

# The Effect of Educational Interventions Based on Theory of Planned Behavior on Nurses' Intention to Perform Hand Hygiene

Maryam Heydarizadeh<sup>1</sup>, Mehdi Birjandi<sup>2</sup>, Heshmatolah Heydari<sup>\*2</sup> , Hossein Ashtaria<sup>3</sup>

<sup>1</sup> Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran

<sup>2</sup> Social Determinants of Health Research Center, Lorestan University of Medical Science, Khorramabad, Iran

<sup>3</sup> Kermanshah University of Medical Sciences, Kermanshah, Iran

---

## ABSTRACT

Considering the importance of hand hygiene in the nurses, this study has aimed to determine the effect of educational interventions based on Theory of Planned Behavior on nurses' intention to perform hand hygiene. In this randomized controlled clinical trial, subjects including 60 nurses were selected by using the convenience sampling method and then were located in the intervention or control groups by the simple random sampling. The intervention group received educational interventions based on the Theory of Planned Behavior through a four-session workshop. Instrument was Theory of Planned Behavior questionnaire with four subscales including attitudes, perceived behavioral control, subjective norms and hand hygiene intention. The questionnaire was filled in the two groups before, immediately after, and one month after intervention. The mean score of attitude, subjective norms, perceived behavioral control, and intention in the baseline of intervention group were  $1.96 \pm 0.62$ ,  $1.87 \pm 0.68$ ,  $1.84 \pm 0.72$ , and  $3.96 \pm 0.64$  respectively. Immediately after the intervention the mean score of these constructs changed to,  $2.88 \pm 0.68$ ,  $2.79 \pm 0.79$ ,  $3.82 \pm 0.69$ , and  $3.78 \pm 0.71$  respectively, and the changes were statistically significant ( $P < 0.001$ ). Also education performed in the intervention group increased the scores of attitude, subjective norms, perceived behavioral control and intention in comparison with the control group and changes were significant statistically ( $P < 0.001$ ). The use of educational models could improve the nurses' intention to perform hand hygiene behaviors; therefore, it is necessary to consider this model by modifying the training patterns.

**Keywords:** Hand hygiene; Nurses; Theory of planned behavior; Intention

---

## Introduction:

Nosocomial infections refer to infections that patients get within the 48-72 hours of their admission if they have not had obvious symptoms of infection and the disease is not at the incubation period [1]. The prevalence of nosocomial infections is between 5 and 12 percent in developed countries and between 5 and 19 percent in developing countries [2]. The prevalence of nosocomial infections, including respiratory, urinary tract, bloodstream and

surgical site infections in intensive care units is relatively high [3, 4]

One of the causes of the increasing prevalence of nosocomial infections is attributed to the poor health behaviors of the health care providers [5]. Hand hygiene is the most important control criteria to protect patients and personnel against infections [6]. Nurses play an important role in infection control due to their permanent care of patients [7]. The hand hygiene practice is poorly done

---

\* Corresponding author: Heshmatolah Heydari  
Social Determinates of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran  
Telefax: 06633120140 E-mail: [h-hidari@razi.tums.ac.ir](mailto:h-hidari@razi.tums.ac.ir)

DOI: [10.22087/ijac.2021.146337](https://doi.org/10.22087/ijac.2021.146337)

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

by the health care providers around the world and imposes care-related costs on the health care system [8-10]. According a systematic review, compliance rate of hand hygiene in the health care provider is about 40%, this comply in the intensive care unit is 30-40% [11]. Typically, infection control training regarding hand hygiene is one of the most important strategies that can be provided through lectures, practical skill training, and practice in hospitals [12], although this procedure is not based on scientific principles in many health centers, which can be improved through changes in the health care workers' motivation and reinforcement of their purposive behaviors [13]. In educational planning, one of the most important measures is to choose a proper model based on the problem and purpose of the program [14]. There are some theories for the predicting and changing behavior. Group of theories in this field are cognitive theories that people's behavior is formed according the internal and external factors [15]. One of the models, which can provides a conceptual framework for understanding the hand hygiene behaviors is the TPB [16]. Icek Ajzen recommended the TPB, which is one of the most widely used cognitive theories [17]. TPB applies when a person has complete optional control on their behavior and can manage all dimension of their behavior [18]. This model focus is on how a person's perception could create interest and causes a change in behavior in him, and consider behavior as the product of knowledge and attitude that lead to changing of behavior in the individuals [19].

This theory provides a framework for studying attitudes through behaviors. According to this theory, the most important determinants of a person's behavior is their intentions that lead to behaviors and is a combination of their attitudes toward behaviors, subjective norms and perceived behavioral control. One's attitudes toward behaviors include behavioral beliefs, assessment of behavioral outcomes, and subjective norms including normative beliefs and obedience motivation [20]. Overall, this model focuses on changes in beliefs and

considers changes in beliefs to lead to changes in behavior [18].

According to the guidelines of the WHO, care providers should wash their hands in five positions including before and after contacting the patient, after contact with the patient's discharge, after contact with the patient's environment, and before performing a treatment procedure [21].

Evidence shows that despite the convenient and inexpensive of hand washing, this behavior is less than expected among health care providers [10].

In some cases, care providers maybe have the sufficient information about the desired behavior; however, they do not implement it, then in order to design more proper interventions, it is necessary to have more information about the determinants of that behavior [22].

Despite the importance of hand hygiene for the prevention of nosocomial infections, this issue has not yet become a priority for the health officials and managers of the world [1]. The choice of an appropriate training method tailored to the goals of educational content and the culture of the people involved is one of the most important steps in planning for training [23]. Considering that no intervention has not been conducted in Iran based on the TPB and designing an intervention based on this theory can provide a clear vision for designing effective targeted interventions on the predictive factors of nurses' intention of hand hygiene behaviors, this study aimed for determining the effect of educational interventions based on TPB on nurses' intention to perform hand hygiene.

## **Materials and Methods**

This study is a randomized controlled clinical trial conducted on the nurses of Imam Khomeini and Shahid Mostafa Khomeini hospitals in Ilam city in 2018. The inclusion criteria in this study included having at least one year of experience in the selected hospitals, employment during the research and follow-

up periods, having at least a bachelor's degree in nursing, obtaining a score of less than 60 in the pre-test, and lack of activity and work experience as the instructor of nursing students and clinical and infection control supervisor. The exclusion criteria included lack of participation in the first session of training intervention, transfer from the hospitals to other cities, incomplete responses to the questionnaire and tests at each stage of the study, non-participation in more than one of the training sessions for any reason, and non-collaboration in performing the exercises assigned in the training sessions.

According to the expectation of authors from the effect size 0.4 of the present intervention, confidence interval 95% and statistical power 90%, using the PASS software the at least sample size estimated 30 subjects in each group. Accordingly, a total of 60 nurses were selected by using the convenience sampling method and then the simple random sampling method, in such a way that each sample received a code using a draw and then the carts associated with the codes were taken out of the dish without any replacement and finally 30 nurses were placed in the intervention group and 30 nurses were placed in the control group. The control group received no intervention at all, while the experimental group were divided by the

research units into 4 groups of 8-7 nurses, (Figure 1). The intervention was performed in four 90-minute training small-group sessions in the following way:

Handwashing training was done based on the Model of Planned Behavior and as recommended by the WHO[24]. For promotion in the knowledge and attitude of nurses, subjects in the intervention groups, received training on patient safety and hospital-acquired infections at the first session through workshop. The nurses were presented with the training package that included a guideline for hand washing in the form of slide, pamphlet, and expressed their viewpoints using a group discussion on hand washing. The subjects also were practically trained how to wash their hands and watched films in this session. In the second and third session, for recognize and exploring the subjective norms and reinforcement of perceived behavioral control, the participants were asked to discuss the barriers and facilitators to the hand hygiene practice, and also discuss about the role of other colleagues and how they were influenced by them, In the fourth session, moreover reviewed the mentioned training points in the previous sessions, the researcher used those who performed the hand hygiene practice well as the best exemplars.

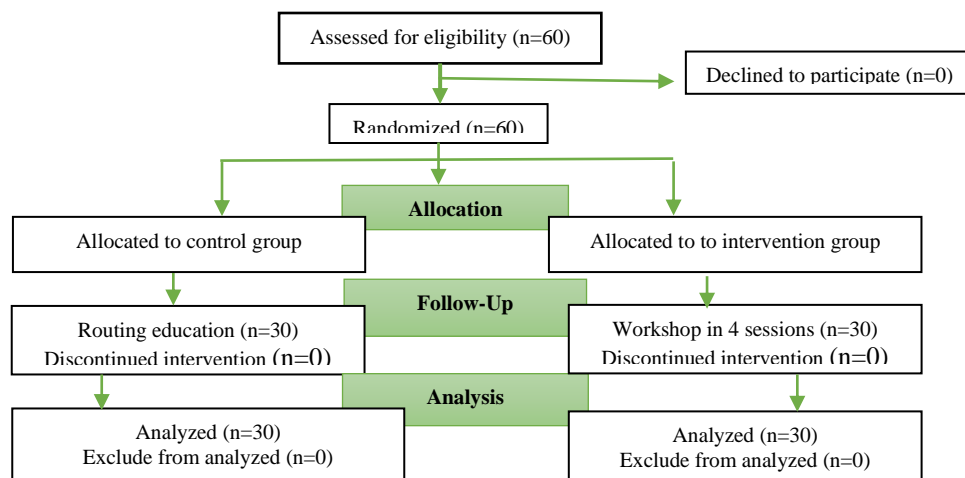


Figure 1. Flow diagram of the study

### Data collection

The researchers used the Susan E. Piras modified questionnaire for hand hygiene based on the Model of Planned Behavior[25] to achieve the research goals. This tool consisted of two parts, demographic characteristics and assessment of constructs. Demographic information included age, gender, educational level, work experience, workplace, type of work shift, and type of employment. The assessment of constructs included attitudes, perceived behavioral control, subjective norms, and hand hygiene intention, which included a total of 20 questions in the 5-point Likert scale, from 5 for "strongly agree" to 1 for "strongly disagree". Therefore, each sample could get a score between 20 and 100, with low scores indicating a negative attitude toward handwashing and poor behavioral intention for this behavior, and high scores indicating a positive attitude toward this behavior and a strong behavioral intention for it.

In order to determine of the content validity of questionnaire, 12 expert professors were asked to review each of the tool items based in the range of necessary, useful but not necessary and not necessary. Then information was evaluated by using the Lawshe table for computing the CVI and CVR indexes [26]. The minimum CVR acceptable in this regard was estimated to be 56% based on the Lawshe Table and the number of professors, which was 12, and the CVR of the tool was provided on this basis.

In order to calculate the CVI index, the evaluators had to evaluate each item in terms of the three criteria of specificity, simplicity, and transparency, based on a 4-point Likert Scale, and calculated the content validity index using the CVI formula. The Cronbach's alpha values for the sub-scales of attitude, perceived behavioral control, subjective norms and intention were estimated to be 0.87, 0.70, 0.82 and 0.88, respectively. In addition, a retest was administered to assess the reliability of the tool, the internal consistency of which was reported to be 0.94 for the attitude score and 0.77 for the perceived behavioral control score.

The questionnaires were distributed among the experimental and control groups in three stages including a pre-test, a post-test and a test administered one month later

### Data Analysis

The data were then entered into the SPSS 23 software application and analyzed using descriptive statistics (mean, standard deviation, etc.) and inferential statistics (T-test, Chi-Square, the Repeated measure ANOVA).

### Ethical Considerations

All of the sample members were presented with information about the purpose and method of the study, and were assured about the preservation of their anonymity and confidentiality of their information. They were also told to have the right to leave the research at any time they wished. Then the researchers received written informed consent from them. Proposal of the project was also discussed by the Ethics Committee of Lorestan University of Medical Sciences and approved with the code IR.LUMS.REC.1397.036. This study was also registered at Iranian Clinical Trials Center (IRCT) with the code 20180721040540N1.

### Results

The demographic the findings of study showed there was no significant difference between two groups statistically. There was no statistically significant difference between the mean age of the two groups of intervention ( $31,33 \pm 6,07$ ) and control ( $31,60 \pm 5,36$ ) with ( $P= 0/587$ ) and also there was no statistically significant difference between the mean experience of the two groups of intervention ( $7,13 \pm 5,04$ ) and control ( $6,90 \pm 4,79$ ) with ( $P= 0/855$ ). Result of other demographic information reported in the Table 1.

There was no significant difference in the mean score of nurses' subjective norms between the two groups before the intervention, but there was a significant difference between the mean score of the experimental group ( $2.79 \pm 0.79$ ) and the control group ( $2.03 \pm 0.60$ ) immediately after

the intervention ( $P < 0.001$ ), and one month after the intervention ( $P = 0.27$ ).

There was no significant difference in the mean score of nurses' perceived behavioral control between the experimental group ( $1.88 \pm 0.68$ ) and the control group ( $1.75 \pm 0.76$ ) before the intervention, but there was a significant difference between the mean score of the experimental group ( $3.82 \pm 0.69$ ) and the control group ( $1.99 \pm 0.73$ ) immediately after the intervention ( $P < 0.001$ ), and one month after the intervention ( $P < 0.001$ ).

There was no significant difference in the nurses' mean intention score between the experimental group ( $1.84 \pm 0.72$ ) and the control group ( $1.78 \pm 0.82$ ) before the intervention, but there was a significant difference between the mean score of the experimental group ( $3.78 \pm 0.71$ ) and the control group ( $1.94 \pm 0.83$ ) immediately after the intervention and one month after the intervention ( $P < 0.001$ ). (Table 2).

Table 1: A comparison of the intervention and control groups in the demographic characteristics

| Characteristics           |                                    | Intervention | Control   | <i>p value*</i> |
|---------------------------|------------------------------------|--------------|-----------|-----------------|
| <b>Gender</b>             | Female                             | 11 (36.7)    | 14 (47.7) | p=0.6           |
|                           | Male                               | 19 (63.3)    | 16 (53.3) |                 |
| <b>Workplace</b>          | Department of Internal Medicine    | 3 (10)       | 7 (23.3)  | p=0.288         |
|                           | Surgery Department                 | 9 (30)       | 7 (23.3)  |                 |
|                           | Pediatrics' Department             | 3 (10)       | 4 (13.3)  |                 |
|                           | Neonatal Unit                      | 4 (13.3)     | 0 (0)     |                 |
|                           | Intensive Care Unit                | 2 (6.7)      | 3 (10)    |                 |
| <b>Position</b>           | Emergency Room                     | 9 (30)       | 9 (30)    | p= 0.99         |
|                           | Nurse                              | 29 (96.7)    | 30 (100)  |                 |
| <b>Type of employment</b> | Head Nurse                         | 1 (3.3)      | 0 (0)     | p=0.921         |
|                           | official                           | 16 (53.3)    | 16 (53.3) |                 |
|                           | contractual                        | 4 (13.3)     | 5 (16.7)  |                 |
| <b>Work shift</b>         | Compulsory nursing service program | 10 (33.3)    | 9 (15)    | p=0.99          |
|                           | fixed                              | 0            | 0         |                 |
|                           | Rotating                           | 30           | 30        |                 |

\* Chi-Square Test

Table 2: The mean and standard deviation of the scores of the constructs of the planned behavior model in the intervention and control groups before, immediately after, and one month after the intervention.

| Constructs                   | Group        | Time effect (Mean $\pm$ SD) |                    |                              | <i>p value*</i> |
|------------------------------|--------------|-----------------------------|--------------------|------------------------------|-----------------|
|                              |              | Before Intervention         | after Intervention | One month after Intervention |                 |
| Attitude                     | Intervention | 1.96 $\pm$ 0.62             | 2.88 $\pm$ 0.68    | 2.91 $\pm$ 0.66              | <0.001*         |
|                              | Control      | 2.08 $\pm$ 0.59             | 2.06 $\pm$ 0.55    | 2.07 $\pm$ 0.54              | 0.791           |
| Subjective norms             | Intervention | 1.87 $\pm$ 0.72             | 2.79 $\pm$ 0.79    | 2.90 $\pm$ 0.76              | <0.001*         |
|                              | Control      | 2.03 $\pm$ 0.61             | 2.03 $\pm$ 0.60    | 2.80 $\pm$ 0.58              | 0.311           |
| Perceived behavioral control | Intervention | 1.88 $\pm$ 0.68             | 3.82 $\pm$ 0.69    | 3.97 $\pm$ 0.60              | <0.001*         |
|                              | Control      | 1.75 $\pm$ 0.76             | 1.99 $\pm$ 0.73    | 1.97 $\pm$ 0.56              | 0.004*          |
| Intention                    | Intervention | 1.84 $\pm$ 0.72             | 3.78 $\pm$ 0.71    | 3.96 $\pm$ 0.64              | <0.001*         |
|                              | Control      | 1.78 $\pm$ 0.82             | 1.94 $\pm$ 0.83    | 1.84 $\pm$ 0.64              | 0.196           |

\*statistically significant based on ANOVA

## Discussion

The findings of this study indicated that training intervention significantly increased the nurses' attitude in the intervention group.

Table 2: Frequency and standard deviation of anxiety among patients undergoing hemodialysis

Table 3: Independent T-test results between State and Trait anxiety scores for both sexes

The finding of this study is consistent with that of the study conducted by Baghaei et al., which

showed a significant increase in the nurses' attitude after intervention based on the BASNEF Theory[27]. Yuan showed that nurses had a good attitude toward hand hygiene behavior[28], but attitude is not the only factor that determines behavior, as there may be cases where poor hand hygiene behaviors have been reported despite high attitudes; therefore, we need to study other constructs and factors in order to improve the hand hygiene behavior.

Funding in current study revealed, interventions based on TPB was could change attitude of nurses for hand washing. Positive attitude to behavior increases the likelihood of intention to behavior. In line to finding of this study, study founding of Najafi and et al revealed, nurses' knowledge about hand hygiene was weak and most of subjects had negative beliefs about hand hygiene[29]. Various factors affect the level of compliance with hand hygiene. The belief in the importance of hand hygiene and the type of attitude toward the effect of hand hygiene on infection control is one of the personal factors with the highest rank from the personnel's perspective[30].

Founding in current study revealed, interventions based on TPB was could change subjective norms in the intervention groups of nurses for hand washing. In line with the findings of this study, the findings of the study of Piras and et al showed, interventions to improve of hand hygiene perceived control and

subjective norm scores could increase hand hygiene[31]. In the subjective norms, beliefs in which the approval or rejection of the desired behavior by the reference people of the society is important. A person's colleagues can influence nurses' health behaviors for hand hygiene[32]. Consequently, future hand hygiene work should focus on exploring social strategies with particular attention to the nurse leader because nurses identified them as the most important referent. A study conducted by Carroll et al. confirmed the role of the external reinforces of officials' support, rewards and encouragement for staff, and feedback[33]. With regard to the important role of doctors and their seniority in hospitals, their negative attitudes can affect the hygiene behavior of their colleagues, including nurses.

As nurses have to have teamwork and interact with other clinical and preclinical personnel, their behaviors are inevitably influenced by their colleagues[34]. Given the importance of clinical environments and their positive effects on subjective norms for compliance with the principles, rules and guidelines of the environments, experience has shown that people imitate senior managers in their behaviors, so inappropriate hand hygiene behaviors of head nurses, doctors, infection control nurses and other managers will directly influence the performance of other personnel[31].

It seems that it is possible to influence the nurses' level of compliance with the principles and rules of hand hygiene by making senior managers supervise their behaviors, giving feedback to staff, and increasing the doctors' level of participation.

Founding of this study revealed intervention based TBI was had positive for changing in the behavior of hand hygiene compliance of nurses. Perceived behavioral control plays an important role for hand hygiene compliance.

In the line with founding in current study, founding of a study conducted in Turkey showed, nurses unable to hand washing occasionally because of lack of adequate facilities for drying hands, heavy workload and sensitivity of hand for repeated washing [35].



Also White et al. identified the barriers (high workload, emergency conditions) and facilitators (access to handwashing sink / detergent, training, reminders) of the relevant factors that affect handwashing[36]. Considering that perceived behavioral control is one of the factors that influence the nurses' intention to perform hand hygiene, nursing managers should take measures to eliminate the barriers and use handwashing-facilitating strategies, including an appropriate nurse-patient ratio, easy access to handwashing sinks, and availability of high-quality and suitable solutions.

Despite the successful theory-based studies having been conducted in this regard, there are studies that have not been effective in the nurses' behavioral change[37]. According to Piras, an increase in the intention score in a self-report cannot be used to predict hand hygiene behaviors[25]. Despite the increased intention score in some self-report studies, no improvement has actually occurred in the nurses' hand hygiene behavior. In line the Founding of this study, results of another study revealed, educational interventions based on the BASNEF model, was not successful in increasing adherence of hand hygiene behaviors in the nurses[27]. This shows that although intention is a precondition for performing a behavior, there may be deterrent factors that prevent one from doing that behavior.

Funding studies' Labrague et al. show that, training of nursing plays a vital role in the professional competency of nurses and that the nursing students' knowledge and acceptance of hand hygiene was at a low-to-moderate level[38].

Although Gould et al. came to a contradictory finding in this regard, they indicated an equal number of hand hygiene practices in the intervention control groups after 3 months of intervention[39].

Perhaps the positive impact of intervention in the clinic is to be attributed not only to the theoretical training, but also to the use of handwashing facilities. Staines' study, which was conducted using a multimodal

improvement program based on the WHO' strategy, increased access to handwashing equipment, increased reminders, feedback, and so on showed a significant improvement in hand hygiene behavior through direct observations[40]. Therefore, it seems that the use of different training methods and types of interventions, the quality and content of educational materials, the ability of trainers, and the previous experiences of the units under investigation could justify the differences between the results of the present study and those of other aforementioned studies.

The limitations of this study include its limited time and the lack of direct observation of handwashing behavior.

## Conclusion

As hand washing is the most important and simplest ways of preventing nosocomial infections and training based on the TPB has been shown to be affect the nurses' intention to perform hand hygiene practices, so nursing educators and managers and supervisors need to take measures to achieve the above goal by adopting certain basic strategies.

## Conflict of Interests

Authors declare that they do not have any conflict interests.

## Acknowledgment

This study is part of the findings of a master's thesis of nursing, discipline of intensive care, with the code IRLUMS.REC.1397.036 on June 25, 2018. Thanks are due to the Vice-Chancellor for Research of Lorestan University of Medical Sciences for his kind assistance and cooperation in this respect.

## References:

1. Challenge FGPS. WHO Guidelines on Hand Hygiene in Health Care. Retrieved from: [whqlibdoc who.int/publications/009.pdf](#). 2009.
2. Raffa RB, Pergolizzi JV, Taylor R, Choudhuri S, Rodenbeck R. Persistence of Healthcare-Associated (Nosocomial) Infections Due to Inadequate Hand

*Heydarizadeh et al. Effect of Educational Interventions on Intention to Perform Hand Hygiene*

- Hygiene: Part 1-Biological and Treatment Factors. *Pharmacology & Pharmacy*. 2018;9(08):293.
3. Edwardson S, Cairns C. Nosocomial infections in the ICU. *Anaesthesia & Intensive Care Medicine*. 2019;20(1):14-8.
  4. Dasgupta S, Das S, Chawan NS, Hazra A. Nosocomial infections in the intensive care unit: Incidence, risk factors, outcome and associated pathogens in a public tertiary teaching hospital of Eastern India. *Indian J Crit Care Med*. 2015;19(1):14-20.
  5. Fox C, Wavra T, Drake DA, Mulligan D, Bennett YP, Nelson C, et al. Use of a patient hand hygiene protocol to reduce hospital-acquired infections and improve nurses' hand washing. *American Journal of Critical Care*. 2015;24(3):216-24.
  6. Öncü E, Vayısoğlu SK, Lafcı D, Yıldız E. An evaluation of the effectiveness of nursing students' hand hygiene compliance: A cross-sectional study. *Nurse education today*. 2018;65:218-24.
  7. Brunner LS. *Brunner & Suddarth's textbook of medical-surgical nursing*: Lippincott Williams & Wilkins; 2010.
  8. Luangsanatip N, Hongsuwan M, Lubell Y, Limmathurotsakul D, Srisamang P, Day N, et al. Cost-effectiveness of interventions to improve hand hygiene in healthcare workers in middle-income hospital settings: a model-based analysis. *Journal of Hospital Infection*. 2018;100(2):165-75.
  9. Nazari R, Haji Ahmadi M, Dadashzade M, Asgari P. Study of hand hygiene behavior among nurses in Critical Care Units. *Iranian Journal of Critical Care Nursing*. 2011;4(2):95-8.
  10. Nouri B, Hajizadeh M, Bahmanpour K, Sadafi M, Rezaei S, Valiee S. Hand hygiene adherence among Iranian nurses: A systematic review and meta-analysis. *Nursing Practice Today*. 2020.
  11. Erasmus V, Daha TJ, Brug H, Richardus JH, Behrendt MD, Vos MC, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital care. *Infection control and hospital epidemiology*. 2010;31(3):283-94.
  12. Alp E, Altun D, Cevahir F, Ersoy S, Cakir O, McLaws M-L. Evaluation of the effectiveness of an infection control program in adult intensive care units: a report from a middle-income country. *American journal of infection control*. 2014;42(10):1056-61.
  13. Al-Tawfiq JA, Pittet D. Improving hand hygiene compliance in healthcare settings using behavior change theories: reflections. *Teaching and learning in medicine*. 2013;25(4):374-82.
  14. Weijers RJ, de Koning BB, Paas F. Nudging in education: From theory towards guidelines for successful implementation. *European Journal of Psychology of Education*. 2020:1-20.
  15. Conner M. Theory of planned behavior. *Handbook of Sport Psychology*. 2020:3.
  16. Mostafazadeh-Bora M, Bahrami M, Hosseini A. A survey of nurses' compliance with hand hygiene guidelines in caring for patients with cancer in a selected center of Isfahan, Iran, in 2016. *Iranian journal of nursing and midwifery research*. 2018;23(2):119.
  17. Ajzen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*. 1991;50(2):179-211.
  18. Sheppard BH, Hartwick J, Warshaw PR. The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of consumer research*. 1988;15(3):325-43.
  19. Ajzen I. Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal of Applied Social Psychology*. 2002;32(4):665-83.
  20. Mullan BA, Wong C, Kothe EJ. Predicting adolescents' safe food handling using an extended theory of planned behavior. *Food Control*. 2013;31(2):454-60.
  21. Sax H, Allegranzi B, Chraïti M-N, Boyce J, Larson E, Pittet D. The World Health Organization hand hygiene observation method. *American journal of infection control*. 2009;37(10):827-34.
  22. Srigley JA, Corace K, Hargadon DP, Yu D, MacDonald T, Fabrigar L, et al. Applying psychological frameworks of behaviour change to improve healthcare worker hand hygiene: a systematic review. *The Journal of hospital infection*. 2015;91(3):202-10.
  23. EL Hajjar ST, Alkhanaizi MS. Exploring the factors that affect employee training effectiveness: A case study in Bahrain. *Sage Open*. 2018;8(2):2158244018783033.
  24. Safety WP, Organization WH. Hand hygiene technical reference manual: to be used by health-care workers, trainers and observers of hand hygiene practices. 2009.
  25. Piras SE. The Effect of Social Influence on Nurses' Hand Hygiene Behaviors. December, 2016. Submitted to the Faculty of the Graduate School of Vanderbilt University in partial fulfillment of the requirements for the degree of Phd in Nursing Science. Available from: <https://etd.library.vanderbilt.edu/available/etd-11282016-170413/unrestricted/SPiras.pdf>. Access: 10 sept 2017.
  26. Lawshe CH. A quantitative approach to content validity I. *Personnel psychology*. 1975;28(4):563-75.
  27. Baghaei R, Sharifian E, Kamran A. Can theoretical intervention improve hand hygiene behavior among



- nurses? Psychology research and behavior management. 2016; 9:133.
28. Yuan C, Dembry L, Higa B, Fu M, Wang H, Bradley E. Perceptions of hand hygiene practices in China. *Journal of Hospital Infection*. 2009;71(2):157-62.
29. Najafi Ghezeljeh T, Abbasnejad Z, Rafii F, Haghani H. Nurses' Knowledge, Beliefs and Practices towards Hand Hygiene. *Journal of hayat*. 2015;21(1):79-93.
30. Arshadi Bostanabad M, Asdollahi M, jebrailli M, Mahallei M, Abdolalipour N. Nurses attitudes towards hand hygiene barriers in the neonatal unites of tabriz. *Iranian Journal of pediatric Nursing*. 2014.
31. Piras SE, Minnick A, Lauderdale J, Dietrich MS, Vogus TJ. The effects of social influence on nurses' hand hygiene behaviors. *JONA: The Journal of Nursing Administration*. 2018;48(4):216-21.
32. Perkins MB, Jensen PS, Jaccard J, Gollwitzer P, Oettingen G, Pappadopoulos E, et al. Applying theory-driven approaches to understanding and modifying clinicians' behavior: what do we know? *Psychiatric Services*. 2007;58(3):342-8.
33. Carroll C, Gladson S, Camins B. "Your hands touch many lives": a hand hygiene compliance improvement campaign. *American Journal of Infection Control*. 2006;34(5): E27-E8.
34. Schot E, Tummers L, Noordegraaf M. Working on working together. A systematic review on how healthcare professionals contribute to interprofessional collaboration. *Journal of interprofessional care*. 2020;34(3):332-42.
35. Akyol AD. Hand hygiene among nurses in Turkey: opinions and practices. *Journal of clinical nursing*. 2007;16(3):431-7.
36. White KM, Jimmieson NL, Obst PL, Graves N, Barnett A, Cockshaw W, et al. Using a theory of planned behaviour framework to explore hand hygiene beliefs at the '5 critical moments' among Australian hospital-based nurses. *BMC health services research*. 2015;15(1):59.
37. Reason FP. Improving hand hygiene compliance for the reduction of nosocomial infections: recommendations for behaviour change in a health care setting: Faculty of Health Sciences-Simon Fraser University; 2008.
38. Labrague L, McEnroe-Petitte D, van de Mortel T, Nasirudeen A. A systematic review on hand hygiene knowledge and compliance in student nurses. *International nursing review*. 2018;65(3):336-48.
39. Gould D, Chudleigh J, Drey N, Moralejo D. Measuring handwashing performance in health service audits and research studies. *Journal of Hospital Infection*. 2007;66(2):109-15.
40. Staines A, Vanderavero P, Duillard B, Deriaz P, Erard P, Kundig F, et al. Sustained improvement in hand hygiene compliance using a multimodal improvement program at a Swiss multisite regional hospital. *Journal of Hospital Infection*. 2018.