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# A survey on the effects of patient safety training programs based on SBAR and FMEA techniques on the level of self-efficacy and observance of patient safety culture in Iran hospital, Shiraz in 2022–2023

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## Abstract:

**BACKGROUND AND OBJECTIVE:** Patient safety and medical personnel self-efficacy are among the main factors involved in providing quality health services. Moreover, safety culture in an organization is considered one of the most critical factors regarding patients' safety. Therefore, the present study aimed to determine the effects of patient safety programs based on Situation, Background, Assessment, Recommendation (SBAR) and Failure Model Effects Analysis (FMEA) techniques on self-efficacy and patient safety culture in Iran Hospital of Shiraz in 2022–2023.

**MATERIALS AND METHODS:** This two-stage quasi-experimental study was conducted in 2022–2023. Considering inclusion criteria, the present study included 80 nurses working in Iran Hospital. The participants were divided into groups of SBAR (40 participants) and FMEA (40 participants). All the data were collected using a Hospital Survey on Patient Safety Culture questionnaire and Sherer General Self-Efficacy Scale. Then, the collected data were analyzed using SPSS 13, Fisher's exact test, paired *t*-test, and independent *t*-test with a significant level of  $P < 0.05$ .

**RESULTS:** The mean score of total patient safety culture between the two groups was insignificant before the intervention ( $P = 0.58$ ). However, it was more significant in the FMEA group than the SBAR group after the intervention ( $P < 0/05$ ). In addition, the mean self-efficacy score between the two groups was insignificant before the intervention ( $P = 0.80$ ). However, after the intervention, the mean score of the FMEA group was significantly higher than the SBAR group ( $P < 0.05$ ).

**CONCLUSION:** According to the findings of this study, there is a meaningful relationship between patient safety training programs based on SBAR and FMEA techniques on patient safety and self-efficacy of nurses; however, FMEA training has more positive effects on self-efficacy and patient safety compared to other techniques. As a result, these techniques, along with other plans, are recommended to authorities in order to help improve patient safety.

## Keywords:

FMEA technique, patient safety culture, SBAR technique, self-efficacy

## Introduction

Today, patient safety is one of the essential needs for delivering quality

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health services and clinical governance. The health department aims to ensure the safety of patients, which is one of the

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main components of quality healthcare. Patient safety refers to the avoidance of unintended or unexpected harm to patients while providing healthcare.<sup>[1,2]</sup> Despite advances in medical healthcare, patient safety, and patient-centeredness are ongoing concerns worldwide. In other words, medical error remains one of the most challenging issues in healthcare systems worldwide that threatens all countries.<sup>[3]</sup> A report published by the Institute of Medicine in 1999 called for a national effort to make healthcare safer. Then, it received tremendous attention from the healthcare industry. It publicized that 44000 patients die in hospitals each year because of preventable medical errors, and 3.7% of deaths and injuries in the United States are due to negligence in healthcare.<sup>[4]</sup> Medical errors are among the five most common medical mistakes in the world. According to the World Health Organization (WHO), tens of millions of patients worldwide are the victims of unsafe and poor-quality healthcare.<sup>[5]</sup> For instance, medical errors cause between 44000 and 98000 deaths yearly in America. According to studies, adverse events are identified in 10% and 16.6% of admissions in England and Australia, respectively.<sup>[6]</sup> Injuries and deaths caused by medical errors adversely affect patients and the healthcare system. Put simply, the costs of preventable medical errors in America are estimated between \$17 and \$29 billion a year. However, 50% of the adverse events are preventable.<sup>[3]</sup> Although precise statistics on medical error rates are unavailable in Iran, some studies have addressed the issue. The results of the study are as follows: medication errors (38.5%), skin and neuromuscular damage (36.7%), and post-operative (16%).<sup>[7]</sup> In another study, 10–16% of adverse events caused by medical errors are related to inpatient departments, and 15–21% are related to special departments in hospitals.<sup>[8]</sup> It can be stated that patient safety is fundamental to delivering quality health services due to the increase in grievances against physicians to the medical council<sup>[9]</sup> and 19.5% of medication errors by nurses in three months.<sup>[10]</sup> According to the studies conducted in Iran, the top three life-threatening events in intensive care units are medical errors (80%),<sup>[11]</sup> the prevalence of hospital infections (10.85%),<sup>[12]</sup> and the prevalence of pressure ulcers or bed sores 10.1–21%.<sup>[13]</sup> These statistics are just a part of events that threaten patient safety.<sup>[14]</sup> There is a growing recognition to improve healthcare quality and patient safety from healthcare organizations. Moreover, patient safety culture has received widespread attention from healthcare organizations.<sup>[15]</sup> Patient safety culture reflects the extent to which staffs prioritize the safety of patients.<sup>[16]</sup> Organizational learning is positively related to the performance of healthcare staff in order to create a positive safety culture. In a safety culture, all the staff within the organization are involved in identifying and resolving safety concerns. The associated factors to patient safety culture include reporting

medical errors, training employees about patient safety, establishing an error reporting system, using the collected information from error reporting systems to improve the quality of services, no blame culture, teamwork, team communication, and collaboration to reduce potential errors.<sup>[17]</sup> Nevertheless, a considerable number of patients are harmed due to medical errors in healthcare systems rather than receiving treatment.<sup>[18]</sup> Delivering healthcare in complex, pressurized, and fast-moving environments could threaten patient safety today.<sup>[19]</sup> Unsafe services can be catastrophic; they are a leading cause of adverse consequences, such as injury, disability, unpleasant consequences for patients and families, prolonged hospitalization and admission, psychological stress for the healthcare providers, and economic burden on the healthcare system and society.<sup>[20]</sup> One in 10 patients is harmed while receiving hospital care in developed countries. However, this number is higher in developing countries.<sup>[21]</sup> According to WHO, there are 421 million hospitalizations in the world every year, and approximately 42.7 million adverse events occur during these hospitalizations. The latest data illustrates that patient harm is the fourteenth cause of morbidity and mortality around the world.<sup>[22]</sup> In recent years, it has been internationally recognized that sanitary condition is not satisfying.

Therefore, patient safety has become a common end worldwide to diminish medical errors and their effects.<sup>[23]</sup> One of healthcare organizations' main goals is to develop and improve a patient safety culture among employees.<sup>[24]</sup> Using a patient safety program and a safety management system in hospitals is one of the ways to improve patient safety. These techniques prevent medical errors using Root Cause Analysis and Failure Model Effects Analysis (FMEA). The failure analysis technique is derived from the safety management in industrial engineering technique, which has been applied in health departments of the United States and Europe in response to the needs of patients' immune systems. Failure Model Effects Analysis is a systematic, bottom-up, and teamwork-based approach used to define, identify, prevent, and eliminate causes and effects of potential errors in service systems. It is a structured approach to discovering potential failures that may exist before the product is delivered to the customers.<sup>[25]</sup> In this regard, a descriptive study was conducted by Seyedreza Mazlom *et al.*, that shows FMEA methodology can be beneficial to emergency departments in identifying and prioritizing errors related to the admission and transfer process. However, this model is not well known as a new approach regarding patient safety improvement in the majority of Iranian hospitals.<sup>[26]</sup>

Moreover, effective communication and interpersonal skills are critical to enhancing patient safety culture.

Teamwork and collaboration lead to better patient safety culture. Nurses need to establish effective communication with the patient, his family, physicians, other nurses, healthcare centers, and other healthcare professionals.<sup>[24]</sup> The quality and quantity of professional communication between nurse and patient have a significant role in patient satisfaction. In fact, patients' emotional support is associated with nursing care.<sup>[1]</sup> Communication skills maintain patient safety, improve patient health, and decrease anxiety and burnout among hospital staff. Because effective communication skills, especially among nurses, have been linked to improving the quality of care, better communication with other healthcare professionals, and empowering patients.<sup>[27,28]</sup> Therefore, interprofessional communication and training programs are critical regarding patient safety and medical error reduction.<sup>[29]</sup> Emily Kilner *et al.* (2010) believe that effective interprofessional communication positively influences patient safety improvement and the reduction of medical errors.<sup>[30]</sup> Poor communication can also result in various unwanted outcomes and adverse events in healthcare environments.<sup>[31]</sup> In Iran, clinical documentation of patients is performed verbally and using nursing Kardex without following any standard instructions.<sup>[32]</sup> As a result, patients' crucial details are lost during shift change. Such negligence often occurs when exchanging information in hospital departments.<sup>[18]</sup>

The Situation, Background, Assessment, Recommendation (SBAR) technique is suggested by the Joint Commission Center to facilitate communication among healthcare members. Medical errors are improved by this technique and lead to patient safety. The SBAR technique is a structured communication tool that provides a framework for communication during patient services.<sup>[33]</sup> Moreover, SBAR helps increase focus on an issue; in a way that does not allow personal preferences and supports common language among team members. As a result, it leads to the development of teamwork and collaboration.<sup>[34]</sup> On the other hand, self-efficacy can improve the quality of healthcare and communication among healthcare team members.<sup>[35]</sup> According to Bandura, self-efficacy is related to people's beliefs in their capabilities to perform actions necessary to achieve goals.<sup>[36]</sup> Self-efficacy determines how much time people allocate to do their tasks, their flexibility in various circumstances, and their resilience in times of crisis.<sup>[37]</sup> Such beliefs affect thought patterns and impulsive actions. Individuals with low self-efficacy believe that difficulties and challenges are beyond their capabilities. As a result, it leads to tension, depression, and despair.<sup>[38]</sup> However, high self-efficacy levels could help individuals deal with difficulties effectively. Some factors can adversely influence nurses' self-efficacy, including patient acuity, high responsibility nature of nursing, and physicians' expectation of nurses. In addition, nurses play an influential role in patient safety

that is associated with patient quality care.<sup>[39]</sup> The results of a study conducted by Hajloo show that dealing with patients and high work pressure burdens healthcare professionals. Self-efficacy can affect their mental health, as well as the quality of patient care.<sup>[40]</sup>

Moreover, another study indicated that nurses with higher self-efficacy provide better care quality than nurses with lower self-efficacy.<sup>[41]</sup> Improving patient quality care is essential today; therefore, patient safety culture needs special attention. Moreover, due to a lack of prior studies on this topic, the present study aimed to compare the effects of training programs based on SBAR and FMEA techniques on self-efficacy and observance of patient safety in Iran Hospital of Shiraz in 2022–2023. Improving patient quality care is essential today; therefore, patient safety culture needs special attention. The results of this study will provide practical knowledge and information to help identify the level of self-efficacy, strengths, and weaknesses of patient safety culture in Iran Hospital of Shiraz. In addition, the results of this study could be beneficial to authorities and hospital staff in order to raise their awareness regarding patient safety culture. Moreover, the current study aims to investigate opportunities to enhance patient safety culture, staff self-efficacy, and quality patient care to help hospital managers and policymakers take necessary actions.

## Materials and Methods

### Study design and setting

This two-stage quasi-experimental study (before and after the intervention) examined the effectiveness of the two independent variables on dependent variables. In other words, the present study aimed to evaluate the effectiveness of "training programs based on SBAR and FMEA techniques" on "patient safety culture" and "self-efficacy".

### Study participants and sampling

Convenient sampling was conducted after obtaining an informed consent form from the participants. Nurses of Iran Hospital in Shiraz who were willing to participate in the research were included. Then, 80 were selected considering the inclusion criteria: Declaration of consent and at least one year of employment. The participants were randomly selected using systematic sampling. Then, they were divided into the groups of SBAR (40 individuals) and FMEA (40 individuals). Not participating in two training sessions and not filling out either of the two questionnaires were considered exclusion criteria of this study.

### Data collection tool and technique

The Hospital Survey on Patient Safety Culture (HSOPSC) and Sherer General Self-Efficacy Scale (GSES) was used

in this study for data collection. The HSOPSC is a 42-item instrument with a 5-point Likert scale from strongly agree to strongly disagree, which measures overall perceptions of patient safety regarding dimensions of patient safety (frequency of events reported, supervisor/manager expectations, organizational learning, teamwork within organizations, communication openness, providing feedbacks and correcting errors, nonpunitive response to errors, staffing, management support for safety, teamwork across units, handoffs and transitions). The maximum and minimum score of the HSOPSC questionnaire is 210 and 42, respectively. It is a semantic differential scale, negative and positive sentences. Put simply, for semantically positive sentences, there is a scale of one (strongly disagree) to five (strongly agree).

Furthermore, for semantically negative sentences, there is a scale of one (strongly agree) to five (strongly disagree). Semantically negative sentences are the following question: 2, 3, 4, 6, 10, 11, 21, 25, 26, 27, 29, 30, 31, 34, 35, 37, 39, 40, 41, and 42. Each item is given a score on a scale of one to five.

The GSES is the other data selection tool with 17 questions. Each question is on a 5-point Likert scale ranging from strongly disagree to strongly agree. Therefore, the maximum score would be 85 and the minimum 17. Items 1, 3, 8, 9, 14, and 15 are given a score on a scale of one (strongly disagree) to five (strongly agree); however, the rest of the items are scored on a scale of one (strongly agree) to five (strongly disagree). In an Iranian study conducted by Moghri *et al.*, Cronbach's alpha of the internal correlation regarding the HSOPSC questionnaire was 0.82, and its construct validity was also measured. Thus, it is a reliable and validated questionnaire that could be used to assess patient safety culture in the country's hospitals.<sup>[42]</sup> Moreover, in Mohammad Ali Yaghobifar *et al.*'s study, the HSOPSC questionnaire's reliability was evaluated using Cronbach's alpha (0.87) with 385 participants.<sup>[43]</sup> In the study by Abbas Haghayegh *et al.*, the reliability and validity of GSES have been confirmed with an internal correlation of 0.83. Furthermore, for the criterion validity, its correlation with "Internal restraint" was obtained as  $r = 0.342$ , which is considered significant at the level of  $P < 0.01$ .<sup>[44]</sup>

### Ethical consideration

Ethical approval was granted from the research committee at Isfahan University of Medical Sciences with the ethics code of IR.MUI.NUREMA.REC.1401.010. Then, the researcher made necessary coordination with the hospital manager. A meeting was organized with the hospital's nurses to make them fully aware of the nature and purpose of this research, and their anonymity and confidentiality were preserved. An informed consent form was obtained, then samples were selected. The

participants were told that when completing the questionnaires, there was no need to state their names and surnames to gain their trust.

Moreover, the participants were assured that the collected data would be used only in the present study. Then, the HSOPSC and GSES scales were obtained from the two groups before the intervention. Each group received either a patient safety training program based on the SBAR method or the FMEA. It included six sessions of a patient safety training program based on SBAR and FMEA techniques. The training sessions were held using educational slides, as well as giving a presentation and group discussion two days a week. Seven faculty members of nursing departments confirmed the educational content at Isfahan University of Medical Sciences. The project managers conducted educational sessions for two groups. It should be noted that safety culture training booklets based on the two mentioned methods were prepared after the research was completed, then presented to all the nurses. After training sessions, the participants were given a one-month break to review all the explained educational content and ask questions if needed. Finally, the participants were again asked to complete the HSOPSC and GSES scales. The collected data were analyzed using descriptive statistics (descriptive indices and mean and standard deviation), as well as Fisher's exact test, independent *t*-test, and paired-*t* test. All the analyses were done using SPSS 13 software (SPSS Inc., Chicago, IL, USA). A *P* value less than 0.05 is considered to be statistically significant.

### Results

Eighty-seven participants were selected randomly in this study, and 30 (38.46%) were male. Then, they were randomly divided into the SBAR and FMEA groups. The SBAR group comprised 16 males (20.51%) and 23 females (29.49%). In addition, the FMEA group included 14 males (17.95%) and 25 females (32.5%). Based on the *Chi*-square test, there was no significant difference between the two groups ( $P = 0.64$ ). Five individuals from the SBAR group and three from the FMEA group had prior experience with patient safety culture training. Therefore, 34 individuals from the SBAR group and 36 individuals from the FMEA group had no relevant training. In terms of academic degrees, 37 participants from the SBAR group had a bachelor's degree, and two participants had a master's degree. Moreover, 38 participants from the FMEA group had a bachelor's degree, and one had a master's degree. Fisher's exact test showed no significant difference between the two groups' frequency distribution of participation in the training workshop ( $P = 0.36$ ) and the academic degree ( $P = 0.50$ ). Nurses' mean age in the SBAR and

FMEA groups were 40/97 ± 3/66 and 41/08 ± 3/51, respectively. According to the *t*-test, no statistically significant differences were found in the mean age of the participants (*P* = 0/90).

The mean scores of patient safety culture before intervention in the SBAR and FMEA groups were 140/05 ± 3/65 and 140/51 ± 3/61, respectively. However, after the intervention, the mean scores changed to 177/46 ± 5/50 and 182/77 ± 5/21, respectively. The paired *t*-test showed that the mean score of patient safety culture in both groups was significant after the intervention (*P* < 0/05). Moreover, according to the independent *t*-test, there was no meaningful relationship between the score of patient safety culture in the two groups before the intervention (*P* = 0/58); however, the mean score of the FMEA group was more significant than the SBAR group after the intervention (*P* < 0/05).

The mean self-efficacy scores in the SBAR and FMEA groups before the intervention were 54.97 ± 2.88 and 54.3 ± 79.40, respectively. However, after the intervention, the mean scores changed to 68.67 ± 4.4.8 and 72.13 ± 4.51. The paired *t*-test showed that the mean self-efficacy score in both groups was significant after the intervention (*P* < 0/05). Moreover, the mean self-efficacy score before and after the intervention is illustrated in Table 1. According to the independent *t*-test, there was no meaningful relationship between the score of self-efficacies in the two groups before the intervention (*P* = 0.80); however, the mean score of the FMEA group was more significant than the SBAR group after the intervention (*P* < 0.05).

The independent *t*-test showed that the mean scores of patient safety dimensions were not significantly different between the SBAR and FMEA groups before the intervention (*P* < 0.05). However, the independent *t*-test showed a significant difference among some of the two groups' dimensions, including organizational learning, communication openness, feedback and communication about errors, nonpunitive response to errors, staffing, and teamwork across units. According to the independent *t*-test, the mean scores of the mentioned dimensions were more significant in the FMEA than in the SBAR. However, the mean scores were significantly higher in the SBAR group compared to the FMEA regarding handoffs and transitions (*P* < 0.05). The mean scores of the rest of the patient safety dimensions were not significantly different in the two groups (*P* > 0.05) [Table 2]. The paired

*t*-test showed that the mean scores of all patient safety dimensions were more significant in the SBAR group before the intervention (*P* < 0.05). The paired *t*-test also showed that there was a significant difference in the mean score of the entire patient safety dimensions in the FMEA group before the intervention (*P* < 0.05) [Table 3].

## Discussion

One of the most critical matters is the concept of patient safety culture which could prevent patient injuries and lead to better quality service and patient safety in hospitals.<sup>[45]</sup> Thus, the present study investigated the effects of patient safety based on SBAR and FMEA techniques on self-efficacy and patient safety culture in Iran Hospital, Shiraz.

According to the present study, training programs based on the SBAR technique improve the patient safety culture. Effective communication is an essential element in nursing care. Some eminent nurses believe good communication skill is the core part of the nursing role.<sup>[46]</sup> Standard communication is made of four stages; in this communication technique, the patient is introduced, and their current condition is explained in detail; put simply, a concise statement of the problem is stated in the first stage. Then, the patient's reasons for seeking care and their medical history, and brief information related to the situation will be examined. In the third phase, the patient's vital signs, reasons for the patient's current condition, and recovery process are evaluated; in other words, in this stage after analysis, all the options are considered. Finally, necessary actions and recommendations are given and healthcare providers take necessary actions including giving recommendations and providing effective interventions. Although these four phases may be expressed in regular communication among healthcare providers, the SBAR technique provides a standard framework to ensure all the mentioned phases occur properly. The SBAR provides a framework for communication of the healthcare team to ensure everything is in the correct order.<sup>[47]</sup> The results of Fatemeh Raeisi *et al.* showed that interprofessional communication training among emergency department staff could improve patient safety culture.<sup>[24]</sup> According to another study by Khaksar *et al.*, effective interprofessional interaction and collaboration reduce medical errors regarding patient safety.<sup>[1]</sup> Another study regarding the SBAR communication model showed that healthcare staff had more effective verbal

**Table 1: Comparison of self-efficacy in the SBAR and FMEA groups before and after the intervention**

Group	Before intervention		After intervention		Paired <i>t</i> -Test	
	Mean	Standard deviation	Mean	Standard deviation	<i>t</i>	<i>P</i>
SBAR	54.97	2.88	68.67	4.48	20.004	<0.001
FMEA	54.79	3.40	72.13	4.51	22.74	<0.001

**Table 2: Comparison of the mean scores in the SBAR and FMEA groups, regarding dimensions of patient safety culture, before and after the intervention**

Dimensions of patient safety	Before intervention		P	After intervention		P
	SBAR	FMEA		SBAR	FMEA	
Frequency of Events Reported	9.49±0.94	9.41±1.02	0.73	11.46±1.10	11.62±1.02	0.52
Overall Perceptions of Patient Safety	14.05±0.72	14.03±0.71	0.88	16.72±1.50	16.92±1.40	0.54
Supervisor/Manager Expectations	15.10±0.82	15.08±0.77	0.89	17.56±1.29	18.10±1.07	0.049
Organizational Learning	8.74±0.99	8.87±1.28	0.62	11.41±1.14	12.54±1.19	<0.001
Teamwork across Units	13.95±1.28	14.03±1.22	0.79	17.51±1.21	17.92±1.22	0.14
Communication Openness	9.77±1.31	9.82±1.25	0.86	11.90±1.25	12.85±1.14	<0.001
Feedback and Communication about Errors	9.54±0.97	9.44±0.94	0.64	12.59±1.14	13.45±0.99	<0.001
Nonpunitive Response to Errors	8.46±1.02	8.41±0.99	0.82	11.05±1.12	12.56±1.27	<0.001
Staffing	15.15±0.81	15.08±0.93	0.70	18.33±1.36	19.03±1.25	0.02
Management Support for Patient Safety	10.36±1.16	9.95±0.94	0.09	12.38±1.43	12.85±1.41	0.15
Teamwork within Units	11.41±0.97	11.44±0.97	0.91	13.18±1.05	13.92±1.13	0.004
Handoffs and Transitions	14.49±1.25	14.51±1.50	0.94	23.36±1.60	21±1.76	<0.001

**Table 3: Comparison of the mean scores in the SBAR and FMEA groups, regarding dimensions of patient safety culture before and after the intervention**

Dimensions of patient safety	SBAR		P	FMEA		P
	Before	After		Before	After	
	intervention	intervention		intervention	intervention	
Frequency of Events Reported	9.49±0.94	11.46±1.10	<0.001	9.41±1.02	11.62±1.02	<0.001
Overall Perceptions of Patient Safety	14.05±0.72	16.72±1.50	<0.001	14.03±0.71	16.92±1.40	<0.001
Supervisor/Manager Expectations	15.10±0.82	17.56±1.29	<0.001	15.08±0.77	18.10±1.07	<0.001
Organizational Learning	8.74±0.99	11.41±1.14	<0.001	8.87±1.28	12.54±1.19	<0.001
Teamwork across Units	13.95±1.28	17.51±1.21	<0.001	14.03±1.22	17.92±1.22	<0.001
Communication Openness	9.77±1.31	11.90±1.25	<0.001	9.82±1.25	12.85±1.14	<0.001
Feedback and Communication about Errors,	9.54±0.97	12.59±1.14	<0.001	9.44±0.94	13.45±0.99	<0.001
Nonpunitive Response to Errors	8.46±1.02	11.05±1.12	<0.001	8.41±0.99	12.56±1.27	<0.001
Staffing	15.15±0.81	18.33±1.36	<0.001	15.08±0.93	19.03±1.25	<0.001
Management Support for Patient Safety	10.36±1.16	12.38±1.43	<0.001	9.95±0.94	12.85±1.41	<0.001
Teamwork within Units	11.41±0.97	13.18±1.05	<0.001	11.44±0.97	13.92±1.13	<0.001
Handoffs and Transitions	14.49±1.25	23.36±1.60	<0.001	14.51±1.50	21±1.76	<0.001

communication with patients after the intervention. In addition, some of the healthcare providers stated that reporting duration has decreased after the SBAR training. However, some believed that the SBAR communication model increased reporting duration; although this might be considered an opposing side of the SBAR model, effective communication minimized misunderstanding and confusion. Put simply, an effective SBAR model ensures that essential and relevant details are included.<sup>[48]</sup>

Relationships and collaboration between doctors and nurses are in relation to patient safety; it is one of the influential factors in achieving proper patient safety. Therefore, it is essential for delivering quality patient care. Moreover, effective communication plays a vital role in the field of healthcare, employee satisfaction, patient satisfaction, and dealing with challenges.<sup>[49]</sup> According to a study by Starmer conducted in a medical center, implementation of the SBAR model was associated with a significant reduction in adverse events (90 to 40 in a 1000-day hospitalization) and medical errors (30% to 18% in a 1000-day hospitalization).<sup>[4]</sup> The present study

also showed that the mean score of patient safety culture significantly increased after implementing patient safety training programs based on the FMEA technique. According to the survey by Seyedreza Mazlom *et al.*, the FMEA model can help identify and prioritize medical errors.<sup>[26]</sup> Patient safety risk management from a systematic perspective is carried out in two stages; assessment and management. The FMEA technique is a risk analysis tool with a systematic approach to errors; the systematic approach suggests a holistic approach than an individual one, a punitive response, and a linear process. Therefore, a framework based on clinical care standards and deviation management is essential for an effective patient safety system.<sup>[50]</sup> Failure Model Effects Analysis is a proactive technique for identifying and eliminating potential problems before adversely affecting systems, customers, and services. In fact, implementing the FMEA technique is an approach that leads to patient safety.<sup>[51]</sup> A quasi-experimental study by Raeda Fawzi AbuAlRub *et al.*, in 2014, showed that interventions improved patient safety among Jordanian nurses.<sup>[52]</sup> Experts also believe that patient safety culture training, and other

structural interventions, must be taught to nurses and healthcare providers to improve patient safety.<sup>[53]</sup> Patient safety culture directs healthcare providers' behaviors. Accordingly, patient safety becomes one of their highest priorities. Patient safety culture can encourage healthcare providers to report and analyze their errors, which is an effective tool for safety improvement.<sup>[15]</sup> Therefore, the patient safety training program can help with effective communication.

The results of the present study showed an increase in the entire dimensions of patient safety culture after interventions in both groups. According to the study by Azimi *et al.*, all dimensions of patient safety among nurses significantly improved after the interventions.<sup>[54]</sup> Another study by Donnelly *et al.* indicated similar results. However, there might be some differences concerning the intensity of improvement in the mentioned dimensions.<sup>[55]</sup> Based on Khaksar *et al.*, the mean score of the safety culture subscales and the total safety culture score were significantly higher in the experimental group than in the control group after intervention.<sup>[1]</sup> After handoffs and transitions, the mean score was higher in the SBAR than in the FMEA group. SBAR is a standard communication tool that provides a framework for communication between healthcare team members about a patient's condition. SBAR is also a structured technique for communicating critical information regarding care, treatment, service, condition, and recent change that needs special attention.

This tool can prevent breakdowns in communication among healthcare providers.<sup>[47]</sup> On the other hand, the mean scores of organizational learning, communication openness, feedback communication about errors, nonpunitive response to errors, staffing, and teamwork across units in the FMEA group were more significant than the SBAR. The best way to avoid errors in medical centers is error prevention; it begins with identifying their root causes, learning from mistakes, and modifying the healthcare system to prevent errors.<sup>[26]</sup> Spath (2003) also believes it is essential to adopt various process-improvement techniques to identify inefficiencies and preventive errors to influence changes in relation to systems.<sup>[56]</sup> According to Benjamin, many errors, especially medication errors, occur due to poor oral or written communication. Therefore, the FMEA technique is suggested to prevent system errors and identify a safety net (with effective communication) in healthcare systems.<sup>[57]</sup>

Another result of the present study is an increase in self-efficacy after implementing patient safety training programs. In line with this study, Mohammad Tahan *et al.* reported that teaching safety culture to nurses improves their self-efficacy.<sup>[58]</sup> In another study

by Lee *et al.*, the results indicated that self-efficacy is one of the essential factors in Korean nurses' performance.<sup>[59]</sup> On the other hand, Harsul reported that there is no meaningful relationship between nurses' self-efficacy and their patient safety culture.<sup>[60]</sup> The difference between this study and Harsul's could be due to sample size, selecting participants only from one medical center, different countries, and cultures.

Moreover, according to Ali Abbasi *et al.*, patient safety culture training affects nurses' self-efficacy.<sup>[7]</sup> Bahreini and Alavi also reported that there is a meaningful relationship between nurses' self-efficacy and patient safety culture. Therefore, hospital managers can help with nurses' safety culture and create a safer place for patients by improving nurses' self-efficacy as a cognitive factor and giving attention to their job expectations as a motivational concept.<sup>[61]</sup> In addition, Sheikhbardsiri *et al.* stated that educational workshops might improve nurses' self-efficacy.<sup>[9]</sup>

Increasing nurses' self-efficacy can result in quality healthcare.<sup>[62]</sup> Not being present at the patient's bedside, gathering at the nurses' station, and avoiding stressful situations indicate nurses' lack of self-efficacy, which can put patients' safety at risk.<sup>[63]</sup> The results of an American study by Manojlovich showed that self-efficacy plays a mediating role between the structural power and professional performance of nurses and recommends that nursing managers enhance nurses' professional performance behaviors by creating opportunities to reinforce nurses' self-efficacy. The results of this study indicated that increasing self-efficacy can improve nurses' professional practice behaviors; since individuals not only react to environmental influences but also can exercise self-influence to build their social systems.<sup>[64]</sup>

Many healthcare providers work as a team in a healthcare center, and the FMEA technique compared to the SBAR, is more based on teamwork; therefore, they all contribute to the identification, evaluation, prevention, control, or elimination of the causes and effects of potential risks. As a result, the FMEA can be beneficial to improve nurses' patient safety culture and self-efficacy. On the other hand, the SBAR is mainly focused on communication regarding patient safety culture, while the FMEA technique attempts to identify errors, identify roots and systematic causes of errors, learn from the errors, and modification of care system to enhance patient safety in medical centers.

### Limitations and suggestions

Tools of the present research were all self-reported, and the statistical population was limited to nurses. Therefore, further research is suggested to investigate the effects of patient safety training programs on non-nursing

samples. Moreover, it seems the design of operational plans and their implementation in different healthcare departments, along with using patient safety training programs, can benefit patient safety improvement and quality healthcare. Therefore, managers' support programs and the design of educational interventions can accelerate the establishment of a patient safety culture so that patient safety will be considered a high priority in organizations.

## Conclusion

The present study aimed to investigate the effects of training programs based on SBAR and FMEA techniques on self-efficacy and patient safety culture. According to the findings, although there is a meaningful relationship between training programs based on SBAR and FMEA techniques on patient safety programs and the nurses' self-efficacy, the FMEA training program is more effective regarding self-efficacy and patient safety culture than the SBAR technique. Therefore, the results of this research could benefit executives in the healthcare field; they could apply these techniques along with other patient safety techniques to improve healthcare quality.

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## Conflicts of interest

There are no conflicts of interest.

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