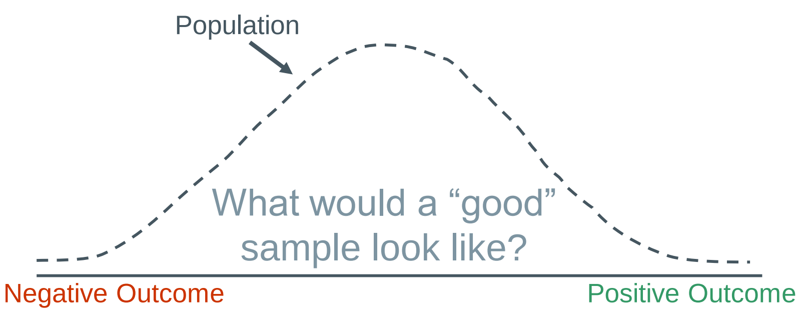
- Separation & classification of data according to predetermined categories
- Designed to discover patterns in the data
- For example, are there differences by shift, time of day, day of week, severity of patients, age, gender or type of procedure?
- Consider stratification BEFORE you collect the data

Sampling

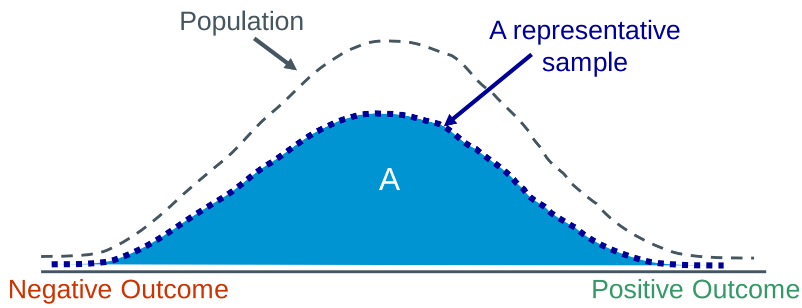


When you can't gather data on the entire population due to time, logistics or resources, it is time to consider sampling.

The Relationships Between a Sample and the Population

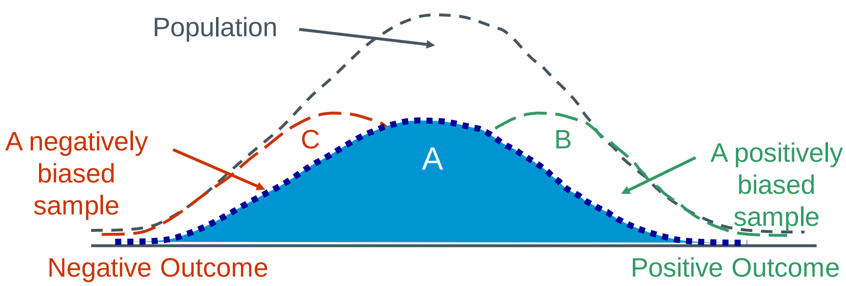


The Relationships Between a Sample and the Population



Ideally a "good" sample will have the same shape and location as the total population but have fewer observations (curve A).

Sampling Bias



But a sample improperly pulled could result in a positive sampling bias (curve B) or a negative sampling bias (curve C).

How do you draw your samples?

Sampling Methods

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

Probability Sampling Methods

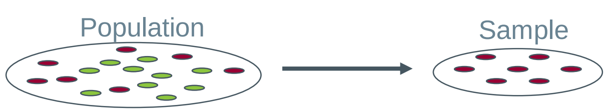
- Simple random sampling
- Stratified random sampling
- Stratified proportional random sampling
- Systematic sampling
- Cluster sampling

Non-probability Sampling Methods

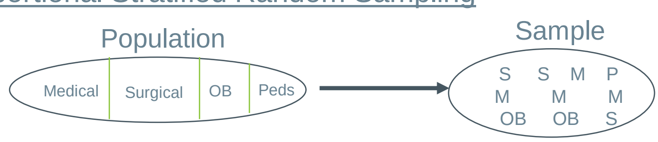
- Convenience sampling
- Quota sampling
- Judgment sampling

Sampling Options

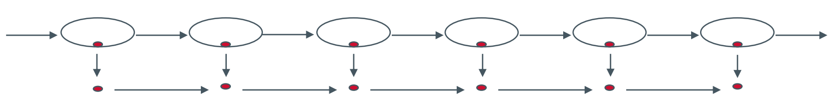
Simple Random Sampling



Proportional Stratified Random Sampling



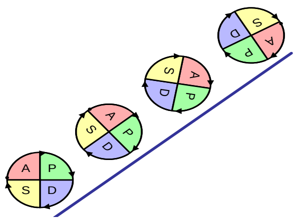
Judgment Sampling



Judgment Sampling

Especially useful for PDSA testing. Someone with process knowledge selects items to be sampled.

Characteristics of a Judgment Sample:



- Include a wide range of conditions
- Selection criteria may change as understanding increases
- Successive small samples instead of one large sample

Judgment Sampling takes advantage of the knowledge of those who own the process

But, things are pretty quiet after 3 PM.

We are absolutely crazy around here between 9 and 11 AM!

What do I know? I usually work afternoon shift and that is a different process altogether!

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

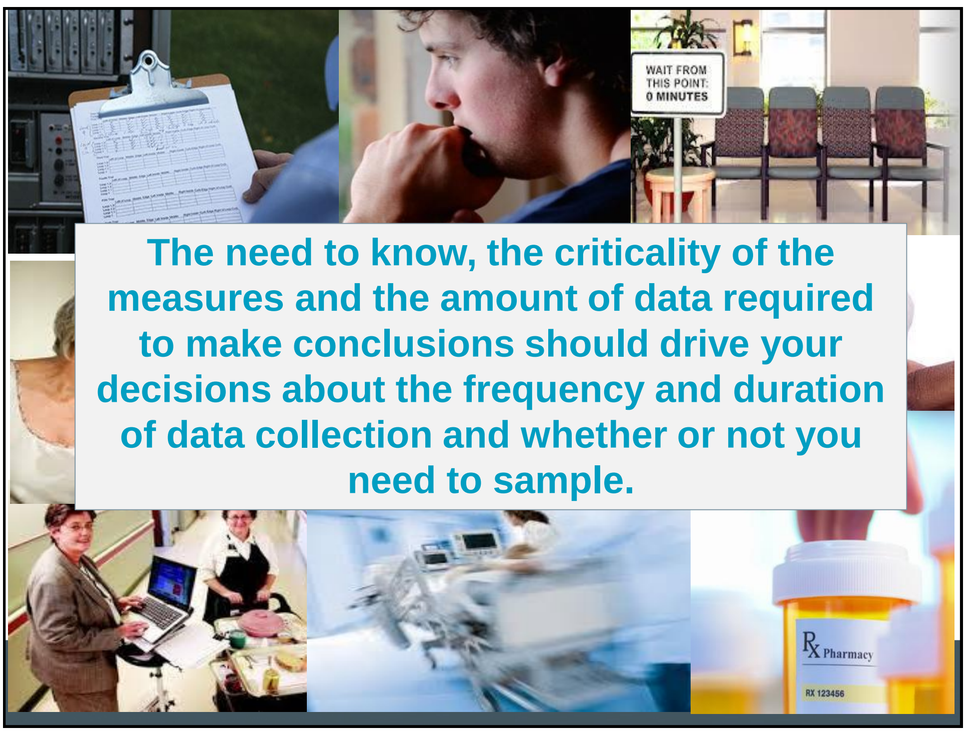
Frequency – the period of time in which you collect data (i.e., how often will you dip into the process to see the variation that exists?)

- 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)



The need to know, the criticality of the measures and the amount of data required to make conclusions should drive your decisions about the frequency and duration of data collection and whether or not you need to sample.

Exercise: Data Collection Strategies
(frequency, duration and sampling)

- This exercise has been designed to test your knowledge of and skill with developing a data collection plan.
- In the table on the next page is a list of eight measures.
- For each measure identify:
  - The frequency and duration of data collection.
  - Whether you would pull a sample or collect all the data on each measure.
  - If you would pull a sample of data, indicate what specific type of sample you would pull.
- Spend a few minutes working on your own then compare your ideas with others at your table.

Exercise: Data Collection Strategies
(frequency, duration and sampling)

The need to know, the criticality of the measure and the amount of data required to make a conclusion should drive the frequency, duration and whether you need to sample decisions.

Measure	Frequency and Duration	Pull a sampling or take every occurrence?
Vital signs for a patient connected to full telemetry in the ICU		
Blood pressure (systolic and diastolic) to determine if the newly prescribed medication and dosage are having the desired impact		
Percent compliance with a hand hygiene protocol		
Cholesterol levels (LDL, HDL, triglycerides) in a patient recently placed on new statin medication		
Patient satisfaction scores on the inpatient wards		
Central line blood stream infection rate		
Percent of inpatients readmitted within 30 days for the same diagnosis		
Percent of surgical patients given prophylactic antibiotics within 1 hour prior to surgical incision		

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The Quality Measurement Journey

AIM (Why are you measuring?)

Concept

Measure

Operational Definitions

Data Collection Plan

Data Collection

Analysis → ACTION

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators.* Jones and Bartlett Publishers, 2004.

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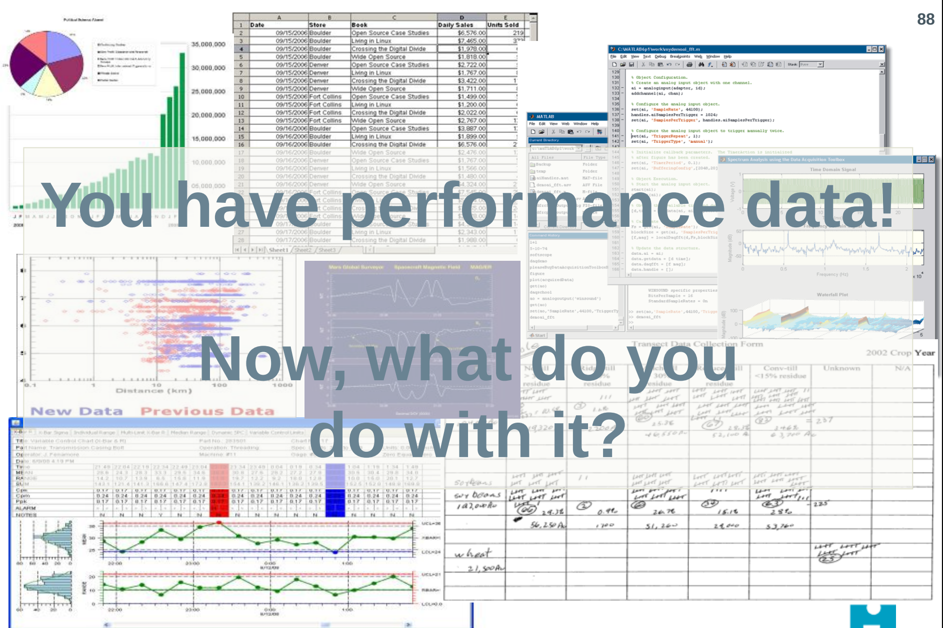


You have performance data!

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.

Percent of A&E patients Seen by a Physician within 10 min

Week	Date	Percent
1	3-Oct	88%
2	10-Oct	88%
3	17-Oct	94%
4	24-Oct	71%
5	1-Nov	88%
6	8-Nov	73%
7	15-Nov	78%
8	22-Nov	67%
9	29-Nov	69%
10	6-Dec	87%
11	13-Dec	83%
12	20-Dec	68%
13	3-Jan	83%
14	10-Jan	70%
15	17-Jan	73%
16	24-Jan	76%
17	31-Jan	78%
18	7-Feb	79%
19	14-Feb	84%
20	21-Feb	89%
21	28-Feb	95%
22	6-Mar	95%
23	13-Mar	91%
24	20-Mar	95%

Week 1 - 12	
Avg	80%
Max	94%
Min	67%
Week 13 - 24	
Avg	84%
Max	95%
Min	70%

Did we improve?

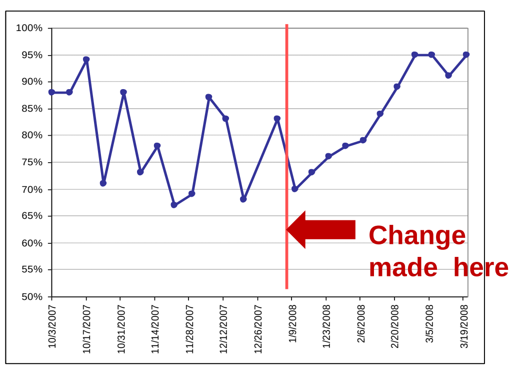
What will happen next?

Should we do something?

Source: R. Lloyd

Percent of A&E patients Seen by a Physician within 10 min

Week	Date	Percent
1	3-Oct	88%
2	10-Oct	88%
3	17-Oct	94%
4	24-Oct	71%
5	1-Nov	88%
6	8-Nov	73%
7	15-Nov	78%
8	22-Nov	67%
9	29-Nov	69%
10	6-Dec	87%
11	13-Dec	83%
12	20-Dec	68%
13	3-Jan	83%
14	10-Jan	70%
15	17-Jan	73%
16	24-Jan	76%
17	31-Jan	78%
18	7-Feb	79%
19	14-Feb	84%
20	21-Feb	89%
21	28-Feb	95%
22	6-Mar	95%
23	13-Mar	91%
24	20-Mar	95%

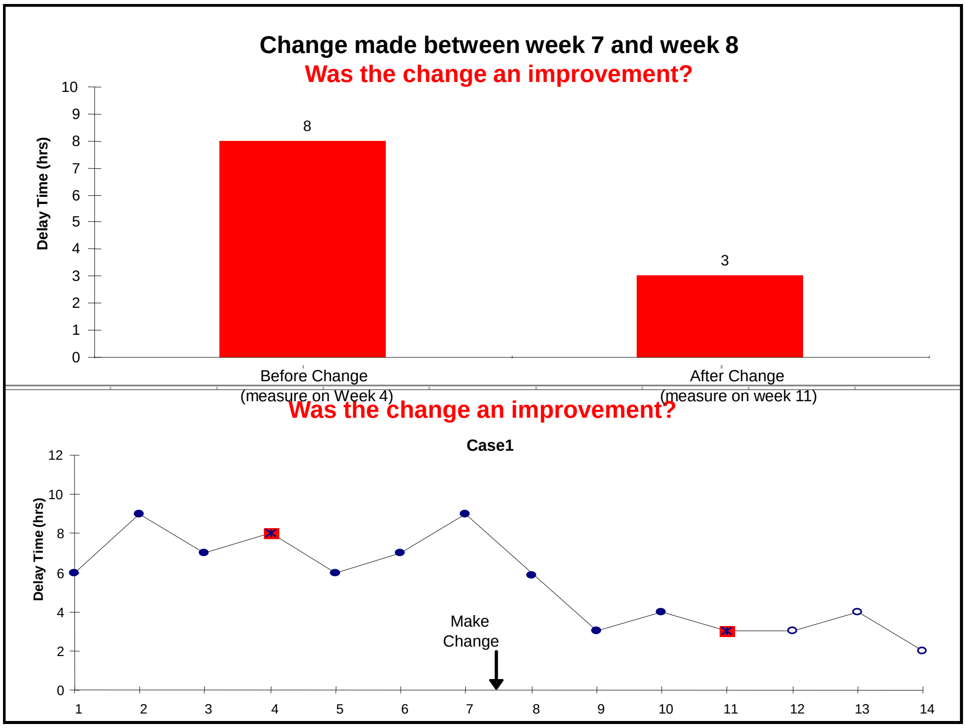


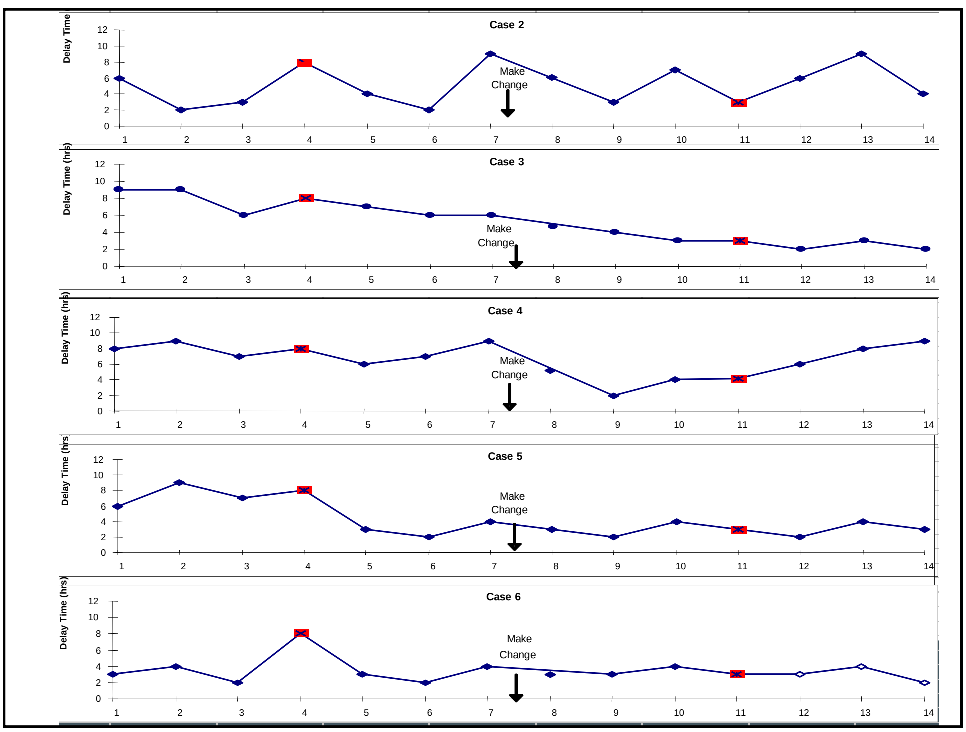
Did we improve?

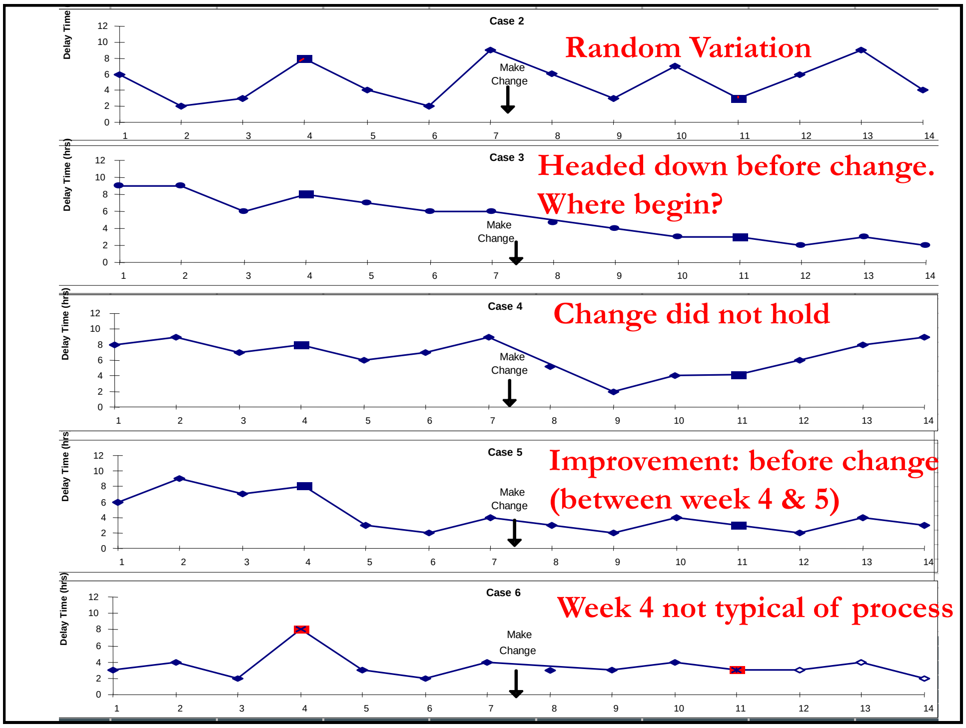
What will happen next?

Should we do something?

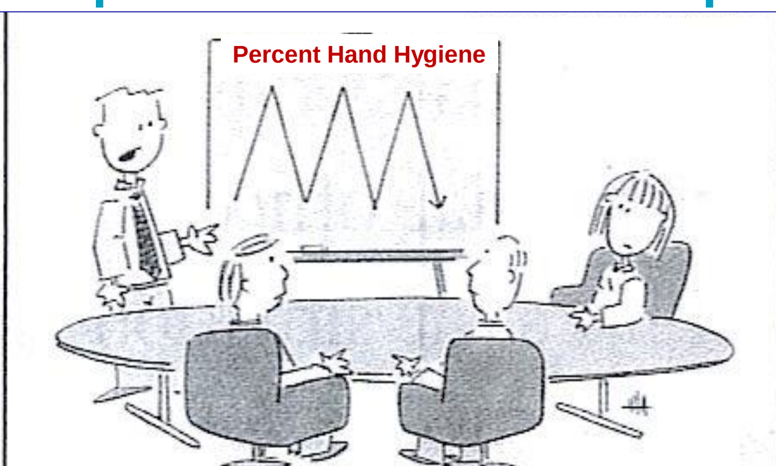
Source: R. Lloyd


Change made between week 7 and week 8
Was the change an improvement?
Delay Time (hrs)
8
3
Before Change
(measure on Week 4)
After Change
(measure on week 11)
Was the change an improvement?
Case1
Delay Time (hrs)
Make
Change


Case 2
Case 3
Case 4
Case 5
Case 6
Delay Time (hrs)
Make
Change



People unclear of the concept!



"...and then another decrease in the percent compliance with hand hygiene this month. But, I have a <u>really good</u> feeling about next month!

SOSA SLAMS 55TH – TIES MCGWIRE / See Page E1

PENINSULA EDITION

San Francisco Chronicle

NORTHERN CALIFORNIA'S LARGEST NEWSPAPER

TUESDAY, SEPTEMBER 1, 1998 — 415-777-1111 — 50 CENTS

EXCITE	NETSCAPE	AMAZON.COM	YAHOO	DELL COMPUTER	AMERICA ONLINE	CISCO SYSTEMS	MICROSOFT	IBM	INTEL
-28.8%	-23.4%	-20.9%	-16.9%	-15.8%	-14.9%	-13.5%	-8.9%	-8.1%	-7.6%

Panic Hammers Market

Dow falls 513, with tech stocks leading way

Chronicle Staff and Wire Reports

New York

The Dow Jones industrial average suffered its second-largest point loss ever yesterday, plunging 512.61 points, or 6.4 percent, as panicky investors, worried about the global economy, sent the market into a headspinning fall that erased all of this year's gain — and then some.

The technology-heavy Nasdaq Composite Index lost almost 8.6 percent of its value — much of it in the final, frantic minutes of trading. The Nasdaq posted its largest point decline ever and its fourth-largest percentage decline.

Internet companies that had led this year's market ascent also led yesterday's rout. Stocks such as Netscape Communications, Amazon.com and Excite fell 20 to 30 percent.

San Francisco Examiner

Tuesday evening — SEPTEMBER 1, 1998

CLOSING STOCKS — Dow up 288.36

TWENTY-FIVE CENTS

Stocks bounce back

Mayor to Muni: Keep riders informed

Operators will give delayed passengers reason, prognosis

By Rachel Gordon

Tech's filthy rich take a bath

What top officers lost in 11 days

	$57.6 million	$1 billion	$4.5 billion	$168.4 million
Name	James Barksdale	Larry Ellison	Bill Gates	Jerry Yang
Company	Netscape	Oracle	Microsoft	Yahoo
Shares owned	4.8 million	220 million	271 million	5.7 million
Aug. 20 worth	$143.7 million	$5.4 billion	$30.5 billion	$556 million
Monday's worth	$86.1 million	$4.4 billion	$26 billion	$387.6 million

Bargain hunters drive Dow up 288, second-biggest point gain ever

EXAMINER NEWS SERVICES

NEW YORK — Stocks soared Tuesday as Wall Street made a U-turn in the heaviest trading day in the New York Stock Exchange's history, a day after the market suffered its second-worst loss.

Based on early and unofficial data, the Dow Jones industrial average ended up 288.36 points, or 3.8 percent, at 7,827.43, an impressive comeback from Monday's 513-point slide.

In the broader market, declining issues beat advances 20 to 12 on record volume of 1.21 billion shares on the NYSE, surpassing the old high of 1.20 billion on Oct. 28, 1997, the session after the Dow plunged a record 554 points.

The Nasdaq composite index also jumped into the record books, climbing 76.32 points, or 5.1 percent, to 1,575.57, eclipsing the biggest record gain of 67.93 points also set on Oct. 28 last year.

Franklin Templeton

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MEDFL 4/98

The average of a set of numbers can be created by many different distributions

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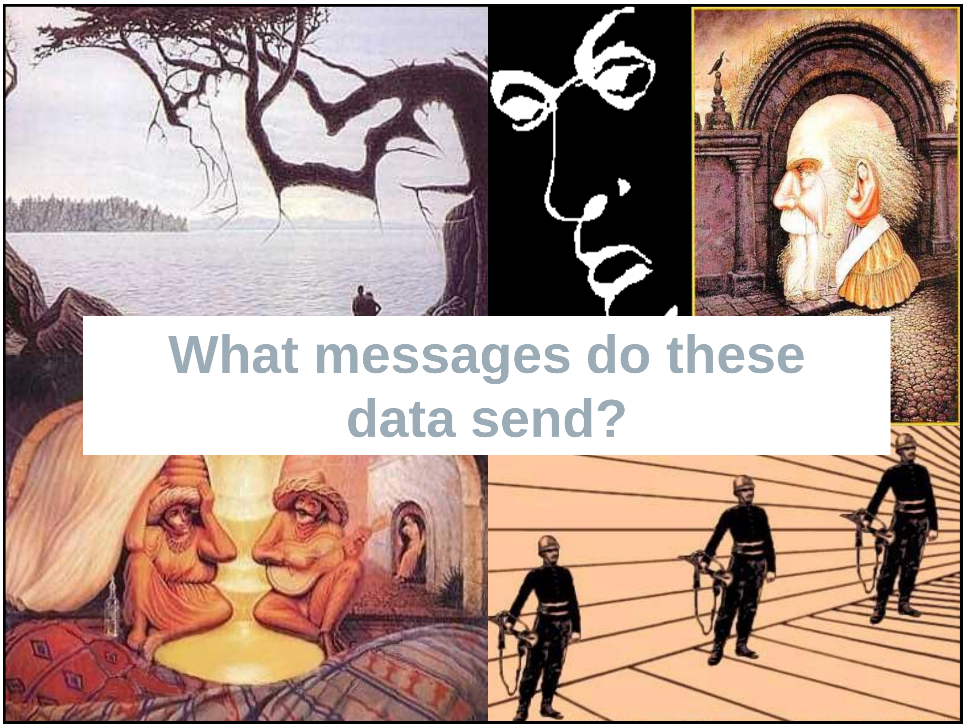

If you don't understand the variation that lives in your data, you will be tempted to ...

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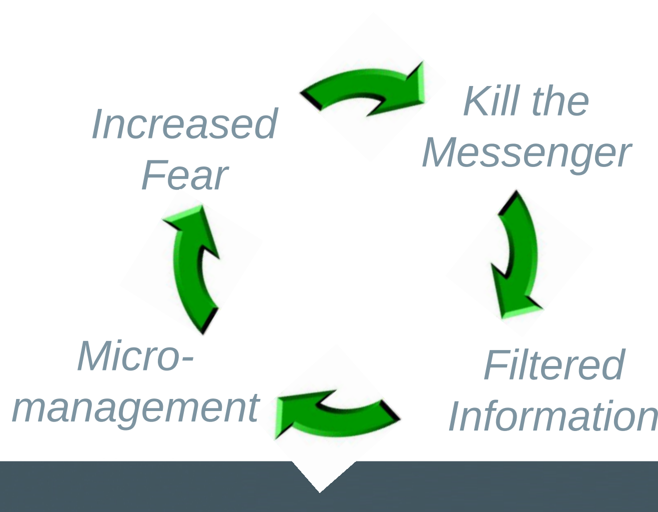
- Deny the data (It doesn't fit my view of reality!)
- See trends where there are no trends
- Try to explain natural variation as special events
- Blame and give credit to people for things over which they have no control
- Distort the process that produced the data
- Kill the messenger!

Distorting the Data!

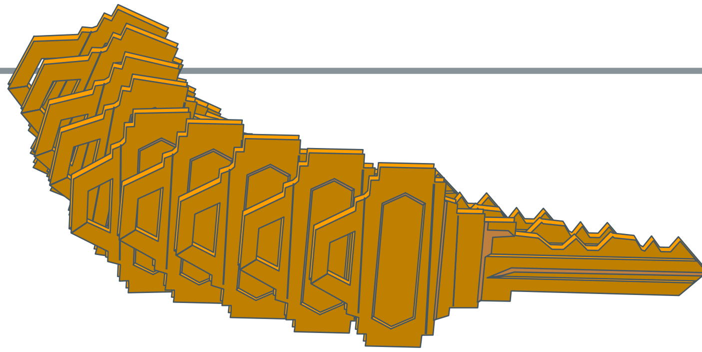
"You'll be happy to see that I've finally managed to turn things around!"

Deming's Cycle of Fear

Source: William Scherkenbach. The Deming Route to Quality and Productivity. Ceep Press, Washington, DC, 1990, page 71.



The



to understanding quality performance, therefore, lies in understanding variation over time not in preparing aggregated data and calculating summary statistics!

Dr. Walter A Shewhart

W. Shewhart. *Economic Control of Quality of Manufactured Product*, 1931

"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"

"What is the variation in one system over time?"

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

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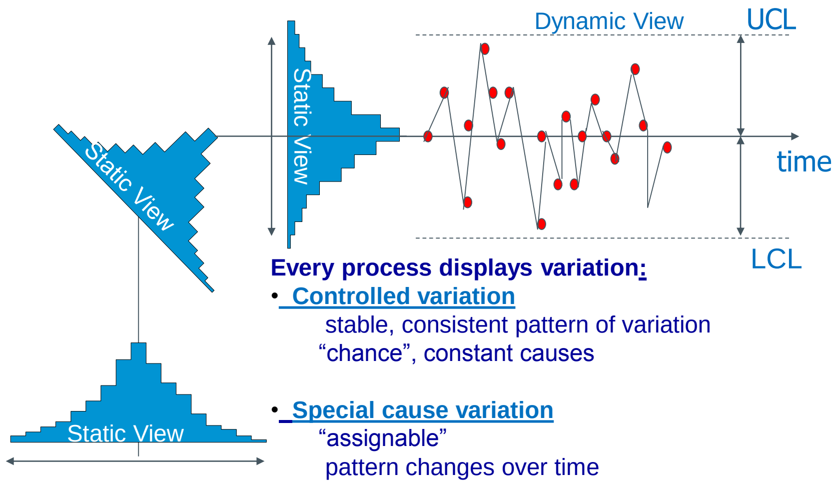


Every process displays variation:

- Controlled variation
  stable, consistent pattern of variation
  "chance", constant causes

- Special cause variation
  "assignable"
  pattern changes over time

Types of Variation

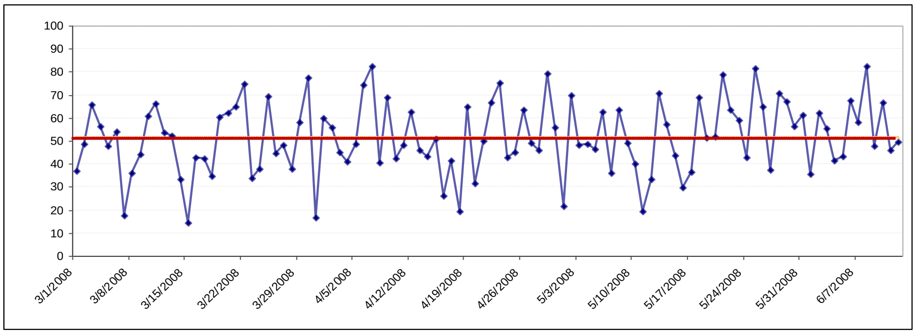
Common Cause Variation

- 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

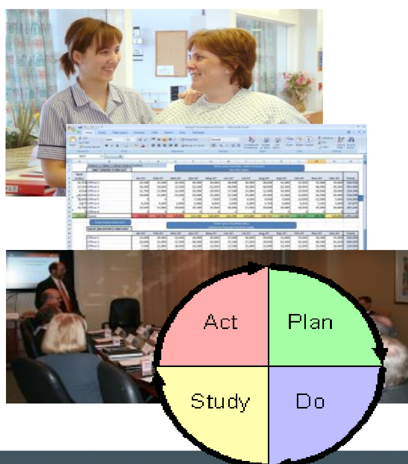
Common Cause Variation



- 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

A Stable Process is Predictable



Thus you can confidently:

- Counsel patients about what to expect
- Plan for the future
- Inform management
- Use PDSA testing to improve it!

Courtesy of Richard Scoville, PhD, IHI Improvement Advisor

Where do special causes come from?

- ***Inherent instability in the process***
  - Lack of standardization – a chaotic process
  - Changes in personnel, equipment, management, etc.
- ***Unusual extrinsic events***
  - Catastrophes, breakdowns, accidents, personnel issues
- ***Entropy***
  - Equipment wear, lack of focus, habit, emerging culture
- ***Intentional changes*** – part of an improvement initiative

Courtesy of Richard Scoville, PhD, IHI Improvement Advisor

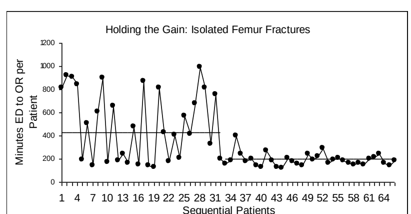
Two Types of Special Causes

Unintentional

When the system is out of control and unstable

Intentional

When we're trying to change the system



Courtesy of Richard Scoville, PhD, IHI Improvement Advisor

Is this common cause or special cause?

Courtesy of Richard Lendon, Clinical Lead for High Impact Changes, NHS, UK

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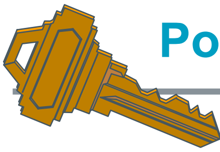
Is this common cause or special cause?

Courtesy of Richard Lendon, Clinical Lead for High Impact Changes, NHS, UK

A demonstration of Common & Special Causes of Variation

A classic example of common and special causes of variation!



Point …Variation exists!

Common Cause 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 that represents a very good result (e.g., a low turnaround time), which you would want to emulate. Special Cause merely means that the process is unstable and unpredictable.

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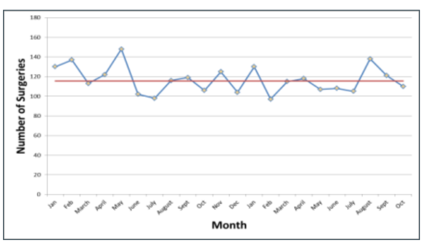
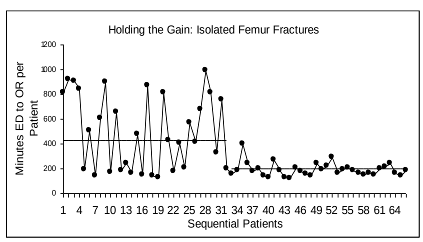
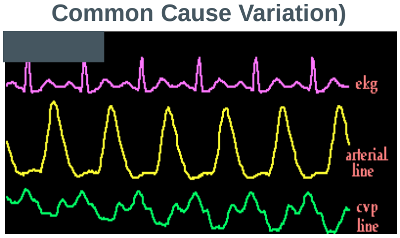
Common Cause Variation



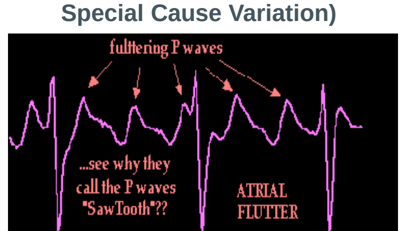
Special Cause Variation



Normal Sinus Rhythm (a.k.a. Common Cause Variation)



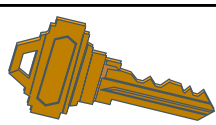
Atrial Flutter Rhythm (a.k.a. Special Cause Variation)



Appropriate Management Response to Common & Special Causes of Variation

	Is the process stable? YES	Is the process stable? NO
Type of variation	Only Common	Special + Common
Right Choice	Change the process	Investigate the origin of the special cause
Wrong Choice	Treat normal variation as a special cause (tampering)	Change the process
Consequences of making the wrong choice	***Increased variation!***	***Wasted resources!*** *(time, effort, morale, money)*

Source: Carey, R. and Lloyd, R. *Measuring Quality Improvement in Healthcare: A Guide to Statistical Process Control Applications*. ASQ Press, Milwaukee, WI, 2001, page 153.

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 predictable.

*You **have to decide if the output of the process is capable of meeting the target or goal you have set!***

Attributes of a Leader Who Understands Variation

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.

Understanding Variation Statistically

See Appendix C for a review of some of these principles.

ATIC 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)

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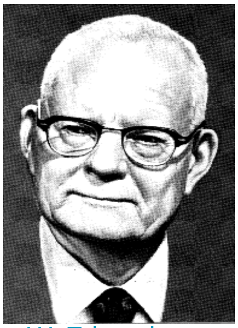
The SPC Pioneers

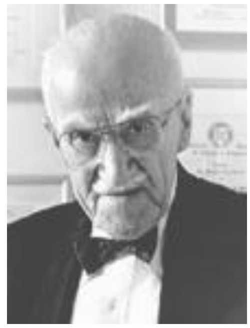


W. Edwards Deming

(1900 - 1993)

Walter Shewhart

(1891 – 1967)



Joseph Juran

(1904 - 2008)

How do we analyze variation for quality improvement?

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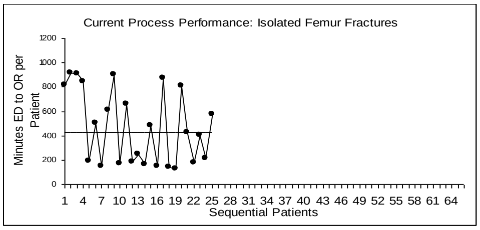
Run and ***Control Charts*** are the best tools to determine:

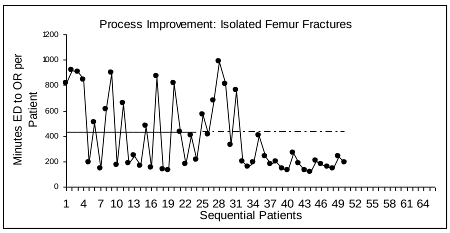
1. *The variation that lives in the process*
2. *if our improvement strategies have had the desired effect.*

Three Uses of SPC Charts

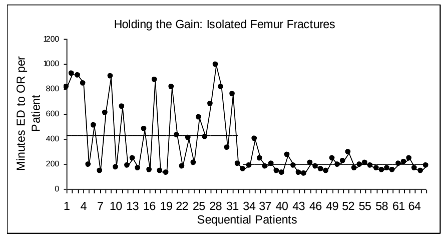
1. Make process performance visible



2. Determine if a change is an improvement



3. Determine if we are holding the gains



Understanding Variation with Run Charts

How many data points do I need?

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Ideally you should have between
10 – 15 data points before constructing
a run chart

10 – 15 patients

10 – 15 days

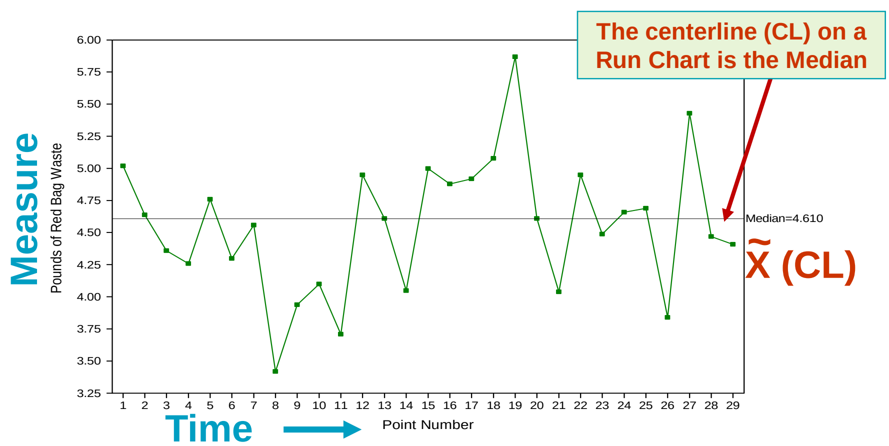
10 – 15 weeks

10 – 15 months

10 – 15 quarters…?

- *If you are just starting to measure, plot the dots and make a line graph.*
- *Once you have 8-10 data points make a run chart.*

Elements of a Run Chart



Four simple run rules are used to determine if special cause variation is present

Selecting a Centerline

Why Median Rather Than Mean?

Mean = arithmetic average of data

Median = middle value of ordered data

(n + 1)/2 = Median Position which leads you to the Median Value

- 8,10,11,14,16,18,20

  Mean = 13.8

  Median Position =

  Median = 14

- 8,10,11,14,16,18,**95**

  Mean = 24.5

  Median Position =

  Median = 14

- **1**,10,11,14,16,18,20

  Mean = 12.8

  Median Position =

  Median = 14

But how do you compute the Median when you have an even number of data points?

The Median with an even number of data points?

(n + 1)/2 = Median Position which leads you to the Median Value

- 8,10,11,14,16,18,20,35 — Mean = 16.5
  Median Position =
  Median = 15

- 8,10,11,14,16,18,30,**95** — Mean = 25.3
  Median Position =
  Median = 15

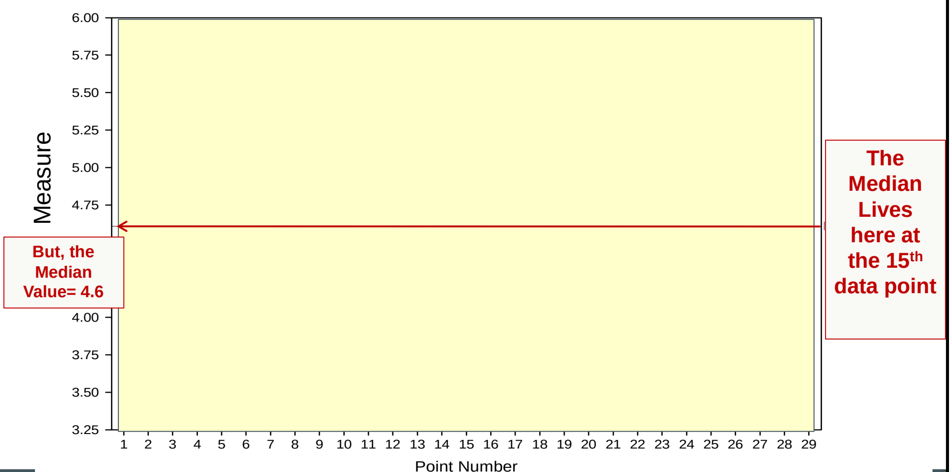
- **1**,10,11,14,14,18,19,20 — Mean = 13.4
  Median Position =
  Median = 14

Run Chart

How do you find the median?

(n + 1)/2

(29 + 1)/2 = 30/2 = 15



How do we analyze a Run Chart

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

<u>It is actually quite easy:</u>

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

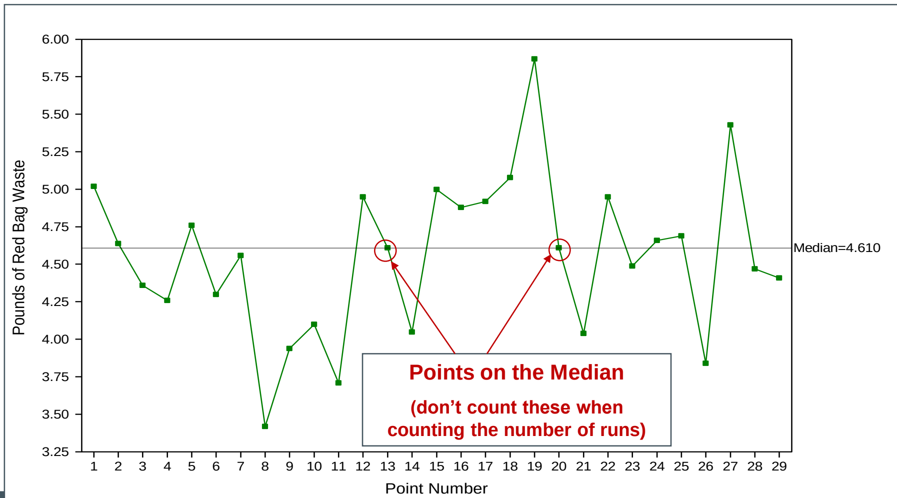
<u>What is a Run?</u>

- One or more consecutive data points on the same side of the Median
- Do not include data points that <u>fall on the Median</u>

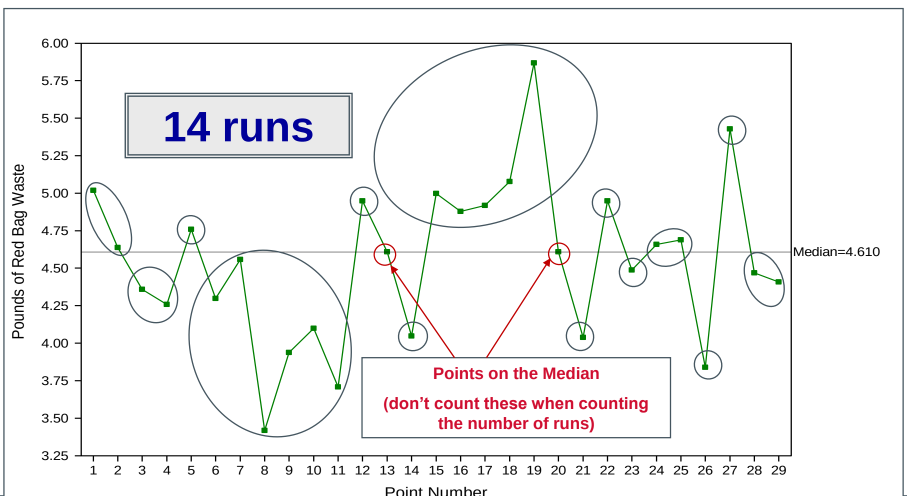
How do we count the number of runs?

- 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 (the line on the chart) crosses the Median and add "1"
- The two counts should be the same!

Run Chart: Medical Waste
Determine the number of runs on this chart



Run Chart: Medical Waste
Determine the number of runs on this chart



Rules to Identify non-random patterns in the data displayed on a Run Chart

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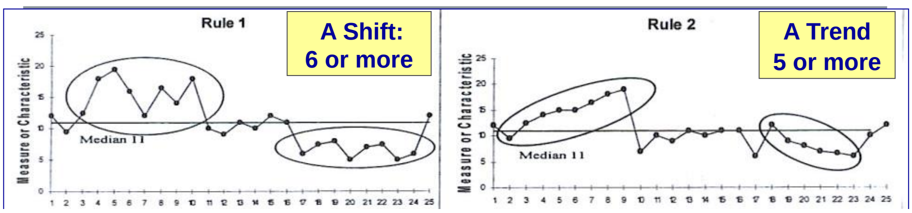
- Rule #1: A shift in the process, or too many data points in a run (6 or more consecutive points above or below the median)
- **Rule #2: A trend (5 or more consecutive points all increasing or decreasing)**
- Rule #3: Too many or too few runs (use a table to determine this one)
- **Rule #4: An “astronomical” data point**

Non-Random Rules for Run Charts



Source: The Data Guide by L. Provost and S. Murray, Jossey-Bass Publishers, 2011.

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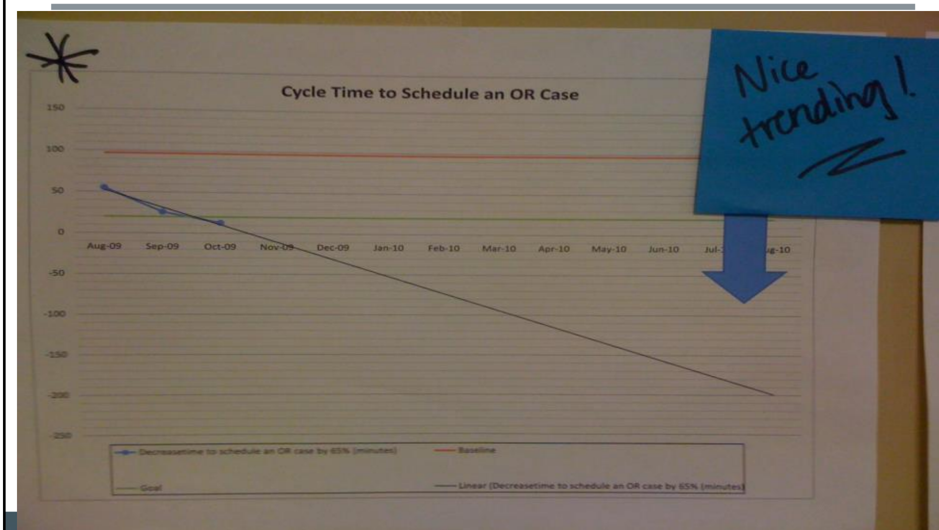
This is NOT a trend!

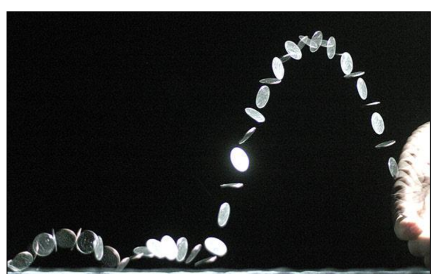


Probability of a "trend"

Why do we need 5 data points for a trend?

What is the probability of a coin landing heads or tails?

One head or tail .5
.5 x .5 = .25
.5 x .5 x .5 = .125
.5 x .5 x .5 x .5 = .0625
.5 x .5 x .5 x .5 x .5 = .03125
.5 x .5 x .5 x .5 x .5 x .5 = .015625



Non-Random Rules for Run Charts

Source: The Data Guide by L. Provost and S. Murray, Jossey-Bass Publishers, 2011.

Rule #3: Too few or too many runs

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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.

# of Useful Observations		Lower Number of Runs		Upper Number of Runs
14			4	
15		5		12
16		5		13
17			5	
18		6		14
19		6		15
20		6		16
21		7		16
22		7		17
23	Two data points on	7		17
24	the median = 27	8		18
25	useful	8		18
26	observations		9	
27		10		19
28		10		20
29	Total data points	10		20
30		11		21

Source: Swed, F. and Eisenhart, C. (1943) "Tables for Testing Randomness of Grouping in a Sequence of Alternatives." *Annals of Mathematical Statistics*. Vol. XIV, pp. 66-87, Tables II and III.

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

Checking for Too Many or Too Few Runs on a Run Chart

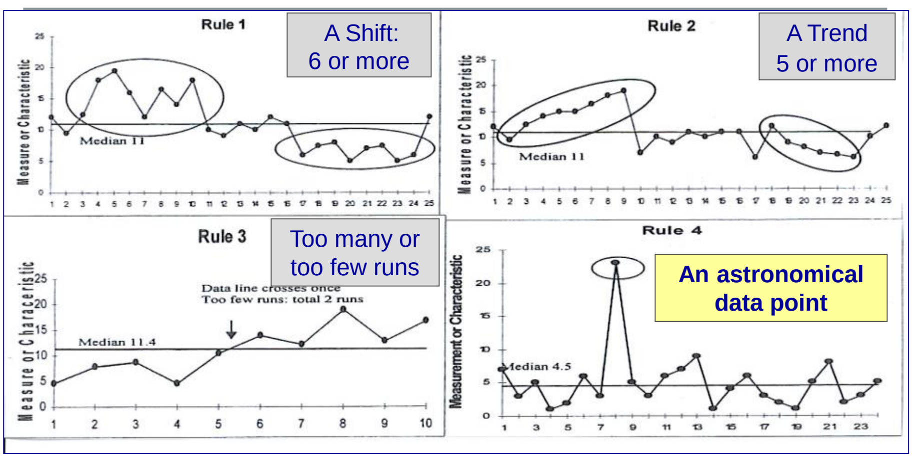
Total number of data points on the run chart that do not fall on the median	Lower limit for the number of runs (< than this number runs is "too few")	Upper limit for the number of runs (> than this number runs is "too many")
10	3	9
11	3	10
12	3	11
13	4	11
14	4	12
15	5	12
16	5	13
17	5	13
18	6	14
19	6	15
20	6	16
21	7	16
22	7	17
23	7	17
24	8	18
25	8	18
26	9	19
27	10	19
28	10	20
29	10	20
30	11	21
31	11	22
32	11	23
33	12	23
34	12	24
35	12	24
36	13	25
37	13	25
38	14	26
39	14	26
40	15	27
41	15	27
42	16	28
43	16	28
44	17	29
45	17	30
46	17	31
47	18	31
48	18	32
49	19	32
50	19	33
51	20	33
52	20	34
53	21	34
54	21	35
55	22	35
56	22	36
57	23	36
58	23	37
59	24	38
60	24	38

Table is based on about a 5% risk of failing the run test for random patterns of data. Adapted from Swed, Feda S. and Eisenhart, C. (1943). "Tables for Testing Randomness of Grouping in a Sequence of Alternatives. Annals of Mathematical Statistics. Vol. XIV, pp.66 and 87, Tables II and III.

Table 3-3: Checking for Too Many or Too Few Runs on a Run Chart

Source: Swed, F. and Eisenhart, C. (1943) "Tables for Testing Randomness of Grouping in a Sequence of Alternatives." *Annals of Mathematical Statistics*. Vol. XIV, pp. 66-87, Tables II and III.

Non-Random Rules for Run Charts



Source: The Data Guide by L. Provost and S. Murray, Jossey-Bass Publishers, 2011.

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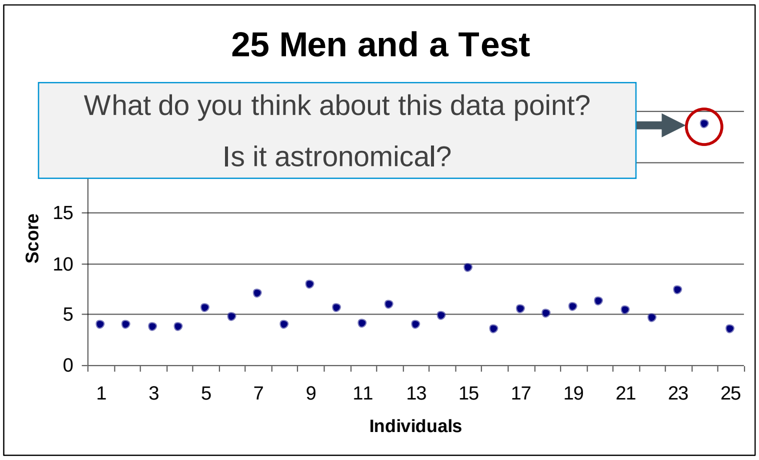
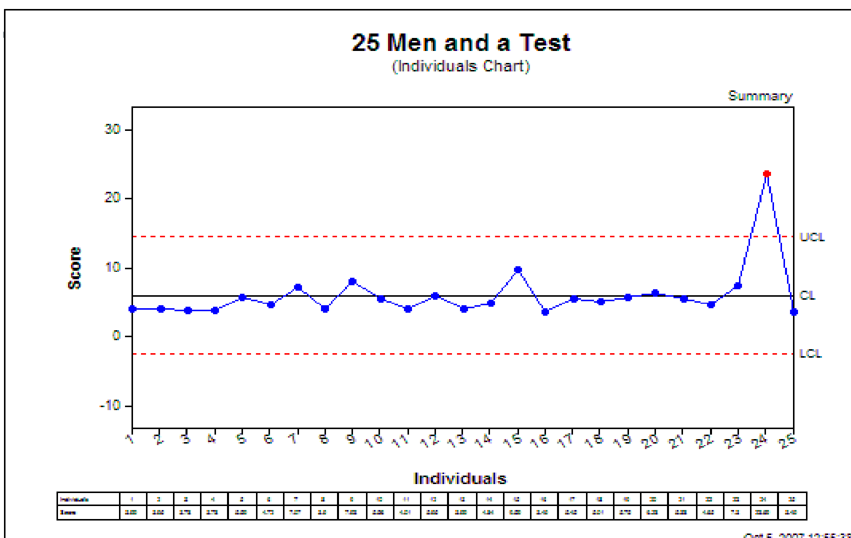
Rule #4: An Astronomical Data Point





Run Chart Interpretation: Medical Waste

Total data points = 29

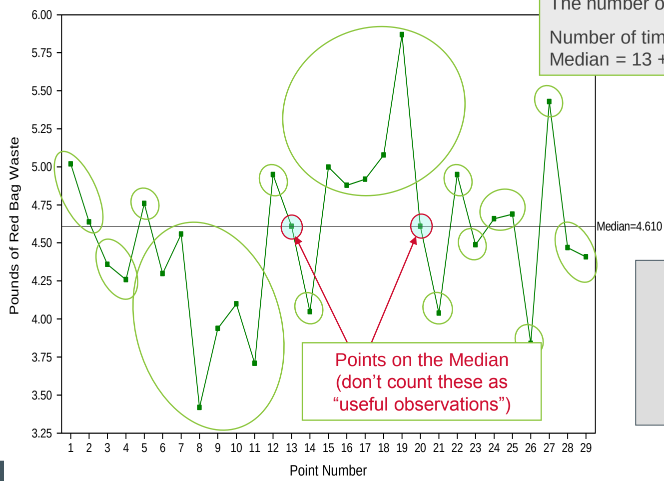
Data points on the Median = 2

Number of "useful observations" = 27

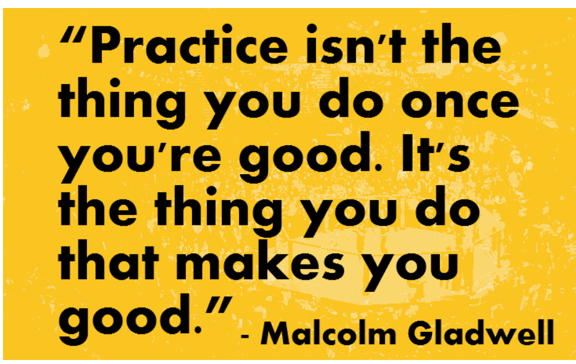
(should have between 10 &19 runs)

The number of runs = 14

Number of times the data line crosses the Median = 13 + 1 = 14



Are there any non-random patterns present?



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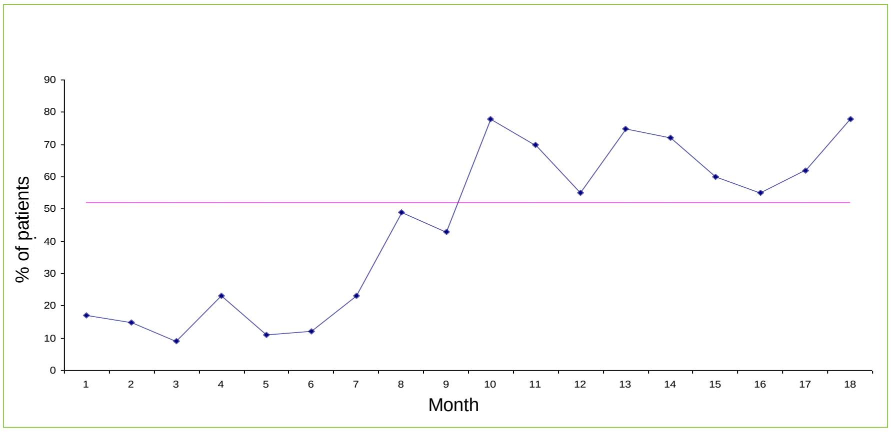
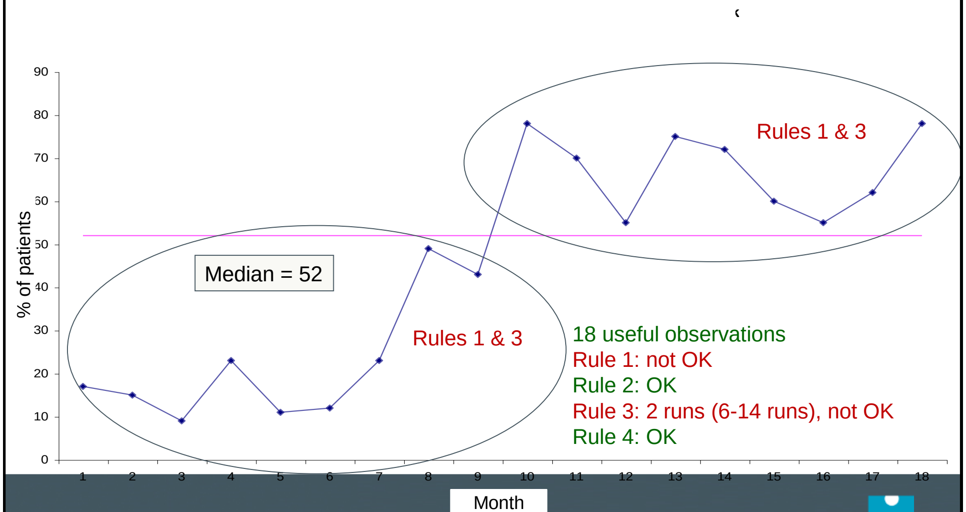
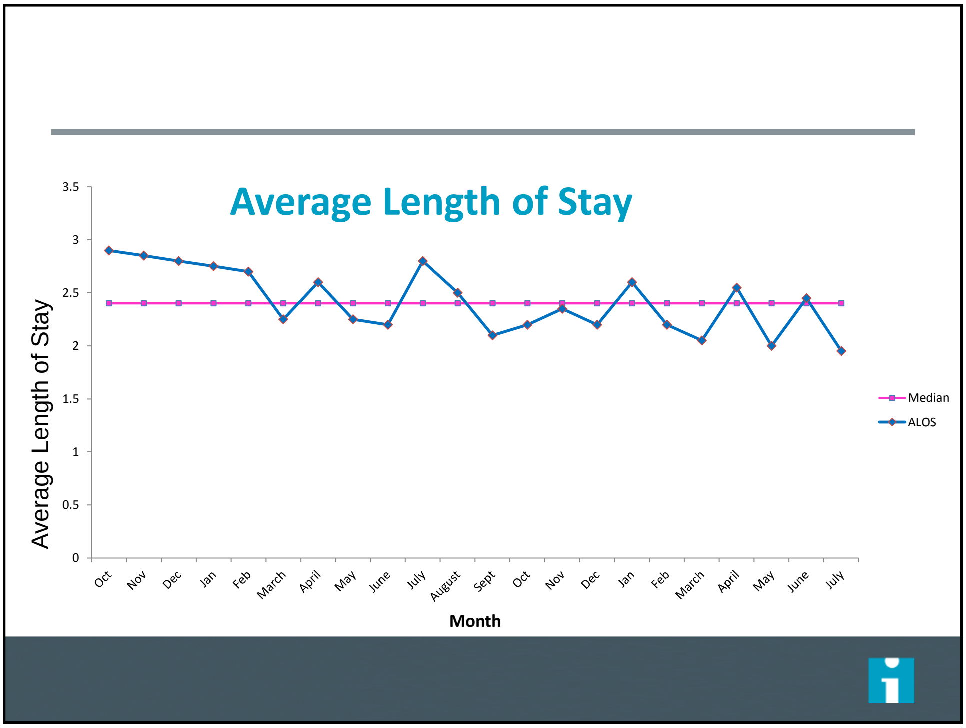
So, let's identify some non-random patterns…

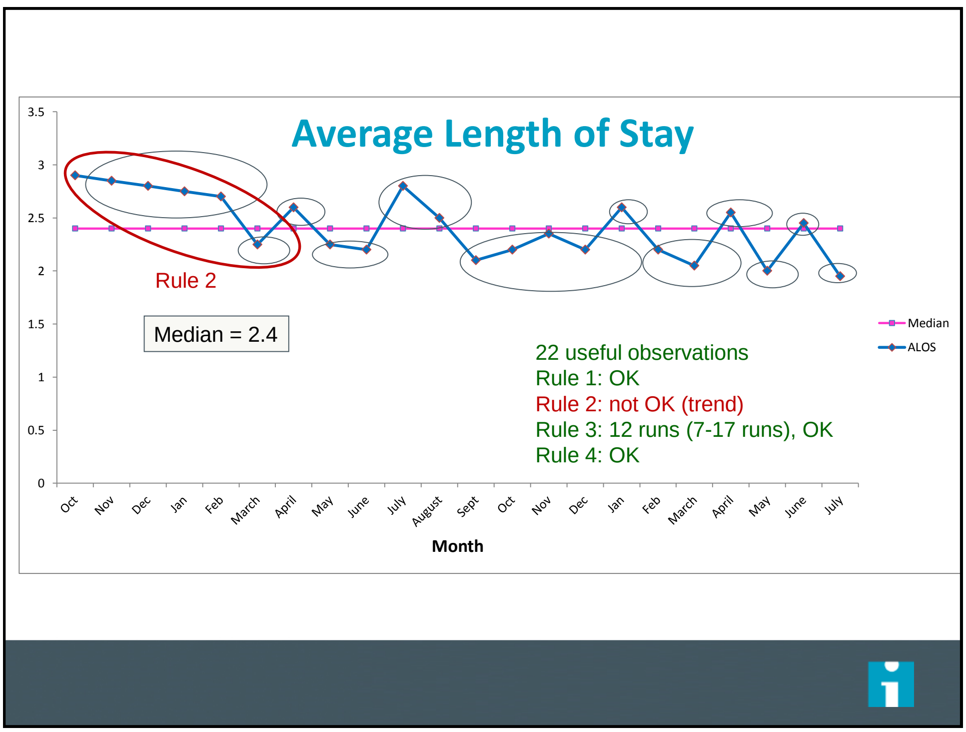
Test #1:
% of patients with Length of Stay shorter than six days

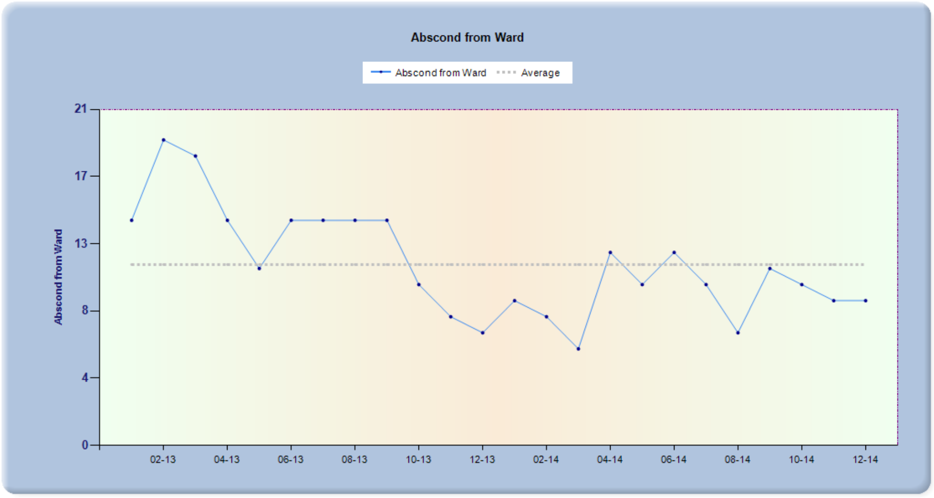


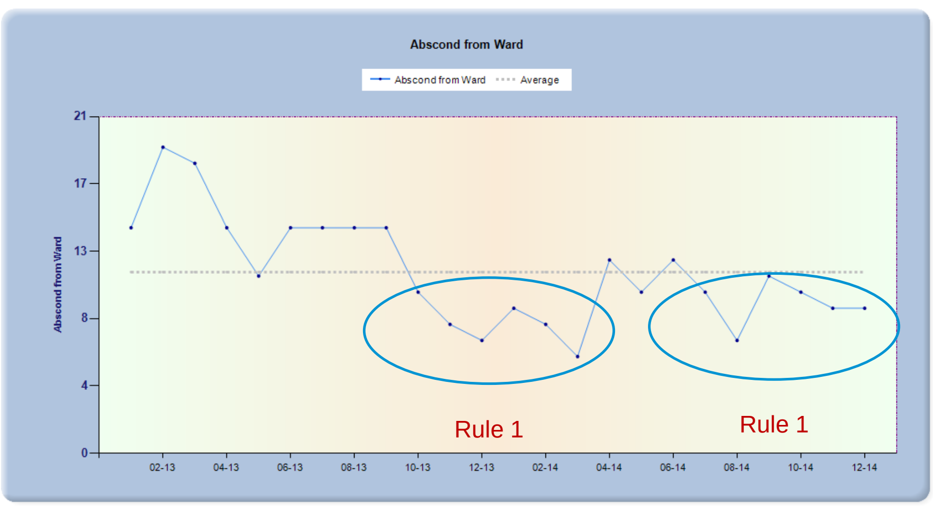
% of patients with Length of Stay shorter than six days



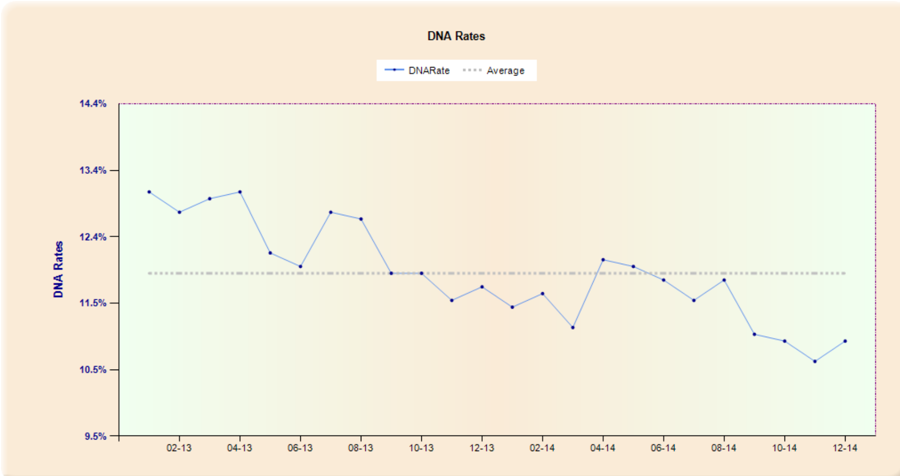

Average Length of Stay
Average Length of Stay
Month
Oct
Nov
Dec
Jan
Feb
March
April
May
June
July
August
Sept
Oct
Nov
Dec
Jan
Feb
March
April
May
June
July
Median
ALOS

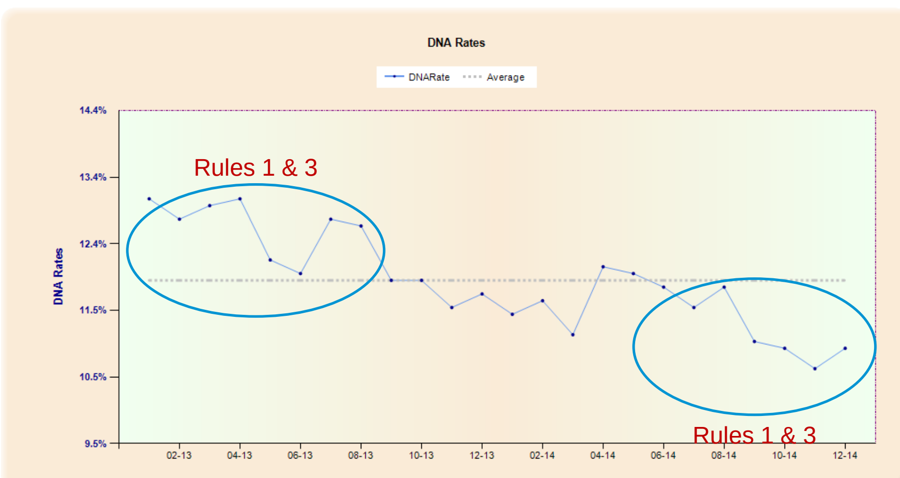

Average Length of Stay
Rule 2
Median = 2.4
22 useful observations
Rule 1: OK
Rule 2: not OK (trend)
Rule 3: 12 runs (7-17 runs), OK
Rule 4: OK
Month
Median
ALOS



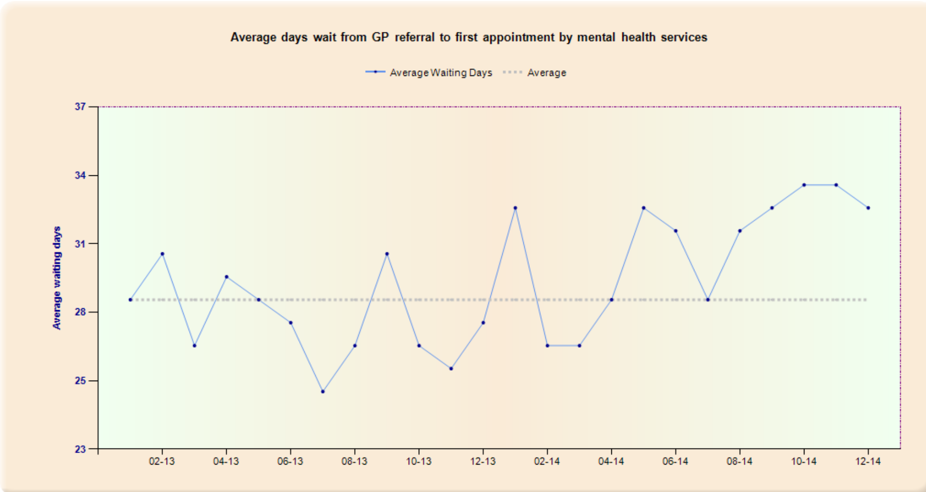


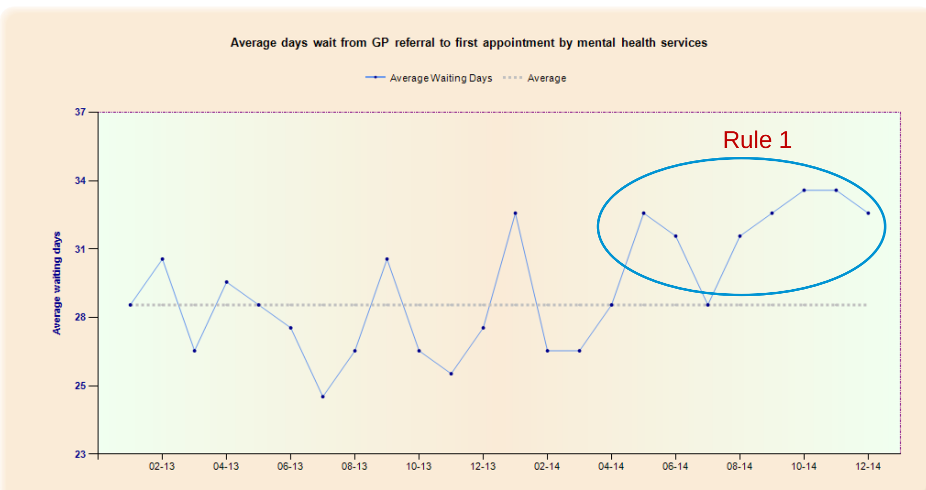
24 useful observations
8 runs - ok (8 to 18 runs)





22 useful observations (2 on the median)
4 runs – NOT ok (7 to 17 runs)



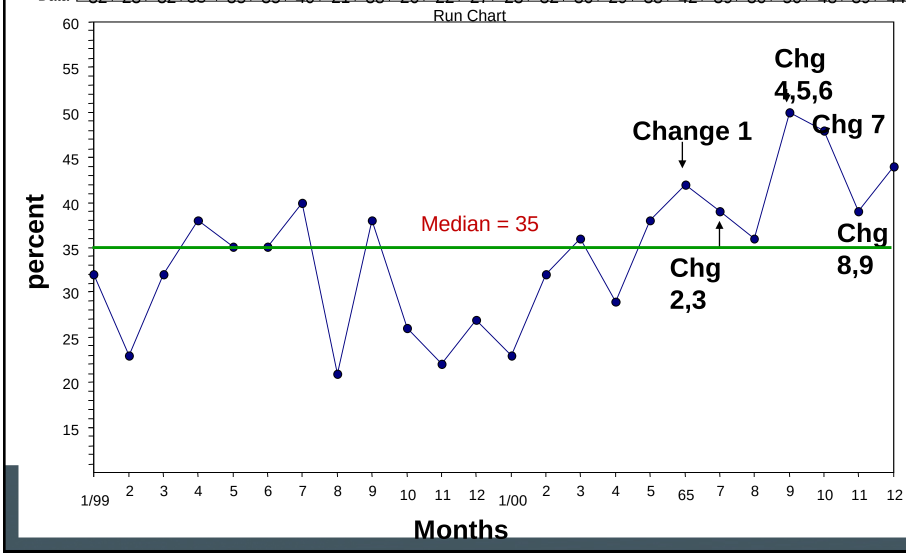


20 useful observations (4 on the median)
9 runs – ok (6 to 16 runs)

Analyze this Run Chart

% Timely Reperfusion

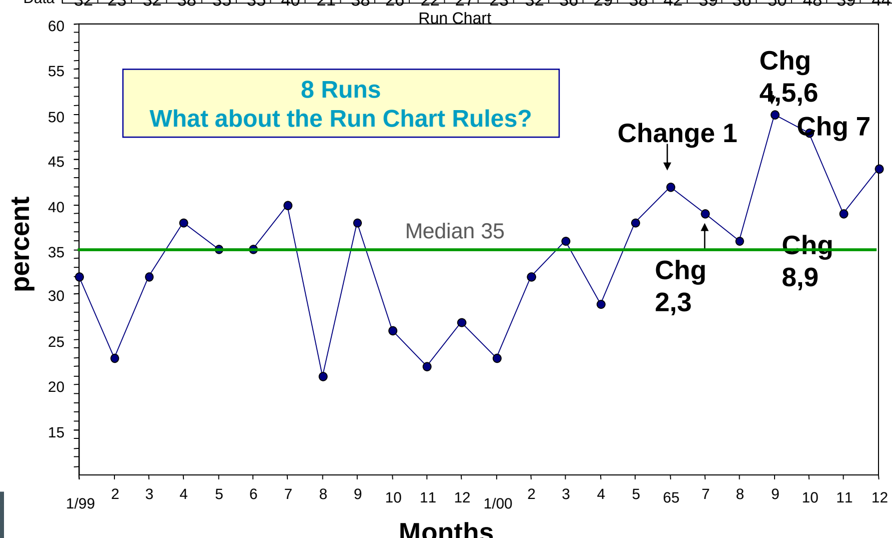
Date	1/99	2	3	4	5	6	7	8	9	10	11	12	1/00	2	3	4	5	65	7	8	9	10	11	12
Data	32	23	32	38	35	35	40	21	38	26	22	27	23	32	36	29	38	42	39	36	50	48	39	44



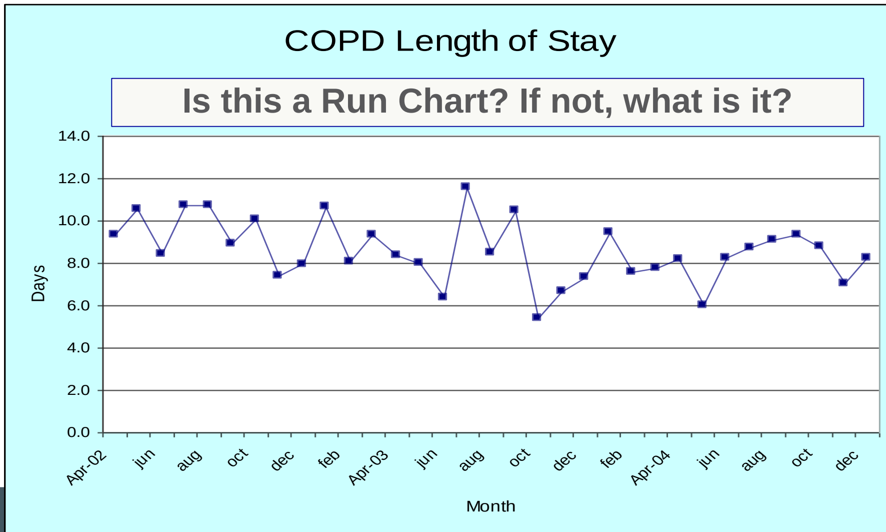
Analyze this Run Chart

% Timely Reperfusion

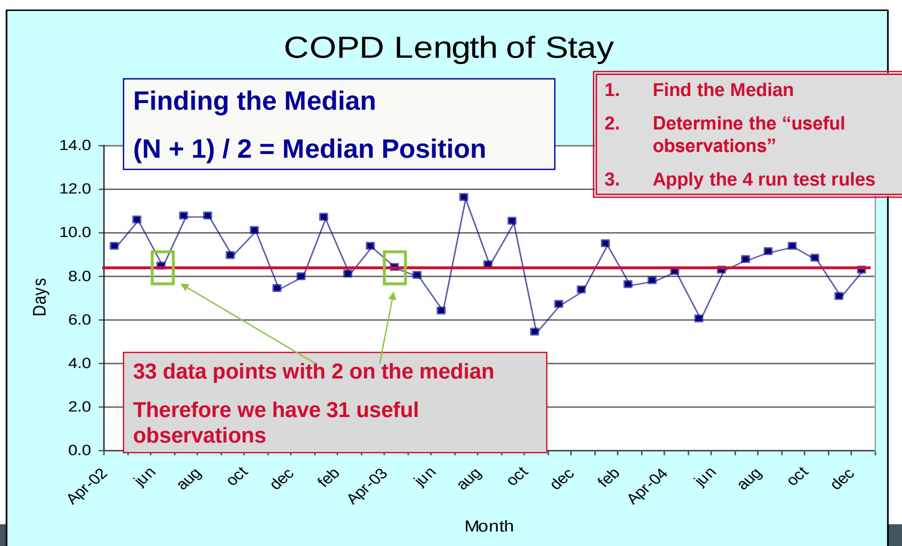
Date	1/99	2	3	4	5	6	7	8	9	10	11	12	1/00	2	3	4	5	65	7	8	9	10	11	12
Data	32	23	32	38	35	35	40	21	38	26	22	27	23	32	36	29	38	42	39	36	50	48	39	44



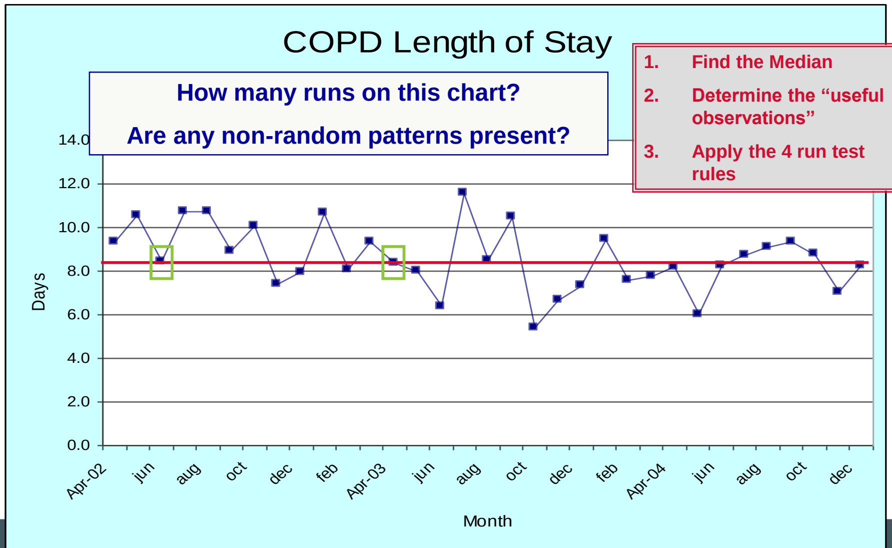
Length of Stay for COPD



Let's make it a Run Chart!



Now, let's analyse the Run Chart!



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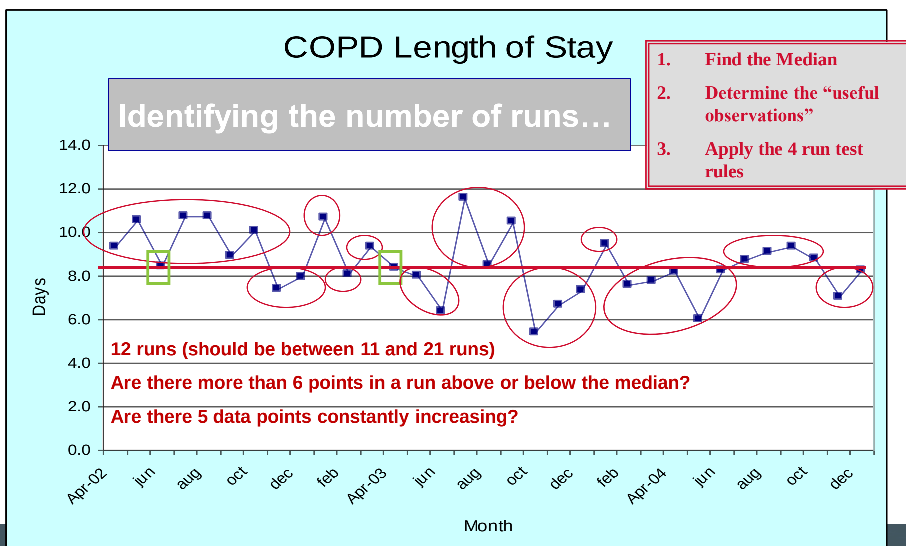
Conclusions?



Week	Percent Compliance
1	79
2	82
3	86
4	84
5	85
6	79
7	77
8	86
9	82
10	74
11	85
12	74
13	78
14	83
15	81
16	81
17	74
18	84
19	78
20	75
21	74
22	68
23	81
24	84
25	70
26	85
27	77

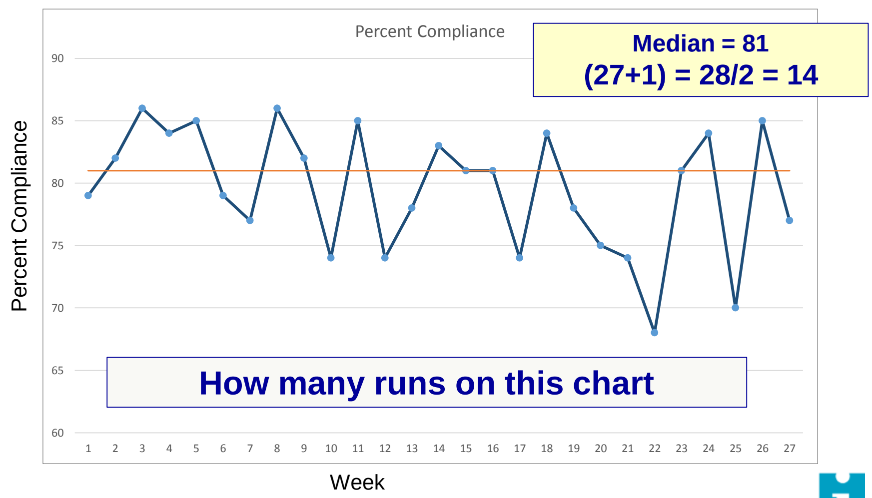
Measure is the percent compliance with proper hand hygiene by week.

N = number of properly completed hand washings

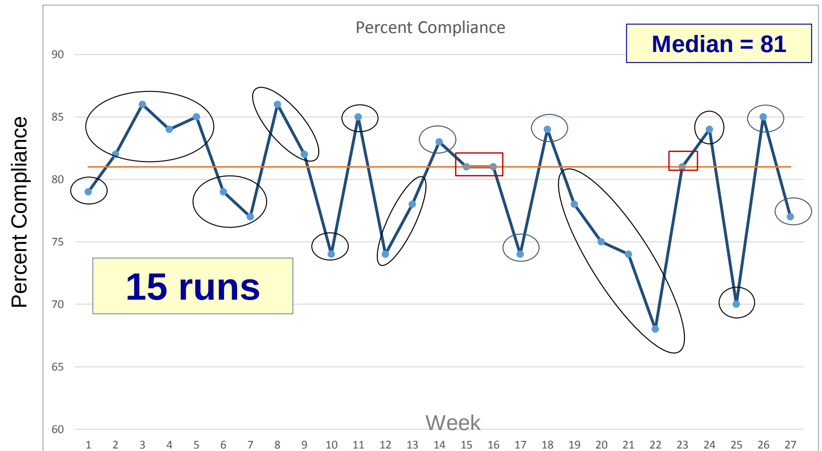
D = total number of hand washing observations

- Make a run chart with the data shown in the table to the left.
- **Decide how you want to lay out the X (horizontal) axis and Y (vertical) axis.**
- Plot the data points.
- **Calculate the median. Hint: use the (n + 1)/2 formula to find the median position first.**
- Then determine the median value.
- **Determine the number of runs on the chart.**
- Apply the run chart rules and interpret the results
- ***DO NOT use your calculator or Excel!!!***

Exercise
Percent Compliance with Proper Hand Hygiene

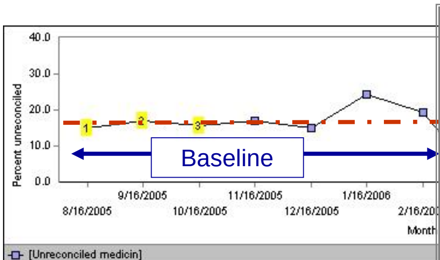


Exercise
Percent Compliance with Proper Hand Hygiene



Apply the rules and interpret the chart.
NOTE: 27 data points with 3 on the median gives you 24 "useful observations."
For 24 useful observations you expect between 8 and 18 runs.

A Final Thought!



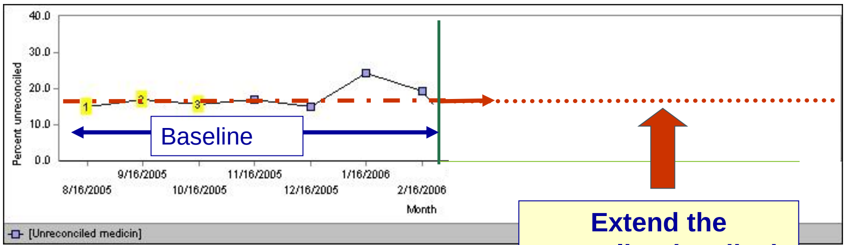
How will we know that a change is an improvement?

Annotations
1: AMU
2: AMU
3: excl herbal/OTC
4: after pharmacy intervention on AMU
5: 15.91 before pharmacy intervention
6: 12.41 before pharmacy intervention
7: 14.47 pre pharmacy intervention
8: 23.26% pre pharmacy intervention
9: 18.6 before pharmacy
10: 27.05 before pharmacy

Source: Conwy and Denbighshire NHS Trust

Percent Unreconciled Medications

Deciding if things have changed



Extend the centerline (median) as a reference point for the new results

Annotations
1: AMU
2: AMU
3: excl herbal/OTC
4: after pharmacy intervention on AMU
5: 15.91 before pharmacy intervention
6: 12.41 before pharmacy intervention
7: 14.47 pre pharmacy intervention
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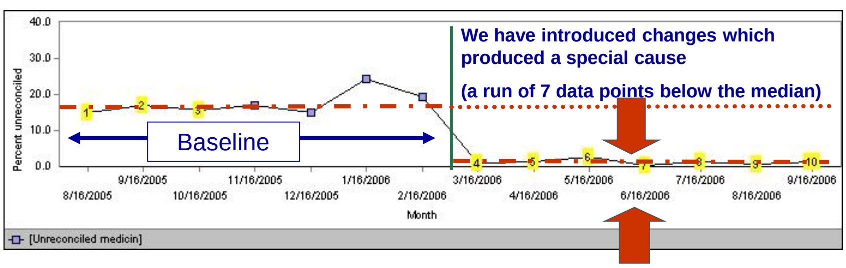

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8: 23.26% pre pharmacy intervention
9: 18.6 before pharmacy
10: 27.05 before pharmacy

Now, we plot the new data and use the run chart rules to determine if a true change has occurred.

Source: Conwy and Denbighshire NHS Trust

Percent Unreconciled Medications

Your next move…

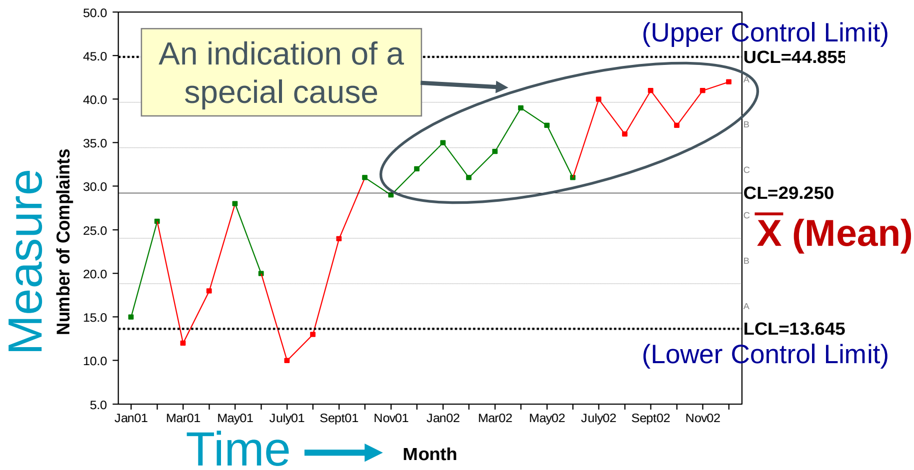
…to gain more knowledge about Shewhart Charts (a.k.a. control charts)

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 Control Chart



The choice of a Control Chart depends on the Type of Data you have collected

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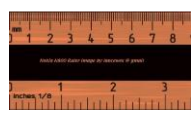
Continuous (Variables) Data

Time, money, scaled data (temperature, length, volume), workload or productivity (throughput, counts)






Attributes Data

Nonconforming Units

Defectives (classification)

percent that meet a particular criteria (OK vs not OK)
% of staff who receive QI training)
% of new inpatients with a skin assessment completed within 12 hours)

Nonconformities

Defects (count)

data are counted, not measured. Must be whole numbers.
(e.g., number of errors, falls or incidents)

Let's identify your measures…

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There Are 5 Basic Control Charts

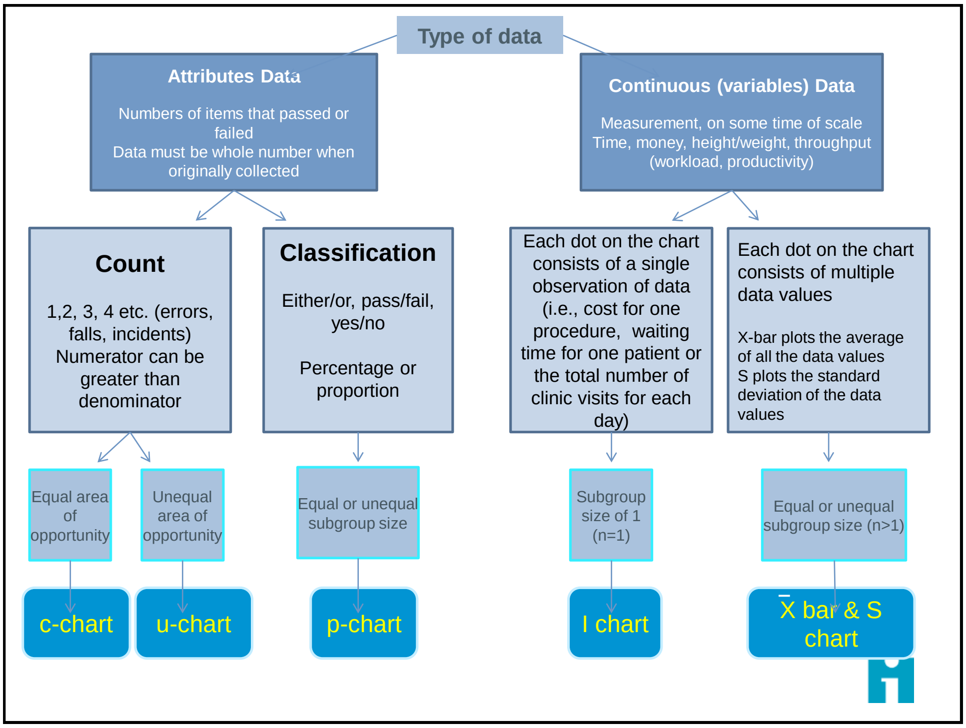
Variables Charts

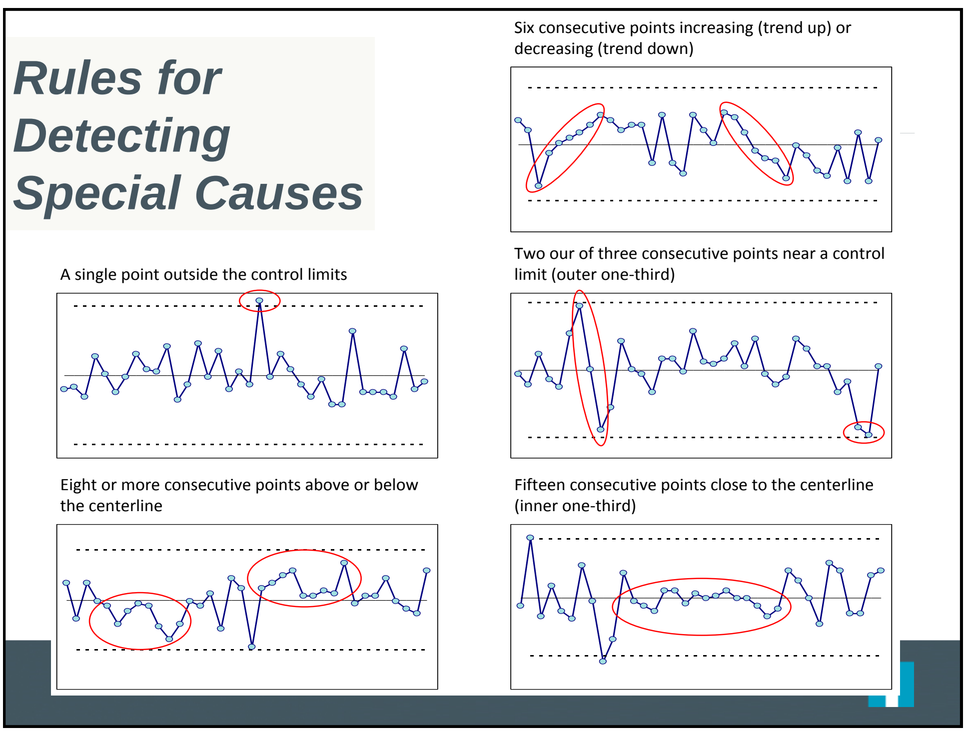
- I chart
  (individual measurements)
- $\bar{X}$ & S chart
  (average & SD chart)

Attributes Charts

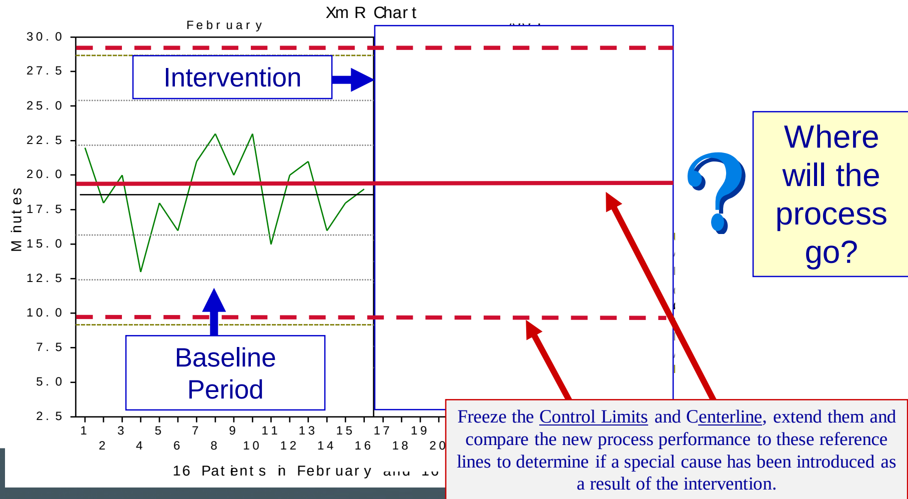
- C chart
  (number of defects)
- U chart
  (defect rate)
- P chart
  (proportion or percent of defectives)

Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett, 2004, Chap.6

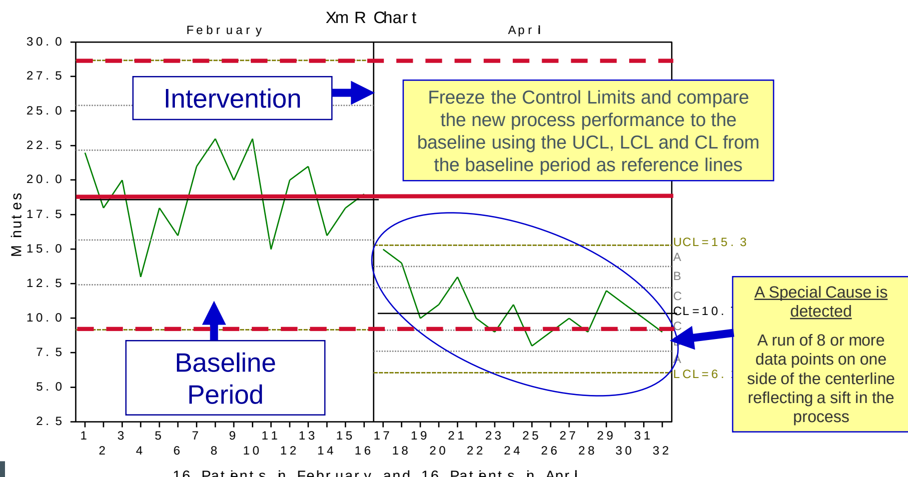

Type of data
Attributes Data
Numbers of items that passed or failed
Data must be whole number when originally collected
Continuous (variables) Data
Measurement, on some time of scale
Time, money, height/weight, throughput (workload, productivity)
Count
1,2, 3, 4 etc. (errors, falls, incidents)
Numerator can be greater than denominator
Classification
Either/or, pass/fail, yes/no
Percentage or proportion
Each dot on the chart consists of a single observation of data (i.e., cost for one procedure, waiting time for one patient or the total number of clinic visits for each day)
Each dot on the chart consists of multiple data values
X-bar plots the average of all the data values
S plots the standard deviation of the data values
Equal area of opportunity
Unequal area of opportunity
Equal or unequal subgroup size
Subgroup size of 1 (n=1)
Equal or unequal subgroup size (n>1)
c-chart
u-chart
p-chart
I chart
X bar & S chart


Rules for Detecting Special Causes
Six consecutive points increasing (trend up) or decreasing (trend down)
A single point outside the control limits
Two our of three consecutive points near a control limit (outer one-third)
Eight or more consecutive points above or below the centerline
Fifteen consecutive points close to the centerline (inner one-third)

Using a Control Chart
(Wait Time to See the Doctor)

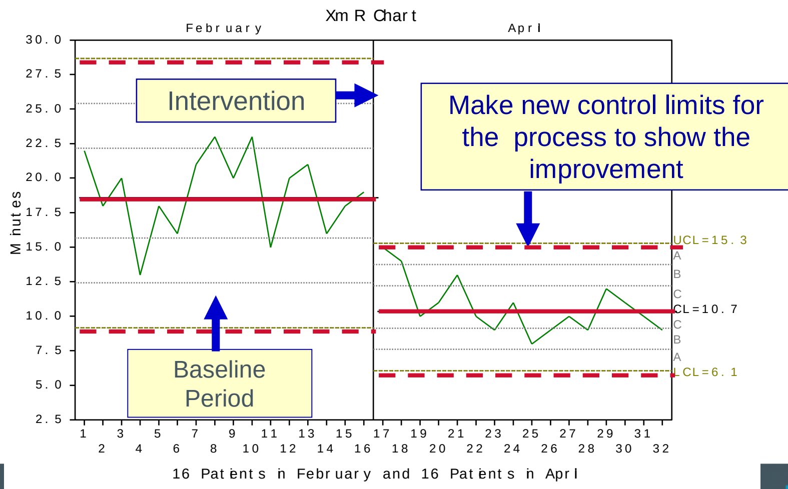


Using a Control Chart
(Wait Time to See the Doctor)



Using a Control Chart

(Wait Time to See the Doctor)



This really is child's play!

1:36:37

The Charts Don't Tell You…

- The reasons(s) for a Special Cause.
- Whether or not a Common Cause process should be improved (is the performance of the process acceptable?)
- How the process should actually be improved or redesigned.

A Simple Improvement Plan

1. Which process do you want to improve or redesign?
2. Does the process contain common or special cause variation?
3. How do you plan on actually making improvements? What strategies do you plan to follow to make things better?
4. What effect (if any) did your plan have on the process performance?

SPC methods and tools
will help you answer Questions 2 & 4.
YOU need to figure out the answers to Questions 1 & 3.

Simple Hints To Improve Measurement

From a presentation by Don Berwick, M.D., Quality Management Network Meeting, Boston, July 28, 1995.

Graph data over time

Local collection/local use

Develop knowledge of "tampering"

Use "fast feedback"

Develop views of the whole

Use the entire range of data

Foster immediate recovery

Create an environment for reflection

Encourage the public posting of results

Make predictions and see how well they work

Use small samples vigorously

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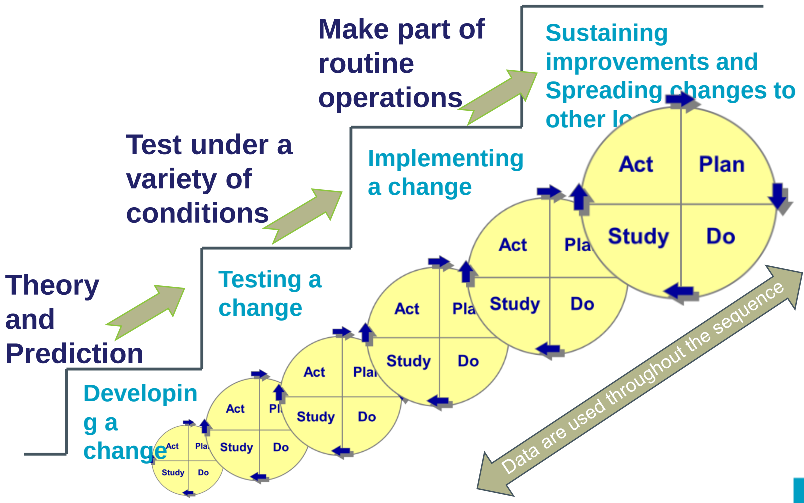
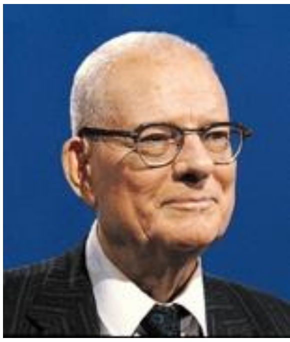
Finally, remember that data is a necessary part of the Sequence of Improvement



Appendices

- Appendix A: General References on Quality
- Appendix B: References on Measurement
- Appendix C: Basic “sadistical” principles



"Quality begins with intent, which is fixed by management."

W. E. Deming, *Out of the Crisis*, p.5

Appendix A
General References on Quality

- *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. G. Langley, K. Nolan, T. Nolan, C. Norman, L. Provost. Jossey-Bass Publishers., San Francisco, 1996.
- *Quality Improvement Through Planned Experimentation. 2nd edition.* R. Moen, T. Nolan, L. Provost, McGraw-Hill, NY, 1998.
- *The Improvement Handbook*. Associates in Process Improvement. Austin, TX, January, 2005.
- A Primer on Leading the Improvement of Systems," Don M. Berwick, *BMJ,* 312: pp 619-622, 1996.
- "Accelerating the Pace of Improvement - An Interview with Thomas Nolan," *Journal of Quality Improvement,* Volume 23, No. 4, The Joint Commission, April, 1997.

Appendix B
References on Measurement

- Brook, R. *et. al.* "Health System Reform and Quality." *Journal of the American Medical Association* 276, no. 6 (1996): 476-480.
- Carey, R. and Lloyd, R. *Measuring Quality Improvement in healthcare: A Guide to Statistical Process Control Applications*. ASQ Press, Milwaukee, WI, 2001.
- Lloyd, R. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, Sudbury, MA, 2004.*
- Nelson, E. *et al*, "Report Cards or Instrument Panels: Who Needs What? *Journal of Quality Improvement, V*olume 21, Number 4, April, 1995.
- Solberg. L. *et. al.* "The Three Faces of Performance Improvement: Improvement, Accountability and Research." *Journal of Quality Improvement* 23, no.3 (1997): 135-147.

Appendix B
References on Measurement (cont.)

- Brook, R. *et. al.* "Health System Reform and Quality." *Journal of the American Medical Association* 276, no. 6 (1996): 476-480.
- Carey, R. and Lloyd, R. *Measuring Quality Improvement in healthcare: A Guide to Statistical Process Control Applications*. ASQ Press, Milwaukee, WI, 2001.
- Lloyd, R. *Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, Sudbury, MA, 2004.*
- Nelson, E. *et al*, "Report Cards or Instrument Panels: Who Needs What? *Journal of Quality Improvement, V*olume 21, Number 4, April, 1995.
- Solberg. L. *et. al.* "The Three Faces of Performance Improvement: Improvement, Accountability and Research." *Journal of Quality Improvement* 23, no.3 (1997): 135-147.

Appendix C
A few basic "sadistical" principles

Descriptive Statistics related to depicting variation

The **sum of the deviations** $(x_i - \overline{x})$ of a set of observations about their mean is equal to zero.	$\Sigma (x_i - \overline{x}) = 0$
The **average deviation (AD)** is obtained by adding the absolute values of the deviations of the individual values from their mean and dividing by *n*.	$AD = \frac{\Sigma \mid x_i - \overline{x} \mid}{n}$
The **sample variance (s^2)** is the average of the squares of the deviations of the individual values from their mean.	$s^2 = \frac{\Sigma (x_i - x)^2}{n - 1}$
Which finally leads us to our good old friend, the **standard deviation,** which is the positive square root of the variance.	See the next page for this fun formula!

Institute *for* Healthcare Improvement

Building Cascading Systems of Learning

Institute for Healthcare Improvement Faculty
Michael Posencheg, M.D.
Rebecca Steinfield, MA

Day 2B
September 10, 2015

Definition of a System

"A group of items, people, or processes working together toward a common purpose."

Langley, et al. *The Improvement Guide*, Jossey-Bass Publishers, 2009: pages 77 -79.

Role of the System

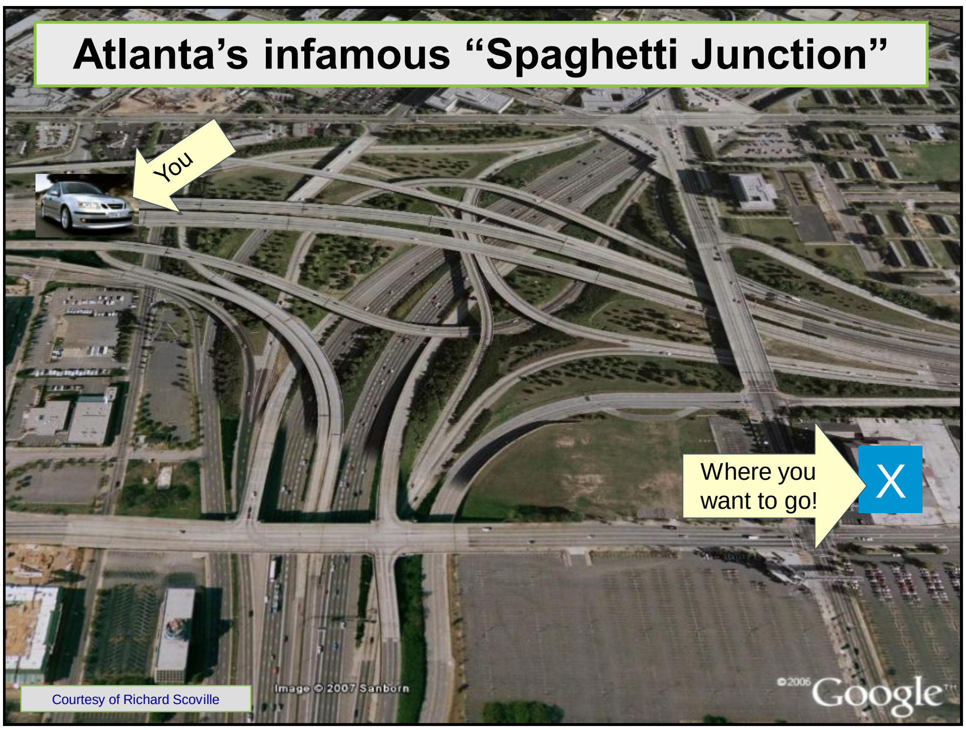
The discipline of seeing interrelationships gradually undermines older attitudes of blame and guilt. We begin to see that all of us are trapped in structures, structures embedded both in our ways of thinking and in the interpersonal and social milieus in which we live. Our knee-jerk tendencies to find fault with one another gradually fade, leaving a much deeper appreciation of the forces within which we all operate.

This does not imply that people are simply victims of systems that dictate their behavior. Often, the structures are of our own creation. But this has little meaning until those structures are seen. For most of us, the structures within which we operate are invisible. We are neither victims nor culprits but human beings controlled by forces we have not yet learned how to perceive.

Peter Senge, The 5th Discipline

Characteristics of a System

- 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.
- Dynamic: The “thing in motion”
- The system is perfectly designed to achieve the results it gets!
- Improving outcomes requires understanding the dynamics of the system



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.

Does the system determine the outcome?

Step 1: Pick a number from 3 to 9

Step 2: Multiply your number by 9

Step 3: Add 12 to the number from step 2

Do you have a 2-digit Number?

Step 4: Add your 2 digits together

Step 5: Divide # from step 4 by 3 to get a 1 digit number

Step 6: Convert your Number to a letter:
1=A 2=B 3=C
4=D 5=E 6=F
7=G 8=H 9 = I

Step 7: Write down the name of a country that begins with your letter

Step 8: Go to the next Letter: A to B, B to C, C to D, etc.

Step 9: Write down the name of an animal (not bird, fish, or insect) that begins with your letter from Step 8

Step 10: Write down the color of your animal

Result:
Color________
Animal________
Country________

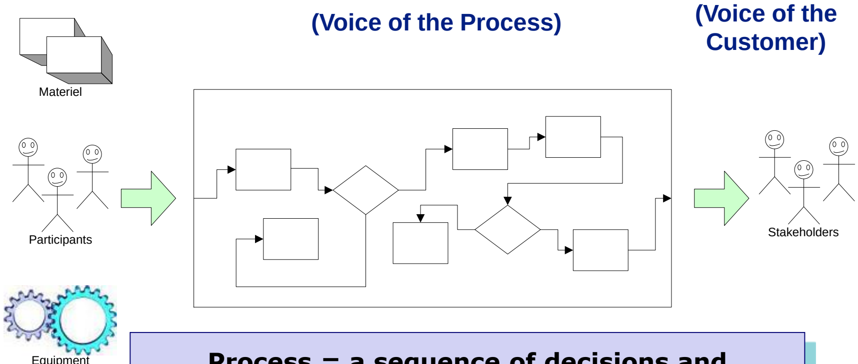
A Gray Elephant in Denmark

Components of a System

Inputs

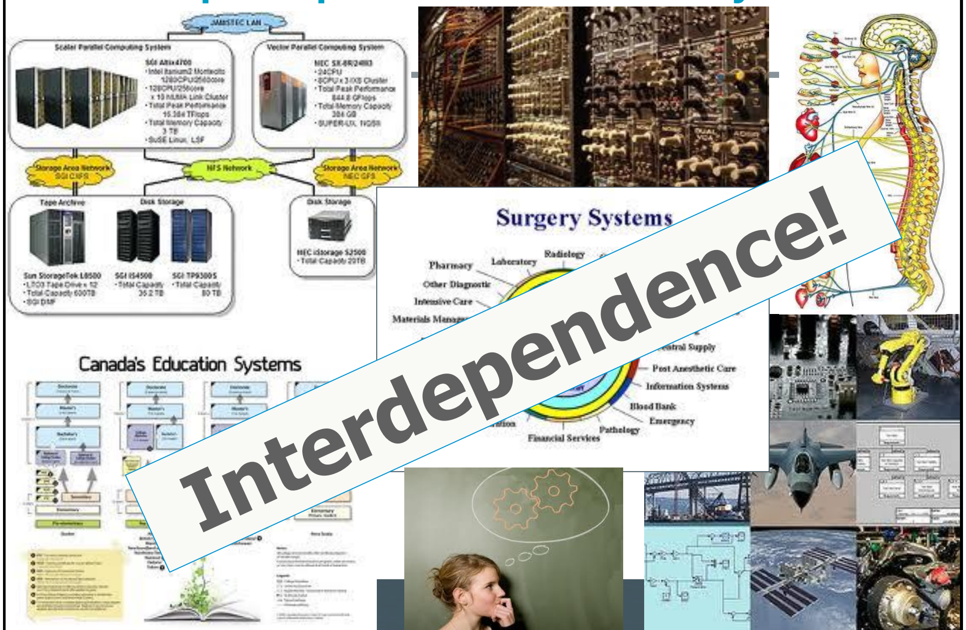
Processes
(Voice of the Process)

Outcomes
(Voice of the Customer)



Process = a sequence of decisions and actions that delivers value to stakeholders

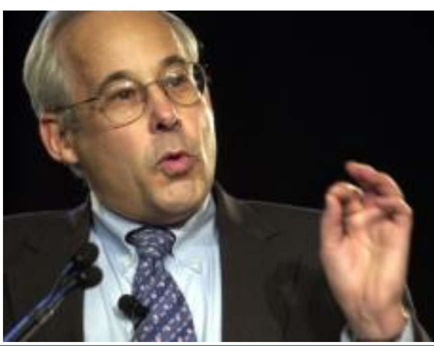
What principle characterizes a system?



Purpose of the Healthcare System

"The quality of patients' experience is the 'north star' for systems of care."

Don Berwick



The Voice of the Customer
(patient, family, care givers, staff)

How would your customers (e.g., patients) describe the purpose of your system of care?

"I want your pharmacy to provide me with the right medications at the right time, in the correct dosages, to help me heal."

"While I am in your care, I want you to provide me with compassionate, respectful care. I want to be free from pain and have a good plan for going home."

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Levels of the System

Nursing Services

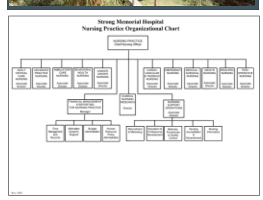
Macro-systems

(e.g. a hospital, multiple hospitals, a state, a region)

Nursing Divisions

Meso-systems

(e.g. a division, a clinical department, pathology, IT)



Frontline Nursing Units

Microsystems

(e.g. a ward or unit, a clinic, home care nurses

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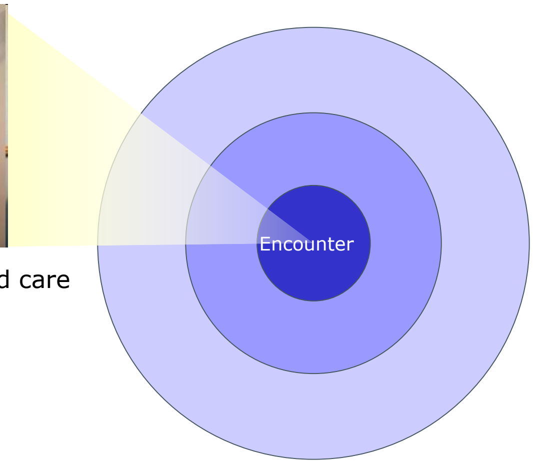
Micro System Of Care



- Reliable evidence-based care
- Patient-centered
- Timely
- Safe
- Efficient
- Equitable

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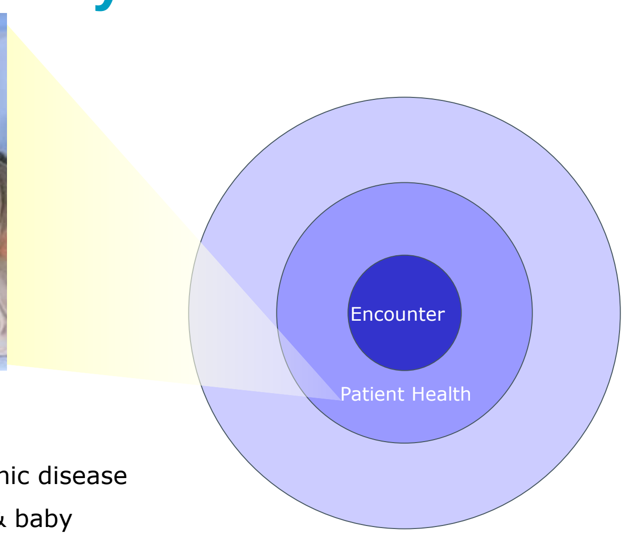
Meso System Of Care



- Staying fit
- Getting better
- Managing chronic disease
- Healthy mom & baby
- Coping with end-of-life

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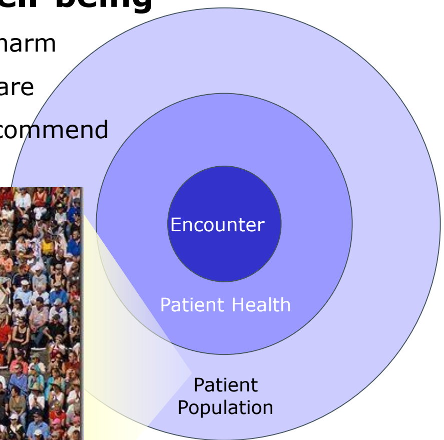
Macro System Of Care

Population health and well-being

- Percent of patients who suffered harm
- Percent with current preventive care
- Percent of patients who would recommend



Drivers of the System

$$S + P + C^* = O$$

Structure + Process + Culture* = Outcomes

Source: Donabedian, A. *Explorations in Quality Assessment and Monitoring. Volume I: The Definition of Quality and Approaches to its Assessment.* Ann Arbor, MI, Health Administration Press, 1980.

*Added to Donabedian's original formulation by R. Lloyd and R. Scoville

Exercise
What is your system?

- Take a few minutes to think about what you want to improve.
- Would you say that what you are thinking about is a Macro, Meso or Micro level issue?
- How would your customers (e.g., patients) describe the purpose of your system of care?
- Do you know the 3 or 4 key factors that produce the outcomes of this system?
- Do those you work with agree that these are the factors that drive the results?

Defining <u>your</u> system!

The ***<u>Driver Diagram</u>*** is a tool to help us understand the system you wish to improve, its outcomes and the processes and related factors that drive the outcomes.

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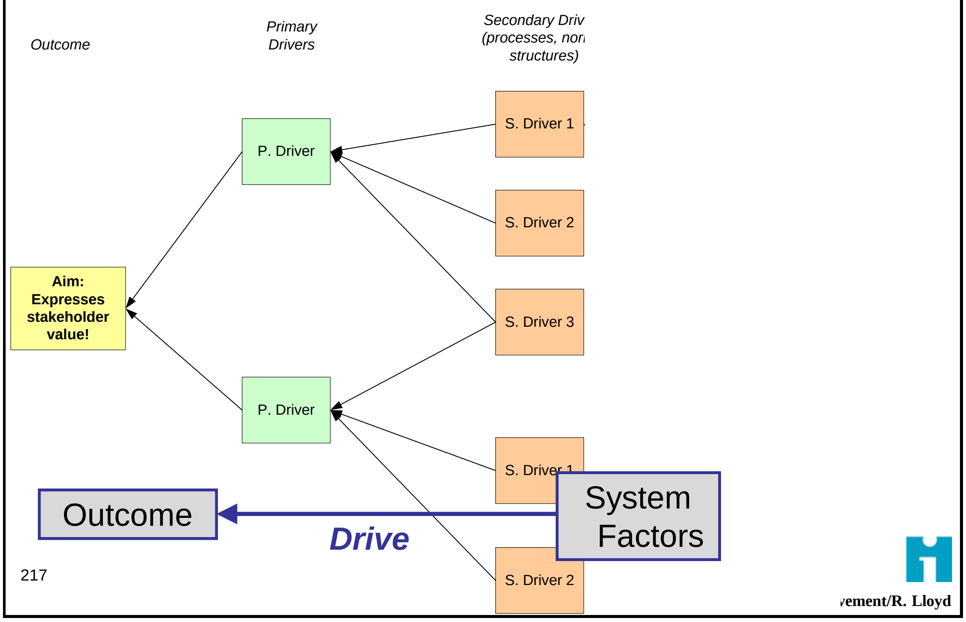
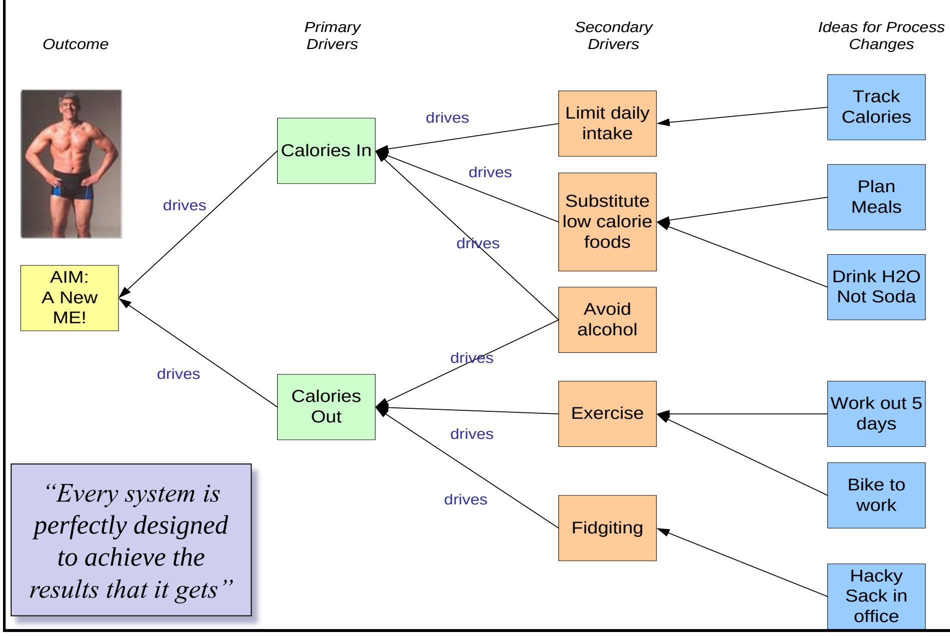
A Theory of How to Improve a System



A Theory for A New Me!



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

Two Main Categories of Drivers

Primary Drivers

System components which will contribute to moving the outcome(s); the "big buckets."

Secondary Drivers

- Elements of the associated Primary Drivers
- They can be used to create projects or a change package that will affect the Primary Drivers and ultimately the Outcome(s).

About Drivers

Primary Drivers

- Groups of secondary drivers with common resources, manager, equipment, patients, etc.
- Could be assigned to a team to improve

Secondary Drivers

- Structures, processes, or cultural norms that contribute to the desired outcomes
- Necessary and sufficient for improvement
- Identified by subject matter experts (i.e., staff)

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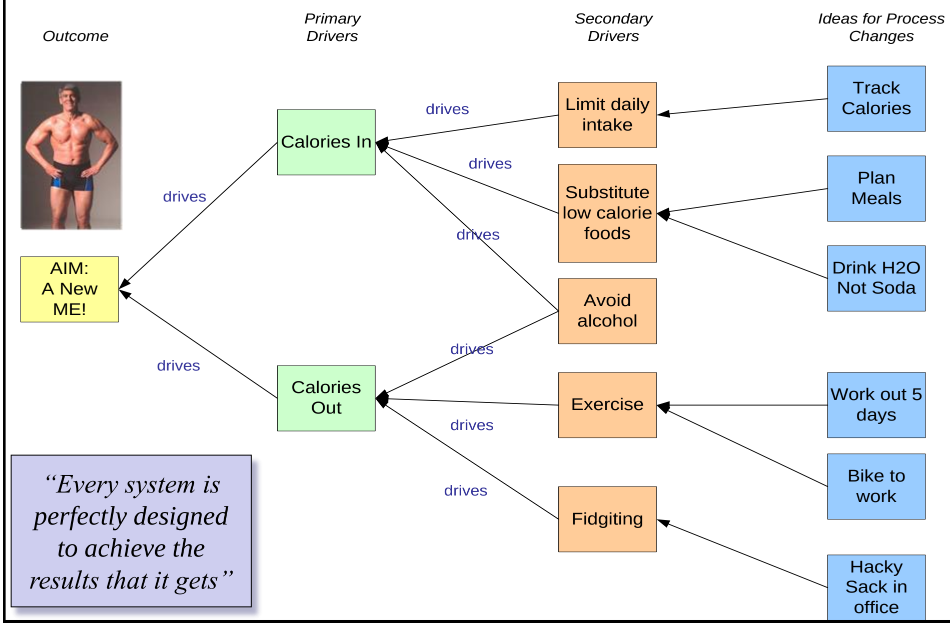
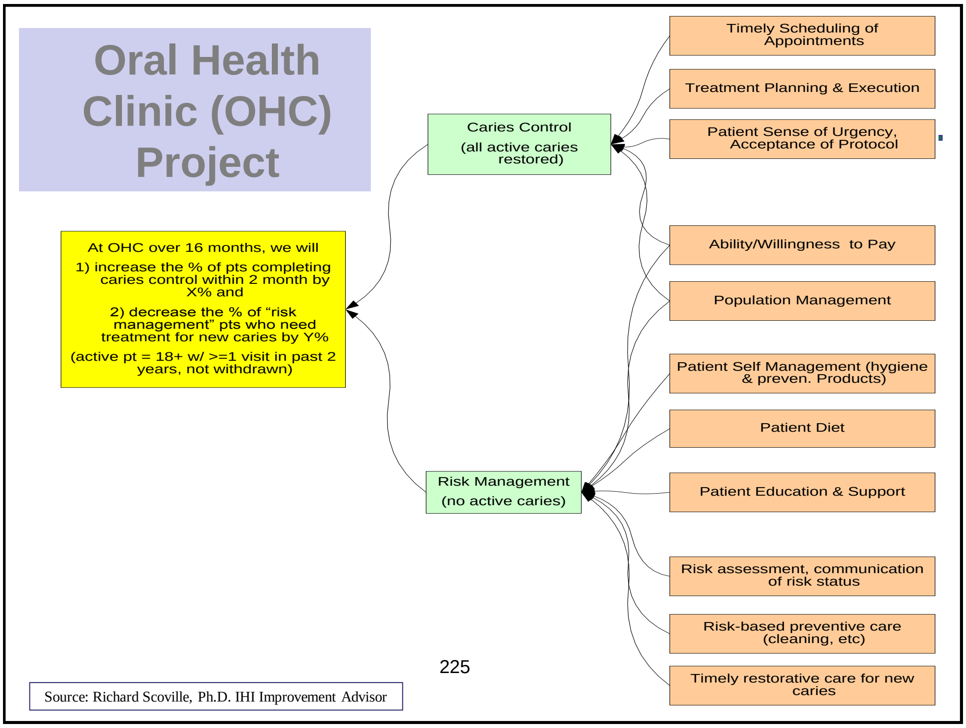
A Theory for A New Me!



Types of Drivers

- **Values and Operating Rules** – A concept, regulation, or norm governing individual conduct
- **Organizational Structures** - The way that the components of a system are connected or interact.
- **Processes** – A sequence of steps that repeatedly interact to make inputs into outcomes


Oral Health Clinic (OHC) Project
At OHC over 16 months, we will
1) increase the % of pts completing caries control within 2 month by X% and
2) decrease the % of "risk management" pts who need treatment for new caries by Y%
(active pt = 18+ w/ >=1 visit in past 2 years, not withdrawn)
Caries Control
(all active caries restored)
Risk Management
(no active caries)
Timely Scheduling of Appointments
Treatment Planning & Execution
Patient Sense of Urgency, Acceptance of Protocol
Ability/Willingness to Pay
Population Management
Patient Self Management (hygiene & preven. Products)
Patient Diet
Patient Education & Support
Risk assessment, communication of risk status
Risk-based preventive care (cleaning, etc)
Timely restorative care for new caries
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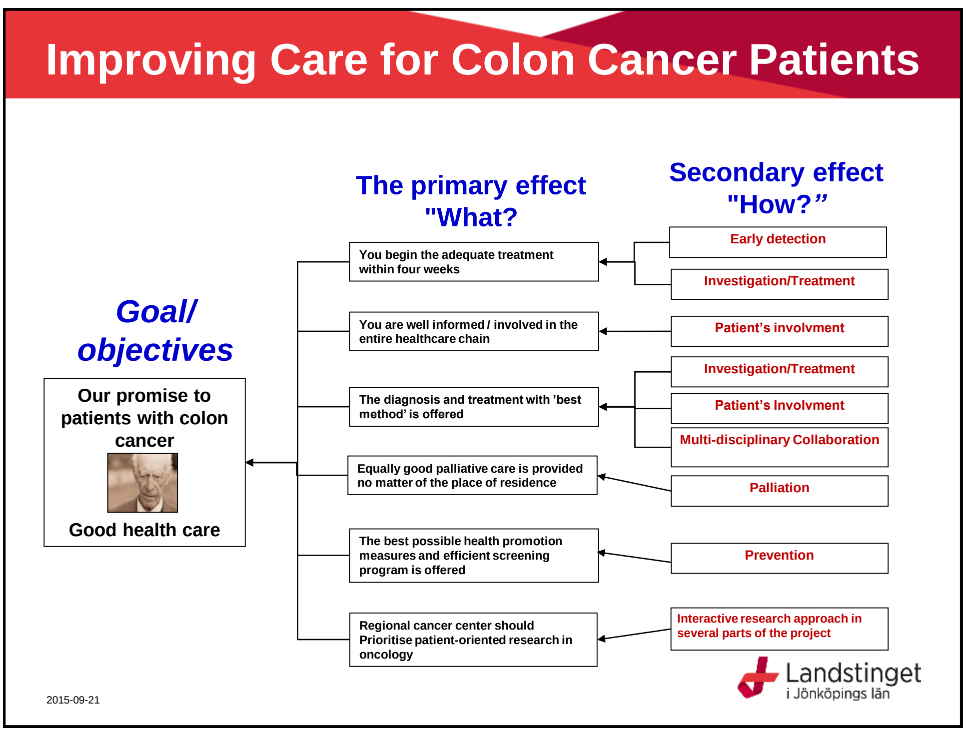
Source: Richard Scoville, Ph.D. IHI Improvement Advisor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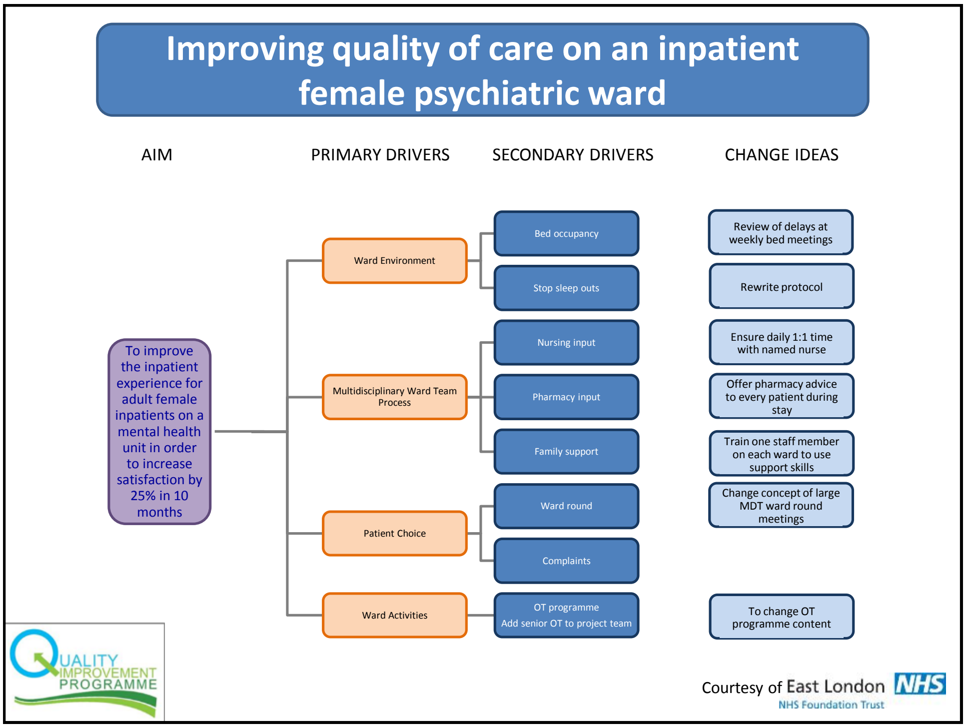
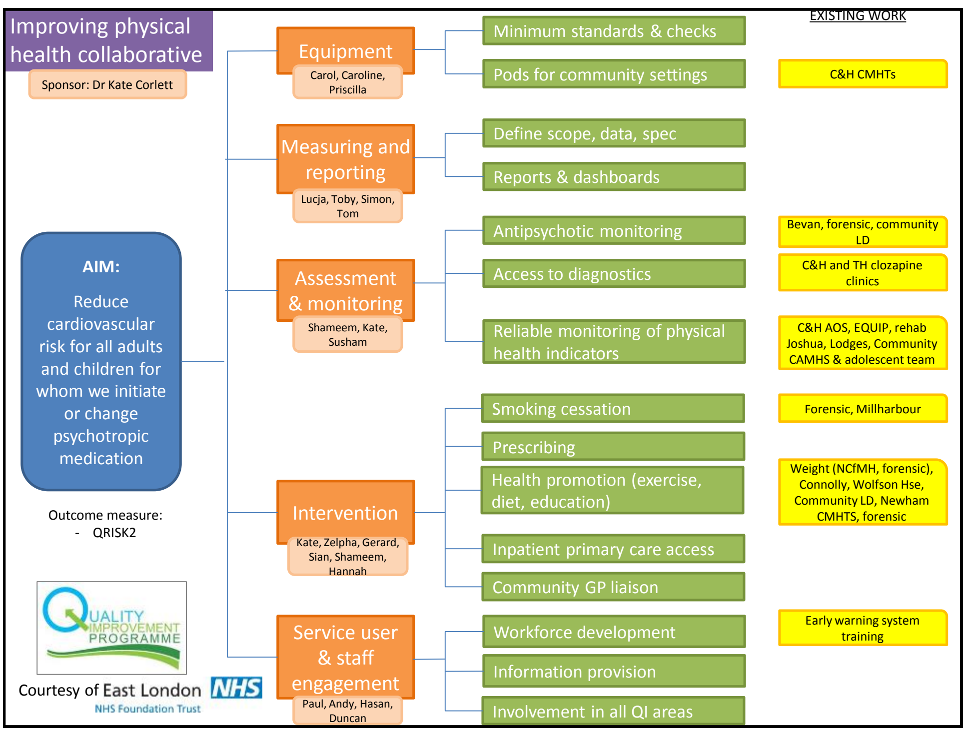
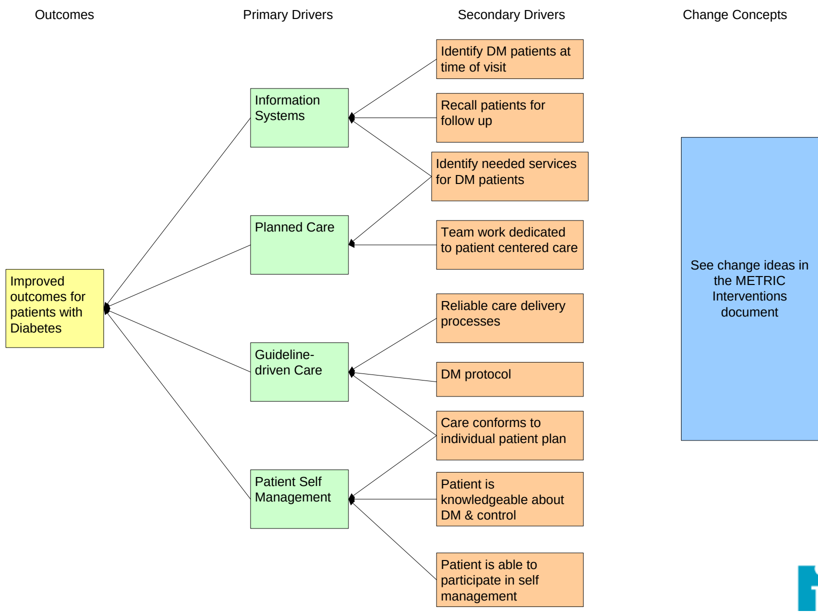

Improving quality of care on an inpatient female psychiatric ward
AIM
PRIMARY DRIVERS
SECONDARY DRIVERS
CHANGE IDEAS
To improve the inpatient experience for adult female inpatients on a mental health unit in order to increase satisfaction by 25% in 10 months
Ward Environment
Multidisciplinary Ward Team Process
Patient Choice
Ward Activities
Bed occupancy
Stop sleep outs
Nursing input
Pharmacy input
Family support
Ward round
Complaints
OT programme
Add senior OT to project team
Review of delays at weekly bed meetings
Rewrite protocol
Ensure daily 1:1 time with named nurse
Offer pharmacy advice to every patient during stay
Train one staff member on each ward to use support skills
Change concept of large MDT ward round meetings
To change OT programme content
QUALITY IMPROVEMENT PROGRAMME
Courtesy of East London NHS
NHS Foundation Trust


Improving physical health collaborative
Sponsor: Dr Kate Corlett
EXISTING WORK
AIM:
Reduce cardiovascular risk for all adults and children for whom we initiate or change psychotropic medication
Outcome measure:
- QRISK2
Equipment
Carol, Caroline, Priscilla
Measuring and reporting
Lucja, Toby, Simon, Tom
Assessment & monitoring
Shameem, Kate, Susham
Intervention
Kate, Zelpha, Gerard, Sian, Shameem, Hannah
Service user & staff engagement
Paul, Andy, Hasan, Duncan
Minimum standards & checks
Pods for community settings
Define scope, data, spec
Reports & dashboards
Antipsychotic monitoring
Access to diagnostics
Reliable monitoring of physical health indicators
Smoking cessation
Prescribing
Health promotion (exercise, diet, education)
Inpatient primary care access
Community GP liaison
Workforce development
Information provision
Involvement in all QI areas
C&H CMHTs
Bevan, forensic, community LD
C&H and TH clozapine clinics
C&H AOS, EQUIP, rehab Joshua, Lodges, Community CAMHS & adolescent team
Forensic, Millharbour
Weight (NCfMH, forensic), Connolly, Wolfson Hse, Community LD, Newham CMHTS, forensic
Early warning system training
QUALITY IMPROVEMENT PROGRAMME
Courtesy of East London NHS
NHS Foundation Trust

Diabetes Driver Diagram



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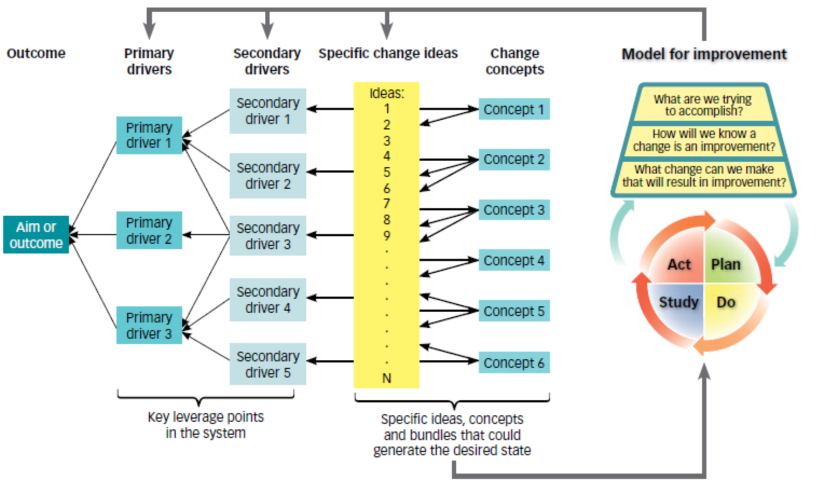
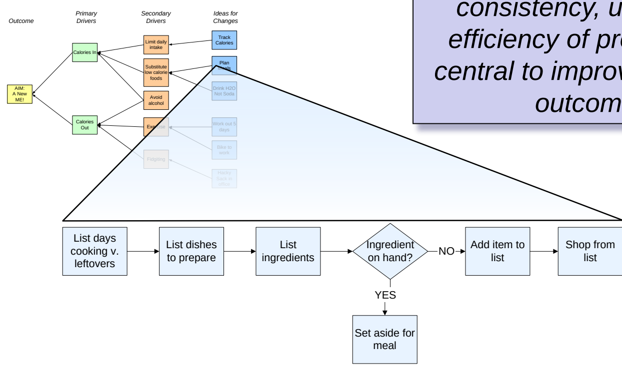
Driver diagram informs testing, testing refines theory / FIGURE 3



Bennet, B, Provost, L *What's Your Theory* Quality Progress. July 2015

Driver Diagram Tip #1
Drivers and Processes are Linked!

Improving the reliability, consistency, usability or efficiency of processes is central to improving system outcomes.



Source: Richard Scoville & I.H.I.

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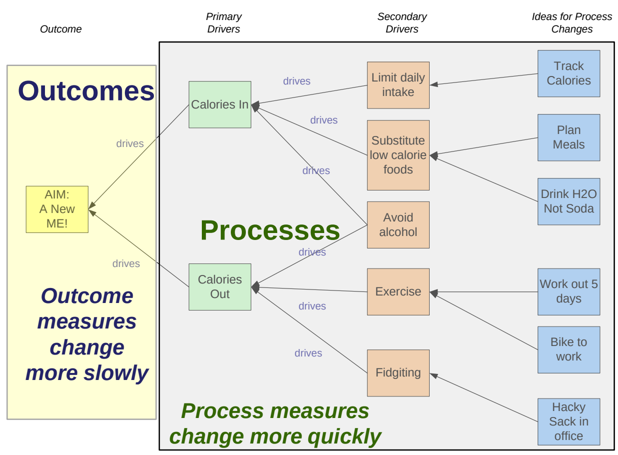
Driver Diagram Tip #2
Don't forget about the timing of change!



Source: Richard Scoville & I.H.I.

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Exercise
Driver Diagram

Draft a Driver Diagram for your project

- Make a list of potential improvement drivers for your system of care
- Create a driver diagram for your project
  - Aim/Outcome
  - Key drivers of improvement in the outcome(s)

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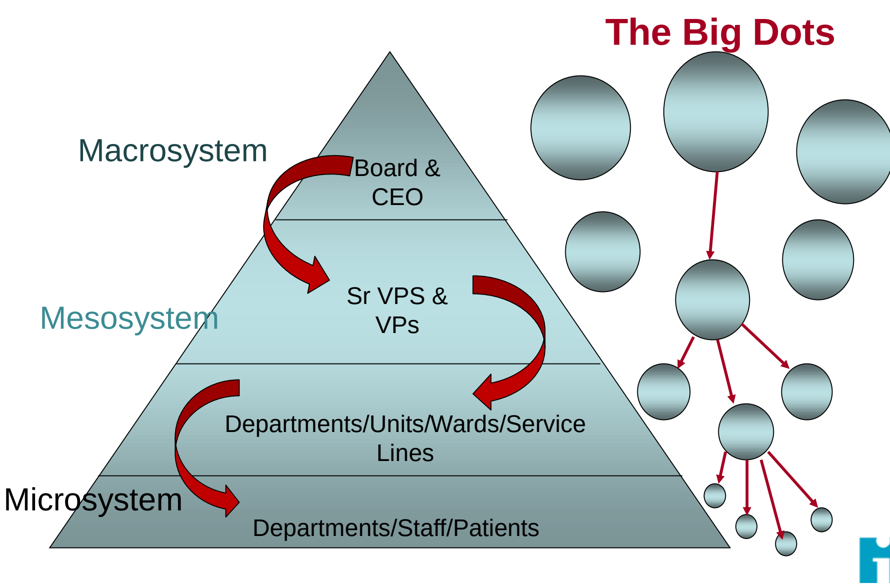
Driver Diagram Tip #3

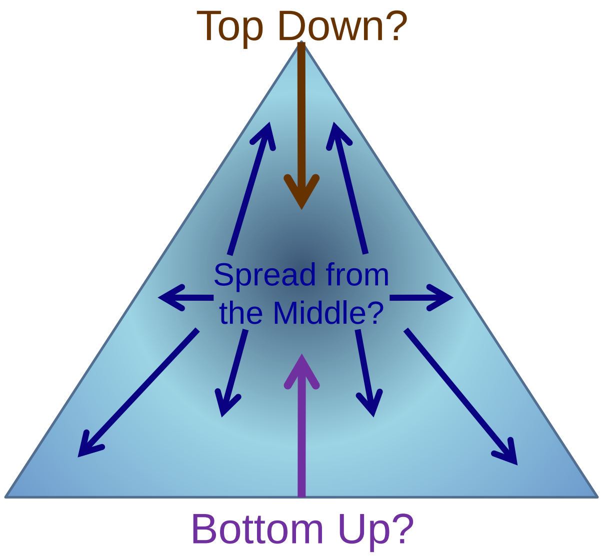
Most cascades start at the top!

And,
trickle
downward…

A typical top-down cascade



Which way does (should) your cascade flow?

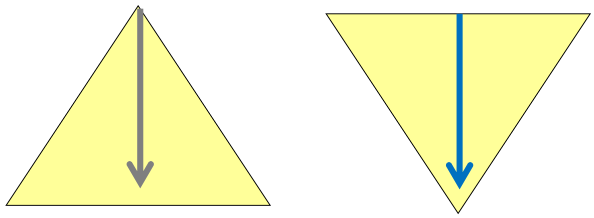


IOM Chasm Report Chain of Effect (it all starts with the patient)

1. Patient (start here)
2. Physician
3. Clinical Unit/Microsystem
4. Clinical Service Line/Mesosystem
5. Health System/Macrosystem

Information System Design Principle: Capture data at lowest level and aggregate up to higher levels for cascading metrics throughout system.

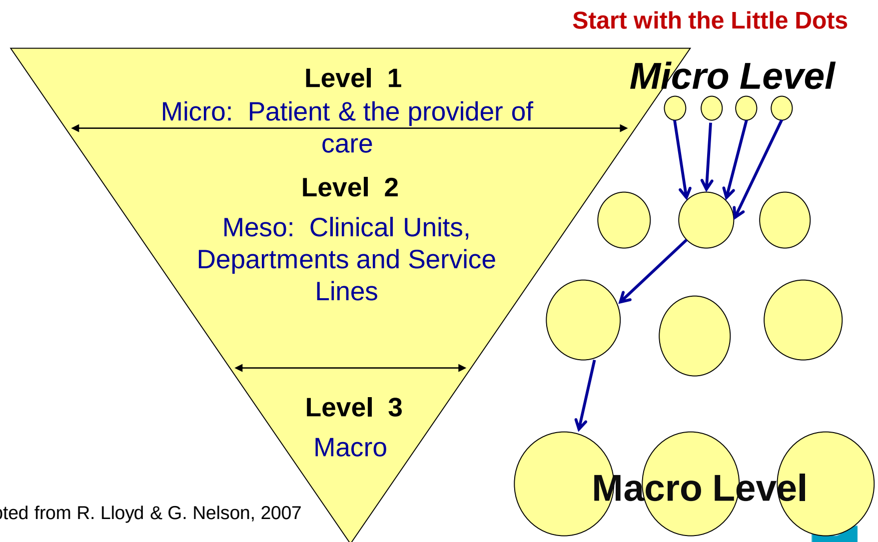
Think about reversing the cascade!



Traditional Pyramids | ***Inverted Pyramids***

Adapted from the work of Dr. Gene Nelson, Dr. Paul Batalden and Marjorie Godfrey
Quality By Design: A Clinical Microsystems Approach, Jossey-Bass, 2007.

So, think about building an inverted pyramid



Adapted from R. Lloyd & G. Nelson, 2007

What system are you trying to improve?

The key question, however, is do you fully understand the complexity of these systems and which aspects of the system you want to improve?

You need to start drilling down from the…

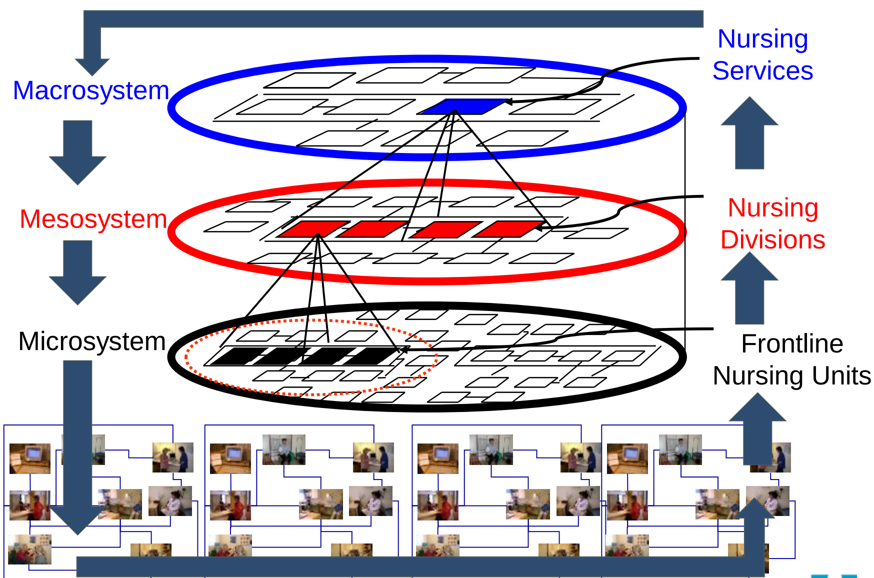
Macro

Meso

Micro levels and build a cascade

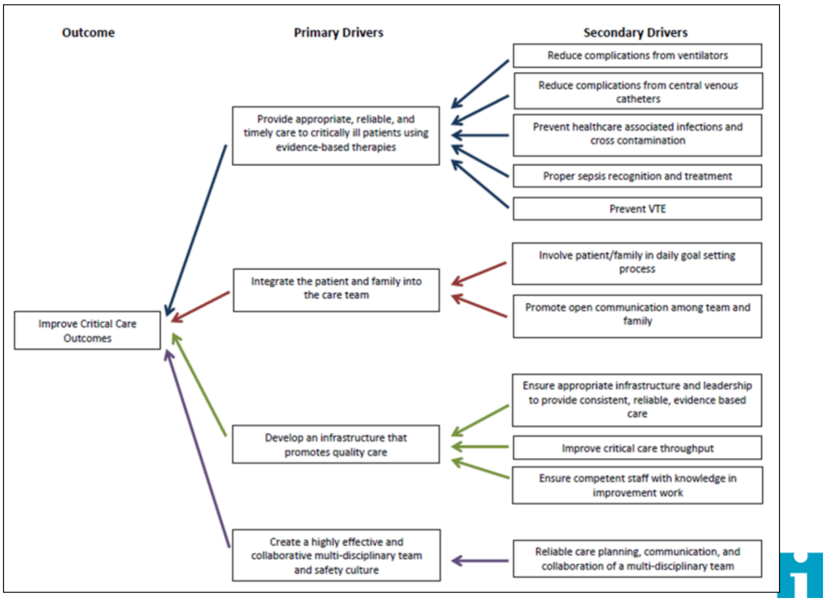
That then percolates back up

Jönköping's System Level Cascade



Source: G. Henriks & Bojestig, Jonkoping County Council, Sweden, 2008

Hamad Medical Corporation Best Care Always Change Package: Critical Care Driver Diagram



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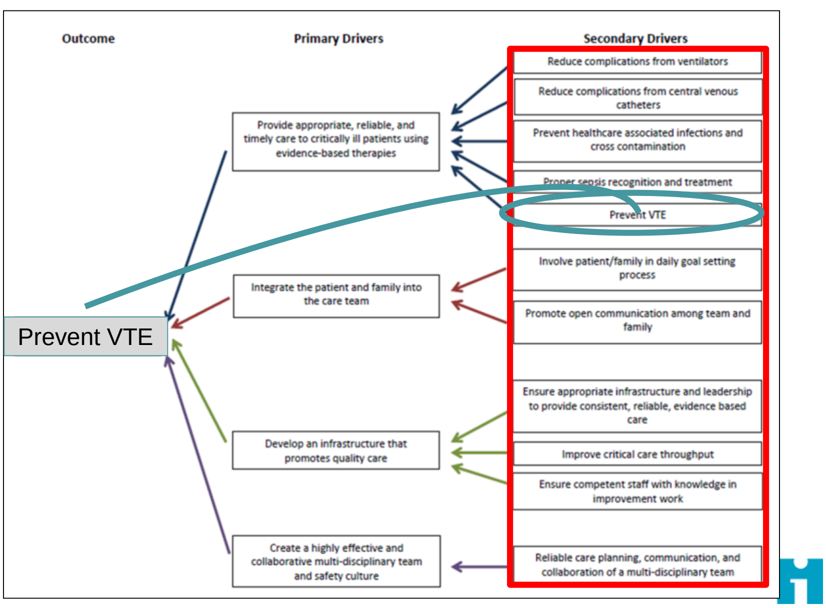

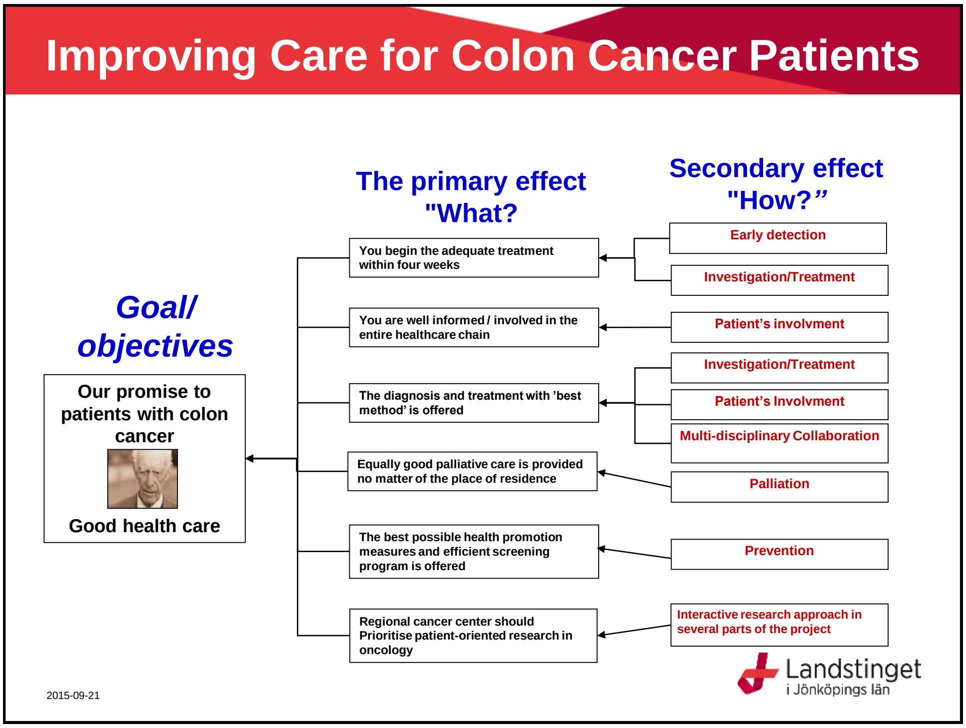
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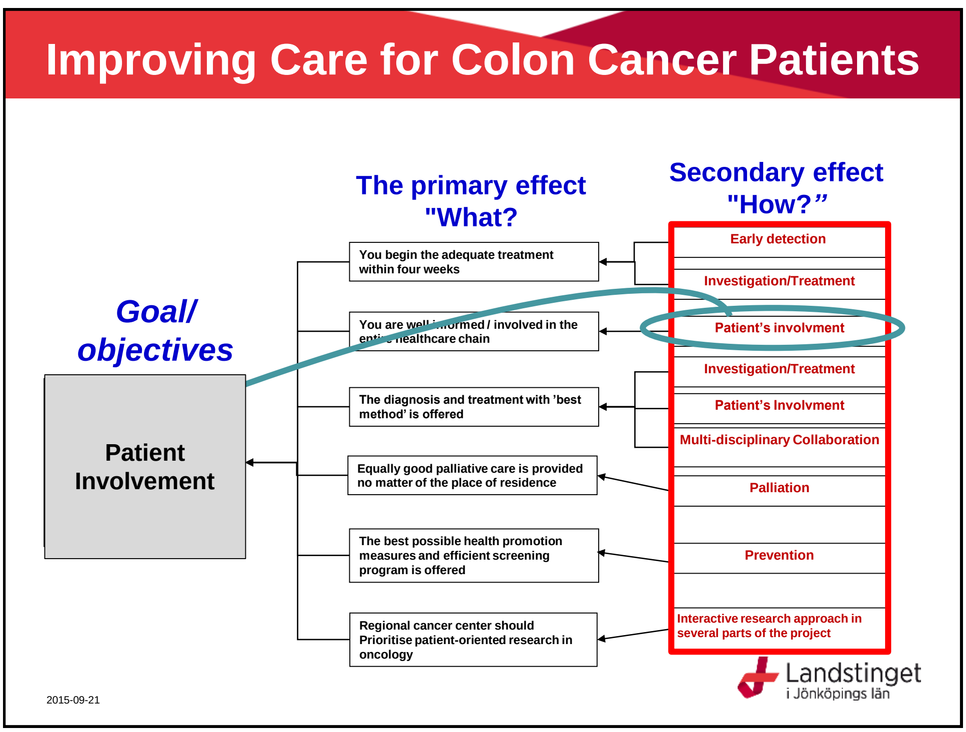
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Exercise
Driver Diagram

- Use the Driver Diagram you just reviewed.
- Review the *Secondary Drivers* you identified on this initial Driver Diagram.
- *Select one of the Secondary Drivers and make it the Outcome of your new Driver Diagram*.
- Identify the Primary and Secondary Drivers of this new outcome.
- Do you need to cascade down another level?

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