

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

Chow A et al. Am J Infect Control 2012'40:800

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

Helder OK et al. *Int J Nurs Studies* 2010;47:1245

Reardon JM et al. *Infect Control Hosp Epidemiol* 2013;34:96

Korhonen A et al. *J Clin Nurs* 2015;24:3197

Stahmeyer JT et al. *J Hosp Infect* 2017;95:338

Clack L et al. *Antimicrob Resist Infect Control* 2017;6:108

Leslie RA et al. *Antimicrob Resist Infect Control* 2015;4(Suppl 1):295

Martinello RA et al. *SHEA Spring Conference 2017, Abstr. 445*

Dalziel C et al. *J Hosp Infect* 2018;98:375

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**

Girard R et al. *J Epidemiol Global Health* 2013;2:193

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

Wilkinson MA et al. *J Hosp Infect* 2017;95:175

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

Bellissimo-Rodrigues F et al. Infect Control Hosp Epidemiol 2016;37:219

Zingg W et al. Am J Infect Control 2016;44:1689

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
 - Volume of ABHR used/shift = mean volume per application
Number of times bottle was opened/shift
 - 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



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

Bellissimo-Rodrigues F et al. Infect Control Hosp Epidemiol 2016;37:219

Zingg W et al. Am J Infect Control 2016;44:1689


Kampf G Infect Control Hosp Epidemiol 2017 (Epub ahead of print)

Recommended Hand Hygiene Technique

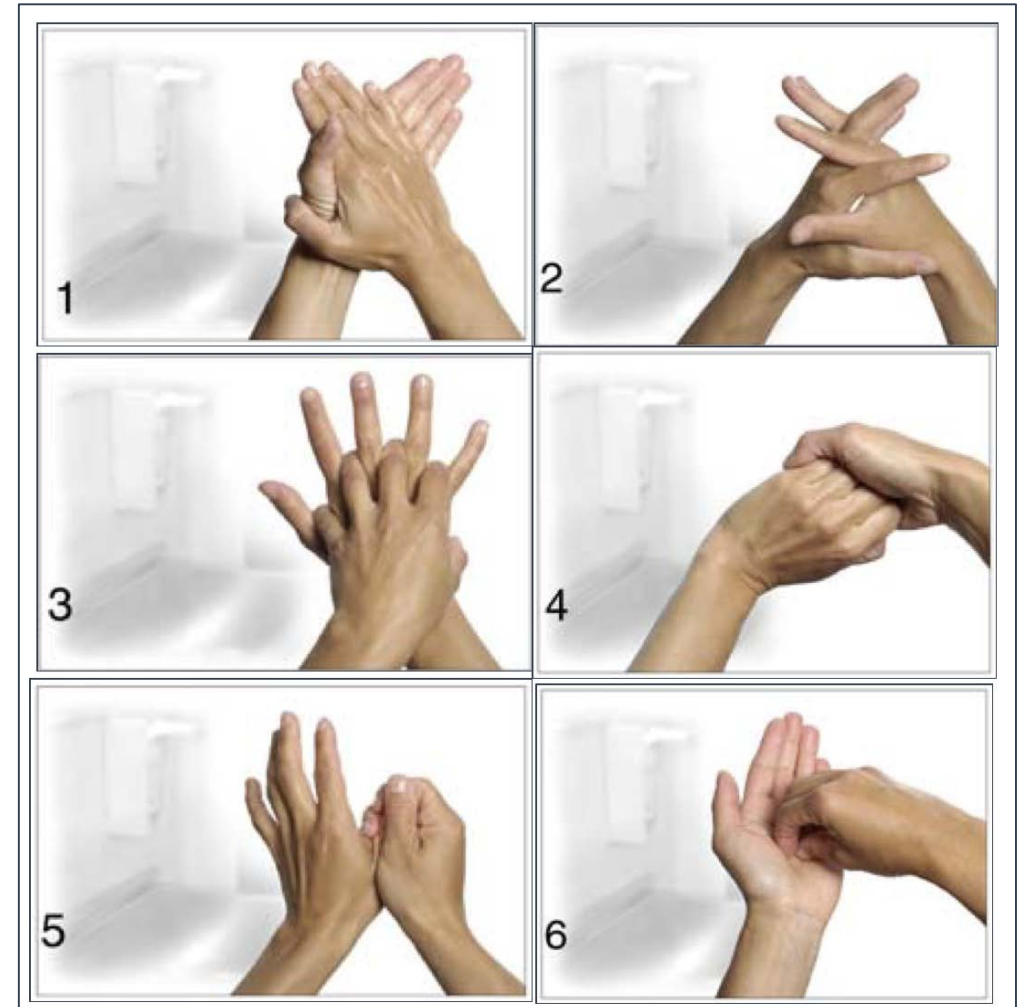
- **2002 CDC Guideline**

- 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%



Stewardson AJ et al. PLoS One 2014;9:e105866

Tschudin-Sutter S et al. Infect Control Hosp Epidemiol 2015;36:48

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;

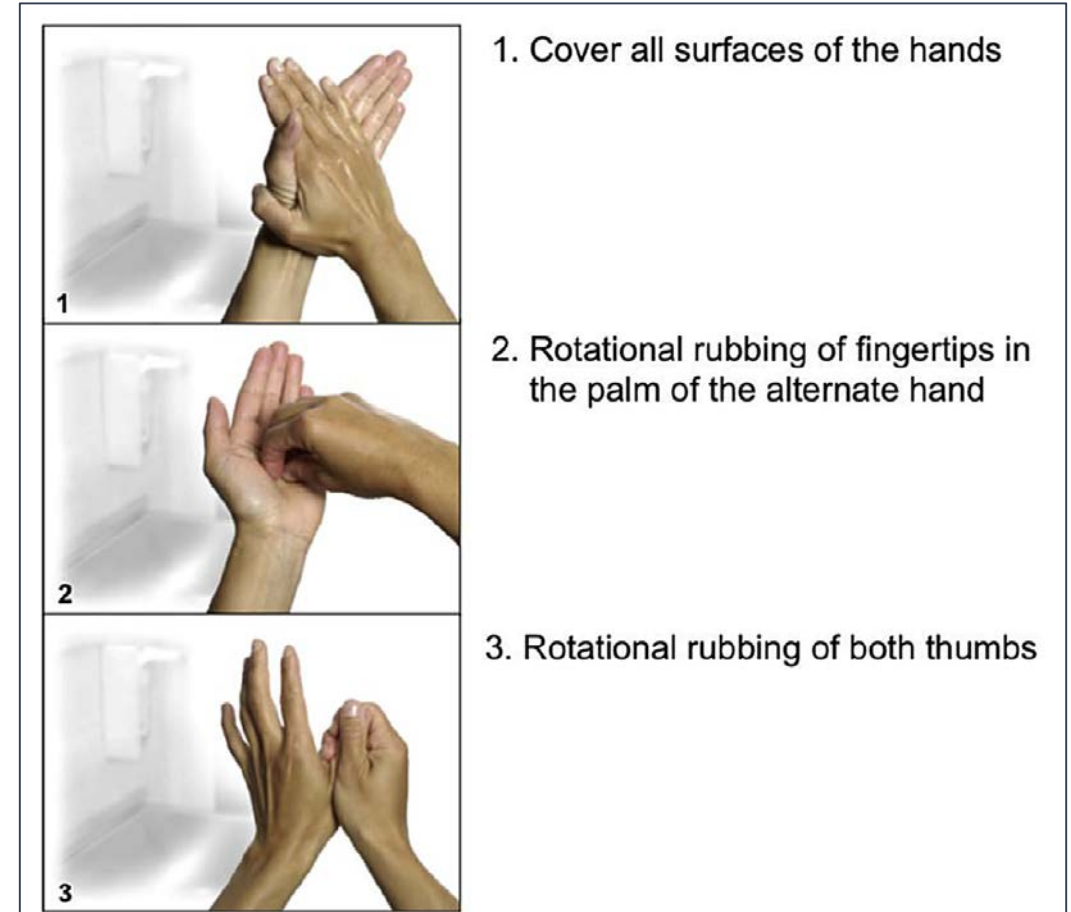
Reilly JS et al. Infect Control Hosp Epidemiol 2016;37:661

Stewardson AJ et al. PLoS One 2014;9:e105866

Kwok YL et al. Am J Infect Control 2015;43:821

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**



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

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}

¹Chassin MR et al. Jt Comm J Qual Patient Saf 2015;41:13

²Sickbert-Bennett et al. Emerg Infect Dis 2016;22:1628

³Armellino D et al, Clin Infect Dis 2012;54:1

⁴Kerbaj J et al. Am J Infect Control 2017;45:234

Essential Elements for Improving Hand Hygiene

- **Reminders in the workplace**
 - Screen saver messages on unit computer displays
 - Signs (based on cognitive biases) next to dispensers¹
- **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

¹Caris MG et al. J Hosp Infect 2018;98:352

²Caris MG Infect Control Hosp Epidemiol 2017;38:1277

³Wolfe 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**

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

Sickbert-Bennett E et al. *Emerg Infect Dis* 2016;22:1628

Harold J et al. *IDSA Annual Meeting, 2007, Abstr. 566*

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

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

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

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

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



Larson EL et al. Am J Crit Care 2005;14:304

Boyce JM et al. Infect Control Hosp Epidemiol 2009;30:1090

Marra AR et al. Infect Control Hosp Epidemiol 2010;31:796

Sodre da Costa LS Am J Infect Control 2013;41:997

Filho MA et al. Am J Infect Control 2014;42:1188

Arai A et al. Am J Infect Control 2016;44:1481

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**
 - $$\frac{\text{\# of HH events}}{\text{\# of estimated opportunities}} = \text{estimated compliance}$$
 - **Further studies of validity in additional settings are warranted**

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

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

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

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

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

Swoboda SM et al. Crit Care Med 2004;32:358

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

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

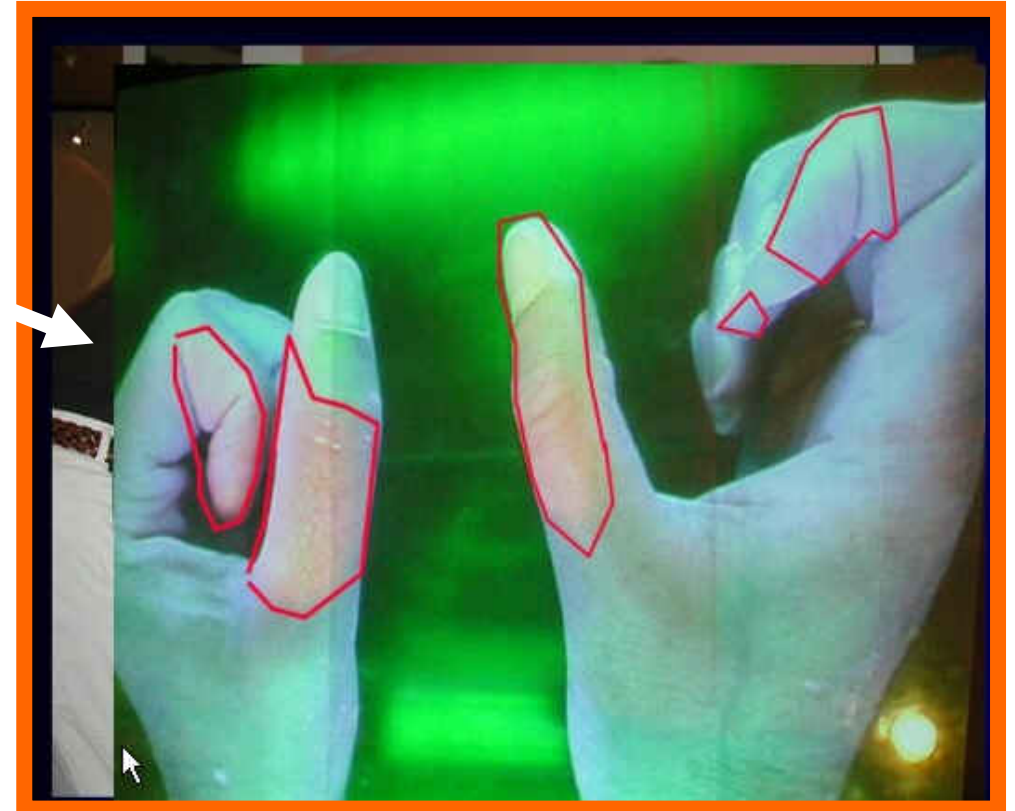
Srigley JA et al. J Hosp Infect 2015;89:51

Boyce JM Am J Infect Control 2017;45:528

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