

# Effectively Monitoring Hand Hygiene: Direct Observation Only or Combined with Automated Monitoring

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Teleclass broadcast sponsored by GOJO Canada ([www.gojo.com](http://www.gojo.com))

## Effectively Monitoring Hand Hygiene: Direct Observation Only or Combined with Automated Monitoring

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Sponsored by GOJO Canada



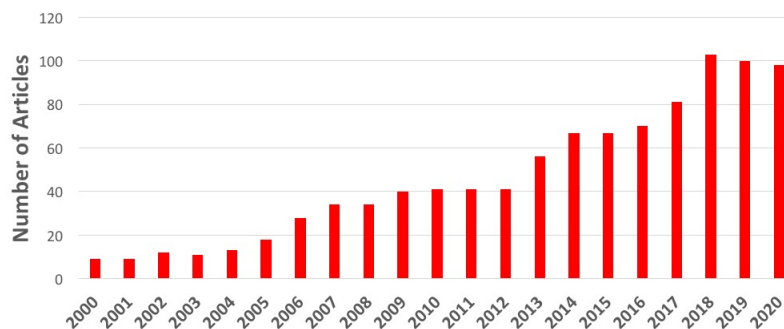
Hosted by Martin Kiernan  
[martin@webbertraining.com](mailto:martin@webbertraining.com)

Disclosures: JMB is a consultant to Diversey, GOJO Industries, and Sodexo Healthcare

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December 3, 2020

Number of PubMed Citations Retrieved on  
“Hand Hygiene Monitoring”, 2000 – Nov 4, 2020

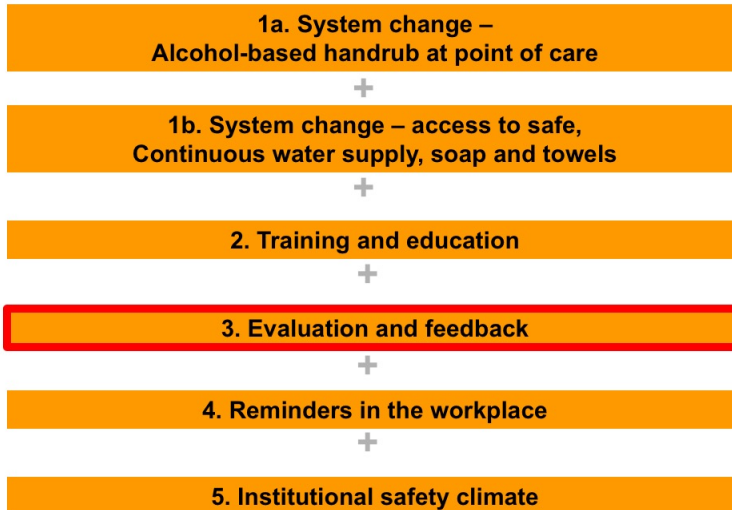


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A Webber Training Teleclass  
Hosted by Martin Kiernan  
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### Monitoring Hand Hygiene Needs to be Part of a Multimodal Hand Hygiene Improvement strategy



[www.who.int/gpsc/5may/tools/training\\_education/en/](http://www.who.int/gpsc/5may/tools/training_education/en/)

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### Methods for Monitoring Hand Hygiene Compliance

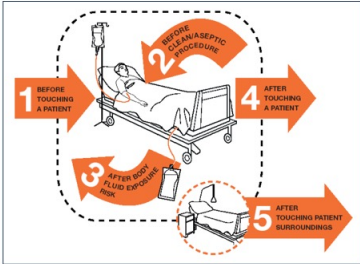
- Direct observations by trained observers
- Consumption of hygiene products such as towels, soap, and alcohol-based handrub (ABHR)
- Automated hand hygiene monitoring systems (AHHMS)

Yin J et al. Infect Control Hosp Epidemiol 2014;35:1163  
Marra AR et al. Clin Microbiol Infect 2014;20:29  
Ward MA et al. Am J Infect Control 2014;42:472  
Srigley JA et al. J Hosp Infect 2015;89:51  
Boyce JM Am J Infect Control 2017;45:528

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### Common Approaches to Direct Observation of Hand Hygiene

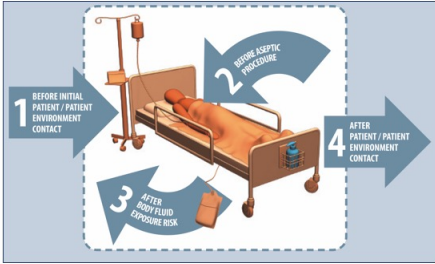
#### WHO 5 Moments for Hand Hygiene



The diagram shows a patient in a hospital bed. Five numbered arrows indicate hand hygiene moments: 1. Before touching a patient; 2. Before aseptic procedure; 3. After body fluid exposure risk; 4. After touching a patient; 5. After touching patient surroundings.

Sax H et al. J Hosp Infect 2007;67:9

#### Canadian 4 Moments for Hand Hygiene



The diagram shows a patient in a hospital bed. Four numbered arrows indicate hand hygiene moments: 1. Before initial patient / patient environment contact; 2. Before aseptic procedure; 3. After any fluid exposure risk; 4. After patient / patient environment contact.

Public Health Ontario  
Estimated to yield 10% to 20% more hand hygiene opportunities (HHOs) than 5 Moments

Percent of Moments: 1, 4 & 5 = 81%      Percent of Moments: 1 and 4 = 78% - 83%

- Monitor hand hygiene compliance at room entry and room exit
  - Room entry = surrogate for Moment 1
  - Room exit = surrogate for Moments 4 + 5

Han A et al. Infect Control Hosp Epidemiol 2017;38:411      Boyce JM Am J Infect Control 2017;45:528  
Nayyar D et al. Infect Control Hosp Epidemiol 2018;39:1378

### Direct Observation by Trained Observers

- Direct observation of personnel by trained observers is currently considered the “gold standard” method of determining hand hygiene (HH) compliance rates
- Advantages
  - Can determine compliance with all 5 Moments for Hand Hygiene
    - Not possible with automated HH monitoring systems
  - Evaluate hand hygiene technique
    - An important aspect of hand hygiene overlooked by many facilities
    - Not possible with automated HH monitoring systems
  - Identify barriers to hand hygiene
  - Most widely used method for monitoring hand hygiene compliance
  - Applicable in virtually all facilities, regardless of level of resources

Stewardson A et al. J Hosp Infect 2011;77:358      Ward MA et al. Am J Infect Control 2014;42:472  
Srigley JA et al. BMJ Qual Saf 2014;23:974      Chang NC et al. Am J Infect Control 2016;44:938  
Boyce JM Am J Infect Control 2017;45:528  
Tartari E et al. Antimicrob Resist Infect Control 2019;8:206

## Direct Observation by Trained Observers

- **Limitations**
  - Lack of standardized methods
  - Evaluates < 1% to 2% of all hand hygiene opportunities
  - Hawthorne effect (personnel improve compliance when watched)
  - Difficult in some settings to monitor all 5 Moments (line of sight issues)
  - Time-consuming
  - Skepticism of auditors and front-line staff regarding accuracy

Ward MA et al. Am J Infect Control 2014;42:472

Chang NC et al. Am J Infect Control 2016;44:938

Livorsi DJ et al. JAMA Network Open 2018;1:e183344

Srigley JA et al. BMJ Qual Saf 2014;23:974

Boyce JM Am J Infect Control 2017; 45:528

Jeannes A et al. Am J Infect Control 2019;47:313

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## Lack of Standardization of Direct Observation

- **Methods for performing Direct Observations vary tremendously**
  - Type of personnel performing observations
  - Type and intensity of training (some get 1 hr of training)
  - Frequency of inter-rater reliability assessment (if performed at all)
  - Criteria for HH compliance
    - Room entry – exit, My 5 Moments, My 4 Moments, Others
  - Duration of observation sessions (10 min to > 1 hr)
- **Lack of standardized methods precludes comparisons between facilities**

Reisinger HS et al. Am J Infect Control 2013;41:989

Ward MA et al. Am J Infect Control 2014;42:472

Boyce JM Am J Infect Control 2017; 45:528

Jeannes A et al. Am J Infect Control 2019;47:313

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## Inadequate Sampling of HH Opportunities (HHOs)

- Many hospitals observe too few HHOs to yield valid rates
  - 10 – 30 opportunities/unit/month is probably common
  - Some hospitals observe substantially more HHOs
  - Often 8 AM – 5 PM Mon - Fri
- Estimated number of HHOs/unit/month
  - Direct observation:
    - General medical and surgical wards: 10,000 – 50,000 HHOs/unit/month
    - Intensive care units: 50,000 – 100,000 HHOs/unit/month
  - Automated hand hygiene monitoring systems (AHHMS):
    - Intensive care units: 50,000 – 150,000 HHOs/unit/month
    - Detect ~ 80% of HHOs using “In-Out” monitoring
- Direct observations often sample **0.025% to 0.1%** of all HHOs

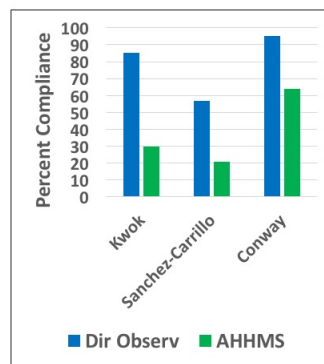
Reisinger HS et al. Am J Infect Control 2013;41:989  
Chen LF et al. Infect Control Hosp Epidemiol 2013;34:207  
McCalla S et al. Am J Infect Control 2017;45:492  
Stahmeyer JT et al. J Hosp Infect 2017;95:338  
Yin J et al. Infect Control Hosp Epidemiol 2014;35:1163  
Monsalve MN et al. ICHE 2014;35:1277

Ellison RT et al. Open Forum Infect Dis 2015;2:ofv121  
Michael H et al. Am J Infect Control 2017;45:311  
Steed C et al. Am J Infect Control 2011;39:19  
Diller T et al. Am J Infect Control 2014;42:602  
Boyce JM Am J Infect Control 2017;45:528  
Nayyar D et al. ICHE 2018;39:1378

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## Direct Observation and Hawthorne Effect

- Hawthorne effect is common with Direct Observation, but not with AHHMS
- Hawthorne effect is influenced by:
  - Observation sessions > 15 – 20 minutes
  - Presence and type of observer
  - Presence of near-by HCP
- Compliance rates are 1.5 – 3 fold higher with Direct Observation than with AHHMS

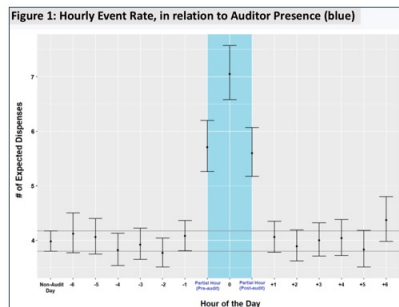


Fries J et al. Infect Control Hosp Epidemiol 2012;33:689  
Kwok YLA et al. Am J Infect Control 2016;44:1475  
Sanchez-Carrillo LA et al. Am J Infect Control 2016;44:868  
Conway LJ et al. Jt Comm J Qual Patient Saf 2014;40:408  
Chen LF et al. Infect Control Hosp Epidemiol 2013;34:207  
Srigley JA et al. BMJ Qual Saf 2014;23:974  
Monsalve MN et al. Infect Control Hosp Epidemiol 2014;35:1277  
Yin J et al. Infect Control Hosp Epidemiol 2014;35:1163  
Hagel S et al. Infect Control Hosp Epidemiol 2015;36:957  
McLaws M-L et al. Am J Infect Control 2018;46:876  
Wu KD et al. BMC Infect Dis 2018;18:369

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## Duration of Hawthorne Effect

- Does Hawthorne effect have a prolonged beneficial effect on compliance?
  - After observer leaves the unit
- 2 studies utilizing electronic monitoring systems evaluated the duration of the Hawthorne effect
  - Hawthorne effect decreased by 55% within 1 hour after observer left unit
  - Number of HH events increased
    - 2.5-fold in a room near auditor
    - 1.75-fold in same hallway and ward
    - Effect did not persist more than 1 hour after the auditor left the unit
- Conclusion: Hawthorne effect does not have a prolonged effect on compliance rates



Filho MA et al. Am J Infect Control 2014;42:1188  
Vaisman A et al. SHEA Spring meeting 2019 Abstract

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## Potential Adverse Impact of In Adequate Sampling and Hawthorne Effect

- Inflated HH compliance rates due to poor sampling and Hawthorne effect can have adverse effects
  - Institutions may become complacent regarding HH compliance rates if rates are artificially high
  - Healthcare personnel (HCP) may question the importance of HH if HAI rates do not decrease when reported HH compliance rates are high

Larson EL Am J Infect Control 2013;41:S42

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## Unique Approach to Direct Observation and Feedback

- **A large academic hospital has implemented a unique form of hand hygiene observation and feedback**
  - All HCP are invited to observe hand hygiene of each other
  - Observers provide real-time feedback for ~50% of observations
    - Most feedback is provided in the form of compliments, with a small fraction provided as reminders (just before opportunity or after missed opportunity)
    - ~60% of feedback is given to individuals in same hierarchical job category
  - HCP report their observations using a web-based crowdsourcing app
- **Results**
  - About 10% employees participate
  - Reported compliance rates over a 3-year increased from 83% to 95%
- **Validation of the high compliance rates using another method (e.g., automated monitoring system) would be of great interest**

Sickbert-Bennett EE et al. Am J Infect Control 2016;44 (Suppl 5):e13  
Sickbert-Bennett EE et al. Emerg Infect Dis 2016;22:1628  
Sickbert-Bennett EE et al. Infect Control Hosp Epidemiol 2020;41:229

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## Tips on Direct Observation of Hand Hygiene

- **Provide observers with standardized training**
  - Include videos if possible
  - Periodically validate observer accuracy
- **Most experts recommend using “secret shoppers” to perform audits**
  - Avoid having HCP perform observations on their own unit
  - Avoid having personnel collecting compliance data perform immediate feedback
- **If possible, limit the role of HH “champions” to:**
  - Education, coaching of staff, promoting improved hand hygiene, overcome resistance
  - Avoid having “champions” also monitor HH compliance (to reduce Hawthorne effect)
- **Limit observation sessions to  $\leq 15$  min**

WHO Guideline for Hand Hygiene in Health Care  
Kohli E et al. Infect Control Hosp Epidemiol 2009;30:222  
Dhar S et al. Infect Control Hosp Epidemiol 2010;31:869  
Pan S-C et al. PloS One 2013;8:e53746  
Fries J et al. Infect Control Hosp Epidemiol 2012;33:689  
Chen LF et al. Infect Control Hosp Epidemiol 2013;34:207

Scherer A et al. Infect Control Hosp Epidemiol 2019;40:89  
Chang NC et al. Am J Infect Control 2016;44:938  
Chen LF et al. Infect Control Hosp Epidemiol 2015;36:1444  
Goedken CC et al. Implementation Sci 2019;14:110

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## What is an Adequate Number of Direct Observations?

- WHO Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy recommends:
  - 150 – 200 HHOs/nursing unit/time period
- Yin et al. recommend:
  - 108 – 194 HHOs/unit/time period, depending on baseline compliance rate, to detect 10% change in compliance rates

Baseline Compliance	Target Compliance	No. of HHOs/unit/time period
40%	50%	191
50%	60%	194
60%	70%	182
70%	80%	153

- Leapfrog Group: if nursing unit has average daily census  $\geq 13$  patients
  - Observe at least 200 HHOs/month
  - For smaller nursing units, fewer observations/month may be reasonable

WHO Hand Hygiene Implementation Guide, 2009  
Yin J et al. Infect Control Hosp Epidemiol 2014;35:1163

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## Tips on Direct Observation of Hand Hygiene

- In facilities monitoring HH compliance on room entry & exit,
  - If possible, dedicate some surveillance time to monitoring
    - Compliance with Moments 2 and 3
- For all facilities using direct observation methods, consider:
  - Monitoring HH compliance when HCP move from a contaminated body site to another body site during care of the same patient
    - Hand hygiene is recommended by both CDC and WHO guidelines
  - Monitor hand hygiene technique
    - Is ABHR applied to all surfaces of hands and fingers?
    - How long to HCP rub their hands together with ABHR?

CDC Guideline for Hand Hygiene in Healthcare Settings  
Chang NC et al. Clin Infect Dis 2020 doi: 10.1093/cid/ciaa130  
Pires D et al. Infect Control Hosp Epidemiol 2017;38:547  
Pires D et al. Clin Microbiol Infect 2019;25:851  
Kenters N et al. Am J Infect Control 2020;48:503  
Tschudin-Sutter S et al. Clin Microbiol Infect 2017;23;:409e1

WHO Guideline for Hand Hygiene in Health Care  
Paula H et al. Am J Infect Control 2018;46:103  
Harnoss JC et al. J Hosp Infect 2019;104:491

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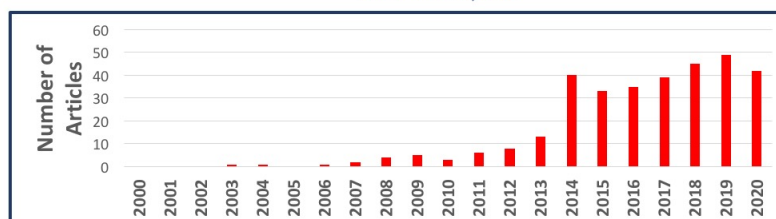


### Why Consider Automated Monitoring of Hand Hygiene?

- Direct observation method has several advantages and multiple limitations
  - Often yields unrealistically high compliance rates
- Automated hand hygiene monitoring systems (AHHMS)
  - Also called Electronic monitoring
  - Address some of the limitations of Direct Observation
- Although relatively few hospitals have adopted AHHMS, there is growing interest in this approach



Number of PubMed Citations Retrieved on "Hand Hygiene Automated Monitoring" or "Hand Hygiene Electronic Monitoring", 2000 – Nov 18, 2020



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### Types of Automated Systems to Assist in Monitoring Hand Hygiene Performance

- Electronically-assisted Direct Observation
- Electronic dispenser counters
- Automated hand hygiene monitoring networks
  - Group monitoring systems
  - Badge-based systems systems that monitor individual healthcare worker performance
- Video camera (also called computer vision) systems

Ward MA et al. Am J Infect Control 2014;42:472  
Marra AR et al. Clin Microbiol Infect 2014;20:29  
Srigley JA et al. J Hosp Infect 2015;89:51  
Boyce JM Am J Infect Control 2017; 45:528

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## Electronically-Assisted Direct Observation

- **Smartphone and computer tablet-based software can make direct observation of hand hygiene more efficient**

- Streamline recording of direct observations
- Obviate the need for transferring data from paper to computer
- Facilitate data analysis and feedback

- **Examples include:**

- Free iScrub Lite app for iPhones
- Commercially available apps
- “In-house” developed apps

- **Underutilized by those doing direct observations**



iScrub Lite

Hlady WG et al. Infect Control Hosp Epidemiol 2010;31:975  
Chen LF et al. Infect Control Hosp Epidemiol 2013;34:207  
Hong TS et al. J Med Syst 2015;39:69  
Wiemken TL et al. Am J Infect Control 2018;46:617  
Thirkell G et al. Am J Infect Control 2018;46:261

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## Electronic Dispenser Counters

- **Electronic dispenser counters record time & date each time a dispenser is accessed data are sent electronically to a server for analysis**

- **Advantages of using such devices include:**

- Capture 100 – 10,000 times more hand hygiene events than direct observation
- Not affected by Hawthorne effect
- Require less personnel time
- Are useful for detecting trends in hand hygiene frequency:
  - Introduction of new hand hygiene agents
  - Modifying feedback strategies
  - Unit-specific interventions to promote hand hygiene
  - Location and number of dispensers employed
- Less expensive than more complex monitoring systems

- **Limitation**

- Cannot detect HHOs or determine HH compliance rates



Marra AR et al. Infect Control Hosp Epidemiol 2008;29:730  
Boyce JM et al. Infect Control Hosp Epidemiol 2009;30:1090  
Sodre da Costa LS Am J Infect Control 2013;41:997  
Filho MA et al. Am J Infect Control 2014;42:1188  
Magnus TP et al. Int j Infect Dis 2015;33:205  
Arai A et al. Am J Infect Control 2016;44:1481  
Boyce JM Am J Infect Control 2017;45:528  
Scheithauer S et al. Am J Infect Control 2018;46:1192

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### Group monitoring System: Records Hand Hygiene Events & Calculates Estimated Opportunities and Compliance Rates

- Dispensers record activations (HH events) & send data to computer server
- HHOs are estimated using a software algorithm based on observations, patient census, patient-to-nurse ratio, and adjustments
- Estimated compliance: # HH events/estimated # HHOs
- Advantages:
  - Calculates unit-based (group) estimates of compliance with all WHO 5 Moments for Hand Hygiene
  - Does not require sensors at patient doors or HCP badges
- Limitations
  - A few studies have validated the method of estimating denominators Additional studies of the validity of estimated denominators in various healthcare settings are needed

Steed C et al. Am J Infect Control 2011;39:19

Conway et al. Jt Comm J Qual Pat Saf 2014;40:408

Kelly KW et al. Am J Infect Control 2016;44:956

Nayyar D et al. Infect Control Hosp Epidemiol 2018;39:1378

Diller T et al. Am J Infect Control 2014;42:602

Kwok YL et al. Am J Infect Control 2016;44:1475

Azim S et al. Am J Infect Control 2016;44:772

Conway L et al. Am J Infect Control 2020;48:490

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### Group Monitoring System: Records Hand Hygiene Events & Calculates Estimated Opportunities and Compliance Rates

- The system has been useful in assessing several aspects of hand hygiene:
  - The magnitude of the Hawthorne effect with direct observation
  - Importance of nursing unit-based culture on promoting hand hygiene
  - Value of an engaged nurse manager in improving compliance rates
  - Impact of system on healthcare-associated infections (HAIs)
  - Importance of assuring feedback of data to HCP
  - Role of poor compliance rates as a precursor to outbreaks
- A 2-yr stepped-wedge cluster randomized trial documented
  - Significant increased rate of hand hygiene compliance
  - Trend toward fewer HAIs due to MRSA

Azim S et al. Am J Infect Control 2016;44:772

Kwok YLA et al. Am J Infect Control 2017;45:222

Larson ELL et al. Behavioral Med 2018;44:141

Leis JA et al. Clin Infect Dis 2020 doi: 10.1093/cid/ciaa412

Kwok YL et al. Am J Infect Control 2016;44:1475

Kovacs-Litman A et al. Clin Infect Dis 2020 [Epub ahead]

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## Group Activity Monitoring Systems

- Dispensers have sensors that record dispenser activations [HH Events]
- Sensors record room entries and exits that represent HHOs
  - Room entry = proxy for Moment 1
  - Room exit = proxy for Moments 4 & 5
- Calculate unit-based performance rates (proxy for compliance)
  - $\# \text{ HH events} / \# \text{ HHOs} = \text{performance rate}$
- Provide near real-time feedback to groups of healthcare personnel (HCP)



Swoboda SM et al. Crit Care Med 2004;32:358  
Ellison RT 3<sup>rd</sup> et al. Open Forum Infect Dis 2015;2:0vf121  
Limper HM et al. Infect Control Hosp Epidemiol 2017;38:348  
Boyce JM et al. Infect Control Hosp Epidemiol 2019;40:741

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## Group Activity Monitoring Systems

- **Advantages include:**
  - Capture 100 to > 10,000 times as many HHOs as direct observation, on 24/7 basis
  - Provide large amount of data on HH performance
  - Require much less personnel time than direct observation
  - Not affected by observer bias and Hawthorne effect
  - Near real-time feedback of performance rates by nursing unit
  - Perceived by HCP as less intrusive than badge-based systems
  - Less expensive than badge-based systems
- **Limitations**
  - Cannot differentiate visitors from HCP entering/exiting rooms
  - Do not provide data on individual variability in compliance rates
  - Limited evidence on ability to sustain improved performance and reduce HAIs

Ellison RT 3<sup>rd</sup> et al. Open Forum Infect Dis 2015;2:0vf121  
Ward MA et al. Am J Infect Control 2014;42:472  
Landon E et al. Open Forum Infect Dis 2017;4 (Suppl 1):S408  
Boyce JM et al. Infect Control Hosp Epidemiol 2019;40:741

Limper HM et al. Infect Control Hosp Epidemiol 2017;38:348  
Boyce JM Am J Infect Control 2017; 45:528  
Arbogast JW et al. AJIC 2019;47:585

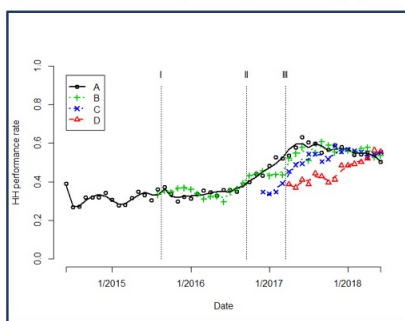
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## Group Activity Monitoring Systems

- These systems have been useful for the following:

- Recording the number of HH events and HHOs/day/per unit
- Providing near real-time feedback to HCP using display terminals on units
- Illustrating the need to combine automated monitoring with complementary improvement projects
  - See adjacent Figure
- Improving HH performance rates, & showing differences by unit
- Demonstrating the utility of weekly 15-min performance improvement calls to engage unit-based personnel

Hand hygiene Performance Rates in Units A-D Following Implementation of Group Activity Monitoring System



Interventions: (I) Front-line ownership  
(II) Visited facility experienced with use of system  
(III) Use of Toyota Kata quality improvement method

Landon E et al. Open Forum Infect Dis 2017;4 (Suppl 1):S408  
Boyce JM et al. Infect Control Hosp Epidemiol 2019;40:741  
Tremblay M-A et al. Open Forum Infect Dis 2019;6 (Suppl 2):S425  
Arbogast JW et al. Infect Control Hosp Epidemiol 2020;41 (S 1):S451  
DiGiorgio M et al. Infect Control Hosp Epidemiol 2020;41 (S 1):S445

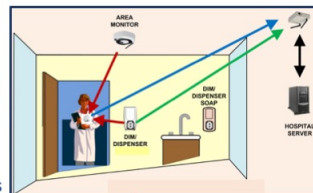
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## Badge-Based Monitoring Systems

- Badge-based systems detect dispenser activations & room entries and exits by HCP wearing electronic badges, and send data wirelessly to a server for data analysis

- Advantages include:

- Record from 10,000 to 150,000 HHOs/month/unit
- Can have reminders that provide immediate feedback to individual HCP, or can facilitate periodic individual feedback by other mechanisms (e.g., text messages)
- Not affected by observer bias or Hawthorne effect
- Identify significant variability in individual compliance rates
- Useful in studying direct observation methods
- Study HCW-patient visit frequency & transmission dynamics



Monsalve MN et al. Infect Control Hosp Epidemiol 2014;35:1277  
Boudjema S et al. Clin Microbiol Infect 2014;20:22  
Fries J et al. Infect Control Hosp Epidemiol 2012;33:689  
Michael H et al. Am J Infect Control 2017;45:311  
Kerbaj J et al. Am J Infect Control 2017;45:234  
Albright J et al. Am J Infect Control 2018;46:1104  
Doll ME et al. Infect Control Hosp Epidemiol 2019;40:1194

Edmond MB et al. J Hosp Infect 2010;76:364  
Muller MP et al. Infect Control Hosp Epidemiol 2014;35:1189  
Storey ST et al. J Hosp Infect 2014;88:84  
Edmisten C et al. Am J Infect Control 2017;45:860  
McCalla S et al. Am J Infect Control 2018;46:1381  
Pong S et al. Am J Infect Control 2019;47:38

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## Badge-Based Monitoring Systems

- **Have yielded performance rates from 63% to 85% - 95%**
  - Performance rates are generally higher than with group monitoring systems
  - Most likely due to individual-specific data and immediate feedback reminders
- **Several studies have reported reductions in HAIs**

Edmond MB et al. J Hosp Infect 2010;76:364

McCalla S et al. Am J Infect Control 2017;45:492

Edmisten C et al. Am J Infect Control 2017;45:860

Albright J et al. Am J Infect Control 2018;46:1104

Pong S et al. Am J Infect Control 2019;47:38

Michael H et al. Am J Infect Control 2017;45:311

McCalla S et al. Am J Infect Control 2018;46:1381

Pong S et al. Am J Infect Control 2018;46:768

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## Badge-Based Monitoring Systems

- **Limitations**
  - Technical issues affect accuracy of some systems
  - Some HCP are concerned about how data will be used
  - Potential problems: refusal of some HCP to wear badges; badge design issues
  - More expensive than direct observations and group monitoring systems
  - Most systems cannot detect compliance with all 5 Moments of Hand Hygiene
- **Additional studies are needed regarding their:**
  - Ability to yield sustained improvements in hand hygiene
  - Effective ways to use data for feedback and training
    - Impact on HAI rates
    - Cost-effectiveness

Pineles LL et al. Am J Infect Control 2014; 42:144

Srigley JA et al. J Hosp Infect 2015;89:51

Masroor N et al. Int J Infect Dis 2017;65:101

Doll ME et al. Infect Control Hosp Epidemiol 2019;40:1194

Ward MA et al. Am J Infect Control 2014;42:472

Edmisten C et al. Am J Infect Control 2017;45:860

Pires D & Pittet D Am J Infect Control 2017;45:464

Boyce JM et al. Am J Infect Control 2019;47:1443

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## Video Camera-Based Systems

- Camera-based systems have been used to:
  - Monitor HH compliance in various settings
  - Study HCP hand contacts with patients
- Advantages: 24/7 recording
  - 2 studies showed sustained improvement in HH compliance
  - Show promise for assessing other clinical procedures
    - E.g., PPE use, type and frequency of hand contacts
- Limitations
  - Cost of equipment and personnel time to review
  - Concerns regarding potential liability



Armellino D et al. Clin Infect Dis 2012;54:1  
Chen J et al. Open Forum Infect Dis 2015;3:ofv200  
Boudjema S et al. Am J Infect Control 2017;45:487  
Grabowski M et al. J Hosp Infect 2018;100:e115

Armellino D et al. Am J Infect Control 2013;41:925  
Brotfain E et al. Am J Infect Control 2017;45:849  
Clack L et al. Antimicrob Resist Infect Control 2017;6:108  
Yeung S et al. N Engl J Med 2018;378:1271

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## Automated Monitoring Systems Must Be Part of a Multimodal Promotion Strategy

- Implementing an automated monitoring system alone, without complementary strategies, will fail to improve hand hygiene
- Examples of complementary strategies used with AHHMS
  - Demonstrable leadership & support from hospital administrators
  - Having unit managers attend short weekly “accountability calls or meetings”
    - Report unit-based compliance rates and discuss plans to improve; share successful measures
  - Enlisting respected clinical personnel to serve as hand hygiene “champions”
  - Assure that front-line staff receive frequent and timely feedback of rates
  - Awards for best-performing unit(s)
  - Promoting a safety climate that includes improved hand hygiene
  - Clinical support by AHHMS vendor personnel + unit-based initiatives

Edmonds-Wilson S et al. Am J Infect Control 2016;44 (Suppl):S6  
Knepper B et al. Open Forum Infect Dis 2017;4 (Suppl 1):S408  
McCalla S et al. Am J Infect Control 2018;46:1381  
Boyce JM et al. Infect Control Hosp Epidemiol 2019;40:741  
Arbogast JW et al. Infect Control Hosp Epidemiol 2020;41 (Suppl S1):S451

Landon E et al. Open Forum Infect Dis 2017;4 (Suppl 1):S408  
Edmisten C et al. Am J Infect Control 2017;45:860  
Doll ME et al. Infect Control Hosp Epidemiol 2019;40:1194  
Leis JA et al. Clin Infect Dis 2020 doi: 10.1093/cid/ciaa412

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## Validation of Automated Monitoring Systems

- **When considering or implementing an AHHMS**
  - Validation of system accuracy is recommended
  - Should be performed by facility personnel or 3<sup>rd</sup> party
    - Don't rely only on vendor claims of accuracy
  - Include assessment of sensitivity & specificity
  - Validation should include two phases
    - **Planned path**: observers record their own dispenser use and entries & exits, and compare their results to those provided by the automated system
    - **Behavior path**: observers watch HCP performing usual patient care activities, record dispenser use and room entries & exits; compare with system results
  - System should accurately record  $\geq 95\%$  of dispenser events, with similar accuracy of room entries & exits
- **Poor accuracy causes HCP to ignore data provided by system**

Pineles LA et al. Am J Infect Control 2014;42:144  
Limper HM et al. Infect Control Hosp Epidemiol 2016;37:1002  
Doll ME et al. Infect Control Hosp Epidemiol 2019;40:1194

Boudjema S et al. Clin Microbiol Infect 2014;20:22  
Limper HM et al. Infect Control Hosp Epidemiol 2017;38:348  
Boyce JM et al. Am J Infect Control 2019;47:1443

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## Combining Direct Observation with Automated Hand Hygiene Monitoring

- **Advancing the use of automated monitoring supported by**
  - Joint Commission
  - Leapfrog Group
  - Geneva IPC - Think Tank
- **Combining automated monitoring with direct observation**
  - **AHHMS can be used to provide more accurate, quantitative estimates of HH compliance**
    - Based on large numbers of HH events and HHOs
    - Without observer bias or Hawthorne effect
    - Can provide immediate or near real-time feedback
    - Require less personnel time than direct observation
  - **Direct observation by trained observers can focus on:**
    - Compliance with Moments 2 and 3
    - HH when moving from a contaminated site to another body site during care for the same patient
    - Assessing HH technique

Zingg W et al. Antimicrob Resist Infect Control 2019;8:83

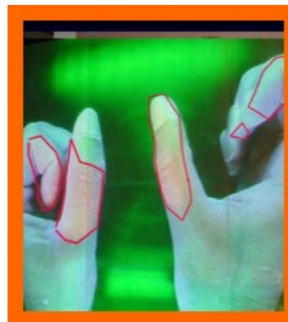
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## Monitoring Hand Hygiene Technique

- CDC and WHO HH guidelines recommend
  - Cover all surfaces of the hands when performing hand hygiene
  - Specific instructions to achieve adequate coverage differ
    - CDC: 3-step protocol
    - WHO: 6-step protocol
- HCP often do not comply with covering all surfaces of hands and fingers
  - Example: only 8.5% of HCP performed all 6 steps in one hospital despite training program
  - Applying a small amount of ABHR can prevent adequate coverage

Areas often missed during hand hygiene



Widmer A et al. ICHE 2004;25:207

Boyce JM & Pittet D. CDC Guideline for Hand Hygiene, 2002  
World Health Organization Guideline for Hand Hygiene in Health Care, 2009  
Tschudin-Sutter S et al. Infect Control Hosp Epidemiol 2015;36:482  
Zingg W et al. Am J Infect Control 2016;44:1689  
Mumma J et al. Clin Infect Dis 2019;69 (S3):S221

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## Monitoring Hand Hygiene Technique

- Duration of hand hygiene using ABHR
  - Amount of time HCP rub their hands together (dry-time) is the major factor affecting antimicrobial efficacy of ABHRs
  - Amount of ABHR applied to hands directly affects dry-time
  - HCP often rub their hands together with ABHR for  $\leq 10$  seconds
- Recommended duration of hand hygiene with ABHR =  $\geq 15$  sec
  - Shorter dry-times suggest an insufficient amount of ABHR was applied

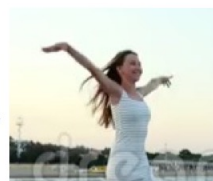
Suchomel M et al. Antimicrob Resist Infect Control 2018;7:65  
Pires Det al. Infect Control Hosp Epidemiol 2017;38:547  
Paula H et al. Am J Infect Control 2018;46:1032  
Pires D et al. Clin Microbiol Infect 2019;25:851  
Harnoss JC et al. J Hosp Infect 2019;104:419  
Kenters N et al. Am J Infect Control 2020;48:503

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### Proposed Approach to Monitoring Hand Hygiene Technique

- **Observe HCP performing HH during their usual duties**
  - Covert observation would be preferable, but may be difficult
  - Observe during routine auditing of compliance, or devote some observation sessions to strictly observing technique
- **Does healthcare worker cover all surfaces of hands?**
  - A) Observe if person rubbed all surfaces of hands with ABHR, or
  - B) Did person rub fingertips and thumbs with ABHR
    - **Inadequate technique: did not cover fingertips and thumbs**
- **Record the total amount of time (seconds) that person rubs their hands together with ABHR (Dry-Time)**
  - Can use stop watch function on smartphone
  - **Appropriate time: 15 seconds or longer**
  - **Inadequate time: < 15 seconds**

Don't count this activity



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### Summary

- **Direct observation of HCP by trained observers has unique advantages, and is the most widely used method for monitoring HH compliance**
  - **However, observed compliance rates are often spuriously high**
    - Hawthorne effect and observer bias
    - Observation of too few hand hygiene opportunities
  - **When used as the only method to monitor hand hygiene,**
    - Assure adequate training and periodic validation of observers
    - Limit observations sessions to < 15 min
    - Avoid having individuals monitor compliance on their own unit
    - Attempt to observe a sufficient number of opportunities to obtain realist compliance rates
- **Dispenser counters monitor hand hygiene frequency, but do not provide data on compliance**

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### Summary

- **Automated group monitoring systems and badge-based systems provide large amounts of data on hand hygiene events and opportunities**
  - Without Hawthorne effect or observer bias
  - Require less personnel time than direct observation
- **Limitations:**
  - Some systems have had suboptimal accuracy
  - Acceptance by HCP can vary
  - Not effective unless accompanied by complementary strategies
  - More data are needed on:
    - Their ability to sustain improved compliance rates and reduce HAIs
    - Cost-effectiveness
- **Combining automated monitoring with direct observation will likely provide the most accurate information regarding hand hygiene performance**

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**Thank you for your attention!**

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# Effectively Monitoring Hand Hygiene: Direct Observation Only or Combined with Automated Monitoring

Dr. John M. Boyce, J.M. Boyce Consulting LLC

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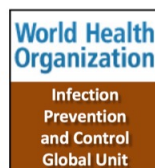
[virox.com](http://virox.com)



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