SHORT REPORT

Continued direct observation and feedback of hand hygiene adherence can decrease incidence of meticillin-resistant *Staphylococcus aureus* infection/colonization

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Introduction

Several studies have shown a relationship between improved hand hygiene practices and reduced healthcare-associated infection (HAI) rates.[1-4] In a study by Arise *et al.*, hand hygiene compliance was evaluated by direct observation over a five year period. This study confirmed that direct observation comprising only monitoring and feedback is an effective strategy that results in a long-lasting improvement in hand hygiene compliance.[5] However, proper hand hygiene is not the ultimate goal itself but the means to an end. The ultimate goal is to stop the transfer of organisms and diseases and finally to decrease the occurrence of HAIs.[6] The objective of the present study was to evaluate the effect of direct observation on meticillin-resistant *Staphylococcus aureus* (MRSA) infection or colonization rates.

Methods

We conducted this observation trial at Kochi Medical School Hospital, Japan, which is a 605-bed tertiary-care general hospital with 13 wards. The study was conducted from January 2005 to December 2010. If MRSA was isolated, the patient was placed in a single room, and contact precautions were used. No active surveillance cultures were conducted during the study period. There were no changes in infection control or environmental disinfection processes during the study period.

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Meticillin-resistant *S. aureus* surveillance data were retrospectively analyzed from all of the patients admitted to Kochi Medical School Hospital. Meticillin-resistant *S. aureus* infection or colonization incidence, as well as the prevalence rates, were used to quantify healthcare acquisition of MRSA, because these metrics are recommended as the basic measures to quantify HAI.[7] Healthcare acquisition of MRSA was defined by a positive culture > 3 days after admission. The incidence rate was the total number of newly diagnosed patients with MRSA divided by 1,000 patient-days in each year. MRSA prevalence rates do not directly express healthcare-associated MRSA transmission. However, they express MRSA transmission pressure in the hospital. Therefore, we used them as an indicator. The prevalence rate was the total number of patients with MRSA divided by 1,000 patient-days in each year. The monthly alcohol-based hand rub consumption (volume in milliliters) was measured during the study period. Briefly, each ward has about 50 alcohol-based hand rubs. The amount used of each bottle was measured every month by an infection control practitioner posted in each ward. These data were sent to the Department of Infection Control and Prevention. The measurement started in January 2005. Data collected before and after the intervention were analyzed using the t-test.

The intervention consisted of observations and feedback. Five observers were present on the ward between 10 AM and 10:30 AM once a week, where they monitored the hand hygiene practice of the healthcare workers (HCWs) using the direct observation technique as described previously.[5] The observers consisted of an infection control practitioner, a pharmacist, a medical doctor, a medical student, and a laboratory technician. The performance results including hand hygiene compliance rates, MRSA infection or colonization incidence as well as the prevalence rates, and the alcohol-based hand rub consumption were assessed and reported to the ward staff as feedback every month through the infection-control team members. The HCWs were educated on the importance of hand hygiene through in-service workshops.

HCWs were not identified during the observation sessions for reasons of confidentiality; therefore, this study was formally exempted from institutional review board approval.

Results

The MRSA infection/colonization and prevalence rates that were measured using laboratory-based records for isolations over six years are summarized in Table I. The overall detection of MRSA infection or colonization was 2.41 per 1,000 patient-days during the baseline period in 2005. The rate gradually decreased to 1.92 per 1,000 patient-days during the intervention period in 2009. This value was significantly lower than that observed in 2005 (p = 0.038). The prevalence rate remained low (1.87 per 1,000 patient-days) during the evaluation period in 2010 (p = 0.032).

The overall incidence of MRSA infection or colonization was 1.44 per 1,000 patient-days during the baseline period in 2005 (Table I). This value also gradually decreased over time. It was not significantly lower during the intervention period in 2009; however, it was significantly lower (1.11 per 1,000 patient-days, p = 0.038) during the evaluation period in 2010.

During the baseline period in 2005, the consumption of alcohol-based hand rub was 8.00 L per 1,000 patient-days (Table I). During the intervention period in 2009, the consumption of this product increased to 16.49 L per 1,000 patient-days. This value was significantly higher than that observed in 2005 (p = 0.047). However, alcohol-based hand rub consumption decreased during the evaluation period in 2010 to 14.42 L per 1,000 patient-days. This was still greater than the volume of alcohol-based hand rub that was used in 2005 (p = 0.060).

Discussion

Decreasing the MRSA infection/colonization incidence rate through direct observation and feedback was achieved during this study period. The feedback concentrated on identifying situations where hand hygiene was not used. Continuous feedback helped HCWs to understand the correct indications for hand hygiene and the need for compliance. Similar studies have shown that such hand hygiene campaigns effectively reduced HAIs.[1-4] However, these programs were multifaceted comprising audits, feedback, increased alcohol-based hand rub availability, and bundling of techniques. In the present study, the decreased MRSA infection/colonization incidence rate was achieved only through direct observation and feedback. It was demonstrated in this study that a

Table I. MRSA infection/colonization rates and alcohol-based hand rub consumption
* significance at p < 0.05 compared with 2005.

Variables	Baseline period 2005	Intervention period 2007	Intervention period 2009	Evaluation period 2010
MRSA infection/ colonization prevalence rate per 1,000 patient-days	2.41	2.36	1.92*	1.87*
MRSA infection/ colonization incidence rate per 1,000 patient-days	1.44	1.40	1.19*	1.11*
Alcohol-based hand rub consumption (L / 1,000 patient-days)	8.00	11.81	16.49*	14.42*

single program of monitoring and feedback decreased MRSA incidence rates.

During this study, chronological changes in the MRSA infection/colonization incidence, as well as the prevalence rates and alcohol-based hand rub consumption were analyzed. In 2007, which was the third intervention year, none of these parameters decreased. The MRSA prevalence rate decreased and alcohol-based hand rub consumption increased in 2009, which was the fifth intervention year. The MRSA incidence rate decreased during the evaluation period in 2010. Even though the alcohol-based hand rub consumption in 2010 was smaller than that of in 2009, it was still greater than the volume of alcohol-based hand rub that was used in 2005, and contributed to decrease MRSA incidence.

These findings suggest that decreasing the MRSA infection/colonization incidence rate through only observation and feedback takes time. Hand hygiene compliance depends on altering behavioral perceptions, and the adoption of behavioral changes. Instituting behavioral changes in HCWs and maintaining a high rate of hand hygiene compliance may be difficult to achieve with short-term interventions.[8]

There were several limitations to this study. First, several factors exist which influence the results, including anything specific that occurred at the hospital. Our hospital had an outbreak of pertussis in 2007. During that time HCWs paid less attention to contact precautions, therefore hand hygiene practice could be negligent. This could be a reason that the MRSA incidence rate did not decrease in 2007. There were no changes in infection control or environmental disinfection processes during the study period, and we are not aware of anything extraneous that might have contributed to the rates in 2009. Second, MRSA infection rates are better indicators than MRSA colonization rates. However, they were not available in our hospital. Finally, this trial was conducted at a single hospital with a high prevalence of MRSA. Therefore, it may be difficult to generalize to other facilities with a lower prevalence of MRSA.

In 2009, the compliance rate for hand hygiene "before entering the room" was statistically significantly higher than that observed in 2005 (p = 0.005).[5] These results suggest that this investigation encouraged the HCWs to fully practice good hand hygiene compliance for protecting patients from HAIs.

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