1C - Determining What to Measure

CAUTI Case Outlines the Approach

1. Baselines, Gaps, Aims, Outcomes
   *Where are we now, and what are we trying to accomplish?*

2. Building a Theory of Improvement (Driver Diagram)
   *What should we measure and why?*

3. Mapping the measures (Measure Tree)
   *How will we calculate the measures?*

4. Defining the Measures
   *Attributes of Useful Improvement Measures*

5. Collecting Data and Testing Changes
Case Background: Reducing CAUTIs

Catheter-Associated Urinary Tract Infections

A medium sized acute care hospital has noticed that there has been an increasing occurrence of catheter associated urinary tract infections (CAUTIs) over the past year. Not only has the occurrence of CAUTIs been gradually going up but also the severity of the infections has been increasing.

Indwelling urinary catheters are commonly used medical devices within acute and non-acute settings. But their use does increase the risk of CAUTIs by:

- Enabling organisms to gain entry to the bladder via external surface or opened connections
- Reducing the body's defense of flushing out organisms during urination
- Facilitating biofilm formation

Reducing CAUTIs would contribute to:

- Improving the patient experience
- Reducing the cost of antibiotic prescribing
- Reducing inpatient length of stay
- Reducing readmissions
- Improving patient outcomes

What Are We Trying to Accomplish?
Improvement is a Systems Issue

What’s A ‘System’?

- An interdependent group of items, people, or processes acting with a common purpose.\(^1\)
- Systems include physical, social, and functional aspects.\(^2\)
- Stakeholder (patients, customers, staff) values define the outcomes of the system.
- The system is dynamic: The ‘thing in motion’.
- The system ‘is what it is.’
- Improving system outcomes requires changing the dynamics of the system.

Ain’t It the Truth?

“If you always do what you always did, you’ll always get what you always got.”

- Jackie "Moms" Mabley
Hierarchical Systems of Care

The environment (policy, payment, accreditation, etc.)

Organizations that support Microsystems

Microsystems

Lives of Patients

Source: Don Berwick

Measuring ‘Quality of Care’

- % mortality
- % of patients readmitted in 30 days
- % annual nursing turnover
- % who agree: “I would recommend.”
- % of sepsis patients with antibiotics within 180 minutes
- Average wait time to be seen
- % of ventilator patients with all bundle elements
- CAUTI infection rate
- Diabetes self management goals established for Mr. Alvarez
- Hospice plan set for Mrs. LeGrande and family
- Successful surgical outcome for Mr. Jones
Exercise Part 1: The Voice of the Patient

How would your patients describe the purpose of your system of care?
What do your patients value in 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 dignified death.”

Exercise Part 2: What’s Your System?

1. Describe the system you want to improve; what is it’s ‘level’ (microsystem, organization, …)?
2. Identify the patient population; list other key stakeholders and what they value in the system.
3. Tell how the system needs to change – what improvements are required?
Balancing Stakeholder Values

- Outcomes, Process, & Balancing measures
- Balancing frameworks; Triple Aim
- Unintended consequences

Key Definitions

- **Outcome Measures**
  - Point to qualities that stakeholders value.
  - Is this system meeting the needs of those who care about its operation?
  - Is our improvement work making a meaningful impact?

- **Process Measures**
  - Voice of the process.
  - Are the parts/steps in the system performing as planned? Are processes reliable? Efficient? Patient-Centered?
  - Are we on track to improve?

- **Balancing Measures**
  - Are we producing perverse unintended consequences in our efforts to improve? What other factors may be affecting results?
Balancing Outcomes: IHI Triple Aim

IHI Triple Aim: Examples of Measures

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Health</td>
<td>1. Health/Functional Status: single-question (e.g. from CDC HRQOL-4) or multi-domain (e.g. SF-12, EuroQol)</td>
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<tr>
<td></td>
<td>2. Risk Status: composite health risk appraisal (HRA) score</td>
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<td></td>
<td>3. Disease Burden: Incidence (yearly rate of onset, avg. age of onset) and/or prevalence of major chronic conditions; summary of predictive model scores</td>
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<td>4. Mortality: life expectancy; years of potential life lost; standardized mortality rates. Note: Healthy Life Expectancy (HLE) combines life expectancy and health status into a single measure, reflecting remaining years of life in good health. See <a href="http://reves.ined.fr/en/DFM/definition/">http://reves.ined.fr/en/DFM/definition/</a></td>
</tr>
<tr>
<td>Patient Experience</td>
<td>1. Standard questions from patient surveys, for example:</td>
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<tr>
<td></td>
<td>-Global questions from US CAHPS or How’s Your Health surveys</td>
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<td></td>
<td>-Experience questions from NHS World Class Commissioning or CareQuality Commission</td>
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<td></td>
<td>-Likelihood to recommend</td>
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<td></td>
<td>2. Set of measures based on key dimensions (e.g., US IOM Quality Chasm aims: Safe, Effective, Timely, Efficient, Equitable and Patient-centered)</td>
</tr>
<tr>
<td>Per Capita Cost</td>
<td>1. Total cost per member of the population per month</td>
</tr>
<tr>
<td></td>
<td>2. Hospital and ED utilization rate</td>
</tr>
</tbody>
</table>
IOM Report: Dimensions of Care Quality

- **Safe** - as safe in healthcare as in our homes
- **Effective** - matching care to science; avoiding overuse of ineffective care and underuse of effective care
- **Patient-centered** - honoring the individual and respecting choice
- **Timely** - less waiting for both patients and those who give care
- **Efficient** - reducing waste
- **Equitable** - closing racial and ethnic disparities in access and health status


Balanced Scorecard

Customer

"To achieve our vision, how should we appear to our customers?"

Vision and Strategy

"To succeed financially, how should we appear to our shareholders?"

Learning and Growth

"To achieve our vision, how will we sustain our ability to change and improve?"

Internal Business Processes

"To satisfy our shareholders and customers, what business processes must we excel at?"

Financial

"To achieve our vision, how should we appear to our shareholders?"

Suboptimization

If each part of a system, considered separately, is made to operate as efficiently as possible, then the system as a whole will not operate as effectively as possible.


For Balancing Measures, Listen to the “Yeah, but’s…”

“Yeah, but…
• “… what’s it gonna cost?”
• “… will it really make a difference for my patients?”
• “… we’re already working too hard!”
• “… we don’t need to improve. We already do it every time!”
• “… our adjusted mortality ratio already compares favorably with national benchmarks.”

Beware of Unintended Consequences!
CAUTI Baseline – Key Outcome

What other measures might be needed for a balanced set of outcome measures?

CAUTI Aim

Reduce CAUTI infections in all units below 1.6 (10th percentile) within 12 months and to zero within 24 months.

Aim statement essentials:
• How much?
• By when?
• For whom?
Exercise

1. CAUTI Case Discussion
   ✓ Why are catheter-associated infections measured as ‘Number of CAUTIs per 1000 Foley catheter days?’
   ✓ What is the evidence that the rate of infections has actually been increasing?

2. Own Project: Reflect and discuss in pairs
   ✓ What are you trying to accomplish (your aim?)
   ✓ What is the outcome measure that best captures the aim of your project?
   ✓ What is the baseline level of performance on the outcome? How much does the outcome need to improve?

3. Share with the group

Improvement

So you have a system. That’s nice.
So how can you improve it?
Building a Theory of Improvement

- Driver diagrams
- Prioritization
- Linking drivers and measures

Theory Drives Improvement

“Without theory, there are no questions; without questions, there is no learning.”

W. Edwards Deming

The New Economics for Industry, Government, Education

Second Edition
A Theory of How to Improve a System

Theory for CAUTI Reduction
**Theory for CAUTI Reduction**

A fundamental assumption of clinical QI: Reliable execution of key clinical driver processes improves outcomes measured at the population level.

### Outcomes
- Reduce catheter-associated urinary tract infections by 50% in one year

### Primary Drivers
1. Leadership and aligned policy for catheter use
2. Transparent reporting of process failures
3. Staff training, with feedback on measured protocol compliance
4. Reliable compliance with catheter insertion protocol
5. Reliable compliance with catheter maintenance protocol

### Changes / Interventions
- **Primary Interventions**
  - Clear policies for infection control
  - Eliminate unnecessary catheter insertions
  - Reliable compliance with catheter insertion protocol
  - Reliable compliance with catheter maintenance protocol

- **Secondary Interventions**
  - Transparent reporting of process failures
  - Staff training, with feedback on observed protocol compliance
  - Insert catheters only for appropriate indications
  - Minimize use of catheters for patients at risk for infections
  - Insertion only by trained staff
  - Standard insertion procedure
  - Daily assessment of need, removal at earliest opportunity

- **Maintenance Interventions**
  - Consider alternative methods
  - Standard cleaning and maintenance procedure
  - Remove when no longer required

### Maintenance Bundle:
- Tamper seal intact
- Secured in place
- Hand hygiene
- Meatal hygiene
- Disposal & clean container
- Maintain unobstructed flow

### Insertion Bundle:
- Hand Hygiene
- Sterile gloves, materials
- Aseptic insertion
- Unobstructed flow

**Measuring Improvement**

Measures let us
- Monitor progress in improving the system
- Identify effective changes
Exercise

- Case Discussion
  - Do you have questions or issues about the CAUTI driver diagram?
  - Discuss and resolve. If you get ‘stuck’, raise the question to the group.

- Own Project Discussion
  - Review (or create) your own project driver diagram
  - Discuss in pairs (or to table)
  - Be prepared to share with the group

Identifying Process Measures

- Prioritizing drivers
- Measure Tree Diagram
Prioritizing Drivers

Limitations of resources, attention or will usually mean we cannot work on (or measure!) everything.

Priorities:
- Where is the ‘Bang for Buck?’ Which drivers do we believe will deliver the biggest impact?
- Which ones will be easiest to work on? Most difficult? Are some ‘beyond our control’?
- What is our current level of performance on these drivers?

CAUTI Driver Rankings
CAUTI Priority Measure Concepts

- **S4: Insert catheters only for appropriate indications.**
  The most effective way to eliminate the possibility of a CAUTI is to eliminate an unneeded catheter.

- **S7: Remove when no longer required.**
  Since the risk of infection is roughly proportional to the time the catheter is in place, removing catheters as soon as possible will reduce the risk.

- **S9: Standard insertion procedure.**
  If trained staff follow strict protocols for aseptic insertion of catheters, the risk of bacterial infection will be minimized.

- **S11: Standard cleaning and maintenance procedure.**
  Similarly, careful adherence to the components of the maintenance bundle will reduce risk.

Measures for CAUTI Reduction

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Primary Drivers</th>
<th>Secondary Drivers</th>
<th>Changes / Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce catheter associated urinary tract infections by 50% in one year</td>
<td>P1 Leadership and aligned policy for catheter use</td>
<td>S1 Clear policies for infection control</td>
<td>M1 Insertion Bundle:</td>
</tr>
<tr>
<td></td>
<td>P3 Eliminate unnecessary catheter insertions</td>
<td>S2 Transparent reporting of process failures</td>
<td>A. Hand Hygiene</td>
</tr>
<tr>
<td></td>
<td>P4 Reliable compliance with catheter insertion protocol</td>
<td>S3 Staff training, with feedback on observed protocol compliance</td>
<td>B. Sterile gloves, materials</td>
</tr>
<tr>
<td></td>
<td>P5 Reliable compliance with catheter maintenance protocol</td>
<td>S4 Insert catheters only for appropriate indications</td>
<td>C. Aseptic insertion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S5 Consider alternative methods</td>
<td>D. Unobstructed flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S6 Minimize use of catheters for patients at risk for infections</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S7 Remove when no longer required</td>
<td></td>
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<td></td>
<td></td>
<td>S8 Insertion only by trained staff</td>
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<td></td>
<td></td>
<td>S9 Standard insertion procedure</td>
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<tr>
<td></td>
<td></td>
<td>S10 Daily assessment of need, removal at earliest opportunity</td>
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<tr>
<td></td>
<td></td>
<td>S11 Standard cleaning and maintenance procedure</td>
<td></td>
</tr>
</tbody>
</table>

Maintenance Bundle: A. Tamper seal intact | B. Secured in place | C. Hand hygiene | D. Mask hygiene | E. Disposable & clean container | F. Maintain unobstructed flow |
CAUTI Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Type</th>
<th>Driver</th>
<th>Desired Direction of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Percent of patients with appropriate catheter placements</td>
<td>Process 54</td>
<td>Insert catheters only for appropriate indications</td>
</tr>
<tr>
<td>M2</td>
<td>Average catheter duration</td>
<td>Process 57</td>
<td>Remove when no longer required</td>
</tr>
<tr>
<td>M4</td>
<td>CAUTIs per 1000 patient days</td>
<td>Outcome N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M3</td>
<td>Count of CAUTIs</td>
<td>Outcome N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M4 (alternate)</td>
<td>Catheter days between CAUTI events</td>
<td>Outcome N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M5</td>
<td>Percent of catheter insertions with all insertion bundle elements in compliance</td>
<td>Process 59</td>
<td>Standard insertion procedure</td>
</tr>
<tr>
<td>M6</td>
<td>Percent of catheter placements with all maintenance bundle elements in compliance</td>
<td>Process 51</td>
<td>Standard cleaning and maintenance procedure</td>
</tr>
</tbody>
</table>

CAUTI Reduction Measures

Denominators:
- D1 Count of patients with catheters in situ in measurement month
- D3, N2 Sum of days with catheters in situ
- D2 Count of catheters inserted in measurement month

Numerator:
- N1 Count of patients meeting criteria for catheter insertion
- N3, M3 Count of CAUTIs in measurement month
- N4 Count of catheter insertions with all insertion bundle elements in compliance
- N5 Count of catheters with all maintenance bundle elements in compliance

Measures:
- M1 Percent of patients with appropriate catheter placements
- M2 Average catheter duration
- M4 CAUTIs per 1000 patient days
- M4 (alternate) Catheter days between CAUTI events
- M5 Percent of catheter insertions with all insertion bundle elements in compliance
- M6 Percent of catheter placements with all maintenance bundle elements in compliance
Exercise

Case Discussion
- Do you have questions or issues about the CAUTI measure tree?
- Discuss and resolve. If you get ‘stuck’, raise the question to the group.

Own Project Discussion
- Based on your own driver diagram, identify the outcome and key process measures you will need (1 outcome, no more than 4 process)
- Be sure your process measures are linked to drivers.
- Sketch a measure tree for your key measures.