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# World Health Organization Framework: Multimodal Hand Hygiene Strategy in Piedmont (Italy) Health Care Facilities

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**Objectives:** In 2009, the World Health Organization (WHO) introduced the “Hand Hygiene Self-Assessment Framework” (HHSAF) to evaluate the level of the application of the Multimodal Hand Hygiene Improvement Strategy (MHHIS), which defines preventive interventions, standards, and tools conceived to improve hand hygiene in healthcare facilities. The aim of our study was to evaluate the implementation of the MHHIS in Piedmont healthcare units in 2014 using the HHSAF document.

**Methods:** Our surveillance was performed through collection and analysis of the data from 50 Piedmont healthcare facilities recorded through the HHSAF in 2014. The HHSAF describes the hand hygiene level evaluating the following 5 parameters: system changes, education/staff training, evaluation and feedback, reminders in the workplace, and promotion of an institutional safety climate.

**Results:** We reported that 70.4% of the healthcare facilities involved in the study achieved the intermediate hand hygiene level, 19% the advanced level, and 11% the basic level. No facility exhibited an inadequate level of WHO multimodal implementation. Only 55% of the healthcare units provided information about hand hygiene to patients, and only 15% actively involved patients and their families.

**Conclusions:** The implementation of the MHHIS has achieved important results all over the world in terms of hand hygiene. Piedmont has reached an overall good level, particularly in terms of the supply and availability of hand washing products and staff education. Our results revealed, however, some critical issues related to direct and indirect monitoring of hand hygiene, providing reminders and the active involvement of patients, family members, and caregivers.

**Key Words:** hand hygiene, WHO framework, healthcare-associated infections

(*J Patient Saf* 2019;15: 317–321)

The prevention of healthcare-associated infections (HAIs) plays a key role in hospitalized patients; it is associated with reductions in mortality, morbidity, antibiotic resistance, and costs related to assistance. In Europe, the HAIs prevalence rates range from 4.6% to 9.3% and comparable rates are reported in Italy (5%–8%).<sup>1</sup> Therefore, to reduce HAIs, it is necessary to implement surveillance systems and prevention programs.

Hand hygiene is certainly considered the most effective strategy for reducing the incidence of HAIs.<sup>2–4</sup>

In recent years, main international organizations have promoted preventive interventions to improve appropriate hand hygiene by healthcare specialists. For instance, in 2002, the Centers for

Disease Control and Prevention published an official document containing recommendations for hand hygiene.<sup>2</sup> Subsequently, in 2009, the World Health Organization (WHO) launched the “WHO Guidelines on Hand Hygiene in Health Care,” which are specific updated guidelines designed to promote this preventive strategy.<sup>5</sup> Moreover, the WHO supported hand hygiene through some prevention campaigns, such as the “Clean Care is Safer Care” program (2005–2006), which was included in the First Global Patient Safety Challenge (2004), and the “SAVE LIVES: Clean Your Hands” program launched on May 5, 2009.

To support healthcare facilities, the WHO also introduced a multimodal strategy (i.e., the Multimodal Hand Hygiene Improvement Strategy [MHHIS]), which describes preventive interventions, standards, and tools that were conceived to improve hand hygiene, and the “Hand Hygiene Self-Assessment Framework” (HHSAF).<sup>5,6</sup>

The HHSAF is a validated, self-administered, useful, and reliable tool that is linked to the MHHIS and the MHHIS implementation guide.<sup>7</sup> The HHSAF provides an overview of hand hygiene structures, resources, promotion, and practices within healthcare facilities and allows for the evaluation of the level of application of the guidelines.<sup>8</sup>

Despite the documented efficacy of these preventive strategies, their application by healthcare workers is currently inadequate, with an average of 40%.<sup>9</sup>

In 2013, Allegranzi et al<sup>4</sup> demonstrated the effectiveness of the WHO multimodal strategy in improving hand hygiene and reducing the onset of HAIs. Subsequently, in 2014, these authors conducted the first surveillance program that aimed to assess the implementation level of WHO recommendations among 129 American facilities, using the “HHSAF.” This surveillance revealed a medium-high hand hygiene level and high scores in staff education, training, and feedback.<sup>10</sup>

In 2006–2008, Piedmont (northwest region in Italy, 4,424,000 inhabitants) has conducted a campaign for hand hygiene and promoted the use of hydroalcoholic gel; since then, it has been asked to all hospitals to implement and monitor the use of hydroalcoholic gels.

In 2008, the region introduced an evaluation system for healthcare infection control based on indicators and reference standards that must be applied throughout the region. One of the regional indicators assesses the level of hand hygiene through the monitoring of hydroalcoholic gel consumption (at least 20 liter of hydroalcoholic gel × 1000 patient-days). Since 2014, according to the multimodal strategy recommendations, the regional indicators also included the drawing up of HHSAF document for all healthcare units. To date, very few studies analyzed the results of the HHSAF application in the improvement of hand hygiene level, and no study aimed to assess the outcomes of HHSAF implementation was performed in the Italian context.

The aim of our study is to evaluate, for the first time, the implementation of the WHO guidelines in Italy and, in particular, in the Piedmont healthcare units. We decided to perform our study in Piedmont because this region is the only one that currently uses the HHSAF document to describe strategies that have already been implemented and to analyze critical issues.

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The authors disclose no conflict of interest.

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## METHODS

Our study was performed through the collection and analysis of regional data recorded with the HHSAF in Piedmont from the January 1 to December 31, 2014. The introduction of the HHSAF into the regional indicators has elicited commitments from each healthcare facility to fulfill and transmit annual hand hygiene data within their own structures.

### The HHSAF Questionnaire

The HHSAF questionnaire is divided into 5 sections that describe the 5 components of the WHO multimodal strategy and include 27 indicators that represent the key elements of the strategy. Each indicator was properly applied and measured in every regional healthcare facilities, which participated in the surveillance.

The document evaluates the following parameters: system changes, education and staff training, evaluation and feedback, reminders in the workplace, and promotion of an institutional safety climate.<sup>6</sup>

Each section can be marked with a score from 0 to 100 points for a maximum score of 500 points. According to the total score achieved, the facilities are assigned in 1 of the following 4 levels of hand hygiene implementation: inadequate (0–125 points), basic (126–250), intermediate (251–375), and advanced (376–500). The healthcare units that achieve the advanced level are invited to complete an additional section (i.e., the leadership section); a score of 12 or higher in the leadership section identifies hand hygiene reference centers.

In Piedmont, there are 53 healthcare facilities, collected in 13 local health unit (LHU) and 8 tertiary referral center (hub hospital); every LHU could include 1 or more facilities for primary or secondary care.

The hospitals belonging to the same LHU and sharing the same hand hygiene strategy compiled only 1 HHSAF questionnaire. Then, the regional healthcare facilities provided a total of 27 HHSAF questionnaires. Overall, only 3 healthcare facilities did not answer to the questionnaire (2 from LHUs and 1 HUB).

The questionnaires were completed by infection control nurses trained through a regional course dedicated to surveillance and control of HAIs. Infection control nurses were supported by a compilation guide released with the questionnaires, and once completed, they were submitted by e-mail to the Public Health Department of Turin.

We evaluated the completeness of the collected documents and the proper completion of the leadership section by healthcare facilities with advanced hand hygiene scores (scores  $\geq$  376 points). Our study was performed on the basis of the analyses of the complete available documents. To provide a benchmark for the results retrieved in Piedmont, we compared in Table 1 our data

with the ones collected by Allegranzi et al<sup>10</sup> in the main study on the field.

The statistical analyses were performed using the STATA 13 software (Stata Corp LP, College Station, Tex). We provided a descriptive picture of hand hygiene in the Piedmont region healthcare facilities based on the frequencies and averages of the HHSAF total scores and individual sections scores.

## RESULTS

Of the 53 facilities contacted in Piedmont, 50 were involved in the surveillance (covering the 94% of the regional hospital beds). Three healthcare facilities (2 from LHUs and 1 HUB) did not answer to the questionnaire because of delays related to health management reorganization.

The final sample included 40 primary and secondary facilities as well as 10 tertiary facilities and were provided 27 wholly and correctly completed HHSAF questionnaires. Every LHU and HUB involved had an infection control team (LHUs facilities do not exceed 500 bed units; HUBs facilities can reach 1100 beds).

The mean (standard deviation) total score was 332.22(63.44) points (range, 190–470 points). Most healthcare facilities involved in the study (70.4%) achieved the intermediate hand hygiene level (scores 251–375 points), 19% of the facilities achieved the advanced level, and 11% achieved the basic level. No facility exhibited an inadequate level of WHO multimodal implementation (Table 1).

Of the 5 healthcare facilities at the advanced level that were invited to complete the additional section of the questionnaire, one was excluded from the analysis because of an incomplete questionnaire. Three facilities achieved scores of 12 or higher, which identified them as reference centers for hand washing promotion.

### System Changes

The first section of the questionnaire, focused on system changes, product supply, and the availability of hand washing tools, exhibited positive results (Fig. 1). The mean (SD) score was 87.41 (16.89) points, and the median was 95 points (interquartile range [IQR], 80–100). All of the healthcare facilities provided a continuous supply of clean running water and soap, and 85% provided appropriate sink/bed ratios (at least 1:10 facility-wide and 1:1 in isolation rooms and intensive care units [ICUs]). In 90% of the reported facilities, the availability of alcohol-based hand rub at each point of care was ensured. Furthermore, in Piedmont, 80% of the healthcare facilities had budgeted a dedicated allocation for the continuous supply of hand hygiene products in 2014.

### Education/Staff Training

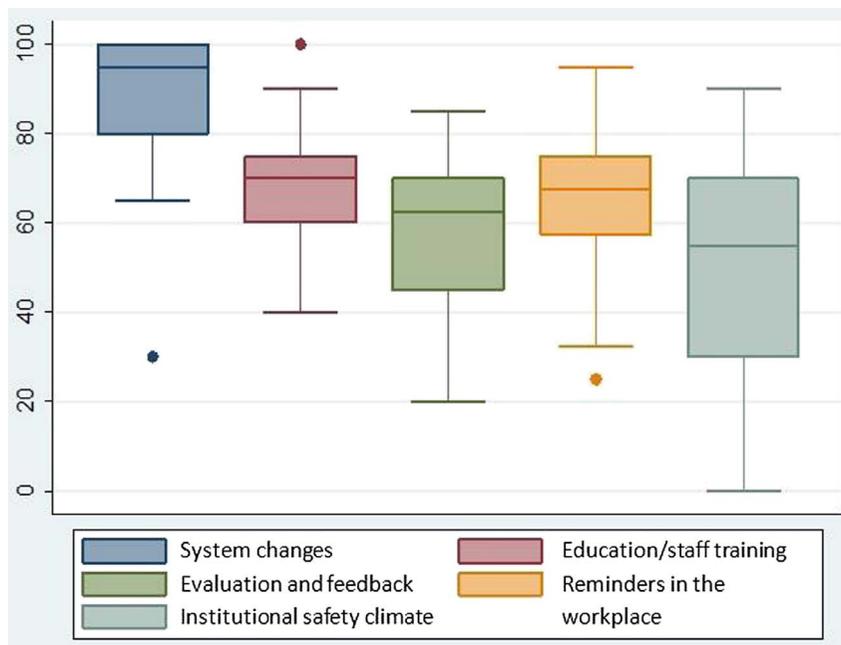
Our analysis revealed high standards of healthcare workers education and training in terms of hand hygiene. The mean (SD) score in the second section was 70.37(13.86) points, and the median was 70 (IQR, 60–75). All facilities organized hand washing training for the staff, and more than 70% guaranteed continuing education at least once a year. Despite the positive results obtained in the second section, 50% of the healthcare facilities did not provide a dedicated budget for hand hygiene training in 2014.

### Evaluation and Feedback

The third section introduces some important indicators for the exam of evaluation systems and feedback data. Only 19% performed direct monitoring of hand hygiene compliance at least every 3 months. Regarding indirect monitoring (performed via the

**TABLE 1.** Total Hand Hygiene Scores Based on the HHSAF

Hand Hygiene Level	Total Score (Range)	No. Healthcare Facilities in Piedmont (n = 27), n (%)	No. Healthcare Facilities in United States <sup>10</sup> (n = 129)
Inadequate	0–125	0	9 (7)
Basic	126–250	3 (11)	
Intermediate (or consolidation)	251–375	19 (70)	58 (45)
Advanced (or embedding)	376–500	5 (19)	62 (48)



**FIGURE 1.** Boxplot of hand hygiene scores in Piedmont facilities calculated for each section of the HHSAF.

monitoring of consumption), the analysis revealed that 67% of the facilities monitored soap consumption every 3 months (as recommended by WHO). The monitoring of hydroalcoholic gel consumption was performed every 3 months by 44% of the healthcare facilities, and the threshold of 20 L for 1000 patient-days (expected consumption) was reached only by 19%. Finally, 9 healthcare facilities had not yet put in place systematic monitoring of hand hygiene.

More than 50% of the healthcare facilities provided feedback data related to hand hygiene indicators with demonstrations of the trends over time (at least every 6 months) and provided the results to the health department.

### Reminders in the Workplace

The last 2 sections evaluated the initiatives of healthcare facilities to support and promote hand hygiene among healthcare workers, patients, and their family. Furthermore, these sections examined the presence and quality of educational materials conceived to promote WHO recommendations of hand hygiene. The mean (SD) score in the fourth section concerning the presence of reminders in the workplace was 65.74(17.36) points, and the median was 67.5 (IQR, 57.5–75). Our analysis revealed that the display of posters that explained the correct use of hand rub and the correct hand washing technique occurred in all facilities. Eighty-five percent of the facilities performed regular inspections and replaced deteriorated posters (at least once per year), and 19% of these facilities performed inspections every 2 to 3 months as indicated by the WHO multimodal strategy. Only 35% of the regional healthcare facilities promoted hand hygiene by displaying and regularly updating posters other than those proposed by the WHO, and more than 30% did not provide brochures and leaflets in all wards.

### Institutional Safety Climate

Finally, the fifth section of the HHSAF questionnaire revealed some important critical issues. First, the mean (SD) score for this section was 50.37(22.95) points (median, 55; IQR,

30–70), and more than 40% of healthcare facilities scored less than 50 points. The commitments to supporting hand hygiene improvement through facility leadership were very heterogeneous. Half of the healthcare units actively engaged both the chief executive officer and medical and nursing directors in the active promotion of hand hygiene. All of the other facilities recruited 1 or several managers. Sixty percent of the units specifically involved the chief executive officer, 74% involved the medical director, and 67% involved the nursing director.

Our study highlights the lack of involvement of patients and their families; only 55% of the healthcare units analyzed provided information about hand hygiene to patients, and only 15% actively involved patients and their families.

Finally, the initiatives for healthcare workers were inadequate, particularly in terms of planning for the World Day of Hand Hygiene program (May 5).

## DISCUSSION

The implementation of the multimodal strategy has achieved important results all over the world in terms of hand hygiene. Since its international introduction, hand hygiene compliance has increased from 51% to 67% (odds ratio, 2.15;  $P < 0.001$ ).<sup>4</sup> The application of the WHO strategy has also elicited encouraging results in Italy; compliance has increased from 55% to 69% (odds ratio = 2.27;  $P < 0.001$ ).<sup>4</sup> Moreover, the HHSAF can improve the implementation of the hand hygiene recommendations. The HHSAF is easy to apply, fast, and reliable, and it allows each healthcare facility to assess their level of hand hygiene, to identify their problems, and to monitor their progress over time.<sup>8</sup>

Our study revealed that hand hygiene in Piedmont has reached an overall good level, although this level remains lower than those in American facilities. A study by Allegranzi et al<sup>10</sup> involving 129 healthcare facilities revealed an average score of 373.2 (versus the mean score in Piedmont of 332.22 points).

In Piedmont, several problems have prevented healthcare facilities from achieving the European and international standards.<sup>10,11</sup> Specifically, our results revealed critical issues related to direct

and indirect monitoring, the provision of reminders, and the active involvement of patients, family members, and caregivers. Moreover, our results highlight the lack of support from chief executive officers, medical directors, and directors of nursing and a deficiency in recurrent training and initiatives designed to upgrade and refresh healthcare workers and the leadership.

In Piedmont, direct and indirect hand hygiene monitoring is regularly performed by few healthcare facilities. Therefore, it is important to implement monitoring systems to achieve the standards set by the WHO. Although direct monitoring is the reference method, it requires the deployment of resources that makes its application difficult. Furthermore, the presence of an observer can influence the behaviors of healthcare workers and make the measurements unreliable.<sup>12,13</sup>

Several European countries have tested new monitoring systems for facilitating direct assessments without the interventions of observers, including video-measurement technologies (SureWash), prototype electronic dispensers designed to record each use, and systems of wireless electronic devices that simultaneously register data.<sup>14–18</sup>

Currently, many European countries have adopted indirect monitoring systems (i.e., France, Belgium, the United Kingdom, Spain, Norway, Germany, and Italy) because such systems are good surrogates for assessing hand hygiene compliance.<sup>11,19–23</sup> In Piedmont, the indirect monitoring has been implemented in all healthcare facilities, but not all units monitor soap and gel consumption at least every 3 months as indicated by the multimodal strategy criteria. The results of surveillance performed in 2013 based on regional indicators are poor, and only a few facilities met the standard level of 20 liter of gel/1000 patient-days. Specifically, the average gel consumptions were 38 mL/patient-days in the ICUs and only 9 mL/patient-days in the non-ICU wards.

The literature also underlines the importance of the settings of facilities. The selection of dispensers based on user-friendliness, the ergonomic positioning of hydroalcoholic rub dispensers and good maintenance are essential elements for encouraging compliance.<sup>24</sup> Several studies have also investigated the effectiveness of continuous access to alcohol-based gels via dispenser pockets, and in Switzerland, an increase of 25% in hand hygiene compliance was reported among healthcare workers who used the pocket dispenser compared with those who did not.<sup>25,26</sup>

In Piedmont, inadequate systems for recording analysis and feedback regarding hand hygiene data were also reported. According to several studies and as described in the WHO multimodal strategy, the presence of feedback systems is one of the most effective strategies for improving compliance among healthcare workers.<sup>4,24</sup> Regular auditing of infrastructural indicators of both professional healthcare workers and chief executive officers is extremely helpful for overcoming systemic and practical obstacles to hand hygiene performance.<sup>11</sup>

Reminders in the workplace are another useful resource for continuously maintaining the focus on hand hygiene. For this reason, each year, the WHO supports the creation of new posters and reminders for healthcare facilities. To improve the effectiveness of poster displays, over the years, the WHO has focused on the identification of strategic areas for the placement of posters, on the choice regarding periodic variation in poster positions, and on the upgrading and replacement of damaged posters.<sup>25</sup>

The review conducted by McGuckin<sup>27</sup> in 2011 also stressed the importance of the complicity of patients, family members, and caregivers with HAIs control, which are achievable with available leaflets, practical demonstrations, and audio-visual or printed material. The active involvement of patients seems to be a viable strategy for increasing hand hygiene compliance. The central element is the empowerment of patients and their families.

Healthcare workers should improve their knowledge and involve and provide patients with useful and effective tools to increase the awareness of hand hygiene obstacles.<sup>28</sup>

Finally, several studies have highlighted the crucial role of involvement of all level of leadership.<sup>11,12,24</sup> Our results revealed that in Piedmont, the commitment of the leadership was lower than that in the US facilities (where the chief executive officer was involved in 80.5% of the healthcare units, the medical director was involved in 70.5%, and the director of nursing was involved in 86.1% of the healthcare facilities).<sup>10</sup>

Our study has some limitations. Firstly, because the HHSAF relies on self-assessment, the received responses might not reflect the real statuses of hand hygiene activities, and healthcare facilities may have underestimated their problems and provided imprecise results. However, the healthcare professionals involved in the study were trained to fulfill correctly the items of HHSAF to avoid mistakes in the evaluation of framework implementation. Secondly, because this is the first surveillance to use the HHSAF tool, we were unable to determine how much the implementation of the multimodal strategy has effectively increased hand hygiene compliance.

## CONCLUSIONS

The systematic implementation of multimodal strategy tools may ensure a safe climate of care and virtuous behavior. The use of the HHSAF required a great effort by healthcare workers and leadership, but it is extremely useful because it provides information about the attention given to hand hygiene and allows for improvements in compliance among the users and subsequent decreases in HAIs. One of the key elements for the success of the multimodal strategy seems to be the active support provided by institutions and governments. In Europe, indeed, countries with a strong institutional support have achieved important results regarding the implementation and efficacy of preventive hand hygiene strategies.

As example, successful initiatives have been developed in France, where the Ministry of Health has established a national surveillance system that publishes an annual report, and in Spain and Germany, where the ministries have financially supported hand hygiene campaigns to increase awareness among health professionals and citizens.<sup>10</sup>

The HHSAF could be a tool for comparing the results, attitudes, and performances of healthcare facilities among institutions and for the design of a regional strategy to improve the hand hygiene program. Free access to WHO tools is an excellent resource for all countries, and the effectiveness of these tools should encourage the participation of more facilities in the WHO global initiative.

## ACKNOWLEDGMENTS

*The authors thank the infection control personnel of the health care facilities who participated in the surveillance.*

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