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Contents lists available at ScienceDirect

## American Journal of Infection Control

journal homepage: [www.ajicjournal.org](http://www.ajicjournal.org)

## Major article

## Status of the implementation of the World Health Organization multimodal hand hygiene strategy in United States of America health care facilities

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## Key Words:

WHO multimodal strategy  
Health care-associated infection  
Infection control  
US hospitals  
WHO Hand Hygiene Self-Assessment Framework

**Background:** The World Health Organization (WHO) launched a multimodal strategy and campaign in 2009 to improve hand hygiene practices worldwide. Our objective was to evaluate the implementation of the strategy in United States health care facilities.

**Methods:** From July through December 2011, US facilities participating in the WHO global campaign were invited to complete the Hand Hygiene Self-Assessment Framework online, a validated tool based on the WHO multimodal strategy.

**Results:** Of 2,238 invited facilities, 168 participated in the survey (7.5%). A detailed analysis of 129, mainly nonteaching public facilities (80.6%), showed that most had an advanced or intermediate level of hand hygiene implementation progress (48.9% and 45.0%, respectively). The total Hand Hygiene Self-Assessment Framework score was 36 points higher for facilities with staffing levels of infection preventionists > 0.75/100 beds than for those with lower ratios ( $P = .01$ ) and 41 points higher for facilities participating in hand hygiene campaigns ( $P = .002$ ).

**Conclusion:** Despite the low response rate, the survey results are unique and allow interesting reflections. Whereas the level of progress of most participating facilities was encouraging, this may reflect reporting bias, ie, better hospitals more likely to report. However, even in respondents, further improvement can be achieved, in particular by embedding hand hygiene in a stronger institutional safety climate and optimizing staffing levels dedicated to infection prevention. These results should encourage the launch of a coordinated national campaign and higher participation in the WHO global campaign.

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Hand hygiene is critical to the prevention of health care-associated infection (HAI), which leads to substantial morbidity, mortality, and health care costs in the United States and around the world.<sup>1,2</sup> The Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) published guidelines with recommendations for appropriate hand hygiene practices in health care settings in 2002 and 2009, respectively.<sup>3,4</sup> However,

compliance with recommended hand hygiene practices by health care workers (HCW) is unacceptably low. Even in high-income countries with more resources available for supplies, training, and promotion programs, average compliance reported in 2010 was approximately 40%.<sup>5</sup> Challenges to improving hand hygiene practices include lack of guidance for field implementation of successful programs and standardized tools to assess hand hygiene practices and to monitor continually the adequacy of improvement programs.

In response to these challenges, WHO released a Multimodal Hand Hygiene Improvement Strategy (MHHIS) accompanied by an Implementation Toolkit to help the translation into practice of guideline recommendations.<sup>6</sup> The MHHIS includes 5 key components: (1) system change, (2) HCWs' training and education, (3) evaluation and feedback, (4) reminders in the workplace, and (5)

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Conflicts of interest: None to report.

promotion of an institutional safety climate.<sup>7</sup> The Implementation Toolkit includes a Hand Hygiene Self-Assessment Framework (HHSAF) (Appendix), a validated tool for the evaluation of the level of implementation of the MHHIS 5 components in health care facilities.<sup>8,9</sup> In 2009, a global campaign, “SAVE LIVES: Clean Your Hands,” was launched by WHO to promote uptake of the MHHIS.<sup>10</sup> To date, more than 15,700 facilities worldwide have joined the movement.<sup>11</sup>

In the United States, there is currently no understanding of which components of the MHHIS have been implemented in health care facilities. A clear picture of existing hand hygiene improvement programs in a variety of US facilities could elucidate local needs and help define achievable benchmarks for facilities at all levels of implementation of hand hygiene improvement programs.<sup>12</sup> The objectives of this study were to (1) evaluate the degree of implementation of the MHHIS by US health care facilities; (2) examine differences in the degree of implementation by facility size, type, geographic region, and infection prevention infrastructure; and (3) suggest achievable benchmarks for implementation of hand hygiene improvement programs across a range of health care facilities.

## METHODS

### Study sample

From July through December 2011, US health care facilities registered for the WHO “SAVE LIVES: Clean Your Hands” global initiative (N = 2,238) were invited by e-mail to participate in a WHO global survey<sup>13</sup> by completing the WHO HHSAF (Appendix) and submitting their results confidentially through a dedicated Web site. Participation in the survey was also promoted on the CDC Hand Hygiene in Health care Settings Web site and through the electronic newsletter of the Association for Professionals in Infection Control and Epidemiology. Three e-mail reminders were sent at bimonthly intervals. Facilities were asked to have the HHSAF completed by infection preventionists or senior managers fully informed about hand hygiene activities within the institution. Approval for the research was granted by the WHO, CDC, and Columbia University Medical Center institutional review boards.

### Survey

The HHSAF is a questionnaire comprising 27 items grouped into 5 sections that reflect the MHHIS components (Appendix). Each component is scored out of 100 points (total maximum score: 500). According to their overall score, health care facilities are assigned to 1 of 4 levels of hand hygiene implementation progress: inadequate, basic, intermediate, or advanced. Facilities that have reached an advanced level are asked to complete 20 additional questions in a “leadership” section that is separately scored out of 20 points; a minimum of 12 points must be reached to qualify for leadership status. In previous testing, the HHSAF took less than 2 hours to complete; inter-rater reliability for total score and component scores ranged from  $\kappa$  0.54 to 0.86.<sup>9</sup> Participants were also asked to provide information about facility demographic characteristics (public or private sector, general or teaching status, type of care), number of inpatient beds, number of full-time equivalent infection preventionists and hospital physician epidemiologists, and participation or not in hand hygiene campaigns.

### Statistical analysis

Descriptive statistics including frequencies and percentages were used to summarize facility characteristics. Mean total HHSAF score and median component scores were calculated in aggregate, as well as stratified and statistically compared by facility

characteristics. The number of inpatient beds was positively skewed and therefore dichotomized at 200 beds by convention. Facility type was categorized as acute care only, long-term care with or without acute care, or ambulatory care only. Facilities were categorized into 1 of 4 US census regions, based on zip code. Staffing levels for infection preventionists and hospital physician epidemiologists were calculated per 100 inpatient beds. The modal response to individual HHSAF items was computed.

Student *t* tests were used to examine associations between facility characteristics and total HHSAF scores. Wilcoxon rank-sum or Kruskal-Wallis tests were used to examine associations between facility characteristics and component scores because they were not normally distributed. Variables that demonstrated association at the  $P < .10$  level were entered into a linear regression model to predict total HHSAF scores or into a multivariable logistic regression model to predict component scores higher versus lower than median. Odds ratios with 95% confidence intervals were calculated for factors associated with high or low component scores. All tests were 2-tailed, and the significance level was set at  $\alpha \leq .05$ . Data analysis was conducted using SAS version 9.3 (SAS Institute, Cary, NC).

## RESULTS

Of 2,238 invited facilities, 168 participated in the survey (response rate, 7.5%). Thirty-nine responses were excluded from the analysis because the HHSAF was incomplete. Characteristics of the 129 participating facilities from 42 states and Puerto Rico (Fig 1) are shown in Table 1. Facilities ranged in size from 5 to 671 inpatient beds. Most were nonteaching (80.6%), acute care (65.9%) facilities belonging to the public sector (56.6%). Median infection preventionist staffing was 0.76 per 100 beds (interquartile range [IQR], 0.6), and most facilities (60.5%) had no hospital epidemiologist. Almost half of all facilities reported that they participated in a national or subnational hand hygiene campaign (45.7%).

According to the HHSAF score, the level of hand hygiene implementation progress was advanced or intermediate in most facilities (Table 2). The mean total HHSAF score was  $373.2 \pm 70.8$  (range, 178–500), which reflects an intermediate level of progress. Median component scores ranged from 100.0 (IQR, 5.0) for the system change component to 60.0 (IQR, 35.0) for the institutional safety climate component (Fig 2). All 63 facilities that reached an advanced level completed the leadership section. Median leadership score was 15.0 (IQR, 4.0). Fifty-nine facilities had  $\geq 12$  points and thus achieved leadership status.

Overall, 77.5% of facilities reported that alcohol-based handrub is continuously available facility wide at each point of care. In 83.7% of facilities, annual mandatory training regarding hand hygiene is required of all HCWs, but only 53.5% reported having a dedicated budget for hand hygiene training. Hand hygiene compliance is evaluated by direct observation at least every 3 months at 76.1% of facilities. Less commonly, hand hygiene practices are indirectly monitored by surrogate markers, ie, alcohol-based handrub (39.8%) or soap consumption (34.1%). Immediate feedback is given to HCWs at the end of each hand hygiene observation session in 64% of facilities. The great majority of facilities displays posters explaining hand hygiene indications and correct techniques for hand rubbing and handwashing (89.9%, 80.6%, and 85.3%, respectively). However, a minority displays the posters in *all* wards/treatment areas (45.7%, 34.9%, and 37.2%, respectively). Other workplace reminders, such as screen savers, are used in 78.3% of facilities.

Most facilities reported that executive leaders such as the chief executive officer, medical director, and director of nursing have made a clear commitment to support hand hygiene improvement (80.5%, 70.5%, and 86.1%, respectively). More than half (58.1%) have established a dedicated hand hygiene team, and 37.2% have a

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