Methods for Monitoring Hand Hygiene (HH) Compliance

- Direct observation
  - Current “gold standard”
- Self-reporting by healthcare workers (HCWs)
- Indirect measurement of product usage
  - Manual measurement of amount of product used
  - Electronic measurement of usage
- Automated monitoring of compliance

Boyce JM. J Hosp Infect 2008;70 (Suppl 1):2

Direct Observation

- Currently, observational surveys conducted by trained personnel (often IPs) are gold standard
- Advantages of direct observations
  - only method that can assess HH technique
  - only method to detect whether all possible HH opportunities are followed by HCWs
  - one of few methods that can identify type of HCW involved in care
  - can identify situations that require further education of staff

Direct Observation

- Problems associated with observational surveys
  - time-consuming (costly)
  - only a tiny fraction of HH opportunities are observed
  - are findings statistically valid?
  - may be problems with inter-rater reliability
  - observation may affect behavior (Hawthorne effect)

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WHO Hand Hygiene Observation Tool

WHO Training Film and Accompanying Slides
Go to: www.who.int/gpsc/5may/en
Click on: Tool and Resources
Click on: Tools for training and education, and then page down

Use of Mobile Digital Devices to Facilitate Direct Observational Surveys
- Wireless or Internet-capable mobile devices (PDA, smartphone)
- Software or smartphone app used to record hand hygiene observations by observers
- Observations recorded on mobile device
  - Uploaded wirelessly to on-site server for data storage and analysis
  - Emailed to observer for easy analysis
  - Uploaded to dedicated internet website for analysis

Hady CS et al. ICHES 2010:31:575
Cooper LM et al. Decennial 2010 Conference, abstr 264
Kahlert C et al. ICAAC 2010, abstr K-513

iScrub Lite 1.5 App

- Highly customizable
- Obviates the need for transcription
- Exported data can be opened in Excel
- Intuitive interface
- Free!

iScrub Features

- Record opportunities for the World Health Organization’s 5 Moments of Hand Hygiene
- Observations are time and location stamped
- Available free at iTunes App Store

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Monitoring Hand Hygiene Compliance - Measuring Product Usage

- Record amount (ml) of soap + ABHR used
- Record number of bed-days (patient-days)
- ml of soap used/bed-days = HH episodes
  1.7 ml soap used per HH episode bed-day
- Same calculation for ABHR
  - Currently being used in numerous sites in USA
  - Little or no data on how method compares to direct observation


Automated Monitoring Systems

- Electronic monitoring of product usage
- Motion sensing systems to detect room entry/exit and use of hand hygiene dispensers, +/- reminders
  - Without identifying persons entering/exiting room
- Real-time Locating Systems (RTLS) to track HCW movements and use of hand hygiene products
- Video monitoring of HCW hand hygiene activity

Electronic Monitoring of Product Usage

- Electronic counting devices can be placed inside dispensers for alcohol handrub or soap
- Record each time the dispenser is accessed 24 hrs per day/7 days per week
- Measure hand hygiene frequency, not compliance rates

Boyce JM et al. ICHE 2009;30:1090
Marra AR et al. ICHE 2010;31:796

Sample Monthly Hand Hygiene Report

Unit B Soap + San combined Bed: 101-101, Category: NON-ACU

Hand Hygiene Events per Patient-Day, by Ward and by Month, SEP - FEB

During the 6-month trial, 150,307 HH events occurred on the 2 wards

SICU
- N = 105,462 HH events
- Mean HH Events/Pt-Day = 48.7

GMW
- N = 44,845 HH events
- Mean HH Events/Pt-Day = 12.2

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Electronic Monitoring of Product Usage
• 2,249 observed opportunities represented only 1.3% of the estimated 172,457 opportunities
  – Noted that in many healthcare facilities, direct observations account for substantially < 1% of all hand hygiene opportunities
• No significant correlation between observed rate of compliance and alcohol handrub consumption or total volume of handrub + soap products used

Electronic Monitoring of Product Usage
• Advantages of measuring product usage
  – Much less labor intensive
  – Feasible for all wards over prolonged period
  – No selection bias
• Problems associated with product usage
  – Can’t identify if HH was performed at right time
  – No way to assess technique
  – Information on compliance by HCW type is not possible
  – Not clear how well product usage correlates with direct observation in terms of compliance levels
• Further studies are needed to correlate product usage measurements with observational data

Electronic Monitoring of Product Usage to Derive Hand Hygiene Compliance Index
• System estimates hand hygiene compliance by
  – (1) real-time electronic product usage for each nursing unit, with data sent to secure website (numerator)
  – (2) statistically valid benchmarks of hand hygiene opportunities/patient-day (denominator)
    – facility can input local benchmarks on hand hygiene opportunities/patient-day (optional)
  – (3) patient perception survey data (optional)
  – Relative weighting of product usage, direct observation, and patient perception surveys
• Software generates HH compliance index, by unit

Automated Monitoring Systems
• 3-phase intervention in an intermediate care unit
  – 1) electronic monitoring and direct observation
  – 2) electronic monitoring and computerized voice prompts for failure to perform hand hygiene on room exit
  – 3) electronic monitoring only
• Motion sensors detected room entry and exit, and sensors attached to sinks and handrub dispensers detected hand hygiene events
• In Phase 2, computerized voice-prompt system gave one of several messages if hand hygiene not done upon exiting the room

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Automated Monitoring Systems

- Results: Compared to Phase 1, HH compliance improved 37% during Phase 2, and 41% during Phase 3
- When adjusting for patient admissions during each phase, point estimates of nosocomial infections decreased by 22% during phase 2; 48% during phase 3
- When adjusting for patient days, the number of infections decreased by 10% during phase 2 and 40% during phase 3
- Electronic monitoring provided effective feedback, improved HH compliance & nosocomial infection rates


Automated Monitoring Systems

- Prospective intervention study in Hematology unit
  - Phase 1: electronic monitoring of HH compliance
  - Phase 2: electronic prompts (beeps, flashing light, and pre-recorded voice prompt) if HH compliance did not occur
  - Motion sensors detected room entry and exit, with HH compliance defined as use of handrub dispenser on room entry and exit
  - Concurrent direct observation by trained observers to validate electronic data

Venkatesh AK et al. AJIC 2008;36:199

Automated RTLS Monitoring Systems

- Real-time locating systems (RTLS) permit identification and tracking of HCWs
  - HCWs wear a special badge (tag)
  - Sensors (readers) located throughout the facility track the location of HCWs using a centralized database and vendor-specific software
  - Readers attached to (or near) hand hygiene product dispensers detect hand hygiene events
  - Different vendors utilize various technologies, most commonly wireless
    - RFID, Infrared (IR), RFID/IR, ZigBee, Wi-Fi, Ultra-wideband, Ultrasound

Fries J et al. SHEA 2009
Sahud AG et al. ICHE 2010;31:634
Edmond M et al. Decennial 2010 Conference, Abstr 740

Electronic Hand Hygiene Monitoring Systems

- Hand hygiene station detects alcohol-containing soap or handrub on HCW hands placed under unit
- HCW badge reminds HCW if hand hygiene not done upon approaching patient
- Bed monitor detects presence of HCW near patient's bed

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Automated RTLS Monitoring Systems

- RTLS based on ZigBee technology was developed to track use of hand hygiene products by HCWs
- Sensitivity, specificity, (+) and (-) predictive values were determined based on trained observers
- Hand hygiene compliance defined as use of hand hygiene dispenser by HCW upon room entry & exit
- Results:
  - Sensitivity: 91 – 97%; Specificity: 100%
  - PPV: 100%; NPV: 96 – 99%
- Conclusion: practical and inexpensive system to determine hand hygiene compliance
  Fries J et al. SHEA 2009

Automated RTLS Monitoring Systems

- 2-phase observational study
  - I. Direct observation of baseline compliance rates
  - II. Use of radio-frequency readers and triggers to detect room entry/exit and use of soap and alcohol-based handrub dispensers; feedback to participants
- Results:
  - Manual recording of room entry/exit and dispenser use by the investigator revealed that 98% of room entries & 95% of dispensing events were captured by the system
  - Overall hand hygiene compliance rate for Phase I (32%) was higher than during Phase II (25%)
- Conclusion: Automated system may provide more reliable compliance rates, including during evening hours
  Sahud AG et al. ICHE 2010;31:634

Automated RTLS Monitoring Systems

- 2-phase intervention study on 35-bed ward with alcohol foam dispensers inside/outside each room
- Phase 1: 4 weeks (100 hrs) of direct observation of HH compliance rates; no feedback given to HCWs
- Phase 2: 2-week period with nurses wearing alcohol sensor badges
  - At room entry and exit, badge is activated at doorway
- Results:
  - Manual recording of room entry/exit and dispenser use by the investigator revealed that 98% of room entries & 95% of dispensing events were captured by the system
  - Overall hand hygiene compliance rate for Phase I (32%) was higher than during Phase II (25%)
- Conclusion: Automated system may provide more reliable compliance rates, including during evening hours
  Sahud AG et al. ICHE 2010;31:634

Automated RTLS Monitoring Systems

- After performing hand hygiene with alcohol-based product, HCW places hand near badge
- If alcohol is detected within 8 sec of room entry or exit, the badge light turns green and emits audible "ping"
- If alcohol is not detected, badge light turns red and emits a beeping noise
- Compliance data are sent wirelessly to centralized database for monitoring
- Results: HH compliance rate for nurses increased
  - Baseline: 72%
  - Intervention phase: 92% (range 72 – 100%) (p < 0.0001)
- Conclusion: Use of badge system resulted in significant increase in HH compliance
- Limitations:
  - Short-term study on single ward
  - Detected only compliance using alcohol-based product
  Edmond MB et al. J Hosp Infect 2010 (Epub)

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Automated Video Monitoring Systems

- Multiple video cameras were used to monitor use of soap or handrub dispensers by HCWs upon entry and exit to an MICU
- External auditors scored use (Pass) or no use (Fail) of dispensers in real-time, 24/7
- Auditor managers performed quality audits of 5% of events to assure validity
- 4-month baseline period, followed by 6-month period with feedback displayed on electric boards updated q 10 min with compliance rates, and emails q shift to MICU managers

Automated Monitoring Systems

- Issues requiring further study
  - Infrastructure
    - Cost & ease of installation of infrastructure; other uses?
    - Ability of systems to define patient zone in multi-bed rooms
    - Percent of hand hygiene opportunities captured
    - Detection of opportunity at bedside (e.g., aseptic procedure)
    - Detection of compliance when patients not confined to bed
    - Impact on compliance rate if HCW does not touch patient or environment
    - Type of real-time reminders given to HCW by badge
    - Reliability of compliance data with video systems
    - Estimates of return on investment (ROI)

Automated Video Monitoring Systems

- Compliance increased from a baseline of < 10% to 89% in the last 4 months of trial period (p < .0001)
- Conclusion: Remote video monitoring of hand hygiene, with real-time feedback to HCWs resulted in a significant increase in hand hygiene compliance

Automated Monitoring Systems

- Issues requiring further study
  - Acceptability by HCWs
    - Willingness to wear badge and be individually monitored
    - Preliminary data suggest this may not be problem
    - Will reports of individual compliance be confidential?
    - Knowledge of who will receive data on compliance
      - Nursing managers, infection control, HCW
    - How will feedback be given to HCW
    - How will compliance data be used by administration?
      - Use for annual performance evaluation
      - Potential impact of system on HCW behavior

Summary

- Direct observation of hand hygiene activities is currently most common method of measuring hand hygiene compliance
  - Provides unique information not available from any other method (HH technique, appropriateness)
  - Will continue to have a role in monitoring compliance
- Shortcomings of direct observation include:
  - Time-consuming and expensive
  - Lack of standardization & Hawthorne effect
  - Only small fraction of HH opportunities can be observed

Summary

- Measuring hand hygiene product usage
  - Less time-consuming and less expensive
  - Can detect hand hygiene events throughout day on all wards
  - Can detect changes in hand hygiene frequency related to planned interventions or unplanned events (pandemic flu)
- Shortcomings of measuring product usage
  - Measures hand hygiene frequency, not compliance rates
  - Can be used to estimate compliance rates
  - Cannot differentiate HCW from other users
  - How well do data correlate with compliance rates established by direct observation?
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Summary

• Automated monitoring of compliance
  – Can provide HCW-specific data on HH activity
  – Can capture many, but not all HH opportunities
  – Particularly WHO Moments 1, 4 and 5
  – Provides real-time compliance data with automated analysis by HCW, Unit, etc.
  – A few preliminary studies suggest they can lead to substantial improvement in HH compliance rates

• Further studies are needed to establish
  – Acceptability by HCWs, impact on HH compliance rates
  – Reliability of compliance rates
  – Resource needs, practicality, cost, Return of Investment

The Next Few Teleclasses

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