



ELSEVIER

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Automated and electronically assisted hand hygiene monitoring systems: A systematic review

Melissa A. Ward MS^a, Marin L. Schweizer PhD^{a,b}, Philip M. Polgreen MD, MPH^a, Kalpana Gupta MD, MPH^{c,d}, Heather S. Reisinger PhD^{a,b}, Eli N. Perencevich MD, MS^{a,b,*}^a Department of Internal Medicine, University of Iowa Carver College of Medicine, Iowa City, IA^b Iowa City VA Health Care System, Iowa City, IA^c VA Boston Health Care System, West Roxbury, MA^d Boston University School of Medicine, Jamaica Plain, MAKey Word:
Hand hygiene

Background: Hand hygiene is one of the most effective ways to prevent transmission of health care-associated infections. Electronic systems and tools are being developed to enhance hand hygiene compliance monitoring. Our systematic review assesses the existing evidence surrounding the adoption and accuracy of automated systems or electronically enhanced direct observations and also reviews the effectiveness of such systems in health care settings.

Methods: We systematically reviewed PubMed for articles published between January 1, 2000, and March 31, 2013, containing the terms *hand AND hygiene* or *hand AND disinfection* or *handwashing*. Resulting articles were reviewed to determine if an electronic system was used.

Results: We identified 42 articles for inclusion. Four types of systems were identified: electronically assisted/enhanced direct observation, video-monitored direct observation systems, electronic dispenser counters, and automated hand hygiene monitoring networks. Fewer than 20% of articles identified included calculations for efficiency or accuracy.

Conclusions: Limited data are currently available to recommend adoption of specific automatic or electronically assisted hand hygiene surveillance systems. Future studies should be undertaken that assess the accuracy, effectiveness, and cost-effectiveness of such systems. Given the restricted clinical and infection prevention budgets of most facilities, cost-effectiveness analysis of specific systems will be required before these systems are widely adopted.

Published by Elsevier Inc. on behalf of the Association for Professionals in Infection Control and Epidemiology, Inc.

Health care worker (HCW) compliance with hand hygiene is universally acknowledged as important in preventing transmission of health care-associated infections (HAIs).^{1,2} However, compliance has not risen to acceptable levels. Covert direct observation of hand hygiene by a trained observer is considered the gold-standard

monitoring method but can be time-consuming, costly, limited, and subject to bias.³

A wide-range of electronic or electronically assisted hand hygiene monitoring systems are being developed.⁴ Current technologies include automated counting systems (eg, counters in pump bottles), enhanced direct observation by a human observer, video monitoring, and fully automated monitoring systems. Fully automated systems generally include a wearable/mobile component, ways to record all hand hygiene opportunities, provision of a feedback or reminder system, and, ideally, responses to HCWs' behavior and actions.⁵ A 2009 survey by Braun et al⁶ found that 8 of 220 responding facilities (4%) used an automatic monitoring system, whereas 18% used a manual data collection system enhanced by technology.

However, there are significant costs associated with electronic and automated hand hygiene systems, particularly if implemented hospital-wide, without a guarantee that their measurements are

* Address correspondence to Eli N. Perencevich, MD, MS, Center for Comprehensive Access and Delivery Research and Evaluation, Iowa City VA Health Care System, 601 Hwy 6 W, Iowa City, IA 52246.

E-mail address: eli.perencevich@va.gov (E.N. Perencevich).

The work reported here was supported by the Department of Veterans Affairs (VA), Veterans Health Administration, Health Services Research and Development (HSR&D) Service through the Comprehensive Access and Delivery Research and Evaluation Center (grant No. REA 09-220). MLS is funded by a VA HSR&D Career Development Award (No. CDA 11-211). ENP was funded through a VA HSR&D grant (No. IIR 09-099). The VA Office of Research and Development had no role in the design and conduct of the study.

Conflicts of interest: None to report.

Table 1
Description of noteworthy studies stratified by surveillance methodology assessed

Method	Study design	Result	Cost	Effectiveness/limitations
Electronically assisted/enhanced direct observation Chen et al, 2013 ²⁷	Implementation-effectiveness	Standardized, electronically assisted directly observed auditing program implemented; compliance increased from 50%-86%	Not noted; application developed in-house	Time-stamped data allowed investigators to correct for bias (eg, Hawthorne); program increased total number of observations from 75-100 to 90,538/year
Video-monitored direct observation Davis, 2010 ²⁸	Quasi-experimental	Intervention of reminders and posters increased compliance from 24%-62%	Not noted	Patient privacy an issue; video camera captured all entrances to the department by staff, visitors, and patients
Armellino et al, 2012 ²⁹	Quasi-experimental	Increase in compliance from 6.5%-81.6% after remote video monitoring and compliance feedback implemented	Installation of video cameras at cost of \$50,000 for 1 unit, salaries for round-the-clock, off-site auditors not noted	Patient privacy at issue; video camera had wide enough angle to detail job category of HCW on room entry/exit
Electronic dispenser counters Larson et al, 2000 ³²	Quasi-experimental with a nonequivalent control hospital	Mean HH/patient-care day higher at intervention hospital following an organizational climate change intervention (RR, 2.1; 95% CI, 1.99-2.21 on 6-mo follow-up)	Not noted	HH frequency only monitored using counting devices in soap dispensers; not validated with in-person direct-observation
Kinsella et al, 2007 ³⁴	Observational	Frequency of ABHR dispenser use varied by location and time of day	Not noted	Counters provided time-stamped data; results may have been confounded by use of personal ABHR dispensers
Koff et al, 2009 ³⁸	Quasi-experimental	Introduction of personal ABHR dispenser significantly increased HHDE ($P < .002$), decreased contamination of IV tubing ($P < .01$), decreased postoperative HAI ($P = .02$)	Device commercially available, cost not specified	Sensitivity of electronic counter in device compared with direct observation not noted
Koff et al, 2011 ³⁷	Quasi-experimental	Introduction of multimodal intervention and personal ABHR dispenser resulted in a reduction of VAP ($P < .01$)	Device commercially available, cost not specified	Number of staff using personal ABHR voluntarily decreased from 20/shift to 8/shift during intervention period; device sensitivity not noted
Marra et al, 2010 ⁴¹	Observational	There was no significant correlation between the rate of directly observed HH compliance and the mean number of HH dispensing episodes per patient-day ($r = .27$; $P = .40$).	Not noted	Time-stamped data useful in monitoring increases in HH frequency and timing of HH in relation to other electronic nursing data; validation with in-person direct observation noted data from electronic counters better estimated HH compliance
Morgan et al, 2012 ⁴⁶	Quasi-experimental	Electronic bottle counters noted significant increase in HH frequency ($P < .001$) that was not observed using in-person direct observation ($P > .05$)	\$30,000-\$40,000 for installation per patient care unit	Data from electronic bottle counters only weakly correlated with data from in-person direct observation and also provided data across all shifts and all days of the week but found 100% agreement during prestudy period
Automated HH monitoring networks Swoboda et al, 2004 ⁵¹	Quasi-experimental	Compliance during phase 1 noted to be 44% via in-person direct observation versus 21.6% recorded by the network. When accompanied by voice prompts, electronic monitoring improved compliance (OR, 1.38; 95% CI, 1.04-1.83)	Not noted	Difference attributed to observer only recording hand hygiene opportunities if HCW interacted with the patient, whereas the network recorded all opportunities regardless of situation or patient-care role

(Continued on next page)

Download English Version:

<https://daneshyari.com/en/article/5867575>

Download Persian Version:

<https://daneshyari.com/article/5867575>

[Daneshyari.com](https://daneshyari.com)