

## The Efficacy of Teaching hand Hygiene to Medical students: An Interventional Study

Rita Rezaee

Health Policy Research Center, Quality Improvement in Clinical Education Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

Mina Danaei

Department of Community Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

Mehrdad Askarian

Professor of Community Medicine, Department of Community Medicine, Shiraz Anesthesiology and Critical Care Research Center, Shiraz, Iran.

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### Abstract

**Background:** Hand hygiene is one of the most important measures to prevent and reduce the incidence of hospital-associated infections.

**Objective:** The main objective of this study was to determine the effect of an educational program on medical students' knowledge, attitude and compliance with hand hygiene at Shiraz University of Medical Sciences.

**Methods:** All medical students who had passed physiopathology courses were selected to participate in this interventional study. A baseline self-reported questionnaire was distributed among the participants to fill out. A one-day teaching workshop was held to discuss the importance of hand hygiene. The participants filled out the questionnaire before attending, on finishing and 3 months after the workshop. Repeated Measures ANOVA test was used for analysis of the data.

**Results:** There was a significant difference between the pre-test scores and late post-test scores of the questionnaire ( $p=0.049$ ). There was a significant difference between the pre-test and the late post-test scores in knowledge and performance categories ( $P=0.045$ ,  $P=0.001$ ). However, regarding the pre-test and immediate post-test scores, a significant difference was found only in the performance category ( $P=0.002$ ).

**Conclusion:** Educational programs can improve the knowledge and performance of medical students in short and long time periods.

**Keywords:** Hand hygiene, Educational effectiveness, Medical students, knowledge, performance

**1. Introduction:**

Hospital associated infections are among the most common concerns of the health care systems. Hand hygiene is known to be the single most important and inexpensive measure to prevent and reduce these infections [1, 2]. Despite strong evidence showing the necessity of hand hygiene and the simplicity of this action, compliance with hand hygiene is still low (averagely less than 40%), especially in the developing countries [3].

Medical students are trained to be perfect and competent physicians. Their knowledge, attitude and performance in this period are a footstone for their performance in the future. Hand hygiene is one critical behavior to which they need to pay attention, in order to prevent nosocomial infection diseases [4].

The findings of a study conducted in the University of Utah showed that medical students had a low level of hand hygiene, even though they reported positive attitudes toward this measure [5]. The medical students' mean score of awareness about hand hygiene in Qassim University in Saudi Arabia was approximately 55% and their compliance with standard hand hygiene methods was less than 20% [6]. One study in a teaching hospital in Brazil demonstrated that 91% of medical students had adequate knowledge about hand washing but only 2.6% of them noted the compliance of hand hygiene [7]. Another study demonstrated that medical students of Shiraz University of Medical Sciences had relatively good knowledge and attitudes toward hand hygiene recommendations but they had poor performance [8].

Several interventional studies were conducted to distinguish the effectiveness of educational programs on compliance with hand hygiene recommendations [9-11]. It seems that educational programs could influence the performance of healthcare workers, especially programs that used cognitive, emotional and behavioral methods. Coupling educational programs with motivational interventions is effective in promotion of nurses' hand hygiene behaviors [12].

The main objective of this study was to determine the effect of educational programs on medical students' knowledge, attitude and compliance with hand hygiene at Shiraz University of Medical Sciences.

**2. Materials and Methods:**

Shiraz University of Medical Sciences is one of the top three universities in Iran which provides medical care for a large part of southern Iran. Every year about 70-100 students are admitted in Shiraz Medical School and after 4 years of study in basic sciences and physiopathology, they get ready for clinical courses.

This interventional study was performed during three consecutive months in 2013. Ethical approval for this study was issued by the Ethics Committee of Shiraz University of Medical Sciences. All medical students who had passed physiopathology courses (fourth year) were selected to participate in this study (n=37). After obtaining verbal informed consent, we distributed a baseline self-reported questionnaire among the participants to fill out. Then, a one-day teaching workshop (3 hrs) was held by an infection control specialist to discuss the importance and role of hand hygiene on prevention of transmission of infectious diseases in the healthcare centers. The participants filled out the self-reported questionnaire immediately and 3 months after the workshop.

The questionnaire consisted of 3 categories: knowledge (12 questions), attitudes (7questions), and performance (13 questions). The participants' knowledge and attitudes toward hand washing were assessed through Likert Scale. The questionnaire assessed the participants' knowledge and attitude according to hand washing before contact with the

patient, hand washing after contact with the patient, hand washing before putting on gloves, hand washing after putting on gloves, and the causes of lack of compliance with hand hygiene recommendations. Compliance with hand hygiene was assessed by self-report questions with two point scale (yes- no). These questions assessed the situations in which the participants washed their hands. The details of all questions are presented in Table1.

In order to determine the content and face validity of the questionnaire, three experts (specialist in community medicine) were asked to determine the accuracy and comprehensiveness of the questionnaire. Then, a pilot study on 20 medical students was done to check the reliability of the questionnaire. A Chronbach's alpha value of 0.84 was obtained.

We investigated the effect of teaching, as an independent variable, on medical students' knowledge, attitudes and performance factors. SPSS software, version 16 was used to perform analytical tests including Repeated Measures ANOVA test with a Greenhouse-Geisser correction and Bonferroni post-hoc test. The statistical significance level was considered less than 0.05.

### 3. Results:

The response rate was 91.89% (34/37). The total participants' mean and standard deviation for the pre-test scores was  $75.17 \pm 6.68$ . The mean and standard deviation of immediate post-test and late post-test scores was  $75.73 \pm 5.59$  and  $80.44 \pm 8.60$ , respectively. The difference between the mean scores at these three times was statistically significant ( $F(1, 33) = 6.40, P = 0.016$ ). The results of the Bonferroni post-hoc test showed a significant difference between pre- test scores and late post-test scores ( $p=0.049$ ). The plot of the mean scores of the test at those three times is displayed in Figure 1.

The participants' mean and standard deviation for the three tests scores in the knowledge, attitude and performance categories is shown in Table 2. The participants acquired better mean score of knowledge, attitude and performance in the late post-test.

The difference between the mean scores of the three tests regarding the knowledge category was statistically significant ( $F(1, 33) = 6.60, P = 0.015$ ). The difference between the mean scores of the tests, regarding the attitude category was not statistically significant ( $F(1, 33) = 0.76, P = 0.388$ ). Regarding the performance category, there was a statistically significant difference between the mean scores of the three tests ( $F(1, 33) = 16.33, P < 0.001$ ). The results of the Bonferroni post-hoc test for knowledge and performance categories are shown in Table 3. There was a significant difference between the pre-test and late post-test scores regarding the knowledge and performance categories ( $P = 0.045, P = 0.001$ ). A significant difference was found between the pre-test and immediate post-test scores regarding the performance category ( $P = 0.002$ ). The plot of the mean scores of the tests in knowledge, attitude and performance categories is shown in Figure 2.

### 4. Discussion:

A multicenter study in the Mediterranean area showed a poor compliance of hand hygiene practice in health care workers. The rate of the following recommendations about hand hygiene was less than 30% in this study [13]. Also, hospital physicians did not comply with hand washing rules perfectly in Shiraz [14]. Following standards is multi-factorial, involving awareness, attitude and performance of individuals. Regular periodic educational programs are critical to maintain hand hygiene compliance [15].

Due to lack of compliance with hand hygiene in medical students in Shiraz and the importance of educational programs, this study discusses the role of educational program, as

an intervention, on medical students' knowledge, attitude and performance. Comparing total scores of the three tests showed a significant difference between pre-test and late post-test scores. Other studies of this type have demonstrated the efficacy of educational programs in hand hygiene compliance and the incidence of nosocomial infection [16, 17]. Existence of a significant difference between pre-test and late post-test scores emphasizes the long term effects of education and also the importance of consistency of educational programs and clinical experiences. The participants started their practical courses in hospitals after acquiring hand hygiene information in a workshop and, therefore, understood the importance of hand washing more than before.

Comparing pre-test and post-test results showed the significant improvement in the participants' knowledge and performance scores. These results confirmed the efficacy of the educational program. In an observational study in Canada, adherence to hand washing and rates of nosocomial infections were tracked before and after an educational program. Before the program, the infection rate was higher than 30% and after the education it decreased to 12%. After 4 years, the nosocomial infection rate was increased to about 33%. The program was repeated and again the infection rate decreased to 9% [18]. This result strongly agrees with our study findings, indicating the effect of teaching programs on behavior and also the need to repeat the educational programs to maintain the effect of teaching. Continuous monitoring and evaluating the hand hygiene knowledge, attitude and practice in HCWs in addition to continuous training programs should improve the students' compliance [19]. It seems that promoting the awareness of community members about hospital hand washing could have additional benefits on clinicians' compliance [13]. The participants' attitude was not different after the educational program. It seems that changing attitudes needs more effective educational methods. These results demonstrate the importance of innovative educational programs rather than traditional educational programs to change the participants' attitude.

This study was interventional research, measuring the effects of an intervention for its immediate and late effects. Each participant was compared with him/herself to avoid several confounders. Some limitations of this study include small sample size and self-reporting study.

#### **5. Conclusion:**

Hand hygiene is an important factor in infection control practice but the rate of adherence to this regulation is not desirable among medical students in Shiraz. Educational programs can improve the knowledge and performance of medical students in both immediate and long time periods. Designing and implementing continuous practical training courses may have better educational effects on medical students' hand hygiene attitude.

#### **6. Acknowledgments:**

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#### **7. Conflict of Interest:**

There was no conflict or competing interests for the authors involved in this study.

#### **References:**

1. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Infection Control Programme. *Lancet*. 2000;356(9238):1307-12. Epub 2000/11/10.

2. Herbert VG, Schlumm P, Kessler HH, Frings A. Knowledge of and Adherence to Hygiene Guidelines among Medical Students in Austria. *Interdiscip Perspect Infect Dis.* 2013;802930(10):11.
3. Alp E, Ozturk A, Guven M, Celik I, Doganay M, Voss A. Importance of structured training programs and good role models in hand hygiene in developing countries. *J Infect Public Health.* 2011;4(2):80-90. Epub 2011/06/15.
4. Gluck PA, Nevo I, Lenchus JD, Sanko JS, Everett-Thomas R, Fitzpatrick M, et al. Factors impacting hand hygiene compliance among new interns: findings from a mandatory patient safety course. *J Grad Med Educ.* 2010;2(2):228-31.
5. Snow M, White GL, Jr., Alder SC, Stanford JB. Mentor's hand hygiene practices influence student's hand hygiene rates. *Am J Infect Control.* 2006;34(1):18-24. Epub 2006/01/31.
6. Al Kadi A, Salati SA. Hand Hygiene Practices among Medical Students. *Interdiscip Perspect Infect Dis.* 2012;679129:16.
7. Garcia-Zapata MR-C, e Souza ACS, Guimarães JV, Tipple AFV, Prado MA, García-Zapata MTA. Standard precautions: knowledge and practice among nursing and medical students in a teaching hospital in Brazil. *Int J Infect Control.* 2009;6(1. (
8. Askarian M, Honarvar B, Tabatabaee HR, Assadian O. Knowledge ,practice and attitude towards standard isolation precautions in Iranian medical students. *J Hosp Infect.* 2004;58(4):292-6.
9. Szilagyi L, Haidegger T, Lehotsky A, Nagy M, Csonka EA, Sun X, et al. A large-scale assessment of hand hygiene quality and the effectiveness of the "WHO 6-steps". *BMC Infect Dis.* 2013;13(249):1471-2334.
10. Mazi W, Senok AC, Al-Kahldy S, Abdullah D. Implementation of the world health organization hand hygiene improvement strategy in critical care units. *Antimicrob Resist Infect Control.* 2013;2(1):2047-994.
11. Santos LX, Souza Dias MB, Borrasca VL, Cavassin LT, Deso di Lobo R, Bozza Schwenck RC, et al. Improving hand hygiene adherence in an endoscopy unit. *Endoscopy.* 2013;45(6):421-5.
12. Salamati P, Poursharifi H, Rahbarimanesh AA, Koochak HE, Najafi Z. Effectiveness of motivational interviewing in promoting hand hygiene of nursing personnel. *Int J Prev Med.* 2013;4(4):441-7.
13. McLaws ML, Maharlouei N, Yousefi F, Askarian M. Predicting hand hygiene among Iranian health care workers using the theory of planned behavior. *Am J Infect Control.* 2012;40(4):336-9.
14. Askarian M, Khalooee A, Emroodi NN. Personal hygiene and safety of governmental hospital staff in Shiraz, Islamic Republic of Iran. *East Mediterr Health J.* 2006;12(6):768-74.
15. Fitzpatrick M, Everett-Thomas R, Nevo I, Shekhter I, Rosen LF, Scheinman SR, et al. A novel educational programme to improve knowledge regarding health care-associated infection g and hand hygiene. *Int J Nurs Pract.* 2011;17(3):269.74-
16. Helder OK, Brug J, Looman CW, van Goudoever JB, Kornelisse RF. The impact of an education program on hand hygiene compliance and nosocomial infection incidence in an urban neonatal intensive care unit: an intervention study with before and after comparison. *Int J Nurs Stud.* 2010;47(10):1245-52.
17. Monistrol O, Calbo E, Riera M, Nicolas C, Font R, Freixas N, et al. Impact of a hand hygiene educational programme on hospital-acquired infections in medical wards. *Clin Microbiol Infect.* 2012;18(12):1.8-212

18. Conly JM, Hill S, Ross J, Lertzman J, Louie TJ. Handwashing practices in an intensive care unit: the effects of an educational program and its relationship to infection rates. *Am J Infect Control.* 1989;17(6):330-9.
19. Amazian K, Abdelmoumene T, Sekkat S, Terzaki S, Njah M, Dhidah L, et al. Multicentre study on hand hygiene facilities and practice in the Mediterranean area: results from the NosoMed Network. *J Hosp Infect.* 2006;62(3):311-8.

**Table 1. Knowledge, attitude and performance questions**

<b>Knowledge and attitude questions</b>	<b>Performance questions</b>
I wash my hands before contact with each patient	<b>Do you wash your hands :</b>
I wash my hands after contact with each patient	After using the toilet
Washing hands before contact with each patient is difficult	After contact with the contaminated materials of patients
Washing hands after contact with each patient is difficult.	After urinary catheterization
I wash my hands before putting on gloves.	Before endotracheal suction
I wash my hands after removing gloves.	Before patients' wound dressing
Washing hands before putting on gloves is not necessary.	Dirty hands
Washing hands after removing gloves is not necessary.	After patient examination
Washing hands before contact with each patient is not necessary.	Before putting on gloves
Washing hands after contact with each patient is not necessary.	After leaving isolation room
I can be as a role model in hand washing for other HCWs.	After contact with patients' blood or body fluids
Doing other duties is more important than hand washing.	After patients' wound dressing
Hospital overcrowding is an obstacle for hand washing.	After removing gloves
Hand washing could reduce hospital mortality rate.	Before patient examination
Hand washing could reduce hospital administration days.	
Interns and residents are good role models for hand washing.	
No hand washing is the HCWs' negligence.	
Frequent hand washing causes immune deficiency and sensitivity to nosocomial infection.	
Deficiency of hand washing materials is the most important cause of no hand washing.	

Tables and figures:

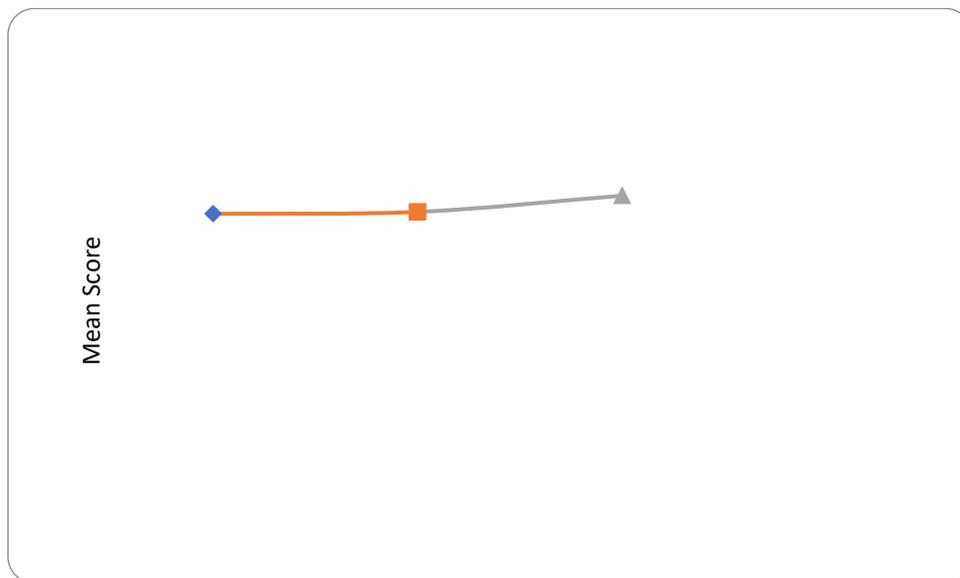


Figure 1. The plot of the mean scores of the three-time test

Table2. Participants’ mean and standard deviation for the three-times test scores according to the knowledge, attitude and performance categories

	Pre test score			Immediate post test score			Late post test score		
	Knowl edge	Attit ude	Perfor mance	Knowl edge	Attit ude	Perfor mance	Knowl edge	Attit ude	Perfor mance
<b>Mean score</b>	39.29	24.17	11.70	39.64	23.32	12.76	42.35	25.08	13.00
<b>Standard Devia tion</b>	3.93	4.11	1.86	3.01	4.12	0.85	5.57	4.48	0.80

Table 3. The results of the Bonferroni post-hoc test for knowledge and performance categories

Time	Mean Difference	P- Value	95% Confidence Interval
late post test versus pre test of Knowledge category	3.05	0.045	0.05-6.06
Immediate post test versus pre test of performance category	1.05	0.002	0.33-1.78
late post test versus pre test of performance category	1.29	0.001	0.48-2.10

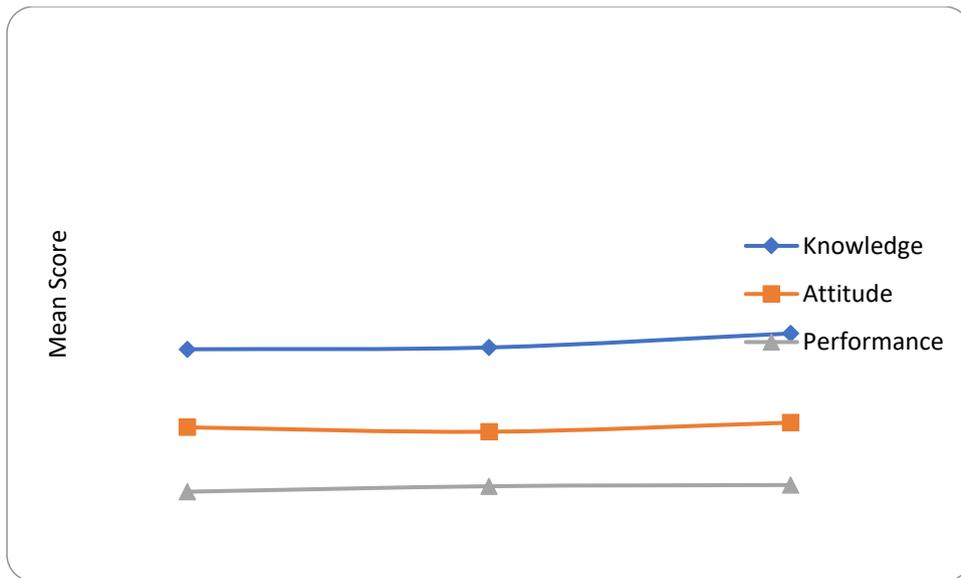


Figure 2. The plot of the mean scores of three-time test regarding knowledge, attitude and performance categories