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Attitudes Toward Practice Guidelines Among ICU Personnel: A Cross-Sectional Anonymous Survey

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Abstract

Objectives—To assess attitudes of ICU staff members toward practice guidelines in general and toward a specific guideline, CDC's Guideline for Hand Hygiene in Healthcare Settings; to correlate these attitudes with staff and hospital characteristics; and to examine the impact of staff attitudes toward the Hand Hygiene Guideline on self reported implementation of the Guideline.

Methods—A cross-sectional survey of staff in 70 ICUs in 39 U.S. hospitals, members of The National Nosocomial Infection Surveillance (NNIS) System. A survey, "Attitudes Regarding Practice Guidelines", was administered anonymously to all willing staff during a site visit at each hospital; 1,359 ICU personnel: 1,003 nurses (74%), 228 physicians (17%), and 128 others (10%) responded.

Results—Significantly more positive attitudes toward practice guidelines were found among staff in pediatric as compared with adult ICUs ($p<0.001$). Nurses and other staff when compared with physicians had more positive attitudes toward guidelines in general but not toward the specific Hand Hygiene Guideline. Those with more positive attitudes were significantly more likely to report that they had implemented recommendations of the Guideline ($p<0.001$) and used an alcohol product for hand hygiene ($p=0.002$).

Conclusions—The majority of staff members were familiar with the CDC Hand Hygiene Guideline. Staff attitudes toward practice guidelines varied by type of ICU and by profession, and more positive attitudes were associated with significantly better self-reported guideline implementation. Because differences in staff attitudes might hinder or facilitate their acceptance and adoption of evidence-based practice guidelines, these results may have important implications for the education and/or socialization of ICU staff.

Keywords

practice guidelines; attitudes; adherence; hand hygiene

Variations in patient care are common, but only appropriate if they are related to variations in the patient's needs for care. Unfortunately, factors in the clinical environment such as type of intensive care unit (ICU), characteristics of care providers (e.g. experience, staffing levels), and hospital size have been shown to result in differences in the quality of care provided and, subsequently, higher rates of adverse events. [1-6] Over the past two decades, clinical practice guidelines have been promulgated as one way to assure that patient care for specific conditions is standardized and reflective of 'best practices'. [7] In light of the proliferation of practice

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guidelines as a mechanism to improve the quality, equity, and efficiency of patient care, the purposes of this study were to assess the attitudes of staff members working in critical care units toward practice guidelines in general and toward a specific guideline, the Centers for Disease Control and Prevention's Guideline for Hand Hygiene in Healthcare Settings[8], to correlate these attitudes with staff and hospital characteristics, and to examine the impact of staff attitudes toward the Hand Hygiene Guideline on self reported implementation of the Guideline.

Methods

Sample and setting

This cross-sectional, anonymous survey was a component of a larger study, "Effect of Hand Hygiene Guideline on Infections and Costs" (1 R01 NR008242, National Institute of Nursing Research). Hospitals were recruited from The National Nosocomial Infection Surveillance (NNIS) System, a voluntary CDC reporting network of acute care hospitals. Electronic messages were sent from CDC to NNIS hospitals explaining the study and inviting them to contact the principal investigator if they were interested in participating. The following were inclusion criteria for study participation: being a NNIS hospital or using NNIS methods and definitions since at least 1999 and having reported data using the Intensive Care Unit (ICU) surveillance component since at least 2000 (to assure that sufficient, standardized data were available), and not using alcohol-based products for hand hygiene prior to June, 2002. All hospitals that contacted us and met the inclusion criteria were included.

Survey instrument

The instrument, "Attitudes Regarding Practice Guidelines", modeled after tools originally developed by Cabana, et al.[9-11], was used to collect the data. In a systematic literature review, Cabana and colleagues identified six categories of barriers to physician adherence to practice guidelines: lack of familiarity or awareness, lack of agreement with guidelines in general or with specific guideline recommendations, lack of outcome expectancy, lack of self-efficacy, lack of motivation, or external barriers such as patient or environmental factors.[11] Our tool was based on this empirical evidence and designed to measure staff attitudes toward these barriers. Initial psychometric evaluation of the Attitude Instrument has been reported in [12].

The original survey form had two sections: The first section included 18 attitudinal statements about practice guidelines in general and the second section included 18 parallel statements specifically regarding the Hand Hygiene Guideline. Items in the tool were rated using a 6-point Likert scale with selections from 'strongly disagree' to 'strongly agree'. Negative items were reverse scored so that the higher the score, the more positive the attitudes. A total score for the form was obtained by adding the points from each of the individual items (from 0 for the most negative attitude to 5 for the most positive). In addition, questions about the extent to which the respondent implemented the Hand Hygiene Guideline and used alcohol products for hand hygiene (never to almost always) were included. Demographic data collected included gender, race/ethnicity, age, and discipline of respondent; type of ICU; and characteristics of the hospital (geographic location, bed size, and affiliation with an academic health center) in which the staff member worked.

Exploratory factor analyses using principal component analysis and Varimax rotation with Kaiser normalization were performed to examine underlying constructs of the survey instrument. Analyses were performed separately for Section 1 (attitudes toward practice guidelines in general) and Section 2 (attitudes specifically regarding the Hand Hygiene Guideline). For Section 1, six items with lower correlation coefficients with the components ($r < .3$) were omitted from the tool. The final instrument consisted of three factors (12 items)

with a possible range of scores from 0-60, and had a Cronbach's alpha coefficient of .83. These three final factors were labeled relevance, motivation, and outcome expectancy. For the section of the instrument measuring attitudes toward the Hand Hygiene Guideline (Section 2), the final scale consisted of two factors (labeled relevance and motivation) with 10 items explaining 50.3% of the variance, a Cronbach's alpha of .77, and the scores ranging from 0-50, Tables 1a, b. Results from this revised instrument are presented in this paper.

Procedures

The study Project Director (DQ) made a two-day site visit to each participating hospital. The Attitude Surveys were distributed in person to patient care personnel who were working in the study hospital ICUs during the site visit. Staff members were asked to complete the surveys during the site visit and return them directly to the Project Director. Those who expressed willingness to participate, but who said they were too busy at the time, were provided with a stamped return envelope and asked to mail the survey form. This study was approved by the institutional review boards of Columbia University Medical Center and of each participating hospital.

Data analysis

Descriptive statistics were used to examine the characteristics of the study population. Analysis of variance (ANOVA) was used to determine whether there were significant differences in mean attitude scores for practice guidelines in general and for the Hand Hygiene Guideline among staff with different demographic characteristics and from different ICUs and hospitals. Variables examined in these analyses included ICU staff characteristics (professional discipline, age, gender, race) and hospital characteristics (type of ICU, affiliation with an academic health center, geographic region, number of active beds). Those variables were then entered into two separate linear regression models to examine the independent effects of each variable on attitude scores for the general practice guideline and for the Hand Hygiene Guideline scales. To test the hypothesis that staff attitudes toward the Hand Hygiene Guideline were associated with the self reported implementation of the Guideline (yes/no) and use of alcohol based hand hygiene product always or almost always, logistic regression was used. Odds ratios comparing the odds of implementing the Guideline or using an alcohol product were calculated for various potential predictors such as discipline, age, geographic region, etc.

Results

Personnel from 70 ICUs in 39 U.S. hospitals were included. A total of 1,995 surveys were distributed and 1,359 were returned (68.2%). Respondents included 1,003 nurses (74%), 228 physicians (17%), and 128 others (e.g. phlebotomist, radiologist, respiratory therapist, dieticians, 10%). Staff participants were predominantly female and white with a mean age of 37 years. The mean number of active beds of the 39 hospitals visited was 417. Almost three-fourths (70.9%) of the respondents were in the eastern region of the United States, and 60.6% were affiliated with an academic health center, Table 2.

Attitudes regarding clinical practice guidelines in general

While most respondents reported that they were familiar with the practice guidelines in their field, 10.2% stated that they were not. The mean score for the scale measuring general attitudes regarding clinical practice guidelines was 44.1 out of a possible 60 (95% confidence intervals: 43.7-45.1). While attitude scores of nurses and other staff members (phlebotomist, radiologist, respiratory therapist, dietician) did not differ significantly from each other, both groups scored significantly higher than physicians ($p<0.001$). In the univariate analyses, female staff scored higher than male staff members ($p<0.001$) and older respondents had significantly more positive attitudes than did younger staff ($p=0.004$). Among the hospital characteristics

examined, number of active beds and type of ICU were significantly correlated with attitudes toward guidelines. Attitude scores were significantly lower in larger hospitals ($p=0.007$), and staff in the pediatric units scored significantly higher than staff in other ICUs ($p<0.001$). Scores of staff in the medical, surgical, and medical-surgical ICUs did not significantly differ. Neither affiliation with an academic health center nor geographic region was correlated with attitudes. In the regression analyses, each of those variables significant in univariate analyses was also found to be significant when the effects of other variables were controlled, Tables 3a, b.

Attitudes specifically regarding the Hand Hygiene Guideline

The majority of respondents (90.4%) noted that they were familiar with the Hand Hygiene Guideline. The mean score for the scale measuring attitudes regarding the Hand Hygiene Guideline was 38.3 (95% CI: 38.0- 38.6) out of a possible 50. There were two characteristics correlated with attitudes toward the Hand Hygiene Guideline: type of ICU and age. Staff in the pediatric units scored significantly higher than staff in other units ($p=.05$), and older staff members had higher scores than younger ($p<0.001$). In the regression analysis, older age and working on a pediatric unit continued to be significantly associated with more positive attitudes, Tables 3a, b.

Relationship between attitudes and reported Guideline implementation

About half of respondents (52%) stated that following the Hand Hygiene Guideline would result in worsened skin condition. These individuals reported using alcohol products significantly less frequently than individuals who did not feel that the risk of skin damage would increase (63.7% versus 72.3%, $p=0.002$). The majority of respondents (96.9%) stated that following the Hand Hygiene Guideline would reduce the risk of healthcare-associated infections. There was no significant difference in the reported frequency of alcohol use for hand hygiene among those who reported that following the Guideline would reduce risk of infection or not ($p=0.85$). Almost all (92.7%) staff members reported that they personally implemented the recommendations of the Hand Hygiene Guideline and 67.2 % reported using an alcohol based product for hand hygiene. In the logistic regression models, staff members who scored higher on the attitude survey were more likely to report that they implemented the Guideline recommendations (OR: 1.11; CI: 1.06-1.16; $p<0.001$) and used alcohol for hand hygiene (OR: 1.05; CI: 1.02-1.08 $p=0.002$), Table 4.

Discussion

Correlates of attitudes toward practice guidelines

This attitude survey included the largest sample of critical care staff of any published to date, which allowed us to identify possible differences in attitudes by certain staff and hospital characteristics. Most of the research related to attitudes and beliefs about practice guidelines has been conducted among physicians in general[11,13-16] and in various specialties including psychiatry,[17] pediatrics,[10] family medicine,[18,19] and intensivists.[20,21] Several studies have also examined attitudes among nurses and other staff.[21-24] Consistent with previous data,[21-23] nurses and other healthcare professionals in this survey reported more positive attitudes toward practice guidelines than did physicians. Nurses have also been found to be more adherent to guidelines than physicians.[21] However, it is not clear whether the differences in attitudes toward guidelines among the two disciplines reflect variations in the content or modality of educating professionals in keeping up-to-date with clinical practice guidelines.

Several differences in attitudes based on staff characteristics deserve mention. First, both gender and profession were significantly related to attitude scores in our study, but after controlling for gender in the multivariate analysis, differences in attitudes toward guidelines

between nurses and physicians still existed. Apparently these differences in attitudes between the disciplines cannot be explained by gender differences, pointing to possible variations in the education and/or socialization of these two professional groups. Second, a surprising finding in our survey was that increasing age was associated with significantly more positive attitudes toward guidelines. Others have reported either no association with age[25] or, for physicians, more acceptance of guidelines and practice standards among younger physicians such as house officers.[26-29] Since attitudes toward the Hand Hygiene Guideline were significantly more positive with increased age for both the physicians and nurses in our study, our findings differed from those previously reported. Reasons for this warrant further examination.

Despite the fact that others have reported that staff from non-teaching hospitals have less positive attitudes toward guidelines,[13] the only hospital characteristic significant in our survey was that staff in pediatric units had consistently more positive attitudes than staff in other ICU types. Similarly, in a survey of >1,000 members of the American Academy of Pediatrics, Flores, et al.[30] reported that 89% of pediatricians agreed that practice guidelines are likely to improve patient outcomes and 94% were motivated to use guidelines to improve the quality of care.

The level of diffusion and adoption of the Hand Hygiene Guideline

Most respondents in our study were familiar with the CDC Guideline; this rapid rate of guideline diffusion (<2 years) has not been the case for most guidelines. Further, dissemination was considerably faster for this Guideline when compared with previous CDC guidelines published several decades ago, consistent with the fact that diffusion of innovation may be faster and easier with electronic communication such as the Internet and email and the increasing availability of rapid publication.[31,32].

The fact that personnel had more positive attitudes toward the Hand Hygiene Guideline than toward practice guidelines in general may be related to several factors. First, reasons for adhering to practice guidelines have been shown to differ for physicians and nurses. Physicians have reported that their non-adherence relates to disagreement with trial results, lack of consensus, or the belief that practice guidelines will not improve patient outcomes. They are more likely to respond positively to guidelines from professional groups in their specialty or sources they consider to be influential and knowledgeable.[10,11,16,21,22,33] For nurses, barriers to guideline adherence have been reported to be primarily environmental (e.g. lack of supplies or staff).[21] In the case of the Hand Hygiene Guideline, barriers to non-adherence reported by both physicians and nurses were minimized; i.e. the Guideline was from a highly respected source (CDC) likely to enhance consensus (important to physicians) and the supplies needed to adhere to the Guideline (alcohol products, sinks, gloves) were generally available (facilitators important to nurses).

Secondly, the Hand Hygiene Guideline recommendations have been included as one assessment parameter during accreditation visits by The Joint Commission for Accreditation of Healthcare Organizations. Others have reported that external motivators and administrative mandate are effective strategies for improving/changing practice.[34-37] Organizational factors such as high levels of staff turnover and the extent to which guidelines are integrated into the quality programs and policies of hospitals are associated with improved adherence and sustainability.[37,38] Elovainio and colleagues[39] examined the effects of certain job characteristics on attitudes toward practice guidelines, and found that the perceived usefulness, availability, and practicality of guidelines were important factors. This is consistent with our finding that relevance and outcome expectancy were important components of our attitude scale. They also reported that those with high job motivation were more ready to use guidelines, even when they had similar attitudes toward guidelines. Finally, it may be that the Hand

Hygiene Guideline was more readily accepted simply because it was less controversial than some guidelines.

Relationship between attitudes and reported guideline implementation

In this study there was a strong correlation between self-reported positive attitudes toward guidelines and increased adherence to the Hand Hygiene Guideline. The theory of planned behavior has been postulated to explain the link between attitudes and behavior. This theory hypothesizes that the intention to perform a behavior such as using alcohol for hand hygiene can be predicted by three intermediate factors—attitudes, subjective norms, and perceived behavioral control.[40,41] This is consistent with evidence that nurses have both a more positive attitude regarding guidelines and are also more adherent. On the other hand, O'Boyle and colleagues[42] tested the extent to which this theory predicted hand hygiene behavior and found, as we did, that attitudes were significantly correlated with self-reported hand hygiene adherence. However, there was no significant relationship between attitudes and observed adherence. They postulated that actual hand hygiene behavior may be more sensitive to work intensity, and this would be particularly relevant in a critical care setting, i.e. work activities may override one's intentions and attitudes.

The Attitude Survey instrument

One of the challenges of measuring attitudes is the availability of valid and reliable tools. Unfortunately, studies have not often reported the psychometric properties of instruments used in sufficient detail to allow study replication.[26,37,43,44] Further, even when a tool is reported to have acceptable reliability and validity, revalidation of the instrument with each use is important. For example, a tool developed by experts to measure attitudes toward clinical practice guidelines[45] was subsequently found to have poor internal construct validity when translated into French and used in another group of practitioners.[46] The survey tool we used was initially derived empirically from research to identify barriers perceived by physicians to use of practice guidelines and underwent preliminary psychometric testing.[12] In this study, we further modified the instrument based on a factor analysis. Since it is now shorter, easy to administer, and had sound psychometric properties when used in a large sample of ICU staff, we recommend this tool to others interested in studying attitudes toward guidelines who could then adapt it for their own use (tool available from authors upon request).

Are guidelines the answer?

Clearly, staff attitudes toward practice guidelines should depend upon the extent to which such guidelines are useful in improving patient care. While there is some evidence that guidelines improve outcomes when they are appropriately implemented,[7] there are a number of problems which mitigate their acceptability, relevance, and applicability. Several of the most important problems include their external validity, currency, and feasibility. In many cases, guideline recommendations are based on expert opinion or on clinical trials from only a few sites. Because guidelines become outdated quickly,[47-49] The National Guideline Clearinghouse requires that guidelines published there must be updated at least every 5 years (<http://www.guideline.gov/about/inclusion.aspx>). Even when guidelines are based on rigorous scientific evidence, efforts to disseminate them and educate users can be expensive and daunting. Hence, questions have been raised about how best to balance the experience and professional autonomy of the individual clinician with the positive benefits of guideline use (reduced costs and practice variations and use of evidence to guide decisions).[50-53] These issues are likely to explain, at least in part, skepticism among staff about the appropriate role of guidelines. As noted by Hanneman,[50] “blind adherence to clinical guidelines is undesirable because it removes patient context from decision making”.

Clearly, personal motivation plays a major role in guideline adherence, and in our study motivation was also a significant factor in the scale for measuring attitudes toward guidelines. Hysong, et.al.[54] found that there was wide variability in the mental concept and models regarding clinical practice guidelines among employees of 15 different Veterans Health Administration facilities. Since they found that a clear, focused model of guidelines was a characteristic of high performing facilities, it seems important that an institution strive to clarify for employees their model for clinical guidelines.

Study limitations

This study suffers from the same limitations as does any study using self-report data. Although self-report is one of the few ways to assess attitudes, there is concern about desirability bias (i.e. participants provide responses they think the researcher wants or expects). We attempted to minimize this potential bias by assuring respondent anonymity. Despite the fact that survey forms were collected in person, it is unlikely that this would have had a major impact on responses since the data collector was unknown to any of the staff members. The sample of NNIS hospitals cannot be generalized to all U.S. hospitals because they represent a group of hospitals that voluntarily report their infection rates into a national database. While it was not the purpose of this study to assess the correlation between attitudes and actual use of guidelines, we did find significant correlations between more positive attitudes toward guidelines and higher self-reported frequency of implementation of the Hand Hygiene Guideline, possible evidence of internal consistency. Finally, the large sample size in this survey has resulted in statistically significant differences, even when the actual differences in scores were small. Because of the large sample sizes in each category of independent variables and the fact that participants were instructed carefully and then generally completed the survey immediately while the data collector was available to respond to questions, it is unlikely that differences in scores are related to different numbers of respondents in the various categories or to measurement error. Nevertheless, the clinical significance of some of these findings needs to be considered.

Summary and Implications

In this large survey of ICU personnel, significantly more positive attitudes toward practice guidelines were found among staff in pediatric as compared with adult ICUs. Nurses and other staff when compared with physicians had more positive attitudes toward guidelines in general but not toward the specific Hand Hygiene Guideline. Older respondents had more positive attitudes, and respondents scored significantly higher on the specific Hand Hygiene Guideline compared with attitudes toward guidelines in general. While some of our results were confirmatory of what has been previously described, this study contributes to an understanding of practice guidelines in several ways. First, we conducted further testing on a psychometrically sound, simple to administer tool to measure staff attitudes toward guidelines that can be adapted to other settings. Second, because these differences in staff attitudes might hinder or facilitate their acceptance and adoption of evidence-based practice guidelines, these results may have important implications for the education and/or socialization of ICU staff.

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Table 1a

Subscales comprising items measuring attitudes regarding clinical practice guidelines in general (Section 1)

General Guideline Subscale	Items
<i>Relevance</i>	There are so many guidelines available that is nearly impossible to keep up.
	I don't have the time to stay informed about available guidelines.
	Guidelines are too "cookbook" and prescriptive.
	Generally, practice guidelines are cumbersome and inconvenient.
	Guidelines are difficult to apply and adapt to my specific practice.
<i>Motivation</i>	Generally, the costs of practice guidelines outweigh the benefits.
	Guidelines interfere with my professional autonomy.
	Generally, I would prefer to continue my routines and habits rather than to change based on practice guidelines.
	Publishing practice guidelines increases the risk of malpractice liability.
<i>Outcome expectancy</i>	In this organization, practice guidelines are important.
	Guidelines improve patient outcomes.
	Guidelines help to standardize care and assure that patient are treated in a consistent way.

Table 1b

Subscales comprising items measuring attitudes regarding attitudes specifically regarding the Hand Hygiene Guideline (Section 2)

Hand Hygiene Guideline Subscale	Items
<i>Relevance</i>	I have confidence that the developer of the guideline is well qualified and knowledgeable about hand hygiene.
	The recommendations of the Guideline are relevant to my patient population
	The person I report to expects me to use the guideline.
	The Guideline is based on sound scientific evidence.
<i>Motivation</i>	If I follow the recommendations of the Guideline, it is likely that my hands will be in worse shape.
	It is not really practical to follow the Guideline recommendations.
	I do not wish to change my hand hygiene practices, regardless of what the Guideline recommends.
	There are other guidelines regarding hand hygiene that conflict with this one.
	I don't have time to use this Guideline.
	The Guideline is cumbersome and inconvenient.

Table 2

Characteristics of ICU staff

ICU staff (n=1,359)	
Discipline	
Nurse	74%
Physician	17%
Others(e.g. phlebotomist, radiologist, respiratory therapist, dietician)	10%
Mean age (yrs.)	37.1 (range: 18-66)
Gender	
Female	78%
Male	21%
Race	
White	75%
Black	8%
Asians/Others	13%
Type of ICU	
Medical	18%
Surgery	11%
Medical-Surgery	51%
Pediatrics	20%
Bed size (mean 417.1)	
100-199	9%
200-399	39%
400-599	35%
600-900	17%
Geographic Region	
Eastern region (Mid-Atlantic, South-Atlantic, East North Central, East South Central)	71%
Western region (Mountain, Pacific, West North Central, West South Central)	29%
Affiliated with academic health center	61%

Note: Not all percentages equal 100% because of rounding or missing values

Table 3a
Attitude scores by staff and hospital characteristics (Univariate analysis)

Variables	General Guideline (Total possible=60)		H.H. Guideline (Total possible=50)	
	Mean Score	P value	Mean Score	P value
Discipline				
Nurse	44.6	<0.001	38.4	0.47
Physicians	41.4		37.8	
Others	45.0		38.5	
Age (yrs)				
18-30	42.9	0.004	36.8	<0.001
31-40	44.1		38.9	
>40	45.0		39.5	
Gender				
Female	44.7	<0.001	38.4	0.23
Male	42.0		37.9	
Race				
White	44.2	0.08	38.4	0.38
Black	44.5		37.8	
Asians/ Others	42.8		37.8	
Bed size				
100-199	45.4	0.007	39.2	0.24
200-399	44.4		38.2	
400-599	44.2		38.3	
600-900	42.6		37.8	
Affiliated with an Academic Health Center				
Yes	44.0	0.42	38.4	0.38
No	44.3		38.1	
Geographic Region				
Eastern region	43.9	0.09	38.3	0.71
Western region	44.7		38.2	
Type of ICU				
Medical	44.4	<0.001	38.6	0.05
Surgery	43.4		38.2	
Medical-Surgical	43.3		38.0	
Pediatrics	46.2		39.1	

Table 3b Attitude scores by staff and hospital characteristics (Multiple regression)

Variables	Gen. Guideline Score		H.H. Guideline Score	
	Regression coefficient	p value	Regression coefficient	p value
Gender	-1.37	0.04	-.215	0.69
Age	.079	0.003	.085	<0.001
Race	-.263	0.49	-.271	0.36
Discipline				

Variables	General Guideline (Total possible=60)		H.H. Guideline (Total possible=50)	
	Mean Score	P value	Mean Score	P value
Nurse/Others compared to Physicians	2.53	<0.001	.507	0.40
ICU				
Medical compared to Pediatric	-.571	0.54	-.737	0.31
Surgical compared to Pediatric	-1.915	0.07	-1.21	0.14
Med-Surg compared to Pediatric	-2.657	<0.001	-1.52	0.007
Active beds	-.820	0.02	-.197	0.68
Affiliated with an academic health center	-.015	0.98	.088	0.86

Table 4

Relationship between attitudes toward Hand Hygiene Guideline and self-reported implementation of the Guideline and use of alcohol for hand hygiene (Logistic regression)

Variables	I personally have implemented the recommendations of the Hand Hygiene Guideline		I use alcohol for hand hygiene frequently or almost always		
	Odds Ratio	95% Confidence Intervals (CI)	p value	Odds Ratio	95% CI
Discipline					
Nurse	.71	.28-1.78	0.46	1.29	.80-2.07
Physician	.94	.29-3.00	0.92	1.75	.94-3.25
Age	.99	.97-1.02	0.71	.99	.97-1.01
Gender	1.13	.53-2.41	0.75	1.11	.72-1.71
ICU					
Medical Surgery	1.01	.37-2.75	0.99	.74	.42-1.33
Medical-Surgery	.85	.29-2.49	0.77	1.31	.66-2.62
	1.09	.48-2.44	0.84	.72	.46-1.15
Active beds	1.07	.73-1.56	0.72	.77	.61-.97
Affiliated by an Academic Health Center	1.49	.78-2.85	0.23	1.15	.773-1.70
Geographic Region	.54	.261-1.10	0.09	.86	.58-1.27
Hand Hygiene Guideline Score	1.11	1.06-1.16	<0.001	1.05	1.02-1.08
					0.002