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Using Data to Guide improvement

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Objectives

- Develop a strategy for using data for improvement at the front line for at least one process change for STAAR

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Why are you measuring?

Research?

Judgment?

Improvement?

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

IMPROVEMENT

"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 counterproductive it can be to mix measurement for accountability or research with measurement for improvement."

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The Three Faces of Performance Measurement

Aspect	Improvement	Accountability	Research
Aim	Improvement of care	Comparison, choice, reassurance, spur for change	New knowledge
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	Hypothesis flexible, changes as learning takes place	No hypothesis	Fixed hypothesis
• Testing Strategy	Sequential tests	No tests	One large test
• Determining if a change is an improvement	Run charts or Shewhart control charts	No change focus	Hypothesis, statistical tests (t-test, F-test, chi square), p-values
• Confidentiality of the data	Data used only by those involved with improvement	Data available for public consumption and review	Research subjects' identities protected

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Do Improvement Projects sometimes feel like this?

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- Cathy's Story: Examples of using data for improvement at the front line.

Table Discussions

How you will know a change is an improvement?

10 Min

- Pair up
- Choose one change you are (or would like to be) testing or implementing (e.g., teachback, follow-up phone calls, warm handovers)
- What information do you need that would tell you if the change is effective (i.e., being executed as expected)?
- What information do you need that would tell you the change is reliable (i.e. being executed for every appropriate patient?

Report Out

- What data will you collect?
- What challenges do you anticipate facing?
- What questions do you have about what you will collect?

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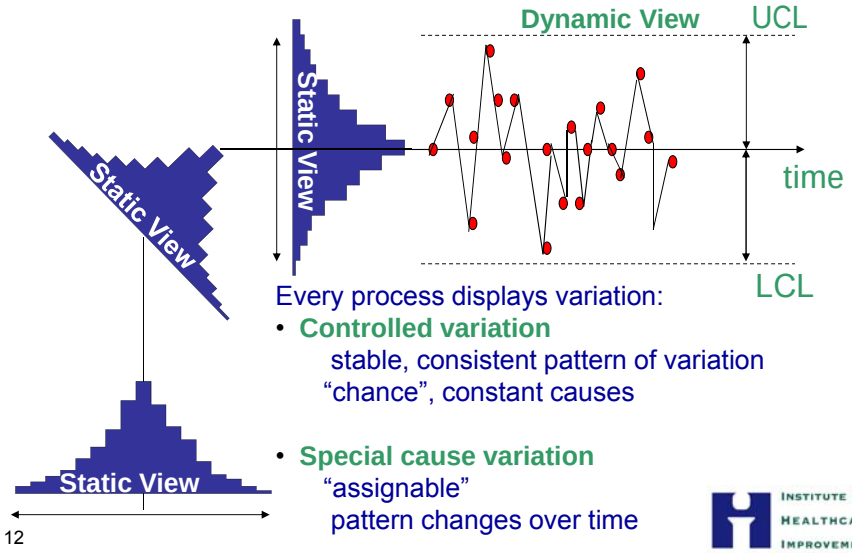
"What is the variation in one system over time?" Walter A. Shewhart - early 1920's, Bell Laboratories



Every process displays variation:

- **Controlled variation**
  stable, consistent pattern of variation
  "chance", constant causes
- **Special cause variation**
  "assignable"
  pattern changes over time

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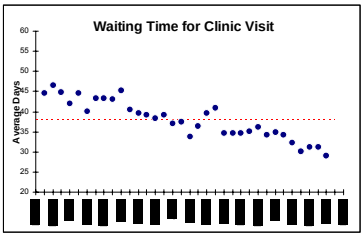
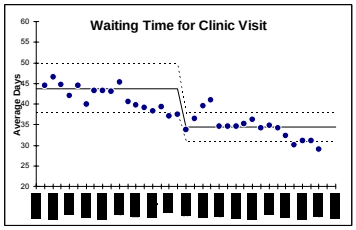
"…and then another drop in our patient satisfaction results this month. But I have a <u>really good</u> feeling about next month!

The Fundamental SPC Tool Kit!

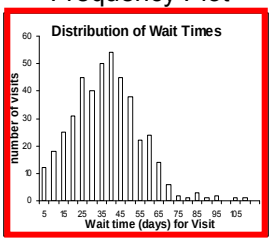
Run Chart



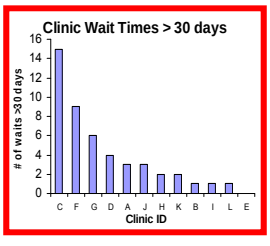
Shewhart Chart



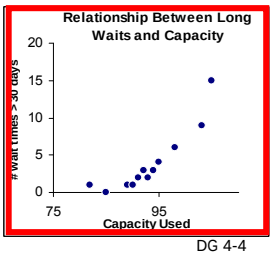
Frequency Plot



Pareto Chart



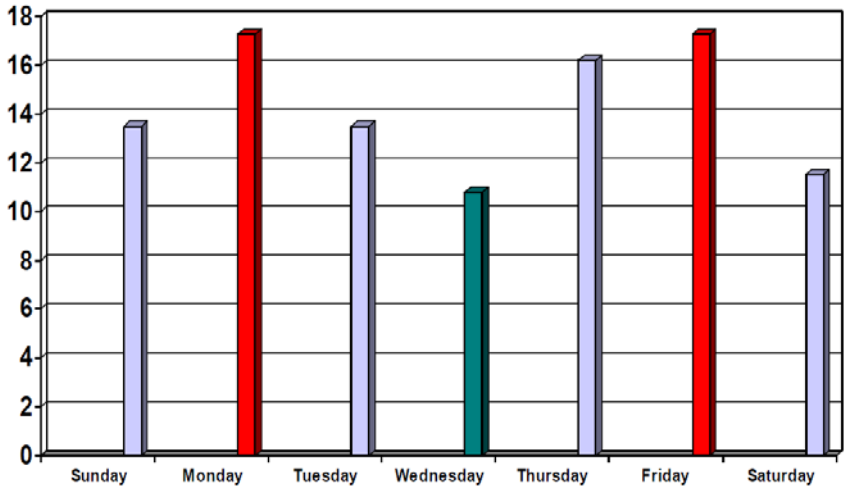
Scatterplot

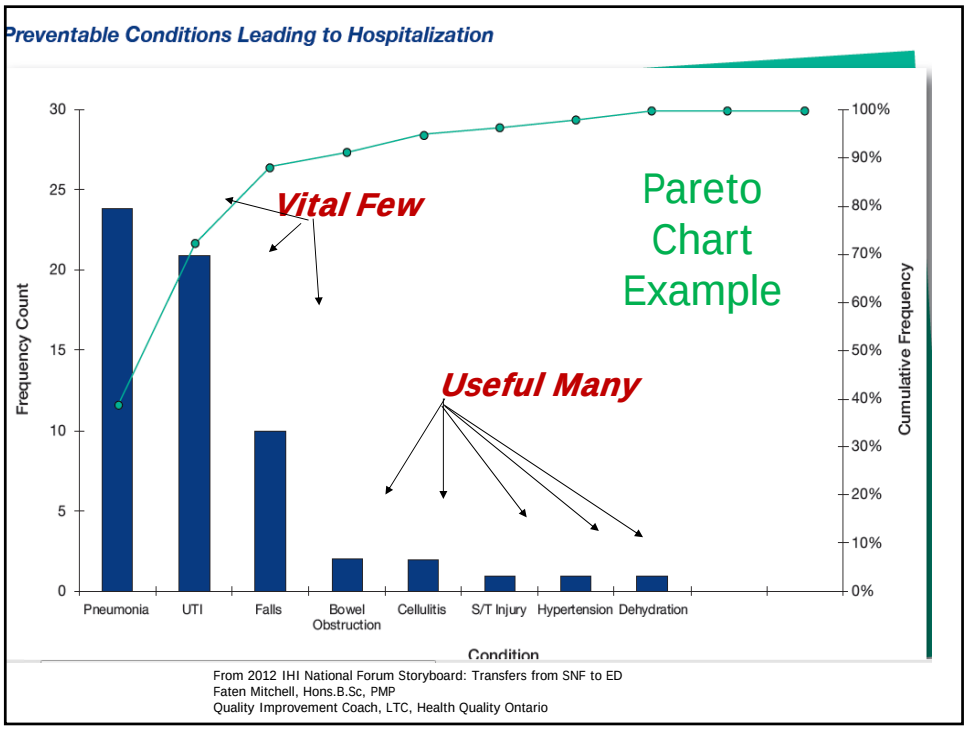


DG 4-4

Slide 14 from API and IHI

Frequency Plot Example





From 2012 IHI National Forum Storyboard: Transfers from SNF to ED
Faten Mitchell, Hons.B.Sc, PMP
Quality Improvement Coach, LTC, Health Quality Ontario

Table Discussions

- Using the graph paper and markers at your table, mock up data displays (run charts or other) that you will use to share the data with you team.
- How frequently will you collect the data?
- Who will you be sharing the data with?

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Report Out

- Share your proposed visual display(s)

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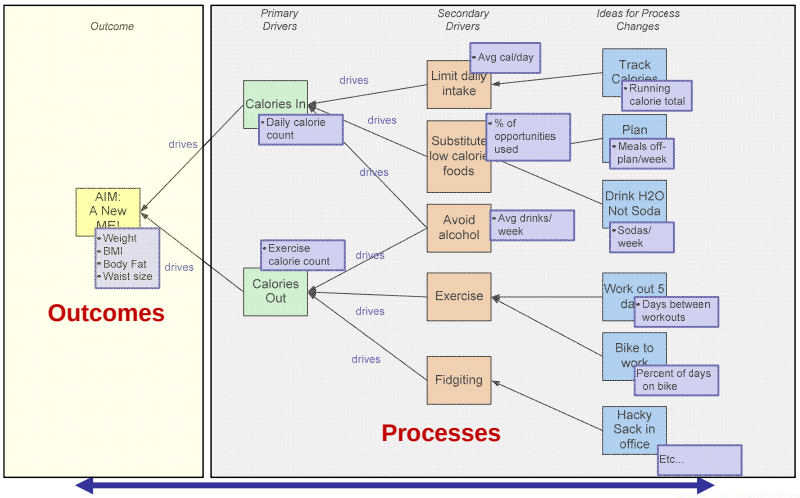
Measurement Frequency



Five Tips for Increasing the Usefulness of Measurement for Improvement

1. **Specify a balanced set of measures for all improvement efforts**
2. **Choose the appropriate statistics to plot**
3. **Conserve measurement resources through sampling and integration into daily work**
4. **Plot key measures in time order on a regular basis throughout the improvement effort**
5. **Develop excellent visual displays of the measures to share your progress with others**

Note: the following slides may not be reviewed in the session but are available for reference

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The run chart: a simple analytical tool for learning from variation in healthcare processes

***British Medical Journal Quality and Safety,* 2011**

Rocco Perla, Lloyd Provost, Sandy Murray

From API and IHI

Important Uses of the Run Chart

- Displaying data to make **process** performance visible
- Determining if changes tested resulted in improvement
- Determining if we are holding the gains made by our improvement
- Allowing for a temporal (analytic) view of data versus a static (enumerative) view

BMJ p. 47

A Run Chart

A run chart is a graphical display of data plotted in some type of order.

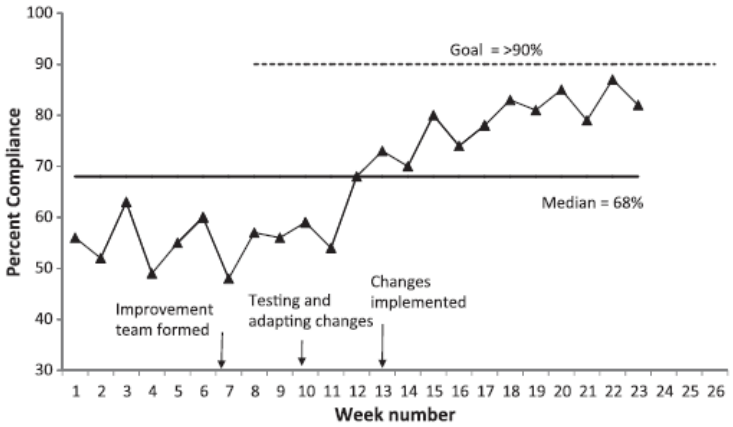
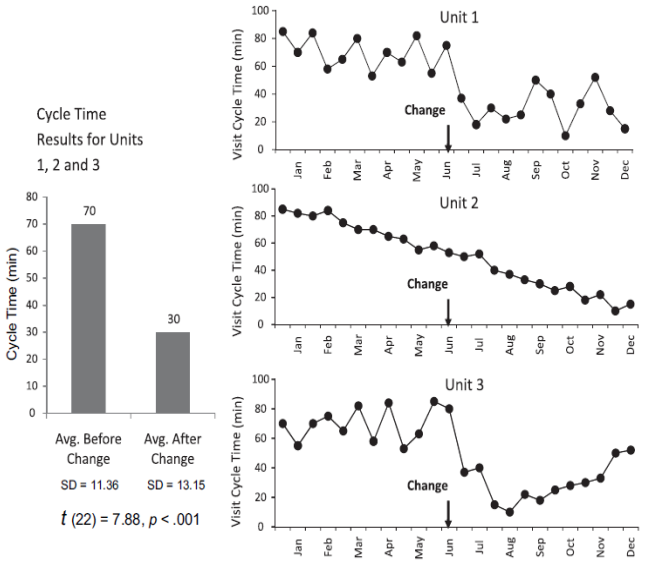


Figure 1 Example of a run chart demonstrating compliance with a standard procedure.

BMJ p. 47

Do we have an improvement?

Figure 2 Summary statistics versus time-ordered data. (Each unit has the same 24 data values ordered differently over time.)



BMJ p. 48

Run Chart Construction

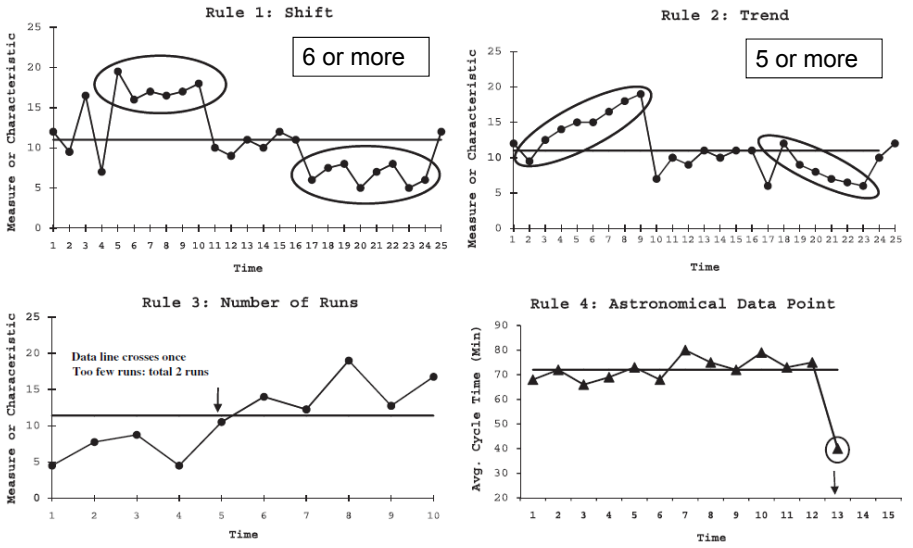
From *Health Care Data Guide*, Jossey-Bass, 2011

Seven Steps to Constructing a Run Chart

1. State the question that the run chart will answer and obtain data necessary to answer this question.
2. Develop the horizontal scale for the run chart. This will usually be a time scale, but other alternatives can be used. Appropriate time increments to develop the axis will typically be days, weeks, months, quarters, years, sequential patients, sequential procedures, and so on. A useful practice is to label several future time increments even though no data yet exist for that time frame. The scale should cover the time period of interest for the graph, not just the time when data are currently available.
3. Develop the vertical scale for the run chart. A good scale is one that is easy to plot, easy to read, and leaves ample room for future data that might be larger or smaller than the values used to create the initial run chart. Criteria for a good scale include:
   - Most of the data lies in about the middle half of the graph.
   - Labeled values on the axis should be round numbers and should be equally spaced.
   - Unlabeled tic marks should be easily plotted and read. They should be easy to work with and interpolate between.

   The completed chart should be sized with a 2:5 vertical to horizontal ratio. Estimate the range of the data points to be plotted on the vertical scale (the smallest value to the largest value). Then use this range to develop a vertical scale for the run chart. Be sure to construct your vertical scale so that it is high or low enough to encompass variation in future data and reference values such as your goal, a benchmark, or zero if it is meaningful to the chart.
4. Plot the data points. Make a dot (or another symbol). Connecting the dots with a line is optional, but the dots should always be distinguishable from the line. The data are communicated through the dots, not the line.
5. Label the graph completely with a useful title. Label the horizontal access with the sequence of the data (for example, case 1, case 2, case 3, week 1, week 2, week 3, or Jan, Feb, Mar, and so forth). Label the vertical access with the name of the measure or characteristic that you are studying.
6. Calculate and place a median of the data on the run chart. The **median** is the number in the middle of the data set when the data are reordered from the highest to the lowest value. If the number of observations is even, the median is the average of the two middle values. The median is required when applying some of the rules used to interpret a run chart. Placing the median on a run chart with a small number of data points or on a run chart with more than one series of data can add complexity to the interpretation of the run chart.
7. Add additional information to the chart. Add a goal or target line if appropriate. Annotate unusual events, changes tested, or other pertinent information on the run chart at an appropriate time location.

Rules for Identifying Non Random Signals with Run Charts



Slide 27

BMJ P. 50

Do we have too many or too few runs?

Table 1 Checking for too many or too few runs on a run chart. Table is based on about a 5% risk of falling the run test for random patterns of data

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

BMJ p. 49

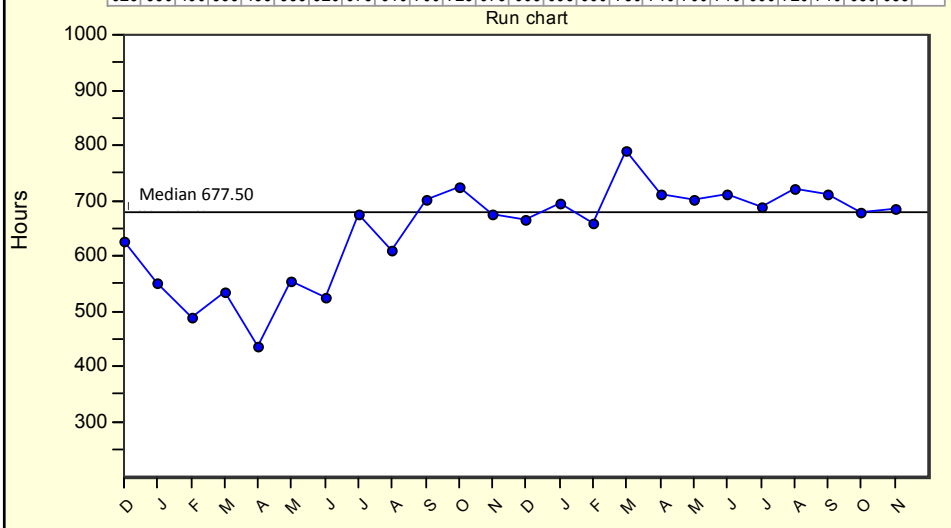
Slide 28

from API and IHI

Are there any non-random signals on this run chart?

Crisis Services Provided Inside Network

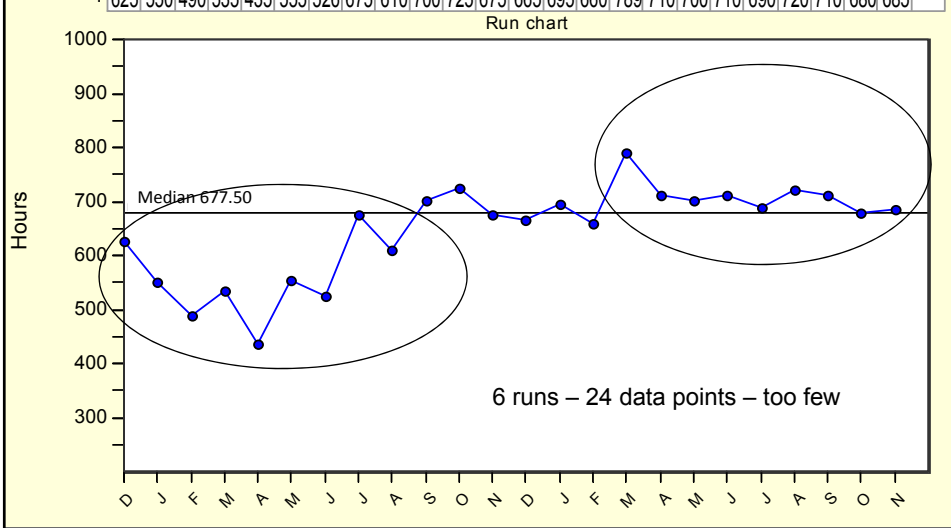
Months	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
1	625	550	490	535	435	555	526	675	610	700	725	675	665	695	660	789	710	700	710	690	720	710	680	685



Slide 29 from API and IHI

Crisis Services Provided Inside Network

Months	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
1	625	550	490	535	435	555	526	675	610	700	725	675	665	695	660	789	710	700	710	690	720	710	680	685



Slide 30 from API and IHI

Conclusions

- Run charts are easy to construct and simple to interpret.
- Since improvements are made over time, plotting data over time using a run chart is a fundamental method to evaluate the success of improvement efforts
- The run chart is therefore an important tool with wide potential application in healthcare improvement.
- Without some objective and simple measure of change and improvement we are left with speculation, intuition, subjective assessments or the application of inappropriate statistical approaches.
- It has long been advocated that aggregate summary statistics always include measures of data in the natural time order as a means of acquiring knowledge.
- The value of a run chart is its simplicity and versatility in letting us learn from our data. By adding some probability- based rules to aid interpretation, we get a picture of the process over time and a method to systematically identify non-random signals.

BMJ p. 51

Slide 31 from API and IHI

Why should I be interested in frequency plots?

Slide 32 from API and IHI

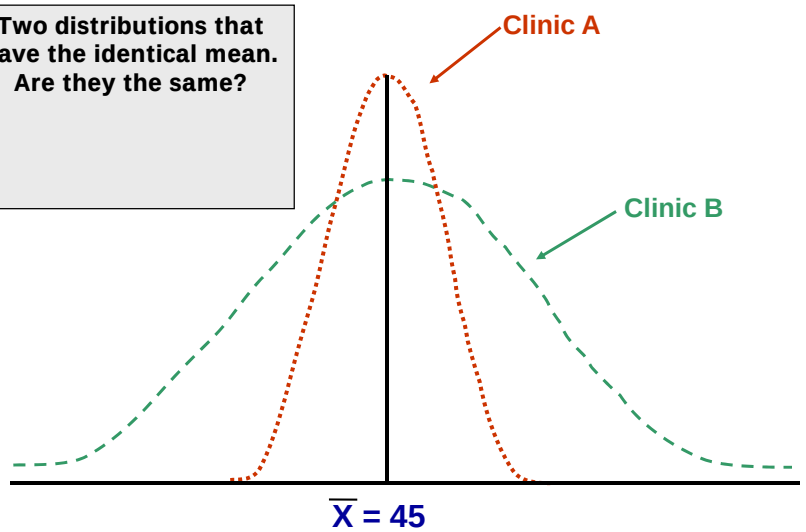
A Tale of Two Clinics

- Imagine that you want to select a medical clinic for you and your family.
- **Two clinics (A & B)**:
  - They are both equal driving distance from your home
  - They both received the same number of "star ratings" from a local quality assessment organization
  - They have an average wait time to see the doctor of 45 minutes

Which of the two clinics would you pick based on this information?

Slide 33 from API and IHI

Two distributions that have the identical mean. Are they the same?



Why are these two distributions different?

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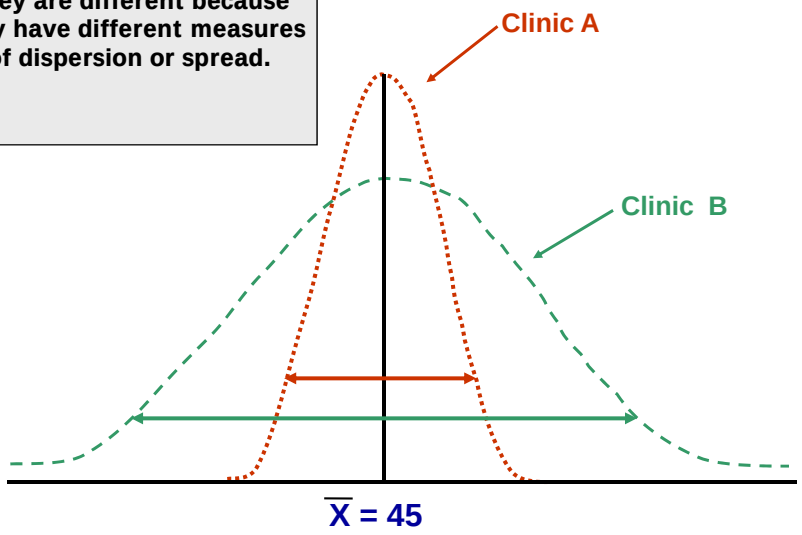
Slide 34 from API and IHI

They are different because they have different measures of dispersion or spread.



The dispersion of the data in Distribution A is not as wide as it is in Distribution B. Distribution A has a smaller standard deviation than Distribution B.

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Slide 35 from API and IHI

Why should I be interested in Pareto Diagrams?

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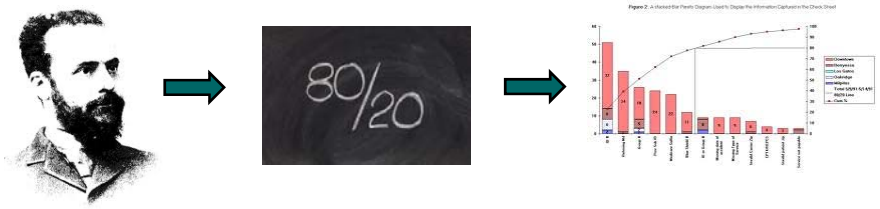
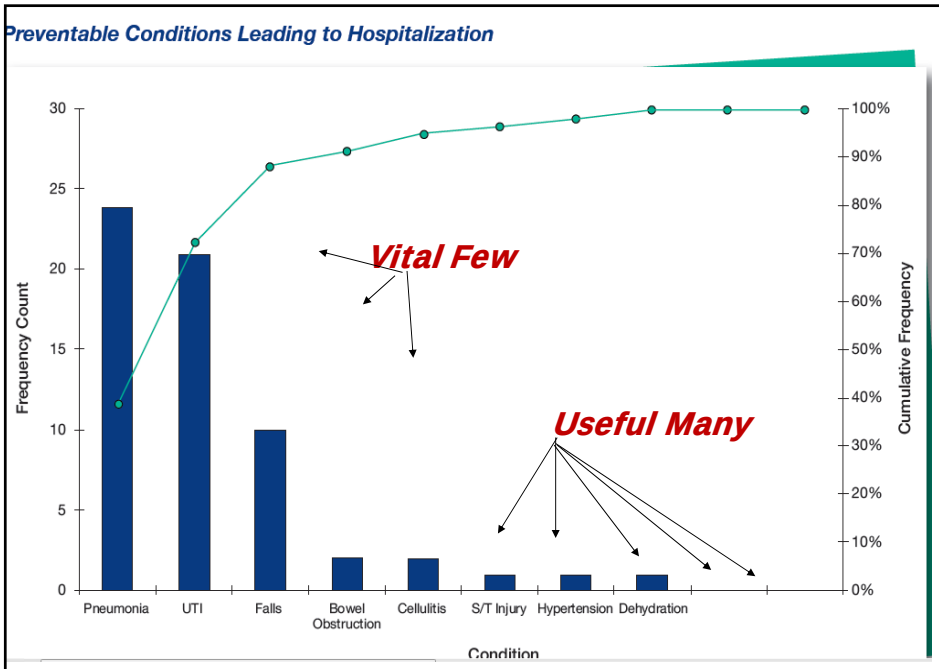
Slide 36 from API and IHI



Vilfredo Federico Damaso Pareto was an Italian engineer, sociologist, economist, political scientist and philosopher. He made several important contributions to economics, particularly in the study of income distribution and in the analysis of individuals' choices.

He introduced the concept of Pareto efficiency and helped develop the field of microeconomics. He also was the first to discover that income follows a Pareto distribution, which is a power law probability distribution. The Pareto principle was named after him and built on observations of his such as that 80% of the land in Italy was owned by 20% of the population. He also contributed to the fields of sociology and mathematics.

Slide 37 from API and IHI



From 2012 IHI National Forum Storyboard:
Faten Mitchell, Hons.B.Sc, PMP
Quality Improvement Coach, LTC, Health Quality Ontario

Why should I be interested in Scatter Plots?

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Moving Beyond One Variable

X ⟷ Y

Is there a relationship between these two variables?

If so, what influences what?

- As X increases do you think Y will also increase?
- As X increases do you think Y will decrease?
- Or, do you think that there is no relationship between X and Y?

IH Ch.33 , DG Ch. 4 p 8-9, QHC Ch. 7 p. 244-256

What Does a Scatter Plot Look Like?

Figure 7.9 A strong positive relationship between the two variables

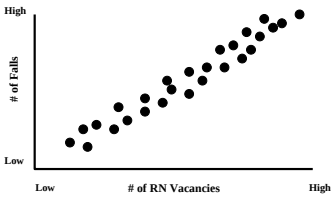


Figure 7.11 A strong negative relationship between the two variables

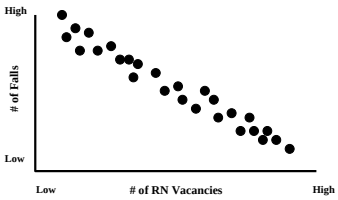


Figure 7.10 A weak positive relationship between the two variables

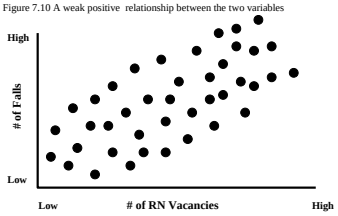
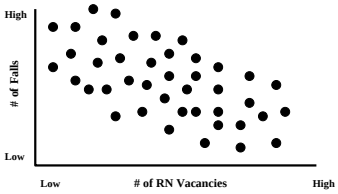


Figure 7.12 A weak negative relationship between the two variables

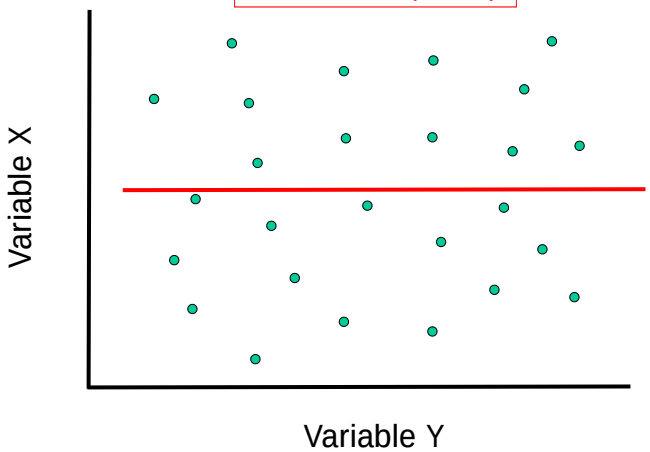


Source: R. Lloyd. Quality health Care: A Guide to Developing and using Indicators. Jones and Bartlett Publishers, 2044; caste Study #6, 244-256.

No Relationship Between X & Y

Source: R. Lloyd. Quality health Care: A Guide to Developing and using Indicators. Jones and Bartlett Publishers, 2044; caste Study #6, 244-256.

No correlation (r = ~0)



A Final Thought on Scatterplots

Scatterplots do not prove anything!

They help you:

- **Understand relationships**
- **Understand the direction and strength of the relationships**

Slide 43 from API and IHI

Why should I be interested in Linking the Tools?

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Slide 44 from API and IHI

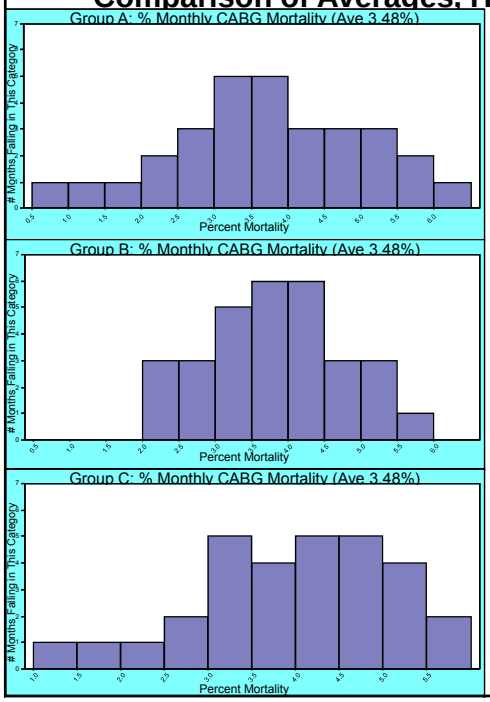
Linking the Tools: Who Will You Buy CABGs From?

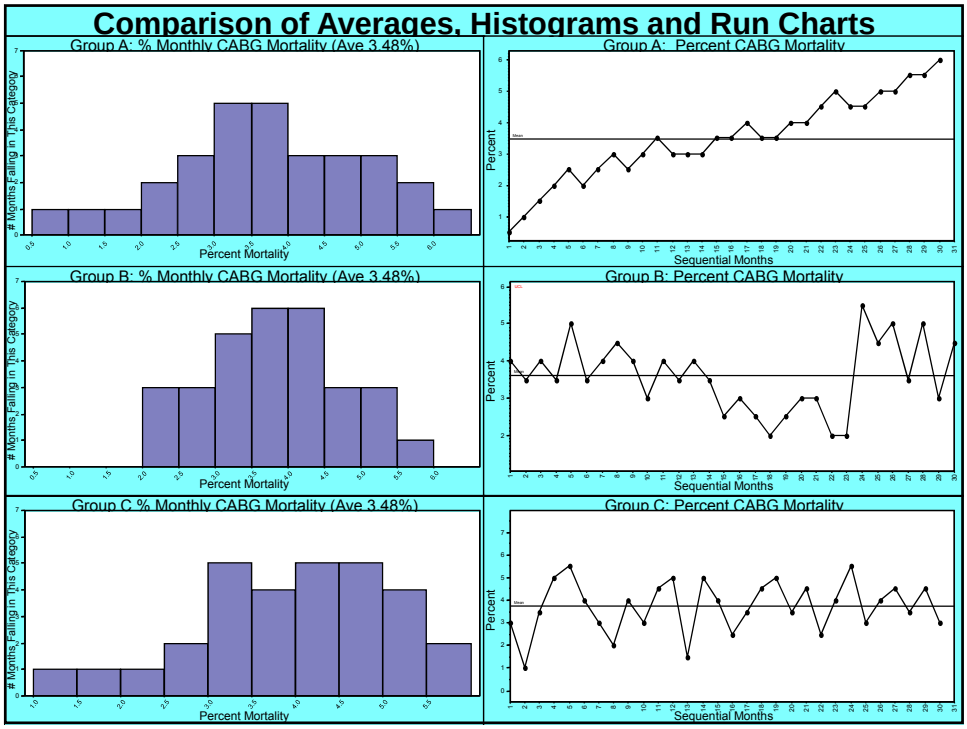
Study the next 3 slides to see how you should be thinking about linking the tools to gain even more knowledge. What summary points can you make about these data and the different ways to present it?

Group	Ave Mo. CABG Mortality Rate	Cost
A	3.48%	$17,000
B	3.48%	$13,000
C	3.48%	$14,500

Slide 45 from API and IHI

Comparison of Averages, Histograms and Run Charts




Comparison of Averages, Histograms and Run Charts
Group A: % Monthly CABG Mortality (Ave 3.48%)
Months Falling in This Category
Percent Mortality
Group A: Percent CABG Mortality
Percent
Sequential Months
Group B: % Monthly CABG Mortality (Ave 3.48%)
Months Falling in This Category
Percent Mortality
Group B: Percent CABG Mortality
Percent
Sequential Months
Group C % Monthly CABG Mortality (Ave 3.48%)
Months Falling in This Category
Percent Mortality
Group C: Percent CABG Mortality
Percent
Sequential Months