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# Effect of interprofessional education of medication safety program on the medication error of physicians and nurses in the intensive care units

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## Abstract:

**BACKGROUND:** The safety of hospitalized patients in the intensive care units (ICUs) is threatened due to incidents and adverse events, including medication errors. Medication error refers to any preventable event at different stage of medication process, such as prescription, transcription, distributing medication, and administration, which can lead to incorrect use of medicines or damage to the patient. This study aimed at investigating the effect of the interprofessional education of medication safety program on medication errors of physicians and nurses in the ICUs.

**MATERIALS AND METHODS:** The study was conducted using a quasi-experimental method (single group, before and after) in 2017. The setting of the study included one ICU of selected teaching hospital affiliated to Isfahan University of Medical Sciences located in the Central Iran with a total of 23 beds. Participants included 50 members of the health-care team (physician, nurse, and clinical pharmacist) with at least 1 year of work experience in the ICUs. Participants were selected using censuses sampling method. Data were collected using a two-section self-made questionnaire. Data were analyzed through descriptive, analytical statistics, and version 16 of the SPSS software ( $P < 0.05$ ).

**RESULTS:** According to reporting of physicians, nurses, and clinical pharmacist, the medication error 1 month after implementation, the interprofessional education of medication safety program was significantly lower than before the implementation of it ( $P < 0.001$ ).

**CONCLUSIONS:** Interprofessional education helps to improve interprofessional collaboration and patient care through the promotion of various professions of health to increase interprofessional collaboration compared to single profession education, which individuals learn in isolation and merely in their profession. Therefore, interprofessional education of medication safety program can reduce medication error and promote patient safety in the ICUs.

## Keywords:

Education, intensive care units, interprofessional relations, medication errors, patient safety

## Introduction

The safety of hospitalized patients in the intensive care units (ICUs) is threatened due to incidents and adverse events, including medication errors.<sup>[1]</sup> Medication error refers to any preventable event at different stage of medication process, such as prescription, transcription, distributing medication, and administration,<sup>[2]</sup> which

can lead to incorrect use of medicines or damage to the patient.<sup>[3]</sup> In the ICUs, on average, patients exposed to 1.7 errors/day and medication errors account for 78% of medical errors.<sup>[4]</sup> In a study carried out by Farzi *et al.* (2015) to examine the rate of medication errors in the ICUs, 80% of participants reported the occurrence of at least one medication error per month,<sup>[5]</sup> and this amount has increased to 91.2% in 2016.<sup>[6]</sup>

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Medication error in the ICUs is a result of several factors. These determinants include lack of interprofessional collaboration, inadequate attention of the health-care team to the principles of medication safety such as the participation in the medication process with inadequate medication knowledge, environmental determinants such as environmental noise and insufficient light of ward, management determinants such as lack of clinical pharmacist in the ICUs, and pharmaceutical agents such as visual, auditory, and written similarities of medication.<sup>[7]</sup> Lack of medication knowledge of physicians and nurses and weak interprofessional collaboration between physicians and nurses is one of the main causes of medication errors in the ICUs.<sup>[1]</sup>

In the teaching hospital, some physicians do not provide adequate information for nurses when visiting patients, and there is no fair exchange of information between physician and nurse. The inappropriate reaction of physicians toward the question of nurses to clarify the medication orders provides the conditions for the occurrence of multiple medication errors at the prescription, transcription, and even giving the wrong medication.<sup>[7]</sup> With regard to patient safety, lack of human resources, and efficacy and effective care, interprofessional collaboration in health-care is a high priority.<sup>[8]</sup> The studies reveal that the collaboration between professions faces to challenge and interprofessional education can provide the necessary platform for solving the challenges, improving interprofessional collaboration, and patient care.<sup>[9]</sup>

Interprofessional education is an opportunity, in which two or more professions learn from each other and about each other to improve the collaboration and quality of care.<sup>[10]</sup> Interprofessional education helps to improve teamwork and patient satisfaction through the promotion of various professions of health to increase interprofessional collaboration compared to single profession education, which individuals learn in isolation and merely in their profession.<sup>[11]</sup> In a study by Remington *et al.*, it was found that interprofessional education increases the knowledge and attitudes of learners.<sup>[12]</sup> Furthermore, in a study by Campino *et al.*, it was found that presenting an interprofessional medication education program as an educational solution through the development of a patient safety culture could reduce medication error.<sup>[13]</sup> In other words, interprofessional education, through the promotion of interprofessional collaboration, prevents fragmentation of care, providing a holistic care, improving patient outcomes, and improving the job satisfaction of the health-care members.<sup>[14,15]</sup>

Therefore, due to the role of weak interprofessional collaboration and inadequate medication knowledge in

the occurrence of medication error,<sup>[1,7]</sup> this study aimed to investigate the effect of the interprofessional education of medication safety program on medication errors of physicians and nurses in the ICUs.

## Materials and Methods

This paper presents the findings from part of a larger study in the form of dissertation. This research was carried out as a quasi-experimental study in 2017. The setting of study includes one of the ICUs of teaching hospitals affiliated to the Isfahan University of Medical Sciences (IUMS) located in the Central Iran with a total of 23 beds. The participants were 50 members of a health-care team (physicians, nurses, and a clinical pharmacist) with at least 1 year of work experience in the ICUs. Sampling was census. The interprofessional education of medication safety program was held in the form of a workshop with a continuing education rating during 2 days (10 h) August 4 and 11, 2017. The scientific secretary was a clinical pharmacist. The purpose of the research team was to implement and to evaluate the education program for physicians and nurses who working in the selected ICUs in August and September 2017, respectively, so the inclusion criteria included working in the ICUs in August and September 2017. Therefore, to introduce the participation, the coordination with the deputy for education and ICUs head nurse of the selected hospital was done. Participants (nurses and physicians) were grouped in two education sessions in three small groups.

The content of the sessions was based on the principles of compiling the contents of interprofessional education programs, the findings of the Farzi *et al.* study,<sup>[7]</sup> which resulted from the experiences of the health-care team (physician, nurse, and clinical pharmacist) to promote medication safety and reduce medication error. After the content was provided, the educational materials were provided to the relevant specialist who was the lecturer of the program and was approved. In educational sessions, the importance of an interprofessional approach, the observance of the professional requirements of the health-care team, the medications calculation, the method of dilution and oral administration of medicine, the role of medication reconciliation, the clinical pharmacist and adverse drug reaction to reduce the medication error, and the education required by lecturer (physician, nurse, and clinical pharmacist).

Teaching methods were small groups discussion about the scenarios related to medication error (scenarios were designed based on real cases by the research team), lecture, and question and answer. While presenting the content by the lecturers, the participants shared the experiences with the topics and discussed around it. In

addition, in each education session, three scenarios, and in total, six scenarios tailored to the topics of each session were given to each of the groups to analyze it and present it at the end of the session as a result of the workgroup. During and the end of each session, participants' questions were answered, and the medication safety education content was provided to the physicians and nurses.

Data were collected using a two-part self-made questionnaire via reporting of the participants from August to September 2017 (before and 1 month after the implementation of the program). The questionnaire included demographic characteristics (5 questions), and 1 question about the number of medication error in different stage of medication process (the question was scored based on 5-part Likert scale). In the cover letter of the questionnaire, a list of various medication errors was provided to the participants based on the various stages of the medication process that was prepared by the experts in the process of verifying the validity of the questionnaire, in order to report the number of medication errors based on these items. After liaising with the administrators of teaching hospitals, the researchers handed out the questionnaire among the eligible participants and demanded them to answer the item based on their last month experiences.

Data were analyzed through descriptive, analytical statistics, and Statistical Package for the Social Sciences software (version 16, SPSS Inc., Chicago, IL, USA) ( $P < 0.05$ ).

Ethics Committee of the IUMS approved the study (IR.REC.1395.3.267). Furthermore, this study was registered at the Iranian Registry Center for Clinical Trials (IRCT2017073135424N1). Verbal and written informed consent was obtained from the participants. After the introduction of the researcher and stating the importance and the objectives of the survey, the allowance of participants was obtained. Participants confided that the information would remain confidential. We used numeric codes in place of personal names to secure the anonymity of the questionnaire. Participants were assured that in the study will not mention the name of the hospital and participants. The participants were free to withdraw from the study anytime.

## Results

Participants in this study included 50 members of the health-care team (nurse, physician, and clinical pharmacist). Means of age and work experience of participants were 32.43 and 5.5 years, respectively [Table 1]. To compare the frequency distribution of medication error reporting from the perspective of physicians, nurses, and clinical

pharmacist of the ICUs before and 1 month after the implementation of the interprofessional education of medication safety program, the Wilcoxon test was used. The result revealed that the medication errors rate were different before and 1 month after the implementation of the interprofessional education of medication safety program in the selected ICUs. So that, the medication error rate of the ICUs one after the implementation of the interprofessional education of medication safety program was significantly lower than the one before it based on the report of physicians, nurses, and clinical pharmacist ( $P < 0.001$ ) [Table 2].

## Discussion

Today, to improve the relationship between the health-care team and patient safety, emphasis has been placed on interprofessional education so that health-care professionals can work together as a team and provide comprehensive care. The competencies necessary for the safe practice of the health-care team require the effective communication of the health-care team, active listening, commenting, respectful and timely, that these competencies must be acquired through interprofessional education.<sup>[16]</sup>

Implement of educational programs for physicians and nurses due to participation in the process of

**Table 1: Frequency distribution of participant's demographic characteristics**

Demographic characteristics	n (%)
Gender	
Female	43 (86)
Male	7 (14)
Age, mean (SD)	32.43 (7.3)
Profession	
Physician	9 (18)
Nurse	40 (80)
Clinical pharmacist	1 (2)
Education	
BSc	36 (72)
MSc	4 (8)
Specialist	10 (20)
Work experience (years), mean (SD)	5.5 (4.4)

SD: Standard deviation

**Table 2: Comparison of the frequency distribution of medication error reporting before and 1 month after the implementation of the program**

Variable	Before, n (%)	After, n (%)	Wilcoxon test, P
Medication error			
0	4 (8)	7 (14)	<0.001
1	12 (24)	31 (62)	
2-3	17 (34)	11 (22)	
4-5	12 (24)	1 (2)	
6 and more	5 (10)	0	

pharmacotherapy in the ICUs in teaching hospitals as an effective strategy for reducing and preventing medication errors.<sup>[6]</sup> The findings highlighted the effectiveness of the interprofessional education of medication safety program. According to members of the health-care team reporting (physicians, nurses, and clinical pharmacist), the medication error rate fell by 1 month after the implementation of the interprofessional education of medication safety program in the ICUs compared to before the program was implemented.

In addition, Cleary-Holdforth and Leufer stated that due to the role, the lack of pharmaceutical knowledge plays in error occurrence, education concerning drug and medication safety is the most important strategy to prevent such errors.<sup>[17]</sup> In other studies, participants have been identified continuing education program about medication as one of the important ways to reduce medication error.<sup>[5-18]</sup>

In a study by Campino *et al.*, it was found that presenting an interprofessional medication education program as an educational solution through the development of a patient safety culture could reduce medication error<sup>[13]</sup> and promote medication safety.<sup>[19]</sup> Applying educational programs with an emphasis on medication calculations and numerical skills reduces the medication error of health-care team, especially the nurses.<sup>[20]</sup> In a systematic review by Reeves *et al.*, the effectiveness of interprofessional education programs was found to be to improve the outcomes of the patient, and more mixed studies are needed to determine the effectiveness of these programs on professional performance and caring for the patient.<sup>[9]</sup>

The tendency of the participants to underreport the medication errors because of the fears of possible consequences was a major limitation of this research. This was partially addressed through reassuring them about the confidentiality of the questionnaires, the fact that only the researchers would have access to the collected data and notifying them that data would be analyzed collectively. Furthermore, the lack of control group was another limitation of this study.

## Conclusions

The findings of this study highlight the importance of interprofessional education of the health-care team in the field of medication safety, with the aim of reducing medication error and enhancing patient safety. An interprofessional medication education program can be included in the program curriculum of medical and nursing disciplines. To continue the impact of interprofessional medication education interventions, this program should be provided to the health-care

team in the orientation program, continuing education, and in-service education. Then, the effectiveness of this program should be examined and corrective measures are taken.

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## Conflicts of interest

There are no conflicts of interest.

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