Quality Improvement
Community of Learning

Measurement for Improvement

July 10th, 2023
3-4 PM ET

ALLIANCE FOR INNOVATION ON MATERNAL HEALTH
NATIONAL INSTITUTE FOR CHILDREN'S HEALTH QUALITY
Welcome!

Thank you for joining the call! We will get start at top of the hour

You are muted upon entry to the call; please unmute yourself to talk - we want to hear from you!

We encourage you to listen, ask hard question, share information, speak your truth.

This presentation will be recorded
The NICHQ Team

Stacey C. Penny, MSW, MPH
Senior Project Director

Callie Rowland, MPH
Project Manager

Rinka Murakami, MPH
Analyst, Applied Research & Evaluation

Sue Butts-Dion
Improvement Advisor

Jane Taylor, EdD
Improvement Advisor

The faculty have nothing to disclose.
Objectives of the QI Workshop Series

Introduce you to quality improvement basics for those new to quality improvement (QI) and offer you an opportunity to practice improvement skills and receive feedback and engage deeper with office hours. We are supporting your learning in

- Laying a foundation for learning and improving
- Developing improvement capability for your PQC, and other state or hospital-based teams
- Applying QI principles to your existing projects
What to Expect from this QI Basics Learning Series

• So far, we covered: setting aims, testing changes and today we focus using data for improvement and learning. Final workshop will address Holding the Gains and Spread

• Pre-work optional assignments for next workshop for action learning

• Targeted coaching, feedback, support and assistance in office hour calls
Discussion Questions

As we move through the workshop today consider:
How will you advise your team to use data to facilitate learning?
How will you coach your team(s) to avoid jumping to conclusions about whether and how they are improving?
Preworkshop Poll (True or False)

• Run chart rules provide signals of special or common cause variation
• Run charts are frequently displayed in the sequence of time
• Run charts can start with one data point
### QI Community of Learning Overview

Be sure to add all webinars to your calendar if you have not already done so!

<table>
<thead>
<tr>
<th>Session Title</th>
<th>Date and Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Improvement: What and Why? Foundations of Improvement</td>
<td>Thursday, May 25&lt;sup&gt;th&lt;/sup&gt; 2023 3:00 – 4:00 PM ET</td>
</tr>
<tr>
<td>Activating the How Using PDSA Cycles to Learn and Improve</td>
<td>Monday, June 12&lt;sup&gt;th&lt;/sup&gt; 2023 3:00 – 4:00 PM ET</td>
</tr>
<tr>
<td><strong>Measurement for Improvement</strong> Collecting, Displaying, and Analyzing Data for Learning and Improvement</td>
<td>Monday, July 10&lt;sup&gt;th&lt;/sup&gt; 3:00 – 4:00 PM ET</td>
</tr>
<tr>
<td><strong>Holding the Gains and Spread</strong> Sustaining Improvement and Cohort Learning</td>
<td>Monday, August 21&lt;sup&gt;st&lt;/sup&gt; 3:00 – 4:00 PM ET</td>
</tr>
</tbody>
</table>
Agenda for Session 2

• Welcome
• Review a PDSA (homework from Session #2)
• Using data for learning whether and how much improvement occurs from testing changes and implementing changes
• Surface questions and discussions about data or measures for improvement
Welcome and Review

Let's share Leah's Sanchez's PDSA cycle
Thank you to those who attended office hours and those who submitted PDSA cycles.
Use data in run charts to foster learning about improvement.

Selecting Useful Measures
Measurement
<table>
<thead>
<tr>
<th>Category</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome measures</strong></td>
<td>• Did our changes impact the aim as predicted?</td>
</tr>
<tr>
<td></td>
<td>• Are we getting results and seeing improvement based on our aim?</td>
</tr>
<tr>
<td></td>
<td>• The “what” of the QI project</td>
</tr>
<tr>
<td></td>
<td>• Limit to a small set of measures</td>
</tr>
<tr>
<td><strong>Process measures</strong></td>
<td>• How did we make the changes?</td>
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<td>• Reflects key steps required for improvement</td>
</tr>
<tr>
<td></td>
<td>• The “how” of the QI project</td>
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<td></td>
<td>• Limit to a few measures</td>
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<tr>
<td><strong>Balancing measures</strong></td>
<td>• Unintended consequences of improving the system</td>
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<td>• May be positive or negative</td>
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<td>• May be something else your team wants to monitor</td>
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<td>• Limit to one or two measures</td>
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</tbody>
</table>
Aim employs Structural Measures (Donabedian)

• A measure meant to designate the conditions under which care is provided:
  • Material resources (such as equipment and facilities)
  • Human resources (such as the number, variety and qualifications of professional and support personnel—educated or not)
  • Organizational characteristics (such as the organization of the staff—staffing models, presence of teaching functions, supervision and performance review, methods of paying for care, etc.)
<table>
<thead>
<tr>
<th>Metric</th>
<th>Name</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
</table>
| P1     | Timely Treatment of Persistent Severe Hypertension | **Report N/D**  
**Denominator:** Pregnant and postpartum people with acute-onset severe hypertension that persists for 15 minutes or more, including those with preeclampsia, gestational or chronic hypertension  
**Numerator:** Among the denominator, those who were treated within 1 hour with IV Labetalol, IV Hydralazine, or PO Nifedipine. The 1 hour is measured from the first severe range BP reading, assuming confirmation of persistent elevation through a second reading. | • Disaggregate by race/ethnicity, payor  
• Full measurement specifications can be found in this SMFM Special Statement |
An Operational Definition...

Puts communicable meaning to a concept by specifying how the concept will be applied within a particular set of circumstances.

- It gives communicable meaning to a concept
- Is clear and unambiguous
- Specifies measurement methods and equipment
- Identifies criteria for measurement

W. Edwards Deming
Operational Definitions

What does “clean” mean?
Organizing Your Measures Worksheet

Topic for Improvement:

<table>
<thead>
<tr>
<th>Aim/Driver Concept</th>
<th>Potential Measure(s)</th>
<th>Outcome</th>
<th>Process</th>
<th>Balancing</th>
<th>Structure</th>
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# Example

## Organizing Your Measures Worksheet

**Topic for Improvement:** Severe Maternal Hypertension (HTN)

<table>
<thead>
<tr>
<th>Concept</th>
<th>Potential Measure(s)</th>
<th>Outcome</th>
<th>Process</th>
<th>Balancing</th>
<th>Structure</th>
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</thead>
<tbody>
<tr>
<td>Harm</td>
<td>Maternal morbidity and mortality rates</td>
<td>✔️</td>
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<tr>
<td>Timely treatment</td>
<td>Percent of birthing people with severe range BP treated within 60 minutes</td>
<td>✔️</td>
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<tr>
<td>Readmissions</td>
<td>Percent of birthing people readmitted w/ complications from severe maternal HTN</td>
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<td>✔️</td>
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<tr>
<td>Staff Education</td>
<td>Percent of staff fully trained in identifying and treating severe maternal HTN</td>
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<td></td>
<td>✔️</td>
<td></td>
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</tbody>
</table>

Operational Definition Worksheet

Measure Name: ______________________________________
(Remember this should be specific and quantifiable, e.g., the time it takes to..., the number of..., the percent of... or the rate of...)

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.”

Can you develop good Operational Definitions?
# Data Collection Plan Worksheet

Project: _____________________________________________________

<table>
<thead>
<tr>
<th>Measure Name</th>
<th>Is Stratification appropriate? If Yes, list the levels of stratification</th>
<th>Will you use sampling? If Yes, describe the sampling method you will use</th>
<th>Frequency of data collection (e.g., hourly, daily weekly?)</th>
<th>Duration of data collection (i.e., how long do you plan to collect the data?)</th>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Measure Name (Be sure to indicate if it is a count, percent, rate, days between, etc.)</th>
<th>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)</th>
<th>Data Collection Plan (How will the data be collected? Who will do it? Frequency? Duration? What is to be excluded?)</th>
<th>Goal</th>
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Data is not just numbers, or “quantitative data”, but “qualitative data” as well.
Displaying Data

"Go for it, Sidney! You've got it! You've got it! Good hands! Don't choke!"
Over Time rather than Before/After

% treated w/in 60 minutes

- April 2020
- Mar 2021

% treated w/in 60 minutes

- Series1
- Series2

Month/Year

Month

Month:
- April-20
- May-20
- June-20
- July-20
- August-20
- September-20
- October-20
- November-20
- December-20
- January-21
- February-21
- March-21

% treated
Two key tools help us to uncover and understand variation in our data.

- Can be for any type of data
- No calculations are required.
- Can easily make by hand
- Show behavior at-a-glance
- They are easily understood
- 3 Elements: Measurement, Time, & Median

- Adds limits (4th element)
- More sensitive
- Center Line = Mean
- But more complex
- Need software
Elements of a Run Chart

The centerline (CL) on a Run Chart is the Median

Median = 4.610
Median vs. Mean

Median = Middle value of ordered data
Mean = Arithmetic average of data

- \(8,10,11,14,16,18,20\)  \(\text{Mean} = 13.8\)  \(\text{Median} = 14\)

- \(8,10,11,14,16,18,20,35\)  \(\text{Mean} = 16.5\)  \(\text{Median} = 15\)
Frequently Asked Questions

1. Why do we use run charts for improvement projects?
1. Make process performance visible

3. Determine if we are holding the gains

2. Determine if a change is an improvement
Frequently Asked Questions

2. How many data points do we need for a run chart?
• *Ideally* you should have more than 8 data points before constructing a run chart.
• May start a line graph with just two points

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, by adding in median
Practically, you can . . .

- Just start; plot the dots
- Add a “temporary” or “provisional” median
- After 10-12 points, establish a median
- Apply rules, rephase as needed when suggested by rules and you understand changes that led to improvement
Frequently Asked Questions

3. How often should we collect data for improvement?
## Lead and Lag Measures

<table>
<thead>
<tr>
<th></th>
<th>Lag</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Reflect what we want to improve</td>
<td>Reflect key processes and changes that contribute to achieving the aim of a related lag measure</td>
</tr>
<tr>
<td></td>
<td>Mortality and Morbidity data</td>
<td>% of those with HTN with BP cuff @d/c</td>
</tr>
<tr>
<td><strong>Responsiveness</strong></td>
<td>Time delay between tests of change and the desired improvement</td>
<td>Provide earlier signals of improvement when tightly linked to lag measure of improvement</td>
</tr>
<tr>
<td><strong>Collection</strong></td>
<td>Data may lag due to complexities related to data collection, assessment, and frequency reported</td>
<td>May be collected locally, i.e., at point of service; more frequently; more sensitive to change than a lag measure</td>
</tr>
</tbody>
</table>

Source: Jane Taylor, EdD, Improvement Advisor
Percentage treated within 60 minutes

Lapsed minutes between first and second

Lapsed minutes between confirmation and treatment

Family of Measures for HTN

Compliance with OB HTN Pathway – “All Entries”

% with HTN Disorder d/c with blood pressure cuff

Lapsed minutes between confirmation and treatment

NICHQ
Measure Frequency-Monthly Minimum (Mock Data)

Aggregate Average % patients with Individualized Inpatient Care Plan-Monthly
Jan 2019-November 2019

Aggregate average % patients with Individualized Care Plan-Quarterly
February-November, 2019

Aggregate Average % patients with Individualized Inpatient Care Plan-Weekly
Jan 2019-November 2019

Source: Butts-Dion Consulting, Inc. SBD
Now What?

Using Run Chart Rules to Analyze the Story in Our Data and to Inform Action
Three simple run chart rules identify signal(s) in our data

**A Shift**
- Six (6) or more consecutive points either all above or all below the median.
- Skip values that fall on the median and continue counting.

**A Trend**
- Five (5) or more consecutive points in a row, all going up or all going down.
- Consecutive like values are counted only once.

**An Astronomical Point**
- A blatantly different value.
- Extreme point(s) far beyond data range, all agree.
A Shift

- Six (6) or more consecutive points either all above or all below the median.
- Skip values that fall on the median and continue counting
A Trend

• Five (5) or more consecutive points in a row, all going up or all going down.
  • Consecutive like values are counted only once
An Astronomical Point

- A blatantly different value.
  - Extreme point(s) far beyond data range, all agree
3. Astro? ____

Average Time to Treat HTN after Confirmatory Reading (in minutes)

<table>
<thead>
<tr>
<th>Obs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26.0</td>
</tr>
<tr>
<td>2</td>
<td>20.0</td>
</tr>
<tr>
<td>3</td>
<td>15.0</td>
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<tr>
<td>4</td>
<td>20.0</td>
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<tr>
<td>5</td>
<td>23.0</td>
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<tr>
<td>6</td>
<td>19.0</td>
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<td>7</td>
<td>16.0</td>
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<tr>
<td>8</td>
<td>16.0</td>
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<td>9</td>
<td>12.0</td>
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<td>10</td>
<td>20.0</td>
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<td>11</td>
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<td>26</td>
<td>7</td>
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<td>27</td>
<td>11</td>
</tr>
<tr>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>29</td>
<td>6</td>
</tr>
</tbody>
</table>

Median = 14

Chart Source: adapted from slide by Phyllis M. Virgil
Percentage of Hypertensive Patients with Controlled Blood Pressure

Baseline

PDSA Testing: Accurate BP, Timely Follow-Up, Outreach

BP measurement training

EHR alert for repeat BP

Outreach

Sustain

Reduced Variation

Shift to a better level

Source: Metro Health, Cincinnati Ohio
In improvement, we want to see favorable signals

We are trying to introduce favorable signals (via change ideas) and then make it sustainable over time – a new process or system.
Preworkshop Poll (True or False)

• Run chart rules provide signals of special or common cause variation
• Run charts are frequently displayed in the sequence of time
• Run charts can start with one data point
Using Run Charts for Improvement

- All data exhibit variation
- Run charts facilitate simple tracking of data over time
- Application of run chart rules identify type of variation present and guide us in what action to take
Understanding Variation leads to Appropriate Action

Random Variation Only, No Unusual Signal Seen
(Act on system)

– Develop and test ideas that might result in improvements to the system

Non-Random Variation, Unusual Signal Seen
(Act on the unusual event or pattern)

– If positive: investigate and propagate
– If negative: investigate and eliminate

Adapted from John S. Dowd, Courses in Continual Improvement

Photo by Victor Sánchez Berruezo on Unsplash

Photo by Iwona Castiello d'Antonio on Unsplash
# Understanding Variation and Taking Appropriate Acting

<table>
<thead>
<tr>
<th>Type of Variation</th>
<th>Random Variation</th>
<th>Non-Random Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate Action</td>
<td>Change the Process (if improvement needed)</td>
<td>Investigate and • Propagate if positive • Eliminate if negative</td>
</tr>
<tr>
<td>Inappropriate Action</td>
<td>Treat each (or any) data point as a special occurrence (aka tampering)</td>
<td>Ignore</td>
</tr>
<tr>
<td>Consequences of Inappropriate Action</td>
<td>Increased variation Frustration Waste of money</td>
<td>If positive – lost opportunity If negative – make things worse</td>
</tr>
</tbody>
</table>

Adapted from John S. Dowd, Deming Collaborator and Consultant in Continual Improvement
Without knowing what type of variation is present, teams...

<table>
<thead>
<tr>
<th>See</th>
<th>trends where there are no trends. Shifts where there are no shifts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blame</td>
<td>and give credit to people for things over which they have no control.</td>
</tr>
<tr>
<td>Spend</td>
<td>a lot of wasted time trying to explain natural variation as special events.</td>
</tr>
</tbody>
</table>
## Run Chart Template

### v. 2.0 • 5-30-2015

*Developed by Richard Scoville, Ph.D. (richard@rscoville.net)*

### Run Chart Tool | IHI - Institute for Healthcare Improvement

<table>
<thead>
<tr>
<th>Date / Observation</th>
<th>Value</th>
<th>Median</th>
<th>Goal</th>
<th>Extend Phase = 'x' New Phase = 'n'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>8.5</td>
<td>30</td>
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<tr>
<td>2</td>
<td>0</td>
<td>8.5</td>
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</tr>
<tr>
<td>20</td>
<td>14</td>
<td>8.5</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

### Instructions:
- Enter dates or observation numbers into the green cells at the right (clear the sample data before you begin).
- Enter your data values into the blue cells. Goal values are optional.
- Don’t leave any blank cells in the Date/Observation column.
- Enter an ‘X’ into the orange column to freeze and extend the median.
- Enter a ‘N’ into the orange column to create a new median (phase).
- Enter your graph title and y-axis label into the cells.

### Graph Title

*Axis Label*

*Goal*

*Median*
Stratifying Data by Race, Ethnicity and Language (REaL)

Deeper Analysis of Data
Stratification by race

Example from infant mortality data
Next Steps

• Submit a run chart from one of your improvement project(s). Include annotations of changes and which run chart rules you used to analyze the data. Submit by Wednesday, August 9th.

• Mark calendar for next workshops
  
  August 21, 2023  3:00 – 4:00 PM ET

• If you want QI technical assistance or time with Sue and/or Jane sign up for office hours
  
  ○ July 20th, July 26th, August 7, August 16th

• If you have not done so already, register for all QI COL sessions and download them to our calendar: https://nichq.zoom.us/meeting/register/tJMtf-2vrjIvHNeOQsssPR1jeVR-E2PVgn8z
Reminder: TA Sessions

• Sign up for a TA session at link in the chat and email

• Complete this TA request form to set up a session with Jane or Sue when you’re ready!

• One person from your state, if joining as a state, should fill this out.
Session Evaluation
Resources

• NICHQ:
  • https://www.nichq.org/resource/quality-improvement-101
  • https://www.nichq.org/resource/quality-improvement-102


• The Health Care Dat Guide: Learning from Data for Improvement, Lloyd P. Provost, Sandra K. Murray, Jossey Bass

• Run Charts (Part 1) | IHI - Institute for Healthcare Improvement
• Run Charts (Part 2) | IHI - Institute for Healthcare Improvement
• Control Charts (Part 1) | IHI - Institute for Healthcare Improvement
• Control Charts (Part 2) | IHI - Institute for Healthcare Improvement
Resources

• Youtube video on PDSA _Univ. of Cincinatti:_ https://www.youtube.com/watch?v=_YOq4KXBahM&t=121s

• Use of PDSA as a personal life example, _Domestic Goddess._ https://www.youtube.com/watch?v=jsp-19o_5vU&t=5s

• How to Improve, _IHI Website_  www.ihi.org _How to Improve | IHI - Institute for Healthcare Improvement_