MEASURING HAND HYGIENE COMPLIANCE: AN OVERVIEW
PRESENTED TO NEW ENGLAND APIC CHAPTER
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Learning Objectives
At the conclusion of this educational session, the learner will be able to:

• Define and describe electronic Hand Hygiene Compliance Monitoring Systems.

• Compare and contrast each system with current methods of measuring and hygiene compliance.

• Explain the potential impact of enhanced data collection for Hand Hygiene on patient outcomes.

• Discuss studies with evidence to support electronic compliance monitoring

Compliance Defined
Leveraging technology, products and clinical interventions to drive sustained improvements in hand hygiene compliance, thereby reducing the incidence of HAIs, reducing the cost of healthcare and improving patient outcomes.

Annual Burden of HAIs

<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Number of Infections</th>
<th>5-10% of all hospitalized patients</th>
<th>Length of Stay +18 Days</th>
<th>Excess Costs</th>
<th>Over 99,000 Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>1.7M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloodstream</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Surgical Site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary Tract</td>
<td></td>
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</tr>
</tbody>
</table>

Why is Hand Hygiene Suboptimal?

- Invisible target
- Incubation period:
  - no immediate feedback
  - unable to trace back
- Risk of non-compliance to HCW is low, especially from a single episode
- Cost to HCW = time
- Number of opportunities is huge

Why is Hand Hygiene so Important?

- Hand Hygiene reduces the incidence of HAIs
- HAIs have created a strain to the healthcare system:
  - Estimated 1.7 million infections annually
  - 99,000 associated deaths each year
  - Increases the length of stay for that patient and blocks resource utilization from other patients
- HAIs add $36 to 45 BILLION to healthcare costs each year

  A 1.0% increase in hand hygiene compliance resulted in annual savings of $39,650 to a 200-bed hospital.*

* Cummings, Anderson, Kopy. Hand hygiene noncompliance & the cost of hospital-acquired methicillin-resistant Staphylococcus aureus infection. Infection Control and Hospital Epidemiology. Apr '10

Why is Hand Hygiene Hard to Measure?

- Patient care takes place in many environments, not just patient rooms
- Opportunities for hand hygiene occur 24/7 and involve many hospital employees
- The frequency of hand hygiene opportunities varies by type of unit, care provided and patient factors
- Observation is resource-intensive
- How many observations needed to achieve statistical significance?
Semmelweis and Childbed Fever

After instructing doctors to rub hands with chlorinated lime, he observed a **10-fold drop in mortality**!

**METHODS OF MEASURING COMPLIANCE**

**Direct Observation**

Current gold standard with limitations:

- Labor-intensive
- Small sample sizes (1% of total HH activity)
- Requires training
- Data are not standardized
- Difficult to combine and analyze data
- Subject to Hawthorne effect
- Data may not be monitored and/or reported frequently enough
- Can compromise patient privacy

Sources:
**iScrub Lite – Direct Observation**

- **Apple® iPhone/iPod Touch application** for the collection of direct observations (vs) the time-consuming and error-prone use of clipboards and transcription
- Record observations, and when finished, the program e-mails the resulting file for easy analysis
- Available for download, free of charge, on the Apple iTunes store

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**Product Consumption Modeling**

- Very indirect proxy
- Does not reveal who is performing hand hygiene
- Does not assess technique
- Does not capture opportunities
- Does not account for factors such as spillage and visitor usage

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**Surveys**

- Inadequate reliability and validity
- Validity depends on quality of survey development
- HCWs tend to overestimate their compliance
- Patients often say what they believe the surveyor wants to hear

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**Activity Monitoring Solution**

Affordable, Automated Reporting Solution

- Near-real-time metrics
  - Dispenser events (numerator)
  - Wash-In/Wash-Out Opportunities (denominator)
- Compliance by location
  - Building, Floor, Unit, Room
- Automated Reporting—24/7/365

- Not “Big Brother”
  - “Community” Metric
  - Team based performance tool
  - Feedback to help caregiver manage staff, patients, and visitors
- Group-level reporting structure

- 20.5%
Electronic Activity Based Monitoring System

Hand hygiene activity monitoring captures usage and opportunities

Dispenser usage confirms a compliant event.

Room entries/exits are recorded as “clean-in/clean-out” opportunities.

How is Activity Measured?

- Collects basic hand hygiene usage & opportunities
  - Transmits actual hand hygiene usage to the system (numerator)
  - Transmits hand hygiene opportunities (denominator)
- Calculates performance rate in near-real time

Performance rate calculation

Performance Rate Calculation

Events (Dispenser Actuations)  x 100 = Performance Rate

Opportunities (Room Entry or Exit)

Hand hygiene activity monitoring measures group performance and should not be compared to observational compliance rates that rely on observations of individual hand hygiene behavior.

Activity Systems - Compliance Data

Compliance Monitoring Programs

Performance Diversity - April 2017

<table>
<thead>
<tr>
<th>Days</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Standard</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
</tr>
<tr>
<td>Total Health System</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
</tbody>
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Benefits of Activity Monitoring System

- Cost-efficient, stand alone monitoring system
- Evidence-based approach with large data pool
- Automated, 24/7, near-real-time data gathering
- Standardized measurement—minimizes Hawthorne effect
- Customizable footprint / dashboard / reports
- Community-level measurement ➔ Not tracking individuals
- “Minimally invasive”—requires little support from hospital IT
- Empowers IPs to observe and coach—not gather data

Real Time Location System (RTLS) in Healthcare

- Improve Patient Care
- Reduce Costs
- Increase Safety

Real Time Location System (RTLS)

- Technology platform used for detecting location
  - Locating and tracking resources in real-time
  - “Internal Global Positioning System”
- Utilizes many wireless technologies
  - WiFi, RFID, Infrared, Ultrasound, Zigbee

Integrating Hand Hygiene into RTLS

- Sensory Network monitors location of HCW and receives HH activity
- Badges transmit real-time HCW location and HH activity
- Dispensers transmit HH events
- RTLS Software provides performance feedback & auditing
• Records when healthcare worker enters or exits patient room
• Records person-specific wash-in/wash-out events via RTLS badge
• RTLS badge records hand hygiene event to RTLS system:
  System records “compliant” and “non-compliant” events
  Hand hygiene compliance activity is presented on dashboard

Benefits of RTLS Integration
• Utilizes existing hospital investment in RTLS infrastructure
• Individual accountability ➔ Role or Person-specific monitoring
• Interfaces with key hospital information systems (HIS)
• Badges provide feedback/cueing to encourage proper hand hygiene
• Works with various wireless technologies (Wi-Fi, RF, LF, IR, etc.)
• Minimal technical support required
• Empowers IPs to observe & coach—not gather data

Video Surveillance for Monitoring Hand Hygiene
• Video monitoring uses a full-time observer that can capture all aspects of Hand Hygiene including a better way to delineate whether contact was made with the patient or their surroundings.
  • Observer may be on-site or in a remote location
  • Sometimes referred to as the “all seeing eye”
  • Issues with patient privacy must be addressed
• The system requires that someone is watching the videos to provide near real time feedback.

Benefits of Video Surveillance
• Real Time Feedback
• Empowers IPs to observe and coach—not gather data
**Compliance Management Approaches**

- Video Surveillance
- Person Specific Tracking (RTLS)
- Activity/Group Monitoring
- Manual Audit/Observation

**Texas Scottish Rite Hospital**

Pediatric Orthopedic Surgery
- 100 inpatient beds
- Several ambulatory clinics on campus
- Treat children from mainly Texas
- International patients- referred by missionary groups, and contacts from physicians in other countries
- Teaching facility with fellows and residents

**Before You Start Looking At Systems**

- What is currently working? Not working? Faith in the current data? What is the current data? Culture?
- Current manpower commitment?
- What is the projected scope of the project?
  - Inpatient
  - Ambulatory Clinics
  - Emergency Department?
  - Other areas- Special Procedures, Radiology
- What’s the budget?
- What IT systems are present? Plans for modifying/upgrading system?
Ready to See What’s Out There

• Current Product Vendor
• Web Search
• APIC Meetings
• Articles

More information than you ever wanted and perhaps difficult choices.

Before You Start Shopping – Ask these Questions Internally

• What are our hand hygiene compliance objectives?
  • What do we want to accomplish with electronic hand hygiene monitoring?
  • What will we do with the data?
• Does the system align with our hospital culture?
• Do we already have RTLS installed? If so, what brand?
• Is person-specific hand hygiene monitoring a must-have or a nice-to-have?
• What frequency band/s are being utilized by the RTLS or any other wireless tracking/monitoring system?

Additional internal questions…

• How much are we currently spending on observation or our current measurement method?
• Are we collecting data that are representative of the total population (all shifts, all times, all locations, statistically relevant sample size)?
• Are we ready to support the implementation of an electronic hand hygiene monitoring system? (Data alone won’t drive compliance; it will need support.)
• What is our total available budget for an electronic hand hygiene monitoring system?
• What kind of soap and sanitizer dispensers do we currently have installed?

Vendor questions

• How are compliance data presented/reported?
• How is the compliance or performance rate calculated? Can we automate reports?
• What type of support do you provide after the system is purchased? Is there a clinical component?
• What will be required of me to facilitate the clinical component?
• Are you able to measure compliance at the point of care?
• Are there plans to update the technology in the future?
• How much IT support would be necessary?
Questions for the Vendor...

- What is the power source to the dispenser (A/C or battery) and what is the battery life of the components if battery?
- Besides monitoring events and opportunities, are there any other features?
- How can you improve compliance if you don’t have badges and know who is non-compliant?
- What reduction in HAIs can we expect?
- What is the upfront and ongoing cost to run a system?
- Is there a break even point related to the cost?
- Can we set up alarms to warn if sanitizer is used in a c diff room?

Plan/Installation

- Baseline Data from new system-
- Develop a committee for both improvement activities and communication to staff
- Be prepared for data not to be comparable to your current measurement system
- Cultural survey

What to do with the data?

- Root Cause Analysis
  - Frontline Caregivers
  - Ancillary Staff
- Plan of Action
  - Parent and Visitor Hand Hygiene
- Staff Education
- Hand Hygiene Day
- Posters
  - Staff photos
- Coloring Books
- Weekly Meetings

Post installation

- Identify problems: patients and visitors, other groups entering the “room”
- Be prepared to spend time doing observations
- Reports on the data:
  - Format
  - Frequency
  - Distribution
- Getting data out to all groups
- Gaming the system
- If data available from dispensers on batteries or low product, plan for how to handle
**Longer Term**

- Sustaining improvements when novelty wears off
- Do you keep the initial committee? Modify members, members from the staff are important
- How often do you, as IP, look at data? What data?
- Noncompliance— who will handle, how?
- Are you going to continue to use more than one system for monitoring hand hygiene and improvement efforts

“**The changing of hand hygiene behaviors is not something that can be accomplished quickly.** It requires frequent feedback to staff and celebrating small victories. Systems that can assist in giving feedback to the staff are important in changing practices and should be a part of the activities in a program to improve hand hygiene.”

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**EVIDENCE TO SUPPORT ELECTRONIC HAND HYGIENE COMPLIANCE MONITORING**

**A Case for Electronic Compliance Monitoring**

Professor Didier Pittet, MD, MS, Director Infection Control Program, University of Geneva Hospitals and Faculty of Medicine, Geneva Switzerland and leader, WHO First Global Patient Safety Challenge commented that “a tool used as a standard for hand hygiene monitoring but providing inaccurate data could produce a false sense of security among healthcare workers and therefore could be counterproductive.”

The Joint Commission Monograph, 2009; Measuring Hand Hygiene Adherence; Overcoming the Challenges; p xxiii.
“Electronic hand hygiene compliance monitoring systems can provide real-time analysis and feedback of hand hygiene activities at the individual and unit level, and preliminary studies suggest that they may provide reasonably accurate compliance rates for WHO Moments 1, 4, and 5, which account for the bulk of all hand hygiene opportunities. Limited trials have been associated with substantial increases in compliance rates.”

“Electronic monitoring systems appear to have considerable promise for improving our ability to measure hand hygiene compliance.”

Boyce, John M; Measuring Healthcare Worker Hand Hygiene Activity: Current Practices and Emerging Technologies; Infection Control and Hospital Epidemiology; August, 2011

Sample Size with Direct Observation is Inadequate

- Example
  - 12-bed ICU with 10 hand hygiene opportunities per hour: 12 patients X 10 HH per hour x 24 hours = 2,880 HH opportunities per hour or 86,500 HH opportunities per month
  - If 100 observations are completed each month, only one-tenth on 1% (0.12%) of all opportunities are observed


Sample Size with Direct Observation is Inadequate

- Despite observing a high number (2,249) of hand hygiene opportunities, direct observation captured only 1.3% of hand hygiene opportunities
- There was no correlation between observed compliance and electronically monitored dispenser events

Costs Associated with Direct Observation

- Direct observation is associated with relatively high resource and labor costs.
- At Virginia Commonwealth University Medical Center the labor cost for only the observers was $0.66 per observation.

Observer Bias Documented with Direct Observation

- Unit based hand hygiene compliance rates were much higher when observations were conducted by unit-based observers than non-unit-based observers.

Automated Devices Measure Hand Hygiene Better Than Observation

- Hand hygiene compliance was measured before and after a feedback intervention.
- Over 30 weeks, there were 424,682 dispenser counts and 338 hours of direct observation.
- During the intervention phase, daily average dispenser counts per patient-day increased significantly (by 22.7 in a neuro ICU and by 7.3 in cardiac ICU).
- No significant change was detected by direct observation.
- Institutions relying on direct observation could be missing important trends of intervention effects.

Automated Devices Measure Hand Hygiene Better Than Observation

- Hand hygiene dispensers were equipped with a mechanism to broadcast a radio transmission with each use. Each doorway in a clinic was outfitted with a motion sensor.
- Nearly 1,400 room entries and exits were recorded by both observers and motion sensors. Human observers coded compliance by direct observation.
- The frequency of inconsistencies between the human observations and observations by the automated system was 38%.
- After eliminating the possibility of equipment errors, the explanations for the inconsistencies were the distance between the observer and the observed event and the activity level in the clinic.
Importance of Real-time Feedback

- When healthcare workers received near real-time electronic reports of their compliance for the current week, the previous week and for the last 30 days, compliance rates increased from less than 10% to 81.6%


Before behavioral perceptions can change, one must be aware of one’s current perceptions and behaviors

- Unless information about hand hygiene rates is provided to staff, it is highly unlikely that anything will change


Healthcare Personnel cautiously accept Electronic Monitoring

- As trends toward transparency and accountability continue with health reform and increased surveillance of HAIs, automated hand hygiene compliance systems are likely to proliferate

- Frontline healthcare personnel (HCP) are not knowledgeable about automated hand hygiene compliance monitoring and have concerns about privacy and punitive implications. However, most indicate a tolerance for technology that could measure hand hygiene activity and room entry / exit

- Frontline HCP recognize that automated hand hygiene monitoring could be a mechanism for change and advise that “if people trust in the data, they respond to the data.”


Electronic Devices Provide Details About ABHR Use

- Electronic devices can provide highly specific information about how frequently healthcare workers use ABHR (i.e., the time of day and the day of the week) and reveal the locations of dispensers with the highest and lowest rate of use

- With electronic devices, it is feasible to record large numbers of HH events. Such devices are useful for monitoring hand hygiene events before and after various types of interventions designed to improve hand hygiene performance among healthcare workers

- Electronic device with automated data-analysis capabilities reduce the amount of time infection control practitioners spend on data analysis

It is Time for Personal Accountability

• Hand hygiene and use of alcohol-based handrub must become a ritual, automatic behavior
• We must change the rules so that healthcare workers expect to be observed and given direct, immediate feedback until the behavior of role models becomes everyone’s ritual

The Case for Electronic Hand Hygiene Monitoring

• Healthcare-associated infections (HAIs) are an enormous burden on the US healthcare system:
  • 1.7 million infections annually (5-10% of all patients)\(^1\)
  • Over 90,000 deaths annually\(^2\)
  • $36 - $45 billion annually in excess cost\(^3\)
• Hand hygiene habits are directly tied to infection rates
• Current compliance monitoring approaches—are relatively costly and limited in quality and scope
• Electronic monitoring technologies enable new approaches that are much more effective at gathering actionable data and driving evidence-based hand hygiene compliance management

Questions?

Thank you for your time and attention!