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Brief report

Replicating changes in hand hygiene in a surgical intensive care unit with remote video auditing and feedback

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Using remote video auditing (RVA) and real-time feedback, we replicated health care workers hand hygiene in a second intensive care unit. During the first 4 weeks using RVA without feedback, the compliance rate was 30.42%. The rate during the 64-week postfeedback period (initial 16 and 48 weeks maintenance) with RVA and feedback exceeded 80% on average. These data demonstrate that improved hand hygiene was achieved and sustained with the use of RVA and feedback.

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Prior to this study, remote video auditing (RVA) on health care workers (HCW) hand hygiene was initiated in 1 medical intensive care unit (MICU) at a tertiary hospital. Hand hygiene compliance within that unit went from less than 10% without feedback to a sustained rate that exceeded 85% after feedback.¹ The aim of this study was to assess HCW hand hygiene upon entry and exit on a second, adjacent surgical intensive care unit (SICU) with the use of RVA without and with feedback.

METHODS

This observational study was conducted between March 2010 and July 2011 (68 weeks) in an 18-bed adult SICU at a 804-bed academic tertiary care hospital. The unit layout includes 10 single and 2 four-bed rooms. All HCWs with direct patient contact were included in the study; patients, visitors, and staff such as dieticians were excluded. The use of RVA for monitoring hand hygiene did not identify patient or employee information. This study was submitted to Institute's Internal Review Board and was determined not to be human subject research.

In January 2010, 24 video cameras were installed in the SICU. The cameras had views of the handwashing sinks and sanitizer

dispensers to protect patient privacy. Motion sensors were installed in the doorway of each patient room, enabling detection of all entrances and exits. When activated, the doorway motion sensor sent a signal with a time stamp to the digital video recorder. Arrowsight, Inc (Mount Kisco, NY), the third party technology company, connected remotely and uploaded the video from the digital video recorder for hand hygiene assessment. These independent auditors reviewed 20 seconds of video data surrounding each sensor-detected event to document compliance. The auditors rated events as a pass, fail, or not evaluable. All the data were automatically loaded into an electronic database that was organized by type of HCW (eg, "other health care professionals" or "attending physician") and monitored on a 24/7 basis. As performance data was collected, feedback metrics were tabulated by a central server database and delivered back to the HCWs through electronic light emitting diode boards, electronic mail summaries (intra-shift and end-of-shift electronic mail summaries), and weekly performance reports. To ensure the quality of the audits, audit managers hired by Arrowsight repeated daily quality assurance audits on 5% of the audits.

The criteria for a "passing" hand hygiene event was assessed if a HCW remained within a patient room for 60 seconds or more and performed hand hygiene inside/outside the room or inside/outside an adjacent room within 10 seconds of entering/exiting a patient room. The criteria for a "failing" event was categorized when hand hygiene was not performed as described. Discarded events were those in which there were entries/exits by nonclinical staff or visitors, multiple staff entering simultaneously, and when a HCW was in the room for fewer than 60 seconds. The discarded events,

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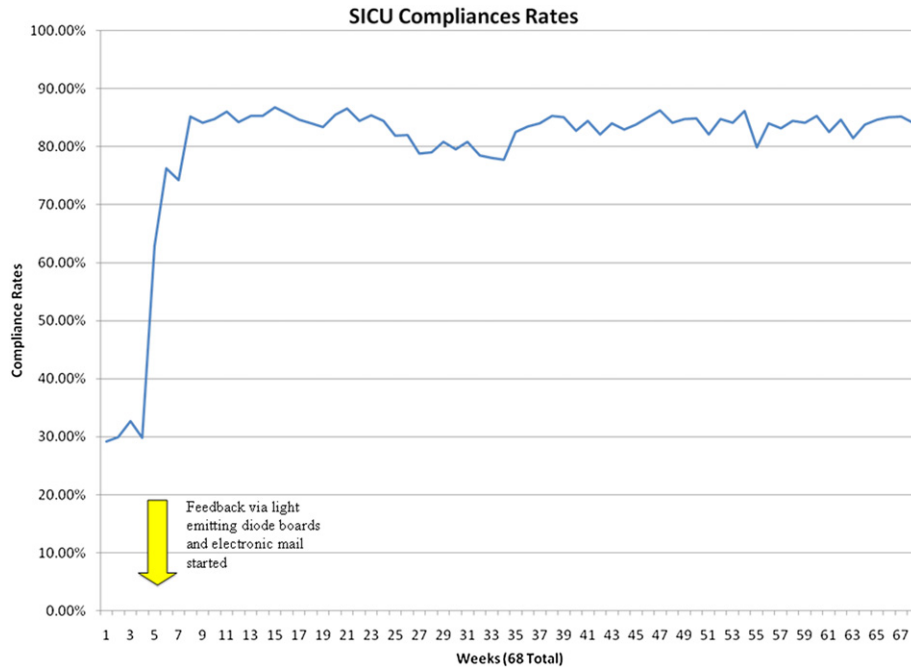


Fig 1. Surgical intensive care unit hand hygiene compliance rates.

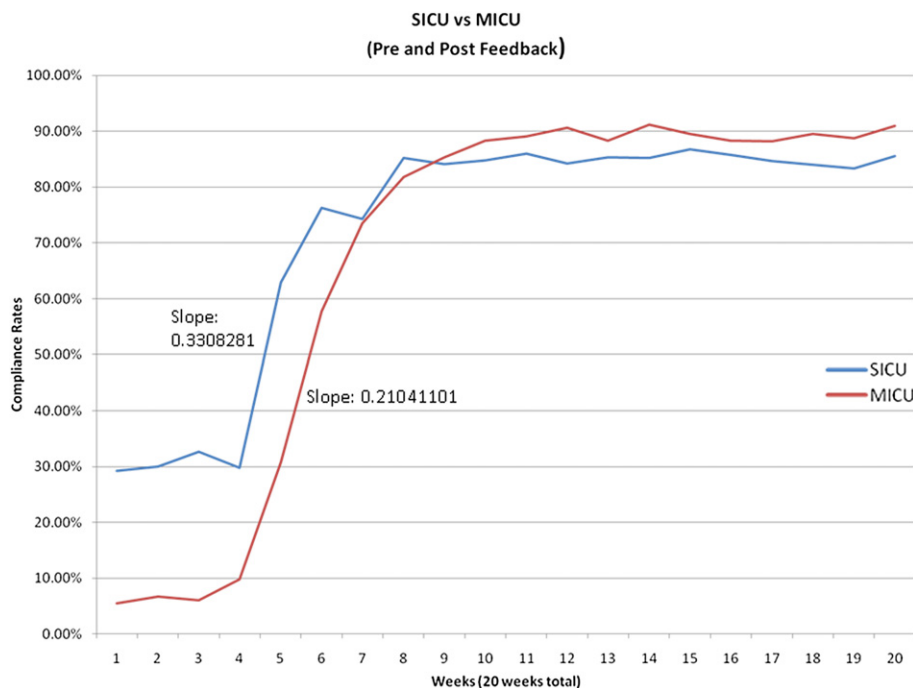


Fig 2. Surgical intensive care unit versus medical intensive care unit hand hygiene compliance rates: pre- and postfeedback.

patient contacts, and quality of hand hygiene were not quantified as part of this study.

Baseline compliance rates with the use of RVA without feedback (March 2010 to April 2010) and after feedback data (April 2010 through July 2011) were collected. Analysis of rates before and after providing feedback to HCWs with RVA was calculated using a paired *t* test. Statistical significance was evaluated at the $P < .05$ level. A SAS statistical analysis software package version 9.2 (SAS Institute, Cary, NC) was used. Hand hygiene rates between 2 points in time were assessed to identify the slope of change.

RESULTS

During the 4 prefeedback weeks, there were 8,297 hand hygiene events observed and 2,525 events categorized as passing, for an overall compliance rate of 30.43% (range, 29.23%-32.65%). For the 16 postfeedback weeks, there were 30,429 observations, with 25,032 categorized as passing, for an overall compliance rate of 82.26% (range, 62.91%-86.75%). During the maintenance period (48 weeks), 97,647 observations were made, with 81,212 in compliance for an average of 83.17% (range, 77.72%-86.61%). The

difference in the pre- and postintervention time period results was significant ($P < .01$) (see Fig 1). The slope of change before and after feedback was 0.33.

DISCUSSION

Our earlier publication that was initiated at a different time period demonstrated that RVA combined with feedback produced a significant and sustained improvement in hand hygiene from a baseline rate of 6.5%.¹ We found that the initial baseline compliance rate for the adjacent SICU was 30.43%, which was markedly increased from the initial MICU rates. We also noticed that the change in rates was faster than what was reported in the previous study in the MICU (see Fig 2). The explanation may be related to staff's knowledge and attitudes regarding the technology for hand hygiene. There was no physical barrier to separate the units; therefore, the practices and performance measurements were readily observed between the two units.

There were several limitations to this study that may have hindered our conclusions and results. Although the staff for each unit was strictly designated, we did not account for the rare occasion when staff "floated" from one unit to the other. The cameras only viewed the handwashing sinks and alcohol-based gel dispensers within the unit to maintain patient privacy; therefore, we were not able to monitor HCW's hand hygiene from patient to patient in either of our 2 four-bed rooms. The discarded hand hygiene events that were not evaluated may have biased the results. We also analyzed hospital-acquired methicillin-resistant *Staphylococcus aureus* and *Clostridium difficile* data and could not correlate improved hand hygiene with decreased health care-associated infections. This was likely due to the limited number of infections identified within the study period.

According to the Centers for Disease Control and Prevention, the compliance rates for hand hygiene are about 40%.² Other studies

have reported low rate.³⁻⁸ Although it has been known for over a hundred years that hand hygiene can decrease the risk of infections, compliance has been unacceptable. This study demonstrates a significant increase in hand hygiene with the use of RVA in a second unit.

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References

1. Armellino D, Hussain E, Schilling ME, Senicola W, Eichorn A, Dlugacz Y, et al. Using high-technology to enforce low-technology safety measures: the use of third-party remote video auditing and real-time feedback in healthcare. *Clin Infect Dis* 2012;54:1-7.
2. Boyce JM, Pittet D. Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. Society for Healthcare Epidemiology of America/Association for Professionals in Infection Control/Infectious Diseases Society of America. *MMWR Morb Mort Wkly Rep* 2002;51:1-4.
3. Berhe M, Edmond MB, Bearman G. Measurement and feedback of infection control process measures in the intensive care unit: impact on compliance. *Am J Infect Control* 2006;34:537-9.
4. Bischoff WE, Reynolds TM, Sessler CN, Edmond MB, Wenzel RP. Hand washing compliance by health care workers: the impact of introducing an accessible, alcohol-based hand antiseptic. *Arch Intern Med* 2000;160:1017-21.
5. Lankford MG, Zembower TR, Trick WE, Hacek DM, Noskin GA, Peterson LR. Influence of role models and hospital design on hand hygiene of healthcare workers. *Emerg Infect Dis* 2003;9:217-23.
6. Pittet D, Simon A, Hugonnet S, Pessoa-Silva CL, Sauvan V, Perneger TV. Hand hygiene among physicians: performance, beliefs, and perceptions. *Ann Intern Med* 2004;141:1-8.
7. Swoboda SM, Earsing K, Strauss K, Lane S, Lipsitt PA. Electronic monitoring and voice prompts improve hand hygiene and decrease nosocomial infections in an intermediate care unit. *Crit Care Med* 2004;32:358-63.
8. Muller MP, Detsky AS. Public reporting of hospital hand hygiene compliance: helpful of harmful? *JAMA* 2010;304:1116-7.