

## The Effect of Educational Program based on the Kirkpatrick Model on Observing the Precautions of Infection Control Standard in Nursing Students

Gholizadgoujehyaran H.\*<sup>1</sup> MSc, Motaarefi H.<sup>1</sup> PhD, Sakhaei Sh.<sup>1</sup> MSc

<sup>1</sup> Department of Nursing, Khoy School of Medical Sciences and Health Services, Urmia University of Medical Sciences, Urmia, Iran

### Abstract

**Aims:** The recent emergence and reemergence of infectious diseases have made the knowledge and practice of standard infection control precautions in developing countries more important than ever. However, schools of nursing in Jordan do not have a prescribed curriculum in Standard Precautions.

**Instrument & Methods:** This was a two-group before-after quasi-experimental design which all final year students were selected by census. Data collection tools include demographic questionnaire and Kirk Patrick evaluation model. For the intervention group, an educational program was implemented based on the Kirk Patrick model and for the control group, an educational booklet was given to the students. Its effectiveness was evaluated in four levels of Kirk Patrick model. The amount of learning was assessed using a researcher-made test before and after the test. To evaluate the performance, an observational checklist was used which was invisibly checked by the researcher on different days before and one month after the intervention and the checklist was completed and determine the level 4, exposure to needle stick, blood and body fluids, the exposure questionnaire was distributed among studied subjects, and they were asked to report their incidents of exposure before and during the next 1 months. For data analysis, we used descriptive statistics, a chi-square test, a paired t-test and the independent samples t-test.

**Findings:** The findings of this study show that the average learning score and performance of nursing students increased significantly after the training program and exposed to needle stick injury and blood and body fluids was reduced after intervention.

**Conclusion:** The results indicate the effectiveness of the course held for nursing students and it seems that Kirk Patrick model can be a suitable way to evaluate the effectiveness of health education.

### Keywords

Kirkpatrick Model [Note Found];

Precautions Standard [Note Found];

Nursing Student [<https://www.ncbi.nlm.nih.gov/mesh/?term=Nursing+Student>]

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\*Corresponding Author

Tel: +98 (44) 36465260

Fax: +98 (44) 36465262

Post Address: Khoy School of Medical Sciences and Health Services, Urmia University of Medical Sciences, Shahid Montazeri Street, Urmia, Iran. Postal Code: 5816645533

[h.gholizad1991@gmail.com](mailto:h.gholizad1991@gmail.com)

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## Introduction

Hospital infections, which pose a serious health problems, threatening the health and safety of patients and health care workers worldwide, are infections that arise within the hospital environment [1]. These infections affect the quality of medical care and increase medical care costs and the increasing number of infections have led to the development of standard precautions. These principles are the basic measures in the control of nosocomial infections [2].

the increase in the incidence of diseases transmitted through blood and body fluids in health care workers and in order to reduce the burden of these infections, the World Health Organization and the Center for Infectious Diseases Control have developed regulations called "standard precautions" [3].

Standard precautions are routine methods of controlling and preventing infections that can be used by all patients and in all medical-care centers and include: hand hygiene, use of personal protective equipment (PPE), respiratory hygiene, environmental controls (cleaning and Disinfection)"waste management", prevention of injuries caused by sharp tools and needles [4] In fact, these measures are a reliable way to prevent infections in occupational exposure [5].

Nurses play a very important role in hospital infections control. Nurses must have sufficient information and necessary skills in this field [6]. The results of studies conducted by Alessandro et al Showed that the failure to these standards is due to poor knowledge of nurses in this regard [7]. In a study in Iran, the knowledge of 177 nursing students and 162 nursing staff about the control of nosocomial infections was examined and the results showed that most nursing staff and students have moderate knowledge [8]. Due to the important role of nursing students in the management and control of nosocomial infections, their knowledge and practice in infection control in different countries has been studied. The results of a study in India showed that 75% of nursing students had good knowledge about the management of nosocomial infections, but their performance was poor [9] Nursing interventions are exposed to occupational exposure and related infections [8]. Recent studies have shown that the clinical environment of nursing students plays a pivotal role in shaping attitudes and creating professional knowledge in compliance with standard precautions [10]. Knowledge and practice of nursing students, as future nurses, play an important role in controlling nosocomial infections [11, 12].

Nowadays, special attention is paid to educating nursing students to increase their knowledge and practice in the prevention and control of nosocomial infections [13, 14]. Undoubtedly, one of the ways that can strengthen the attitude of nurses and students in applying the policy and Adherence to infection control standards is education. Training is one of the

main elements in increasing awareness and improving the clinical performance of employees [15]. There are several models for determining the value of training courses, Kirkpatrick's model is one of the most popular models for evaluation of training effectiveness; this model evaluates effectiveness across four levels. Level 1 (Reaction) evaluation model evaluates if the learners are satisfied with the program. Level 2 (Learning) measures if the program was able to increase the knowledge of learners to a favorable degree. Level 3 (Behavior) evaluates if the program could make a favorable change in the behavior of learners. Level 4 (Results) assesses if the educational program was able to solve the existing problems and meet the organizational goals [16, 17].

Nursing students are taught nosocomial infections during their university studies, and despite educating students about the prevention of nosocomial infections, the rate of infections is still high and new methods are being used by students to increase learning and create expected behaviors. It is necessary, therefore, that no research has been done on the effect of training using the Kirk Patrick model on standard infection control precautions. Therefore, the present study was conducted to determine the effect of implementing an educational program based on the Kirk Patrick model on the observance of standard infection control precautions in nursing students.

## Instrument and Methods

This was a two-group before-after quasi-experimental design, which was done in 2020 in the nursing students of Khoy University of Medical Sciences and Khoy Azad University. All final year students were selected by census. The two groups of intervention and control were randomly determined. Inclusion criteria were willingness to participate and not having taken related educational courses in the past six months prior to their participation. Exclusion criteria were refusal to continue and being absent in the training program. To uphold ethical standards, we obtained permission from the hospital management, didn't indicate their first and last names, and ensured them about the confidentiality of information. Data collection tools include demographic questionnaire and Kirk Patrick evaluation model. For the intervention group, an educational program was implemented based on the Kirk Patrick model and for the control group, an educational booklet was given to the students. After the training program, its effectiveness was evaluated in four levels (reaction, learning, behavior, results) of Kirk Patrick model. For this purpose, the first level questionnaire (reaction) including 12 items was used. Questions in 3 domains; the contents of the program were (5 questions), questions about the teacher (4 questions) and questions related to facilities (3 questions). The questionnaire was

distributed immediately after the training course. The validity and reliability of the reaction stage questionnaire has been performed in various studies and has validity and reliability [18]. The second level (Learning) determines the amount of which the taught skills and techniques are learned. In this level, evaluation was done via awareness questionnaire. This questionnaire consisted of 20 multiple choice items with 4 answers. Each item was rated from zero (minimum) to one (maximum), and the sum of all questions made the total awareness score. Zero showed the minimum awareness level of subjects and 20 the maximum. Level 3 the model (behavior) evaluates changes in behavior or performance. To evaluate this level, an observational functional checklist was used, which consists of 8 sections and a total of 66 functions. Before and one month after the intervention, the checklist was filled out and one point was awarded for each action and zero for each action. In total, the minimum score was zero and the maximum was 66. The validity of the performance checklist by the content validity method and their reliability by the simultaneous observation method were performed by two observations during the Tajabadi study and then the correlation between the results was calculated with an agreement coefficient of 0.86 [19]. Level 4 (Results) determines the effects of the training program outcome. For this section, we used the questionnaire for exposure to sharp objects, blood and body fluids. In order to determine the level of exposure to needle stick, blood and body fluids, the exposure questionnaire was distributed among studied subjects, and they were asked to report their incidents of exposure before and during the next 1 months. For data analysis, we used descriptive statistics, a chi-square test, a paired t-test and the independent samples t-test. Analysis was carried out via the SPSS-22 software and the significance level  $P \leq 0.05$  was statistically accepted.

## Findings

The total number of participants in this study were 70 student nurses with no case of refusal to participate, by eligible persons. The participants' age ranged from 21 to 28 ( $\bar{x}=22.42 \pm 2.06$ ). Most were females (58%) and single (84%).

Results from evaluation of effectiveness in level 1 of Kirkpatrick's model (Reaction) showed that in the experimental group, 1 subjects (2.85%) expressed their satisfaction with the program as poor, 2 (5.71%) as average, 5 (14.28%) as good, 8 (22.85%) as very good and 19 (54.31%) as excellent. Results from evaluation in level 2 (Learning) Independent T-test also showed that the difference in mean of knowledge scores before and after training was statistically significant between the two experimental (43/42 $\pm$ 2.99) and control (41.85 $\pm$ 3.13) groups ( $p=0.007$ ). Independent T-test also showed that the difference in mean of performance scores before and

after training was statistically significant between the two experimental and control groups ( $p=0.036$ ).

Results from evaluation of training effectiveness in level 4 of Kirkpatrick's model (Results) showed the number of nursing students exposed to needle stick injury and blood and body fluids in the control group was 17 (48.57%) and 14 (40%) before and after intervention, respectively. The McNamar test didn't show any significant differences ( $p=0.250$ ). But in the intervention group 15 nurses (42.85%) were exposed to needle stick injury and blood and body fluids before education, but this number was reduced to 9 (25.71%) after intervention. McNamar test revealed a significant difference ( $p=0.031$ ; Table 1). The chi-square test showed a significant difference between two group before and after intervention ( $p=0.004$ ).

**Table 1)** Comparing levels of exposure to needle stick injury and blood and body fluids in the two groups, before and after education

Exposure	Before		After		p-value*
	Number	Percent	Number	Percent	
<b>Intervention group</b>					
Exposed	15	42.85	9	25.71	0.031
Not exposed	20	57.15	26	74.29	
<b>Control group</b>					
Exposed	17	48.57	14	40	0.250
Not exposed	18	51.43	21	60	
<b>p-value**</b>	0.904		0.004		-

\* McNamar test; \*\* Chi-Square test

## Discussion

Each program evaluation model has strengths and weaknesses to measure training activities, but research has shown that the Kirkpatrick's program evaluation model is more appropriate than other models [20, 21]. Accordingly, we used the Kirkpatrick's model to evaluate the effect of educational program based on the Kirkpatrick model on observing the precautions of infection control standard in nursing students and its effects on their learning and behavior.

Evaluation of the second level of Kirkpatrick's model demonstrated a significant difference between the participants' learning scores before and after the intervention. A study conducted by Dorri et al also examined the effect of in-service training on cardiopulmonary resuscitation using Kirkpatrick's model. They found it effective in increasing the participants' learning and knowledge [22]. Other research conducted by Zhou et al the results of the reaction level after the training showed that the nursing staff was satisfied with the training content and satisfied with the form of training [23].

Regarding level 2 of Kirkpatrick's model (Learning), our results showed improvement in awareness scores of participants after training. A study conducted by Dehghani et al examined the

Effectiveness of training Courses on Cardiopulmonary Resuscitation (CPR) Based on Kirkpatrick Model According to the results, the level of nurses' learning had increased after training [24]. Other research Bakhshi and Sattari also achieved similar results in evaluating the effectiveness of cardiopulmonary resuscitation workshop in clinical environment based on Kirk Patrick model [25].

In level 3 of Kirkpatrick's model (Behavior), our results showed that the performance scores of the nursing students improved after execution of education program. In this regard, Abedini conducted a study to evaluate the effectiveness of in-service training courses from the perspective of employees working in Tehran Maskan Bank. He concluded that the participants assessed the behavioral changes at a reasonable level [26].

Results from the present study regarding level 4 of Kirkpatrick's model (Results) revealed that in addition to the increase in awareness levels and improvement of behavior and performance in the experimental group, there was also a decrease in levels of exposure to needle stick injury, and contamination with blood and body fluids; In this regard, hojjati and et al a study aimed to assessing the effectiveness of training outcome based on Kirkpatrick model in course "Patient education for nurses. Findings shows changes in all of the learning levels and behavior and so, the nurse managers would be programmed to achieve a higher level [27].

## Conclusion

The results of this study showed that education increases knowledge and skills and creates behavioral changes in nursing students, which also reduces the rate of exposure. It is suggested that at the end of the training courses, its effectiveness be evaluated with the Kirk Patrick model because this model shows the changes resulting from the training in the levels of learning and behavior and can be planned in the same direction to achieve higher goals.

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