Current Issues in Hand Hygiene

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Topics for Discussion

• How long should healthcare personnel (HCP) perform hand hygiene with alcohol-based hand rubs (ABHR)?

• Does hand size affect the volume of ABHR that should be applied?

• What is appropriate hand hygiene technique?

• What methods for promoting improved hand hygiene work?

• Current approaches to monitoring hand hygiene performance
What is the Appropriate Application Time (Duration) of Hand Hygiene Using an Alcohol-Based Hand Rub (ABHR)?

• **2002 CDC Hand Hygiene guideline**
  • Recommends applying product to a palm, rub hands together, and cover all surfaces of hands and fingers
  • No specific duration recommended
  • Text states that if hands feel dry after rubbing together for 10-15 seconds, an insufficient volume of product has likely been applied

• **2009 WHO Hand Hygiene guideline**
  • Recommends that hands be rubbed together for
    • 20-30 seconds when using an ABHR
    • 40-60 seconds when washing with soap & water
  • WHO 6-step technique for ABHR disinfection requires even longer duration
    • Time to complete 6-step procedure in several studies: 38.5 – 42.5 seconds

Reilly JS et al.  Infect Control Hosp Epidemiol 2016;37:661
HCP Hand Hygiene Practices: Duration and Preferred Volume

- Ward-based surveys of duration of alcohol-based hand antisepsis
  - Median time to rub hands until they feel dry (dry times): 4 sec – 11 sec
  - Mean time to rub hands until they feel dry: 6 sec – 15.3 sec

- HCP prefer small volumes that yield short dry times
  - In two studies that permitted HCP choose volume to apply, mean volume per application ranged from 0.73 ml – 1.09 ml
  - In observational study in Scotland, mean volume per application was 1 ml

Reardon JM et al. Infect Control Hosp Epidemiol 2013;34:96
Stahmeyer JT et al. J Hosp Infect 2017;95:338
Martinello RA et al. SHEA Spring Conference 2017, Abstr. 445
Factors Affecting the Duration of Hand Hygiene with ABHR

- Factors affecting how long HCP need to rub their hands together before they feel dry
  - Volume applied is the major factor
    - The greater the amount applied, the longer the dry time
    - Amount delivered by dispensers is variable (0.7 ml to 1.75 ml)
  - Product formulation is another important factor
    - Applying same amount of two different products may yield significantly different dry times
    - Higher alcohol concentrations yield faster dry times
    - Other product ingredients can also affect dry times

- Recommendation
  - With most products, if an adequate amount of ABHR has been applied, hands shouldn’t feel dry until they have been rubbed together for 15 – 30 seconds

Macinga DR et al. Infect Control Hosp Epidemiol 2013;34:299
Macinga DR et al. BMC Infect Dis 2014;14:511
Pires D et al. Infect Control Hosp Epidemiol 2017;38:547
Should the Volume of Alcohol-Based Hand Rub Applied Be Based on Healthcare Worker Hand Size?

• Goroncy-Bermes et al. reported in 2010
  • Microbicidal efficacy of ABHRs was affected by size of HCP hands and volume applied
  • Type of product also affected log$_{10}$ reductions of bacteria achieved

• Bellissimo-Rodrigues et al. found:
  • Log$_{10}$ reductions of bacteria were significantly lower for large hands compared to small hands
  • Even 3 ml of ABHR applied for 30 second did not yield 2 log$_{10}$ reduction in HCP with large hands

• In a study of 67 HCP, even 3 ml of ABHR was not enough to cover all surfaces of those with medium- or large-sized hands
  • Method of assessing hand coverage seems open to question

Goroncy-Bermes et al. J Hosp Infect 2010;74:212
Should the Volume of Alcohol-Based Hand Rub Applied Be Based on Healthcare Worker Hand Size?

• In a prospective study of 53 nurses on several wards, each nurse was given a special bottle of ABHR on each of 3 shifts
  • Each nurse could choose the volume of ABHR to apply to their hands
  • Bottle cap counted number of times bottle was opened during a shift
  • Amount of ABHR used by each nurse was determined for each shift
  • \[ \frac{\text{Volume of ABHR used/shift}}{\text{Number of times bottle was opened/shift}} \] = mean volume per application
  • Nurses’ hand sizes were measured and surface area estimated

• Results
  • Mean volume of ABHR used/application was 1.09 ml (95% range: 0.19-2.3)
  • No significant correlation between hand size and volume of ABHR applied
  • Most variation in volume used/application was between individual nurses, and less due to differences between wards

Martinello RA et al. SHEA Spring Conference 2017, Abstr. 445
Should the Volume of Alcohol-Based Hand Rub Applied Be Based on Healthcare Worker Hand Size?

• A given dose of ABHR will not provide
  • Same degree of coverage of all hand surfaces in HCP with small vs large hands
  • Same efficacy in reducing bacterial contamination of different-sized hands
  • Volume of ABHR delivered by dispensers may be considered “too much” by nurses with small hands, but be insufficient for those with large hands

• Conclusion
  • Efforts to design ABHR dispensers that individualize dose delivered/application are warranted
  • Dose should be adequate to cover all surfaces of hands, and keep hands wet long enough to achieve desired $\log_{10}$ reductions
  • Possible methods for individualizing the dose of ABHR applied to hands
    • Rapid scan & estimation of hand size when hand placed under dispenser, with dose based on hand size
    • Encoding hand size in electronic badges worn by HCP; dispenser recognizes HCW and delivers appropriate dose

Kampf G Infect Control Hosp Epidemiol 2017 (Epub ahead of print)
Recommended Hand Hygiene Technique

• **2002 CDC Guideline**
  • Apply ABHR to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry

• **2009 WHO Guideline**
  • Apply palmful of ABHR and cover all surfaces of the hands. Rub hands until dry
  • Duration of the entire procedure: 20-30 seconds
  • Recommended a 6-step procedure

• **Compliance with complicated 6-step procedure has varied from 0% to 8.5%**

WHO 6-Step vs Simplified 3-Step Hand Hygiene Technique

• 2 randomized, controlled trials compared the 3-step CDC method to 6-step WHO method
  • One study: no significant difference in the effectiveness of the 2 methods
  • One study: the WHO method was more effective

• One study found the WHO 6-step method required 42.5 seconds vs 35 seconds for the CDC method

• Video camera-based device with immediate feedback was used for self-directed check on compliance with the 6-step technique
  • Use of the device increased the number of steps completed, but did not result in HCP completing all 6 steps in one study
  • In another study, HCP frequently missed one or more of the 6 steps
  • HCP liked the automated device
  • Its effect on ward-based hand hygiene technique was not assessed
  • Hand hygiene compliance rates did not increase

Price L et al. Am J Infect Control 2018;
Reilly JS et al. Infect Control Hosp Epidemiol 2016;37:661
Hand Hygiene Technique

- Kampf et al. found that instructing HCWs to cover both hands completely, without providing any specific steps “responsible application” was as effective a 6-step method.

- Tschudin-Sutter proposed a simplified 3-step method
  - Modified 3-step method was more effective microbiologically than WHO method

- Conclusion
  - Modified 3-step method is easier and quicker than 6-step method, is effective, and should be considered for adoption

Kampf G et al. BMC Infect Dis 2008;8:149
The Five Components of the WHO multimodal hand hygiene improvement strategy (WHO-5)

1a. System change – Alcohol-based handrub at point of care

1b. System change – access to safe, Continuous water supply, soap and towels

2. Training and education

3. Evaluation and feedback

4. Reminders in the workplace

5. Institutional safety climate

www.who.int/gpsc/5may/tools/training_education/en/
Essential Elements for Improving Hand Hygiene

• Making alcohol-based hand rub available at the point of care
  • Evidence favors locating dispensers in hallways and in patient rooms
  • Consider pocket-sized bottles in areas with few locations for dispensers (e.g., ER)

• Educate, then re-educate
  • E.g., mandatory, annual on-line learning sessions

• Performance feedback
  • Quarterly or monthly feedback has questionable impact
  • Just-in-time coaching, providing verbal reminders\(^1,^2\)
    • By designated individuals
    • Peers on nursing units
  • Weekly feedback reports or real-time displays on nursing units
    • Emails to nurse/department managers or text messages to front-line HCWs\(^3,^4\)

\(^1\)Chassin MR et al. Jt Comm J Qual Patient Saf 2015;41:13
\(^3\)Armellino D et al., Clin Infect Dis 2012;54:1
Essential Elements for Improving Hand Hygiene

• Reminders in the workplace
  • Screen saver messages on unit computer displays
  • Signs (based on cognitive biases) next to dispensers\(^1\)

• Visible and vocal support from administration
  • Reports and discussion at high-level board & committee meetings
  • Providing adequate resources for hand hygiene promotion

• Efforts to improve institutional safety climate\(^2,3\)
  • “Do No Harm” programs
  • High-Reliability Organization (HRO) initiatives

\(^1\text{Caris MG et al. J Hosp Infect 2018;98:352}\)
\(^2\text{Caris MG Infect Control Hosp Epidemiol 2017;38:1277}\)
\(^3\text{Wolfe JD et al. J Patient Saf 2018 (Epub ahead of print)}\)
Efficacy of Different Intervention Strategies in Improving Hand Hygiene

- Systematic review and meta-analysis of hand hygiene

- 41 of 3639 studies retrieved were included in the analysis
  - 6 randomized controlled trials
  - 32 interrupted time series studies
  - 1 non-randomized trial
  - 2 controlled before/after trials

- Meta-analysis of 2 randomized controlled trials revealed that adding goal setting to WHO-5 yielded improved compliance

- Of 22 pairwise comparisons of interrupted time series, 18 showed stepwise improvement in hand hygiene compliance

Luangasanatip N et al. BMJ 2015;351:h3728
Efficacy of Hand Hygiene Promotional Strategies

- **WHO-5** was effective in improving hand hygiene
- **Compliance can be further improved by adding other strategies**
  - **Goal setting**
    - Set institutional or unit-based goals for compliance rates
  
  - **Reward incentives**
    - Rotating trophy for unit with best compliance rate
    - Pizza or other food parties for unit with highest compliance
    - Institution-wide employee bonus if compliance goals met
  
  - **Accountability**
    - Peer-to-peer observations and reminders
    - "200% accountability"
    - Administrator/dept chair feedback to recalcitrant physicians
    - Short, mandatory weekly meetings of nursing unit representatives

Luangasanatip N et al. BMJ 2015;351:h3728
Landon EL et al. IDSA Annual Meeting, 2017, Abstr. 151
Approaches to Monitoring Hand Hygiene Compliance

• Direct observations by expert observers

• Direct observations by patients

• Consumption of hygiene products (e.g., ABHR, soap)

• Automated monitoring systems
  • Require limited personnel time after installation
  • Continuously monitor hand hygiene opportunities and events
  • Record many more opportunities and events than by direct observation

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
Direct Observation by Trained Observers

• Direct observation of personnel by trained observers is currently considered the “gold standard” method of determining hand hygiene compliance rates

• Advantages
  • Determine compliance with all 5 Moments for Hand Hygiene
  • Evaluate hand hygiene technique
  • Provide immediate feedback to healthcare personnel

• Limitations
  • Lack of standardized methods
  • Evaluates < 1% to 2% of all hand hygiene opportunities
  • Hawthorne effect (personnel improve compliance when being watched)
  • Time-consuming

Boyce JM  Am J Infect Control 2017;45:528
Srigley JA et al. BMJ Qual Saf 2014;23:974
Electronic Monitoring of Product Usage

• Electronic devices placed inside dispensers can record each time the dispenser is accessed (HH event)
  • HH events are time/date stamped
  • HH Event data can be downloaded for subsequent analysis

• Can establish trends in hand hygiene frequency over time

• Limitations
  • Cannot tell who used dispensers (HCW, visitors, patients)
  • Does not give information on hand hygiene compliance

Marra AR et al. Infect Control Hosp Epidemiol 2010;31:796
Sodre da Costa LS Am J Infect Control 2013;41:997
Automated Monitoring of Product Usage

• Automated system for monitoring of hand hygiene (HH) events
  + estimated number of HH opportunities
    • Dispensers record electronically each time the dispenser is accessed (HH event) and send data to computer server
    • HH opportunities can be estimated based patient census, patient-to-nurse ratio, and adjustments
    • HH compliance is estimated by software
      • \# of HH events \(\frac{\text{\# of HH events}}{\text{\# of estimated opportunities}}\) = estimated compliance
    • Further studies of validity in additional settings are warranted

Automated Group Monitoring and Feedback Systems

• More complex electronic systems with
  • Counting devices in dispensers, and
  • Sensors detect persons entering/exiting patient rooms
  • Can estimate hand hygiene compliance of groups of personnel

• Dispensers record hand hygiene events
• Room entry = proxy for Moment 1; exit = proxy for Moments 4 & 5
• # of Events / # of room entries & exits = estimated compliance

• Provide real-time feedback to groups of healthcare personnel (HCP)

• Limitations:
  • Cannot tell if persons entering room are HCP or not
  • Do not provide data on compliance with Moments 2 and 3

Ellison RT et al. Open Forum Infect Dis 2015;2:0vf121
Limper HM et al. Infect Control Hosp Epidemiol 2017;38:348
Automated Badge-Based Monitoring Systems

• **Advantages**
  - Provide healthcare worker-specific compliance rates
  - Some systems can provide real-time reminders to HCWs
    - Provide real-time visual, auditory or vibratory reminders

• **Limitations**
  - More expensive and complicated than other systems
  - Some systems currently have suboptimal accuracy in detecting hand hygiene opportunities and events
  - Acceptance by HCWs has been a problem with some systems
  - Most systems cannot estimate compliance with all 5 Moments for hand hygiene

• **Further information is also needed on:**
  - Ability to improve hand hygiene compliance rates in a sustained manner
  - Impact on healthcare-associated infection rates and cost-effectiveness
  - How to best combine automated monitoring systems with direct observations in multimodal strategy

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
Questions?
Hand Hygiene Technique Among HCWs

- Study involved 60 healthcare workers

- Methods
  - Hand cultures were obtained before/after hand antisepsis using ABHR + fluorescent dye
  - 5 areas on hands were checked for contact with ABHR

- Results
  - Mean $\log_{10}$ Reduction = 2.0
  - 25% of HCWs achieved less than 1.1 $\log_{10}$ reduction
  - Areas frequently not covered by ABHR included thumbs, finger tips & between fingers

Source: Widmer AF ICAAC 2005

Widmer AF et al. ICHE 2004;25:207