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
Why are you measuring?

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

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

by Lief Solberg, Gordon Mosser and Sharon McDonald

“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.”
# The Three Faces of Performance Measurement

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

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*Do Improvement Projects sometimes feel like this?*
• 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?

“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
"...and then another drop in our patient satisfaction results this month. But I have a really good feeling about next month!

The Fundamental SPC Tool Kit!

Run Chart

Shewhart Chart

Frequency Plot

Pareto Chart

Scatterplot

Relationship Between Long Wait Times and Capacity
Frequency Plot Example

Interact Survey Results
Transfers back to Acute Hospital

Preventable Conditions Leading to Hospitalization

Pareto Chart Example

From 2012 IHI National Forum Storyboard: Transfers from SNF to ED
Faten Mitchell, Hon.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 your team.
- How frequently will you collect the data?
- Who will you be sharing the data with?

Report Out

- Share your proposed visual display(s)
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.

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
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

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.
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.)

Run Chart Construction

Rules for Identifying Non Random Signals with Run Charts

1. **Shift**
   - 6 or more runs in a row.

2. **Trend**
   - 5 or more runs in a row.

3. **Number of Runs**
   - Data line crosses more than 6 or fewer runs total.

4. **Astronomical Data Point**
   - Average cycle time.

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

<table>
<thead>
<tr>
<th>Total number of data points on the run chart that do not fall on the median</th>
<th>Lower limit for the number of runs (&lt; than this number runs is 'too few')</th>
<th>Upper limit for the number of runs (&gt; than this number runs is 'too many')</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3</td>
<td>9</td>
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<tr>
<td>11</td>
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<td>13</td>
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<td>24</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
<td>18</td>
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</tbody>
</table>
Are there any non-random signals on this run chart?

Crisis Services Provided Inside Network

Months

<table>
<thead>
<tr>
<th>D</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
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<tbody>
<tr>
<td>625</td>
<td>550</td>
<td>490</td>
<td>535</td>
<td>435</td>
<td>555</td>
<td>526</td>
<td>675</td>
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<td>675</td>
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<td>710</td>
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<td>690</td>
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<td>710</td>
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</tbody>
</table>

Run chart

Hours

Median = 677.50

6 runs – 24 data points – too few
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

Why should I be interested in frequency plots?
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?*

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

Clinic A

Clinic B

\[ \bar{X} = 45 \]

Why are these two distributions different?
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.

**Why should I be interested in Pareto Diagrams?**
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.
Why should I be interested in Scatter Plots?

Moving Beyond One Variable

$X \leftrightarrow Y$

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 7.10 A weak positive relationship between the two variables

Figure 7.11 A strong negative 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.
A Final Thought on Scatterplots

Scatterplots do not prove anything!

They help you:

• Understand relationships
• Understand the direction and strength of the relationships

Why should I be interested in Linking the Tools?
### 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?

<table>
<thead>
<tr>
<th>Group</th>
<th>Ave Mo. CABG Mortality Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.48%</td>
<td>$17,000</td>
</tr>
<tr>
<td>B</td>
<td>3.48%</td>
<td>$13,000</td>
</tr>
<tr>
<td>C</td>
<td>3.48%</td>
<td>$14,500</td>
</tr>
</tbody>
</table>

### Comparison of Averages, Histograms and Run Charts

<table>
<thead>
<tr>
<th>Group</th>
<th>% Monthly CABG Mortality (Ave 3.48%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[Histogram Image]</td>
</tr>
<tr>
<td>B</td>
<td>[Histogram Image]</td>
</tr>
<tr>
<td>C</td>
<td>[Histogram Image]</td>
</tr>
</tbody>
</table>
Comparison of Averages, Histograms and Run Charts

Group A: % Monthly CABG Mortality (Ave 3.48%)

Group B: % Monthly CABG Mortality (Ave 3.48%)

Group C: % Monthly CABG Mortality (Ave 3.48%)

Group A: Percent CABG Mortality

Group B: Percent CABG Mortality

Group C: Percent CABG Mortality