Improving the Quality and Safety of Patient Care
Lessons Learned from Hand Hygiene

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Objectives

- Understand the basic components of the Model for Improvement
- Effectively use data to guide the improvement process
- Be able to design and run test a change
- List the steps needed to sustain improvement

WHY DO WE NEED TO IMPROVE?

Medical Errors

<table>
<thead>
<tr>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>44,000-98,000 Americans die each year from medical errors (1999 est.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9%-3.7% hospitalized patients have an adverse event (annual estimates)</td>
</tr>
<tr>
<td>Adverse drug reactions occur during 2.0%-6.7% of hospital admissions (annual estimates)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost attributable to medical errors (2008 est.) is $19.5 billion</td>
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<tr>
<td>Total cost per error (2008 est.) is $13,000</td>
</tr>
<tr>
<td>Annual cost attributable to surgical errors (2008 est.) is $1.5 billion</td>
</tr>
</tbody>
</table>

Types of Errors

- **Diagnoses**
  - Error or delay in diagnosis
  - Failure to employ indicated tests
  - Use of outdated tests or therapy
  - Failure to act on results of monitoring or testing

- **Treatments**
  - Error in the performance of an operation, procedure, or test
  - Error in administering the treatment
  - Error in the dose or method of using a drug
  - Avoidable delay in treatment or in responding to an abnormal test
  - Inappropriate (not indicated) care

- **Preventive**
  - Failure to provide prophylactic treatment
  - Inadequate monitoring or follow-up of treatment

- **Other**
  - Failure of communication
  - Equipment failure
  - Other system failure

Healthcare-Associated Infections

Each year in U.S. hospitals alone:
- **1.7 million** healthcare-associated infections
- **99,000** associated deaths

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Why do We Fail?

“One of the report’s main conclusions is that the majority of medical errors do not result from individual recklessness or the actions of a particular group—this is not a “bad apple” problem. More commonly, errors are caused by faulty systems, processes, and conditions that lead people to make mistakes or fail to prevent them.”

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The Improvement Model

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in improvement?

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Evidence Supporting the Effectiveness of Hand Hygiene

- Hospitals that have improved the hand hygiene practices of their healthcare workers have:
  - Decreased their rates of (HAIs) by **almost 50%**
  - Decreased the HAI rate of multi-drug resistant bacteria like MRSA from **0.52 to 0.24** per 1,000 patient-days
  - Decreased the HAI rate of hospital-associated viral infections such as rotavirus from **5.9 to 2.2** episodes per 1,000 discharged patients

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So Why Hand Hygiene?

- Hand hygiene is one of the most important ways to prevent healthcare-associated infections (HAIs)
- How we treat a simple safety measure like hand hygiene says a lot about our overall attention to patient safety.
- Education and supply availability have not proven to be enough
- Complex behavior
  - Self efficacy
  - Behavior of role models and peers
  - Expectations of leadership
  - Long-standing habits

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What Actually Happens

- Overall median hand hygiene compliance rate: **40%**
- ICU settings: **40-50%**
- Non-ICU settings: **50-60%**
- Physicians: **32%**
- Nurses: **48%**
- Before care: **21%**
- After care: **47%**
The Improvement Model

What are we trying to accomplish?

How will we know that a change is an improvement?

What changes can we make that will result in improvement?

Defining the Problem

• Collect data about the problem
  – Key outcomes
  – Processes related to the problem
• Review the literature
• Talk with people intimately related to the problem
  – Frontline staff
  – Patients and families

Hand Hygiene Improvement Project Design

• This was a quasi-experimental study using a staggered intervention design.
• Interventions were sequentially tested on 2 general pediatric units using the model for improvement.
• 12 months of baseline hand hygiene compliance data was obtained prior to interventions.
• Measurement of HCW hand hygiene compliance was performed by covert observations made during routine patient care.

Defining a Problem

If I had only one hour to save the world, I would spend 55 minutes defining the problem and only five minutes finding the solution.

- Albert Einstein
**Literature Review**

- HCWs knowledgeable about when, how and why to perform hand hygiene correctly
- Hand hygiene supplies consistently available at the point of care
- Leadership committed to improving hand hygiene compliance
- HCW behavior had to be addressed
  - Create a change in culture
  - Change long-standing habits


**Setting Project Goals**

- **S**: SPECIFIC
- **M**: MEASURABLE
- **A**: ATTAINABLE
- **R**: RELEVANT
- **T**: TIME-BOUND

**Goal**

Improve the hand hygiene compliance of healthcare workers (HCWs) throughout the hospital

**SMART Goal**

To improve hand hygiene compliance among HCWs on units A and B from a baseline compliance of 65% and 74%, respectively, to > 90% within 6 months.

**Effective Measurement**

- **Outcome Measures**
  - Measure the performance of the system under study
  - Directly relate to the aim of the project
- **Process Measures**
  - Measure whether the parts/steps in the system performing as planned
- **Balancing Measures**
  - Measure whether changes designed to improve one part of the system cause problems in other parts of the system
Measuring Quality Vs. Research

| Research | Vs. | Quality |

**Purpose**
- To discover new knowledge
- To bring new knowledge into daily practice

**Tests**
- One large “blind” test
- Many sequential, observable tests

**Biases**
- Control for as many biases as possible
- Stabilize the biases from test to test

**Data**
- Gather as much data as possible, "just in case"
- Gather "just enough" data to learn and complete another cycle

**Duration**
- Can take long periods of time to obtain results
- "Small tests of significant changes"

Variation in Healthcare Systems

**INTENDED VARIATION**
- Part of effective, patient-centered care
- One size does not fit all
- Often called purposeful, planned, guided or considered

**UNINTENDED VARIATION**
- Due to changes introduced into healthcare process that are not purposeful, planned or guided
- Creates inefficiencies, waste, rework, ineffective care, errors and injuries in our system

Sources of Variation

**COMMON CAUSE**
- Inherent in the process over time
- Affected all outcomes of the process
- Seen by chance
- Stable Process
- Process is in statistical control

**SPECIAL CAUSE**
- Not part of the process, arise from specific problems
- Assignable
- Unstable Process
- Process is not in statistical control

Hand Hygiene Compliance

- Performance of acceptable hand hygiene both BEFORE and AFTER encountering the patient or the patient’s immediate care environment (bed, over-the-bed table, IV pump or pole, etc.).

Acceptable Hand Hygiene

- Application of an alcohol hand rub product with complete coverage of hands and fingers
- Hand washing with soap followed by turning off the faucet without using fingers or the palm of the hand
- For patients on isolation, appropriate personal protective equipment (including gloves) donned upon room entry then removed and hand hygiene performed before exiting the room
The Data Collection Process

- Cohort of 15 patient attendants (12% of the 128 patient attendants)
- Patient attendants provide 24-hour bedside observation of patients who have medical or behavioral conditions that could result in self-injury, removal of medical devices, flight or abduction.
- Trained by the infection control staff
- Hand hygiene observations were recorded on a standard data collection tool
  - Make up to 8 observations during an 8-hour shift
  - No more than 2 observations on any one HCW during a shift
- Entered into a database by a single person
- To ensure consistency of the data collection
  - Handbook was created
  - Infection control staff met with the data collection team monthly

The Improvement Model

What are we trying to accomplish?

How will we know that a change is an improvement?

What changes can we make that will result in improvement?

Plan

Do

Study

Act

What is a Test?

- Putting a change into effect on a temporary basis and learning about its potential impact

Reasons to Test Changes

- To increase your belief that the change will result in improvement
- To evaluate how much improvement can be expected from the change
- To test whether the proposed change will work in the environment of interest
- To evaluate costs, social impact, and side effects from a proposed change
- To minimize resistance to the change

PDSA Model
Appropriate Scope for a PDSA Cycle

<table>
<thead>
<tr>
<th>Current Situation</th>
<th>Resistant</th>
<th>Indifferent</th>
<th>Ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Confidence</td>
<td>Cost of failure large: Very Small Scale Test</td>
<td>Very Small Scale Test</td>
<td>Very Small Scale Test</td>
</tr>
<tr>
<td>that change idea will lead to improvement</td>
<td>Cost of failure small: Very Small Scale Test</td>
<td>Very Small Scale Test</td>
<td>Small Scale Test</td>
</tr>
<tr>
<td>High Confidence</td>
<td>Cost of failure large: Very Small Scale Test</td>
<td>Small Scale Test</td>
<td>Large Scale Test</td>
</tr>
<tr>
<td>that change idea will lead to improvement</td>
<td>Cost of failure small: Small Scale Test</td>
<td>Large Scale Test</td>
<td>Implement</td>
</tr>
</tbody>
</table>

PDSA Pitfalls

- Tests that are miss-sized for the stage of the project (too big or too small)
- No prediction or hypothesis before testing the change
- Lack of a detailed execution plan
- Failure to perform the entire cycle
- Failure to use qualitative measures
- Not learning from “failures”

Testing vs. Implementing

- **Testing:** Putting a change in place on a temporary basis
  - Test on a small scale first
  - Test under as many different conditions as possible
  - Learn from successes and failures
  - Adapt the change based on what is learned

- **Implementing:** Making the change a part of the day-to-day operation of the system

Use of PDSA cycles

Changes That Result in Improvement

- Implementation of Change
- Wide-Scale Tests of Change
- Follow-up Tests
- Very Small Scale Test
- Evidence
- Best Practice
- Testable Ideas

Choosing a Test

Does the choice of intervention matter?

- Prevent: Most improvement efforts begin with an intent to follow a uniform standard process or guideline. This can improve reliability to roughly 90%.
  - Basic standardization
  - Memory aids such as checklists
  - Feedback mechanisms regarding compliance with standards
  - Awareness-raising and training
• **Identify and Mitigate:** Strategies to reduce the opportunities for humans to make mistakes or “error-proofing” can improve **reliability to at least 95%**.
  - Building decision aids and reminders into the system
  - Making the desired action the default (based on evidence)
  - Creating intentional redundancy
  - Scheduling key tasks such as discharges
  - Taking advantage of existing habits and patterns


• Passive interventions, such as increasing availability of alcohol-based hand products:
  - Did not improve compliance unless they were coupled to interventions that also changed behavior
• Multimodal interventions that focused only on education and supply availability:
  - Improved hand hygiene compliance to 55%-80%
• Multimodal interventions that addressed HCW behavior:
  - Improved hand hygiene compliance to 80%-98%

• Hand hygiene habits are developed by around 9 years of age
• Hand hygiene driven by sense of self-preservation
• Our long-standing habits do not match up with what is expected in the healthcare setting
• When faced with time constraints HCWs make judgment calls based on the perceived risk
• Perceived hand hygiene is consistently better than what is actually measured


**Aim:** To show sustainable improvement in hand hygiene compliance among healthcare workers on units A and B from a baseline compliance of 65% and 74%, required now to be >90%

- Leadership committed to improving hand hygiene compliance
- HCWs knowledgeable about when, how and why to perform hand hygiene correctly
- Hand hygiene supplies consistently available at the point of care
- Correct hand hygiene is the social norm

Measure: Performance of acceptable hand hygiene both BEFORE and AFTER encountering the patient or the patient’s immediate care environment (bed, over-the-bed table, IV pump or pole, etc.)

Annotated Statistical Process Control Charts Showing Percentage of Hand Hygiene Compliance Both Before and After Patient Care by Month from November 1, 2007 through April 30, 2010 on Unit A

- Identify and Mitigate
  - Patient attendants carry a handheld bottle of alcohol-based hand rub
  - If a HCW enters the room, and forgets to perform hand hygiene the patient attendant kindly offers the HCW hand gel
  - Initially tested only on unit A
  - Due to its success it was quickly spread hospital-wide
  - Observations were recorded based on the HCWs intended behavior
Barriers and Keys to Success

- **Barriers**
  - Trying to overcome long-standing habits
  - Lack of belief their hand hygiene was poor

- **Keys to success**
  - Support from the unit leadership was crucial
  - Interventions built upon existing processes
  - Worked to increase awareness and urgency
  - The identify and mitigate process was able to improve hand hygiene compliance to 90% or greater across multiple HCW types

Implementing a Successful Change

- Implementation is a permanent change to the way work is done
- If the change is not built into the process improvement often erodes over time
- **Key components necessary for sustainability**
  - Process owner
  - Ongoing monitoring process
  - Redesign of the system

Designing for Sustainability

- **Process owner:**
  - Who is going to oversee the new process?
  - Who is going to monitor the data collection?

- **Monitoring system:**
  - Integrate the data collection plan to monitor the process and continued improvement
  - Have a process in place to address special causes and trends in the data

Designing for Sustainability

- **Redesigning the system:**
  - Update key stakeholders
  - Create a revised process map
  - Update policies and procedures
  - Redesign job responsibilities
  - Training employees in the new procedures and use of new equipment

SPREADING IMPROVEMENT
Arkansas Children’s Hospital Hand Hygiene Improvement Project Goal

- To improve hand hygiene compliance for each patient care unit to at least 90% and show sustained improvement for at least 6 months.

Key Drivers/Processes

1. Leadership committed to improving hand hygiene compliance
2. HCWs knowledgeable about when, how and why to perform hand hygiene correctly
3. Hand hygiene supplies consistently available at the point of care
4. Correct hand hygiene is the social norm

Design Changes

- Leadership
  1. Senior leadership priority
  2. Unit leadership makes hand hygiene a priority
- Education and Training
  1. ACH Moments for Hand Hygiene posters
  2. Online education module
  3. Update new employee orientation
- Supply Availability
  1. Reliable restocking process for supplies
  2. Placement of alcohol hand-rub dispensers in the path of care
- Behavior Change
  1. Sharing compliance data with staff
  2. Immediate positive feedback to staff
  3. Resident physician competency verification

Measure: Performance of acceptable hand hygiene upon ENTERING and LEAVING the patient's care environment (zone).

WHERE DO WE GO FROM HERE?
Additional References