JBI EVIDENCE SUMMARY

HAND HYGIENE MONITORING TECHNOLOGY

Search date

10/09/2021

Author

Tania Marin MPH BHSc, updated by Leaderlou S Magtoto DMD

Question

What is the best available evidence regarding the efficacy of hand hygiene monitoring technology in improving hand hygiene, or reducing the incidence of healthcare-associated infection?

Clinical Bottom Line

Healthcare worker compliance with hand hygiene is considered to be the primary measure to prevent transmission of healthcare-associated infection (HCAI).[1,2,31] Observation is considered to be the gold standard for assessing hand hygiene compliance; however, limitations exist (e.g. the Hawthorne effect).[2] Hand hygiene monitoring technology (HHMT), including electronic and video monitoring systems (EMS/VMS), have been developed as a potential solution to the problem of poor hand hygiene compliance among healthcare workers.[1] An HHMT includes simple systems that count hand hygiene events by alcohol-based hand rub or soap dispensing, and complex systems that provide estimates of compliance and/or real-time hand hygiene reminders,[1] or by giving prompts (e.g. a badge worn may change color or emit a sound).[2] However, HHMT may be expensive and may not be acceptable to healthcare workers due to concerns about privacy, accuracy, or the need to wear additional devices or modify workflow. Hand hygiene monitoring technology uses different algorithms to define compliance or measurements of hand hygiene frequency instead of compliance, and it is not clear how these measures correlate with directly observed compliance.

- A systematic review evaluated the efficacy of HHMT for improving hand hygiene or reducing the incidence of HCAI. The authors reported that the efficacy of HHMT in improving hand hygiene and/or reducing the incidence of HCAI should be confirmed in a variety of clinical settings before HHMT is adopted. The use of HHMT may improve compliance through the provision of enhanced feedback, real-time reminders, or through an enhanced Hawthorne effect (a type of reactivity in which individuals improve an aspect of their behavior in response to their awareness of being observed), created by continuous monitoring. Specifically:[1] (Level 1)
  - A randomized controlled trial (RCT) at low risk of bias showed 6.8% higher study-defined compliance in the intervention arm by an EMS providing individual feedback and real-time reminders.
  - One non-RCT found that an EMS with aggregate feedback showed no difference in hand hygiene frequency but was at high risk of bias.
  - Two pre- and post-test studies, evaluating an EMS that provided voice prompts, showed increases of study-defined compliance, but risk of bias was high.
  - Two time series analyses of a VMS that provided aggregate feedback demonstrated a large, sustained improvement in study-defined compliance and were at moderate risk of bias.
- A mixed-methods study investigated the impact of hand hygiene prompt and monitoring systems on compliance, how the HHMT influenced behavior, and the experience and opinions of healthcare workers on the use of the HHMT. Hand hygiene compliance was monitored (before, during and after system

installation) by observations and alcohol rub usage. The battery-operated system comprised of a small, light badge (approximately 50 g) clipped to the tunic breast pocket, room sensors and a plug-in base station. When the healthcare worker cleaned their hands with alcohol rub, they held a hand near the badge for it to detect clean hands. If the healthcare worker chose to clean their hands with soap and water, a ceiling sensor recognized this providing the healthcare worker was at the sink for two or more minutes. Hand hygiene compliance was recorded by the Infection Prevention and Control Team as increasing from a mean of 73% in the eight weeks before installation, to 83% during the ten-week intervention period, and returning to 73%, once the system was removed (measured over a period of four weeks) – the electronic monitoring system recorded compliance at 98% to 100% during the ten weeks. Additionally, the amount of alcohol rub ordered went from four liters (before) to 10L during, and 2.5L after, installation. Most of the healthcare workers reported being aware of the prompt when they entered or left a room (room entry and exit being proxy measures of the World Health Organization [WHO] hand hygiene moments 1 and 4/5). Both the awareness of patient comfort in the case of a green badge (indicating hand hygiene had been undertaken) and the risk of upsetting the patient with a red badge (failure to undertake hand hygiene) resulted in greater intentions to clean hands; although some healthcare workers had reported removing the badge to prevent patient anxiety. Authors concluded that hand hygiene prompt and monitoring systems seemed to improve compliance; however, the inability to recognize context warrant improvements. HHMT systems may be undermined by healthcare worker irritation and cheating the system.[2] (Level 2)

- A systematic review examined hand hygiene interventions designed to improve hand hygiene compliance. The review reported that EMSs improved monitoring capabilities at reduced costs and resolved some of the reported monitoring problems; however, their widespread application remains limited. The authors concluded the following:[3] (Level 1)
  - An HHMT successful in one setting, may not produce the same positive effects when applied to other healthcare environments; however, the replication of successful HHMT implementation strategies are recommended.
  - Minimal benefit may result from HHMT education unless it is interactive and engaging. Such education should not be overly informative and cognitively demanding and must fit into the healthcare workers' schedules.
  - Organizations should examine the hand hygiene issues particular to their organization before deciding on which HHMT components to implement.
  - HHMT should incorporate hand hygiene opportunities as defined by the WHO/Healthcare Infection Control Practices Advisory Committee.
- An intervention study described the implementation of an electronic hand hygiene monitoring system in three community hospitals. It was reported that the implementation was a complicated and lengthy process. However, the median compliance rate improved to above 85%) with the use of this technology. However, the authors reported that the implementation of an electronic hand hygiene monitoring system required an investment of capital, resources, and time.[4] (Level 2)
- A systematic review investigated the effectiveness of information technology (IT) interventions for hand hygiene compliance among healthcare professionals. Four types of intervention were investigated in the included trials, which included automated training system, electronic counting devices and remote monitoring system, real-time hand hygiene reminders and feedback system and automated hand hygiene monitoring systems. The most commonly used systems in the included studies were both real-time hand hygiene reminders and feedback systems and electronic counting devices and remote monitoring systems. The meta-analysis showed that IT interventions led to significant improvements in hand hygiene compliance; however, there was significant heterogeneity across the included studies. Analysis of

individual studies showed that the largest improvement in compliance occurred in a study that used remote video auditing with real-time feedback as the intervention, with a compliance increase from 30.4% to 83.2%. On the other hand, the least improvement was reported in a study that used an automated training system to train handwashing techniques.[5] (Level 2)

Characteristics Of The Evidence

This evidence summary is based on a structured search of the literature and selected evidence-based health care databases. The evidence in this summary comes from:

- A systematic review of seven studies (one RCT, one non-RCT, three uncontrolled pre-test post-test studies, and two uncontrolled time-series analyses).[1]
- A mixed methods study consisting of an observational component (n=15-20 observations per week for ten weeks) and semi-structured interviews with four staff nurses, three charge nurses, two doctors and three nursing assistants.[2]
- A systematic review of 73 interventional studies (six RCTs and 67 non-RCTs).[3]
- A pre- and post-intervention study conducted in three community hospitals.[4]
- A systematic review of 13 quasi-experimental studies.[5]

Best Practice Recommendations

- There is emerging evidence to support the use of HHMT to increase hand hygiene compliance and reduce the incidence of HCAI; however, at this time no one type of HHMT can be recommended. Organizations should consider the context in which an HHMT will be used, and conditions unique to their setting, before installing any HHMT. (Grade B)
- The use of IT in HHMT can be considered in order to improve hand hygiene compliance, such as the use of remote video auditing with real-time feedback. (Grade B)

References

1. Srigley JA, Gardam M, Fernie G, Lightfoot D, Lebovic G, Muller MP. Hand hygiene monitoring technology: a systematic review of efficacy. J Hosp Infect. 2015 ;89(1):51-60.
2. Dyson J, Madeo M. Investigating the use of an electronic hand hygiene monitoring and prompt device: influence and acceptability. Journal of infection prevention. J Infect Prev [about:blank]. 2017;18(6): 278–287.
3. Neo JR, Sagha-Zadeh R, Vielemeyer O, Franklin E. Evidence-based practices to increase hand hygiene compliance in health care facilities: An integrated review. Am J Infect Control. 2016; 44(6):691-704.
4. Edmisten C, Hall C, Kernizan L, Korwek K, Preston A, Rhoades E, et al. Implementing an electronic hand hygiene monitoring system: Lessons learned from community hospitals. Am J Infect Control. 2017; 45(8):860-865.
5. Lin T-Y, Lin C-T, Chen K-M, Hsu H-F. Information technology on hand hygiene compliance among healthcare professionals. A systematic review and meta-analysis. J Nurs Manag. 2021; doi.org/10.1111/jonm.13316.

Archived Publications

1. JBI-ES-2147-1 (Published at 12 October 2021)

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE)standards.

How to cite: Marin, T, Magtoto, L. Evidence Summary. Hand Hygiene Monitoring Technology. The JBI EBP Database. 2021; JBI-ES-2147-2.

For details on the method for development see Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach. Worldviews Evid Based Nurs. 2015;12(3):131-8.