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Major article

Impact of implementation of the World Health Organization multimodal hand hygiene improvement strategy in a teaching hospital in Taiwan

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Background: Hand hygiene (HH) is considered to be the most simple, rapid, and economic way to prevent health care–associated infection (HAI). However, poor HH compliance has been repeatedly reported. Our objective was to evaluate the impact of implementing the updated World Health Organization (WHO) multimodal HH guidelines on HH compliance and HAI in a tertiary hospital in Taiwan.

Methods: We conducted a before-and-after interventional study during 2010–2011. A multimodal HH promotion campaign was initiated. Key strategies included providing alcohol-based handrub dispensers at points of care, designing educational programs tailored to the needs of different health care workers, placement of general and individual reminders in the workplace, and establishment of evaluation and feedback for HH compliance and infection rates.

Results: Overall HH compliance increased from 62.3% to 73.3% after 1 year of intervention ($P < .001$). The rate of overall HAI decreased from 3.7% to 3.1% ($P < .05$), urinary tract infection rate decreased from 1.5% to 1.2% ($P < .05$), and respiratory tract infection rate decreased from 0.53% to 0.35% ($P < .05$). This campaign saved an estimated \$940,000 and 3,564 admission patient days per year.

Conclusion: The WHO multimodal HH guidelines are feasible and effective for the promotion of HH compliance and are associated with the reduction of HAIs.

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Health care–associated infection (HAI) is the major cause of increasing patient mortality and morbidity during hospitalization. It also increases hospital length of stay and other medical costs.^{1–3} In addition, the emergence of multiple drug-resistant organisms render treatment increasingly difficult.^{4,5} Hand hygiene (HH) is

a simple, important, and economic measure to prevent HAI.^{6,7} However, poor HH compliance has been repeatedly reported in healthcare workers (HCWs).^{8–10} Multifaceted interventions are suggested to be more effective and achieve a sustained improvement in HH compliance.^{3,11,12}

In 2009, the World Health Organization (WHO) guidelines on HH provided comprehensive plans for the promotion of HH, including the concept of patient zones and health care zones, points of care, 5 indications of HH, 5 strategies for HH, and 5 steps for long-term promotion of HH.¹³ The guidelines have been tested in hospitals worldwide to assess their applicability and practicality.^{3,14}

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The Taiwan Centers for Disease Control and Prevention initiated a program to establish 3 HH model hospitals, geographically located in Southern and Northern Taiwan, to develop local HH guidelines. Our hospital was selected as one of the model centers, and the program aimed to establish and implement local HH guidelines that are feasible, practical, culturally tailored, effective, and sustainable. This study aimed to assess the impact of implementation of the WHO multimodal HH improvement strategy on several indicators, including the rates of HH compliance and rates of HAI.

METHODS

Study setting

Kaohsiung Veterans General Hospital is a 1,408-bed tertiary care teaching hospital in Southern Taiwan, with 100 intensive care unit (ICU) beds (77 adult ICU beds, 11 pediatric ICU beds, and 12 neonatal ICU beds) and 18 respiratory care center beds. There are 2,463 HCWs, with 542 physicians, 1,197 nurses, 514 technicians, and 215 nursing assistants in the hospital.

Our hospital had a successful experience in HH promotion prior to the campaign. In December 2003, we started the provision of alcohol-based handrub dispensers on the walls by the doorway outside of patient rooms. From July 2008–July 2009, we began the first hospital-wide HH promotional activity for 1 year, which increased compliance and effectively reduced the daily accumulated numbers of carbapenem-resistant *Acinetobacter baumannii* (CRAB) colonization-infection and methicillin-resistance *Staphylococcus aureus* colonization-infection January 2009–October 2014 (unpublished, Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan).

Study design

We conducted a HH promotion campaign from January 2010–September 2011 following the WHO guidelines and using toolkits. The campaign used the 5 steps and 5 strategies as essential components and was implemented hospital-wide, except in the emergency room.

Five steps

Step 1: Facility preparedness—readiness for action (January–March 2010)

A HH promotion team was formed, with the deputy director of the hospital leading the team, and team members included 3 infectious disease specialists, 5 infection control nurses, and 3 research assistants. The team devised teaching materials according to the WHO HH guidelines and developed different versions of the teaching materials in Chinese, tailored to the different health care worker groups. Teaching materials were targeted to leaders and chiefs in various departments, trainers, observers, and general HCWs. An innovative logo to represent the HH promotion campaign was created and placed on all training and promotional material.

Step 2: Baseline evaluation and preparation—establishing knowledge of the current situation (April–June 2010)

A baseline ward infrastructure survey was conducted hospital-wide, including baseline HH compliance in each ward, alcohol-based handrub consumption, and a questionnaire about the perception and knowledge of HH and HAI in HCWs, patients, and the patient's family. Preparedness included the setting up of alcohol-based handrub dispensers on the walls of each patient room and training of HH observers with lectures and videos of clinical scenarios. We applied the WHO HH observation method to assess HH compliance.¹⁵ In short, an unobtrusive trained observer observed

HCWs openly for 20-minute sessions every month and recorded at least 10 HH opportunities with different HH indications each session. A HH opportunity was defined as the occurrence of HH indications during clinical care sequences. The HH indications include before touching a patient, before clean-aseptic procedure, after risk of body fluid exposure, after touching a patient, and after touching patient surroundings. Infection control nurses recorded cases of HAI, including urinary tract, respiratory tract, and bloodstream infections, according to modified definitions of the U.S. Centers for Disease Control and Prevention.¹⁶ The HAI rate is defined as follows: the number of overall HAIs (with and without catheters) in the hospital per 1,000 admission patient days.

Step 3: Implementation—introducing the improvement activities (July–November 2010)

Posters were displayed to explain the 5 indications of HH, and a HH ambassadors campaign was run hospital-wide. Each service, department, and ward voted for an ambassador from their unit; a life-sized poster was then made of the ambassador to promote HH and was placed just outside of their unit. The director and deputy director of the hospital were voluntary ambassadors. In addition, using slideshows and a training video, we educated heads of departments and wards and HCWs hospital-wide. Alcohol-based handrub dispensers were distributed at the point of patient care, including at the end of the beds and on medication trolleys. Trained observers started to record HH compliance monthly from September 2010, and we gave feedback to observers and heads of departments and wards bimonthly.

Step 4: Follow-up evaluation—evaluating the impact of implementation (November–December 2010)

A postintervention questionnaire was conducted to evaluate the perception and knowledge of HH practice of HCWs, patients, and family members of the patients. We began to promote patient empowerment, including the use of HH corps badges, which pledged the commitment to HH by HCWs, including willingness to be reminded by patients and their family to perform HH, therefore encouraging patients to ask the HCW if he or she washed their hands.

Step 5: Impact and cost-saving evaluations

After 1.5 years of implementing the HH promotion campaign, we estimated the impact and cost-savings of the campaign by comparing the period before (June–September 2010) and after the intervention (October 2010–September 2011). The assumed infection rate in the postintervention period was defined as the pre-intervention rate. The number of reduced infection events was defined as the number of assumed infection events minus the number of true infection events in the postintervention. In the Sheng et al study,¹⁷ done in Taiwan, the extra cost of 1 health care-associated urinary tract infection was estimated to be \$3,822, and the costs were \$3,903 for a respiratory tract infection and \$3,384 for a bloodstream infection. The reduced number of length of admission stay with regard to preventing an HAI was 14 days for urinary tract infection, 15 days for respiratory tract infection and surgical site infection, and 16 days for bloodstream infection. The cost-savings and reduced number of total admission days during the campaign were estimated to analyze the effectiveness and economic benefits of the HH promotion campaign.

Five strategies

Strategy 1: System change

We set alcohol-based handrub dispensers at the points of care hospital-wide from June–August 2010.

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