Measuring Safety Improvement

Nellie Yeo, MBA, MN
APAC Forum on Quality Improvement in Health Care
Auckland, New Zealand
19 September 2012

Learning Outcomes

- Understand the concept of system-level measures in patient safety and quality improvement work
- Explain the importance of measurement in improvement
- Identify three kinds of measures: process, outcome and balance measures
- State the difference between project-level measures and PDSA-level measures
Health System Levels:
IOM Chasm Report Chain of Effect

Health System
Clinical Service Line
Clinical Unit
Care Giver
Patient

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

Macro-view Health System using Whole System Measures
What are System-level measures?

- Balanced set of measures which are not disease-specific or condition-specific
- Evaluate performance on quality and value
- Serve as input for quality improvement planning
Why balanced set of System-level measures?

- Provides leaders and stakeholders with data
- Shows performance of the health care system over time
- Allows the organization to see how it is performing relative to its strategic plans for improvement
- Serves as input to strategic quality improvement planning

Levels of Measures within the Healthcare System

The Big Dots

1. Institution-wide (not program specific)
2. Outcome driven (not process indicator)
3. Connect to other “little” dots or processes (multi-faceted)
4. Reflect organization’s strategic priorities
5. Reflect organization’s quality definition
Big Dot Approaches

<table>
<thead>
<tr>
<th>Themed Categories (Patient Credo)</th>
<th>Clinical Categories (McLeod Health, S Carolina)</th>
<th>Strategic Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Heal Me</td>
<td>- Complications</td>
<td>- Patient Safety</td>
</tr>
<tr>
<td>- Don’t Hurt Me</td>
<td>- Readmissions</td>
<td>- Patient Flow</td>
</tr>
<tr>
<td>- Be Nice To Me</td>
<td>- Mortality</td>
<td>- Mission Excellence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Financial Stewardship</td>
</tr>
</tbody>
</table>

Example: Big Dot connecting with Little Dots

<table>
<thead>
<tr>
<th>Big Dot</th>
<th>Little Dots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Standardized Mortality Ratio</td>
<td>Infections, Medication Error, Falls</td>
</tr>
<tr>
<td>Emergency Department Wait Times</td>
<td>Time to Lab results, Time to DI results, Awaiting for discharge patients</td>
</tr>
<tr>
<td>Margin</td>
<td>Volumes, Bed turns, Sick time</td>
</tr>
</tbody>
</table>

Source: www.patientsafetyinstitute.ca/.../Big%20Dot%20Little%20Dot%20-
Example: Cascading System of Measures

- **Tier 1**: Board & CEO
  - T1: % Inpatient Mortality

- **Tier 2**: Sr VPs & VPs
  - T2: Hospital Acquired Infection Rate

- **Tier 3**: Business Process Quality Management (BPQM)
  - T3: % compliance with bundles
    - T4 VAP bundle
    - Central Line bundle
    - Pressure Ulcer bundle
    - Hand Hygiene bundle

Example: What Changes Can We Make?
Understanding the System for Reducing Hospital Acquired Infections

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Primary Drivers</th>
<th>Secondary Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1: Reduce infections from MRSA, VRE and C. difficile by 30%</td>
<td>P1. Prevention of transmission</td>
<td>S1. Identify patients with ASC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2. Use contact precautions for colonized or infected patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S3. Use appropriate room cleaning and disinfection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S4. Use dedicated equipment for colonized and infected patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S5. Reliable hand hygiene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S6. Comply with all central line bundle components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S7. Comply with all ventilator bundle components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S8. Use decolonization to decrease burden of organisms</td>
</tr>
</tbody>
</table>
### Example: How Will We Know We Are Improving?
Understanding the System for Reducing Hospital Acquired Infections with Measures

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Primary Drivers</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>01. Reduce infections from MRSA, VRE, and C. difficile by 30%</td>
<td>P1. Prevention of transmission</td>
<td>S1. Identify patients with admission surveillance culture collected</td>
</tr>
<tr>
<td>02. Rate of occurrence of MRSA BSI and HAP per 1000 patient days</td>
<td></td>
<td>S2. Use contact precautions</td>
</tr>
<tr>
<td>03. Rate of occurrence of VRE BSI and UTI per 1000 patient days</td>
<td></td>
<td>S3. Use appropriate cleaning</td>
</tr>
<tr>
<td>04. Percent of patients with C. difficile associated disease</td>
<td>P2. Prevention of infection</td>
<td>S4. Use dedicated equipment for colonized and infected patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S5. Relate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S6. Comply with all bundle components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S7. Comply with bundle component</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S8. Use decolonization to decrease burden of organisms</td>
</tr>
</tbody>
</table>

---

### Singapore Story

© National Healthcare Group, SIN
To Decrease Adverse Event Rate for Inpatients at Hospital A from 11% to less than 5% by 2013

Culture & Learning
- Improvement Programme Training Status
- Total No. of eHOR Raised

Teamwork & Communications
- Hospital Acquired Infections
  - MRSA Prevalence
  - VAP Rate for all ICUs
  - Central Line related blood infection rates
  - Catheter related UTI rates
  - Surgical Site Infection

Medication Errors
- Adverse Events in Mortality Cases reviewed by CRP
- Adverse Events per 1000 patient days
- Reported medication Error Incidence
- Medication Reconciliation

Procedural Adverse Events
- Inpatient Anticoagulation Service for Warfarin Titration
- Procedural AEs per 1000 patient days

Adverse Events
- Total No. of eHOR Performed

Medication Safety

1. Medication Errors
   - Reported medication error incidence
   - Medication Reconciliation
   - Inpatient Anticoagulation Service for Warfarin Titration

2. Warfarin Titration
   - Ensure safe use of warfarin and reduce patient harm associated with its use

3. Culture of Safety
   - Increase voluntary electronic hospital occurrence reporting

Indicators Status in Key Areas

- Patient's perspective
  - Medication errors related to incorrect medication
  - Medication errors related to incorrect dosage
  - Medication errors related to incorrect route
  - Medication errors related to incorrect schedule
  - Medication errors related to incorrect administration

- Provider's perspective
  - Medication errors related to incorrect documentation
  - Medication errors related to incorrect communication
  - Medication errors related to incorrect medication administration
  - Medication errors related to incorrect medication storage

- Organizational perspective
  - Medication errors related to incorrect systems
  - Medication errors related to incorrect policies
  - Medication errors related to incorrect procedures
  - Medication errors related to incorrect training

© National Healthcare Group, SIN
Examples of effective AIM statements

- Reduce potential medication errors by 30% through medication reconciliation for newly admitted patients in the next 6 months
- Reduce time of Warfarin titration to therapeutic INR from 90% within 11 days to 90% within 5 days for newly hospitalized patients
- Increase rate of voluntary electronic hospital occurrence reporting from a monthly mean of 100 to 200 per month by the 1st quarter of 2008

Why are we measuring?

Research?  Judgment?  Improvement?

The answer to this question will guide your entire quality measurement journey!
**Measures... ?**

- Drive improvement
- Inform consumers
- Influence payment

“Measurement matters. When clinicians see their numbers, they act to improve them, using their professional pride and competitiveness to find solutions.”

- Randall D Cebul, MD, Director, Better Health Greater Cleveland -

---

**Model of Improvement**

Using Data to understand progress toward the team’s aim

Using Data to answer the questions posed in the plan for each PDSA cycle
Questions?

How will I know that a change is an improvement?

How can I construct measures that will usefully and efficiently answer this question?

Driver Diagram

- Helps to understand the system
- Helps to identify key measures to track improvement in the system
- Assessing system quality may require a combination of several measures
- Helps to organize measures
Understanding the system for reducing medication errors

**GLOBAL AIM**
Zero Harm

**SMART AIM**

To decrease Adverse Event (AE) Rate for Inpatients at Hospital A from 11% to less than 5% by 2013

**OUTCOME MEASURE**
AE per 1000 patient days

What changes can we make?

<table>
<thead>
<tr>
<th>Primary Drivers</th>
<th>Secondary Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What?</strong></td>
<td><strong>How?</strong></td>
</tr>
<tr>
<td>Culture of Safety</td>
<td>Patient Safety and Improvement Workshops</td>
</tr>
<tr>
<td></td>
<td>Physician Engagement</td>
</tr>
<tr>
<td></td>
<td>Patient Safety and Improvement Projects</td>
</tr>
<tr>
<td></td>
<td>Voluntary Electronic Reporting</td>
</tr>
<tr>
<td></td>
<td>Open &amp; Pair Incident Reporting Policy</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
</tr>
</tbody>
</table>

**Management of High Risk Drug Warfarin**

- Inpatient Anticoagulation Service for Warfarin Titration
- Use Pharmacists to assist with identification of Alternatives when contraindications exist
- Use Protocol to discontinue or restart Warfarin pre-operatively

**Medication Errors**

- Analysis of Reported Incidents
- Risk Analysis FMEA
- Medication Reconciliation
- Smart Use of Technology
- Electronic Inpatient Medication Record

How will we know we are improving?

| Percentage of Physicians attended CPIP |
| Percentage of Physicians became coaches |
| Number of Medication Safety Projects |
| Number of Sustained Projects |
| Number of eHOR Raised |
| Annual Patient Safety Climate Survey |
| Number of Patient Safety Leadership Walk-abouts |
| Percentage of raised issues closed |

Quality Measurement Journey

AIM (Why are you measuring?)

- Concept
- Measure
- Operational Definitions
- Data Collection Plan
- Data Collection
- Analysis
- Action
Every concept can have many measures

<table>
<thead>
<tr>
<th>Concept</th>
<th>Potential Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Hygiene</td>
<td>Ounces of hand gel used each day</td>
</tr>
<tr>
<td></td>
<td>Ounces of gel used per staff</td>
</tr>
<tr>
<td></td>
<td>Percent of staff washing their hands (before and after visiting a patient)</td>
</tr>
<tr>
<td>Medication Errors</td>
<td>Percent of errors</td>
</tr>
<tr>
<td></td>
<td>Number of errors</td>
</tr>
<tr>
<td></td>
<td>Medication error rate</td>
</tr>
<tr>
<td>VAPs</td>
<td>Percent of patients with a VAP</td>
</tr>
<tr>
<td></td>
<td>Number of VAPs in a month</td>
</tr>
<tr>
<td></td>
<td>The number of days without a VAP</td>
</tr>
</tbody>
</table>

Source: R Lloyd, Quality Health Care, pages 68-71

Three Types of Measures

- **Outcome Measures**: Voice of the customer or patient. How is the system performing? What is the result?

- **Process Measures**: Voice of the workings of the system. Are the parts/steps in the system performing as planned?

- **Balance Measures**: Looking at a system from different directions/dimensions. What happened to the system as we improve the outcome and process measures? (eg unanticipated consequences, other factors influencing outcome)
### Example: Diabetes Care Measures

<table>
<thead>
<tr>
<th>Outcome</th>
<th>% of patients with HbA1c &lt; 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of patients with BP &lt;= 130/80</td>
</tr>
<tr>
<td></td>
<td>% of patients with LDL &lt; 100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process</th>
<th>% of patients with &gt;= 1 LDL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of patients with &gt;= 9 HbA1c</td>
</tr>
<tr>
<td></td>
<td>% of patients with foot exam</td>
</tr>
<tr>
<td></td>
<td>% of patients with eye exam</td>
</tr>
<tr>
<td></td>
<td>% of patients with micro-albumin screen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Balancing</th>
<th>Annual cost per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cycle time</td>
</tr>
<tr>
<td></td>
<td>Staff satisfaction</td>
</tr>
</tbody>
</table>

### Potential Set of Measures for improvement in the ED

<table>
<thead>
<tr>
<th>Topic</th>
<th>Outcome Measures</th>
<th>Process Measures</th>
<th>Balance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve waiting time and patient satisfaction in the ED</td>
<td>Total Length of Stay in the ED</td>
<td>Time to registration</td>
<td>Volumes</td>
</tr>
<tr>
<td></td>
<td>Patient Satisfaction Scores</td>
<td>Patient/staff comments on flow</td>
<td>% Leaving without being seen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% patient receiving discharge materials</td>
<td>Staff satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Availability of antibiotics</td>
<td>Financials</td>
</tr>
</tbody>
</table>

© National Healthcare Group, SIN

© 2008 Institute for Healthcare Improvement/R Lloyd & R Scoville

© National Healthcare Group, SIN
### Scottish Patient Safety Program
#### Key Measures: General Ward

**Outcome Measures**
1. Crash Call rate
2. *Staph. aureus* Bacteraemias (SABs) rate or Days between SABs
3. *C. difficile* associated disease rate or Days between *C. difficile* associated disease occurrences

**Process Measures**
1. Percent compliance with Early Warning Score Assessment
2. The percent of patients for which a respiratory rate is recorded each time observation occurs
3. Percent of patients identified as at risk that have appropriate interventions undertaken in terms of their management as categorized by the early warning score
4. Number of calls to the outreach team
5. Percent compliance with hand hygiene
6. Percent compliance with using safety briefings
7. Percent compliance with using SBAR

### Scottish Patient Safety Program
#### Key Measures: Critical Care

**Outcome Measures**
1. Ventilator-acquired pneumonia rate
2. Central line bloodstream infections or Days between CLC bloodstream infections
3. *Staph. aureus* Bacteraemias (SABs) rate or Days between SABs
4. *C. difficile* associated disease rate or Days between *C. difficile* associated occurrences
5. Percent ICU and HDU mortality
6. Percent of ICU and HDU blood sugar results within range (3.5 – 8.5 mmol/L)

**Process Measures**
1. Average length of stay (ALOS) on mechanical ventilation
2. Percent compliance with preventing VAP care bundle
3. Percent compliance with central line bundle
4. Percent compliance with hand hygiene
5. Percent achievement of multi-disciplinary rounds and daily goals
6. Re-intubation rate

**Balance Measure**
1. ICU ALOS

© National Healthcare Group, SIN
How will we know we are improving

**MEASURES**

- Percentage of Physicians attended CPIP
- Percentage of Physicians certified coaches
- Number of Medication Safety Projects
- Percentage of Sustained Projects
- Number of eHOR Raised
- Annual Patient Safety Climate Survey
- Number of Patient Safety Leadership Walk-abouts
- Percentage of raised issues closed
- Percentage of patients achieving therapeutic INR within 5 days from Warfarin Titration
- Percentage of admissions associated with Anticoagulation due to Warfarin use
- Total Length of Stay
- Number of Root Cause Analysis
- Number of Failure Mode Effect Analysis
- Percentage of medication errors prevented through medication reconciliation
- Adverse Drug Event Rate
- Number of days without medication error

**Outcome**

- Adverse Drug Event Rate
- Percentage of patients achieving therapeutic INR within 5 days from Warfarin Titration
- Total Length of Stay (LOS)

**Process**

- Percentage of physicians attended CPIP
- Percentage of medication errors prevented through medication reconciliation

**Balance**

- Average Length of Stay (ALOS)
- Number of days without medication error

---

**Improving Medication Errors**

---

**Project Measure vs PDSA Cycle Measures**

- **Achieving Aim**
  - Data for Project Measures
  - Outcome, Process and Balance measures for the life of the project

- **Adapting changes during PDSA Cycles**
  - Data for PDSA Measures
  - Quantitative data
  - Qualitative data
  - Stratification of project measures for particular patients or providers
  - Collect only during cycles

© National Healthcare Group, SIN
Developing improvement with PDSAs

Implementing new procedures & systems - sustaining change

Changes that result in improvement

Testing and refining ideas

Accumulating information and knowledge

Data

Bright idea!

PDSA Worksheet for Testing Change

Aim: Reduce PVC related infections by 50% within 6 months by implementing the PVC bundle with 95% compliance in the medical HDU in Board X

Describe your first (or next) test of change

<table>
<thead>
<tr>
<th>Person Responsible</th>
<th>When to be done</th>
<th>Where to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test the PVC bundle on one patient with one nurse on one shift</td>
<td>Nurse A</td>
<td>17.11.10</td>
</tr>
</tbody>
</table>

Plan

List the tasks needed to set up this test of change

<table>
<thead>
<tr>
<th>Person Responsible</th>
<th>When to be done</th>
<th>Where to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steal shamelessly a template from another unit! Ask nurse to assist and explain PDSA Identify patient at nurse handover that day</td>
<td>Nurse A</td>
<td>16.11.10</td>
</tr>
</tbody>
</table>

Predict what will happen when the test is carried out

<table>
<thead>
<tr>
<th>Measures to determine if prediction succeeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse will use form but will not meet needs of this unit, format not suitable, duplication of existing paperwork</td>
</tr>
<tr>
<td>Did the patient receive the bundle yes/no</td>
</tr>
</tbody>
</table>

Do

Describe what actually happened when you ran the test

Study

Describe the measured results and how they compared to the predictions

Act

Describe what modifications to the plan will be made for the next cycle from what you learned

© National Healthcare Group, SIN
Activity: Which are Measures?

<table>
<thead>
<tr>
<th>Healthcare Associated Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Events</td>
</tr>
<tr>
<td>Patient Satisfaction</td>
</tr>
<tr>
<td>Percentage of Emergency Percutaneous Coronary Intervention within 90 minutes of arrival</td>
</tr>
<tr>
<td>Percentage of extraction of Cataract with/without implant</td>
</tr>
<tr>
<td>Health Screening</td>
</tr>
<tr>
<td>30-day readmission rate after Acute Myocardial Infarction</td>
</tr>
<tr>
<td>Average length of stay for Acute Stroke</td>
</tr>
</tbody>
</table>

© National Healthcare Group, SIN

The Measurement Imperative

"Not everything that counts can be counted, and not everything that can be counted counts"

- Albert Einstein -

“If you can’t measure it, you can’t manage it”

- W Edwards Deming -
Acknowledgements

Materials for program sourced from:
- The Improvement Guide: A Practical Approach to Enhancing Organizational Performance by Gerald J. Langley et al
- The Healthcare Quality Book: Vision, Strategy & Tools by Scott B. Ransom et al
- Toward Optimized Practice [Online information; retrieved on 24/08/12.]
- www.topalbertdoctors.org/services.
- Enhancing Clinical Practice Improvement: A Tribute, 2008 (National Healthcare Group, Singapore)
- Adding Years of Healthy Life, 2010 (National Healthcare Group, Singapore)
- Model for Improvement by Carol Haraden (Institute for Healthcare Improvement)
- www.scottishpatientsafetyprogramme.scot.nhs.uk/.../...
- www.patientsafetyinstitute.ca/.../Big%20Dot%20Little%20Dot%20...
- Visuals adapted from Flickr/LumaxArt