Effect of Triage Education on Nurses' Performance in Diverse Emergency Departments

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ABSTRACT

Context: Nurses are the primary anchorpersons of triage in emergency departments. Triage nurses should have the proper education and proficiency in emergency triage, decision making, and emergency nursing care. Training on triage is an integral part of emergency nursing education. Poor performance and lack of education are well documented in the literature.
Aim: This study aimed at evaluating the effect of triage education on emergency nurses' performance in diverse emergency departments.
Methods: Quasi-experimental (pre, post-test design) used to achieve the aim of this study. A purposive sample of one hundred fifty emergency nurses worked at pediatric, Obstetric, and adult emergency departments affiliated to three major governmental hospitals in Beni-Suef Governorate. The nurses' knowledge, practice, and attitude have been assessed using a self-administered questionnaire, triage competencies observational checklist, and nurses' attitude measuring scale.
Results: The study revealed poor nurses' triage knowledge, practice, and negative attitude for the studied nurses before triage education, compared to a significant improvement after triage educational program, with a statistically significant difference among the three-implementation phases (pre, post, and one month follow up).
Conclusion: The nurses who are subjected to triage education improved in their knowledge, practice, and attitude at the post-intervention evaluation compared to their pre-intervention level, which was sustained after one-month follow-up. These findings support the study hypotheses. Based on these findings, the study recommended the publication and dissemination of the triage educational program. Besides, fostering and sustaining the improvements in practices regarding triage in ED through the orientation of new nurses, on-the-job training, and continuous education.

Keywords: Triage education, nurses' performance, diverse emergency departments

1. Introduction

Emergency medicine in Egypt began in 1966. Egyptian law was issued to establish ambulance emergency service for patient transportation and initiation of urgent first aid. By 1999, a presidential declaration of instigation of Air Ambulance service has ensued. This decree was followed by the establishment of the Egyptian Ambulance Organization in 2009. The roles and responsibilities of emergency staff are clarified. It embroiled the situation and incident location through observation and witness statements; assess the patient and the situation; diagnose the complaint or injury; offer first aid, and transfer the patient to necessary health service safely and quickly *(Japan International Cooperation Agency, (JICA) 2017)*.

The emergency departments are a critical part of modern hospitals. *McCaig and Burt (2005).* In today's health care practice, hospitals challenged by vast numbers of patients due to population growth increased aging population, complexities of current injuries, and drug abuse.

Those patients mostly received at the emergency departments *Weiss et al. (2004).* Awkwardly, the number of emergency departments does not increase significantly alongside the increasing number of patients in need of these services *GolAghaei, Sarmadian, Rafiei, and Nejat (2008).* The primary mission of the emergency department is providing the best care possible in the shortest time *Weihai, (2012).*

However, major hospitals' emergency medical services include surgical emergencies counting cardiac surgeries, medical emergencies, pediatric emergencies, and obstetric and gynecological emergencies *Japan International Cooperation Agency (JICA) (2017).* Most emergency departments do not provide the proper facilities for patient referral *Tanabe et al. (2005).* A critical challenge facing the emergency department is the patient's overcapacity who needs those services, consequently a substantial patient care delay, dissatisfaction, and sometimes complications stemmed *(Hoseini, Jalalmanesh, Sahbaee, & Mahmoodi 2007).* One effective strategy for this challenge is triaging the patient according to their clinical condition *(Fernands (2005).* The emergency triage is a system of prioritizing

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patient care according to their clinical status, setting time and allocating resources to provide the more urgent care first, and postpone the patient with modest complain (*Domres, 2000*).

The triage process includes gathering relevant patient information, performing a focused assessment, determining an acuity level, and prioritizing the needs of the patient seeking emergency care, all in a time-sensitive manner. Accuracy in problem identification is a crucial component of clinical decision making, especially in the triage encounter, and requires the nurse to establish boundaries of physiological and psychological stability and predict the potential trajectory of the patient's condition (*Yurkova & Wolf, 2011*).

Triage nurses are the principal anchors in emergency departments. Their primary role is to decide about the care priorities for emergency patients *Taheri, Kohan, Haghdust, and Foroogh Amery (2005)*. Triage nurses should have the necessary education, skill training, and relevant experiences to perform this role adequately. This training should involve triaging skills, decision making, and emergency nursing interventions (*Mirhaghi & Rudbari, 2011*). Despite scarce studies concerned with triage nurses *Taheri, Kohan, Haghdust, and Foroogh Amery (2005)* acknowledged poor nurses' triage knowledge and performance in Kerman University of Medical Science hospital. *Mirhaghi and Rudbari (2011)* emphasized these findings when they found a similar knowledge level of triage nurses in Sistani Baluchistan hospitals. An earlier study conducted in Australia reported that 42% of the studied emergency nurses did not expose to any triage education. Furthermore, 14% of the trained nurses reported weak self-confidence in performing triage despite their training *Fry and Burr, (2001)*. These studies shed light on a serious concern regarding triage nurses' knowledge and performance in emergency departments and their deficient unsuitable training in such a critical area of patient care that saves many lives (*Keshavarz & Keshavarz, 2007*).

Triage training becomes mandatory for all nurses working at the emergency department *Dadashzade, Abdollahzadeh, lofty, and Ghoojazadeh, (2009)*. Thus, providing an appropriate education for emergency nurses regarding triage and retaining the skillful and experienced nurses for triaging can save many lives, prevent disabilities, and decrease complications, besides decreasing care costs (*Lynch, 2006*). Therefore, formal training regarding triage can improve triage nurses' efficiency, confidence to act more competently (*Cone & Murray, 2002*). This concern started as early as 1990 when *Kelly (1990)* highlighted the prominence of preparing emergency nurses in triage and believe that training will generate adept triage nurses.

Triage is the point at which emergency care begins, and it determines the trajectory of emergency care. Accuracy of triage decisions is a significant influencer in patient outcomes (*Considine, Botti, & Thomas, 2007*). It is embracing further clinical skills of analyzing patient clinical status, making the accurate, timely, and precise decision that augmenting the emergency department's performance (*Tanabe et al., 2005*). Moreover, the quality auditors have used the performance indicators in the triage subdivision to further evaluate the efficiency of the emergency department (*Statistics and Information Technology Office, 2009.*)

2. Significance of the study

The total number of staff involved in emergency medical services in Egypt was estimated to be 6,809 in 2010. The number of emergency personnel continue to increase by up to 17,132 in the year 2014. The number then dropped to 16,500 in 2015 due to resignation because of the harsh work environment and low incomes. A reported statistic from Cairo University Hospital indicated that the hospital received 400 trauma patients per day and 500,000 emergency outpatient per year. The number of patients consulted per hour in the emergency department reaches 50 patients; four of them transferred to the operating room.

Ain Shams University emergency medical services reported similar findings that thirty-five to fifty trauma victims received per day, three-fourths of them require hospital admission. However, 50% could not be transferred and stayed for a long time in the emergency department observation room. The situation is cumbersome by the nursing shortage. Despite the shortage, many of them are communal between emergency and ICU work. Consequently, there is no time to learn or gain experience (*Japan International Cooperation Agency, (JICA) 2017*).

On the other hand, the educational system for preparing emergency nurses still insufficient compared with the growing demand for emergency services. Previous studies revealed that triage was not implemented at the emergency room due to insufficient knowledge, insufficient nurses, and lack of motivation in inpatient care. In upper Egypt, particularly the study settings, there was no statistical report about the incidence of triage services implementation. Based on our observation, there are 70 emergency nurses distributed to work on the three shifts. About 20-25 emergency nurses offer services to 50-70 patients per shift. The ratio of emergency nurses in a triage room to patients each shift is 1: 25-35 approximately. This study aimed to support our local community in Beni-Suef governorate with the appropriate training in three different specialties who are adult, pediatric and obstetric emergencies, and evaluate the effect of triage education on nurses' performance in those departments after implementation of educational training.

3. Aim of the study

This study aimed at evaluating the effect of triage education on emergency nurses' performance in diverse emergency departments.

3.1. Research hypotheses

- The nurses' knowledge will be significantly improved after implementing triage education, compared to their pre-knowledge level.
- The nurses' practice will be significantly enhanced after implementing triage education compared to their pre-practice level.

- The nurses' will exhibit a positive attitude after implementing triage education, compared to their pre-implementation level.

4. Subjects & Methods

4.1. Research design

A quasi-experimental (pre, post, and follow-up) design was used to achieve the study's aim. This design is used to compare participant groups and measure the degree of change occurring due to treatments or interventions.

4.2. Research setting

The study was conducted at three different hospitals distributed through Beni-Suef Governorate to adequately cover the target population. Those were Beni-Suef University Hospital, General Hospital, and Health Insurance Hospital in Beni-Suef Governorate. The study was conducted at three emergency departments named Pediatric, Obstetric, and Adult emergency departments.

4.3. Subjects

A purposive sample consisting of 150 nurses recruited to achieve the aim of this study. Fifty nurses were selected from Beni-Suef University Hospital (15 nurses from pediatric emergency, 17 nurses from obstetric emergency & 18 nurses from adult emergency). Fifty nurses from Health Insurance Hospital (13 nurses from pediatric emergency, 17 nurses from obstetric emergency & 20 nurses from adult emergency), and fifty nurses from General Hospital distributed as 22 nurses from pediatric emergency, 12 nurses from obstetric emergency & 16 nurses from adult emergency, at Beni-Suef Governorate.

The nurses selected according to the following inclusion criteria:

- The nurse implemented triage before.
- Nurses have not less than one year of experience in the emergency department.
- The nurse did not attend any courses about triage.
- Nurses are available at the time of data collection and willing to participate in the study.

4.4. Tools of the study

Three tools were used to collect data for this study.

4.4.1 Self-Administered Questionnaire

The researchers developed it to assess the nurses' socio-demographic characteristics such as age, marital status, rotation shift, educational qualifications, and years of experience in the emergency department in its first part. The researchers designed the second part of the questionnaire to assess the nurses' knowledge about emergency triage in the three different cases (Adult, Pediatric, and Obstetric triaging). It assesses the main concepts in triage. It included ten open-end questions. They are meaning of triage (1 question), triage principles (1 question), triage scale (1 question), triage assessment and allocation of triage category (1 question), prioritizing patients based on their clinical presentation (1 question),

triage decision (1 question), risk factors of patient's condition (1 question), objective data collection (1 question), subjective data collection and communication (1question), and specific nursing interventions for different cases (pediatric, obstetric or adult care) (1 question) *(Vasseur, 2001; Gilboy et al., 2012; Mackway-Jones, Marsden, & Windle, 2014)*. This questionnaire was distributed in the same form three times (pre, post-program implementation, and at one month's follow-up) for the same group of nurses. The questionnaire Alpha Cronbach reliability test equal to 0.87.

Scoring system

A content analysis of the open-end questions' answers. Each step was assigned to three score levels, which are: correct and complete was scored (3), correct and incomplete scored (2), and incorrect scored (1). The total score of the questionnaire was 30 marks distributed over the ten questions' answers. The knowledge level is considered satisfactory if the nurse got 85% of the total score and unsatisfactory if the score was below 85%.

4.4.2 A Triage Competencies Observational Checklist

It was adopted from *Australian College for Emergency Medicine (2009); Elsayed, Ahmed, and Abdelhamid (2014); Mackway-Jones, Marsden, & Windle (2014)* to evaluate nurses' practices concerning the triage process. It encompasses 55 statements distributed on seven essential competencies as followed: Emergency assessment (9 steps) including inspection, specification of medical risks (primary assessment), main complaint, medication taken before admission, medical history, five minutes triaging, correct patient positioning, maintain privacy, and psychological evaluation. Clinical decision-making (3 steps) includes determining patient urgent health care needs, specification of medical care, and initiating priority treatment.

Triage interventions (20 steps) include such assessment as secondary assessment, medical prescriptions, care intervention according to priority, monitoring vital signs, primary la tests, first aid, basic life support, controlling infection, and further lab. Testing, family communication, re triaging, referral if needed, assisting in patient transfer, recording patient clinical data to be sent to the referred hospital. Leadership and management activities (14 steps) include such assessment as referral to needed specialty, communication with the emergency team, patient and family, coordination with other hospital departments, guide patient in respect to patient rights, services provided, rules and hospital protocols, participate in self-and staff leadership improvement, time management, and resources management, self-disciplined, and team working.

Patient safety in the waiting area (3 steps) included applying fall prevention strategy, predicting possible adverse consequences in patient condition, and providing basic health care for the individual patient. Finally, assessing the competencies of avoiding environmental

hazards (6 steps). It includes proper environmental care, prevention of unnecessary radiation exposure, protective equipment, isolation precautions, equipment cleaning and sterilization, and orienting patients to necessary infection control procedures. The researcher filledthis checklist three times with the same form on the same nurses' group (pre, post-program, and at one month's follow-up). The checklist's Alpha Cronbach reliability test equal to 0.86.

Scoring system

Each step was assigned to two score levels: done was scored (2), and not done scored (1). Each subsection scored independently as emergency assessment (18 marks), clinical decision making (6 marks), triage intervention (40 marks), leadership and management activities (28 marks), patient's safety in the waiting area (6 marks), and avoidance of environmental hazards (12 marks). The total score is categorized into either competent (from 80% of the total score and more) or incompetent (less than 80% of the total score). The total practice scores equal to 110.

4.4.3 Nurses' Attitude Measuring Scale

It was adopted by *Suen, Wong, Chow, and Kong (2006); Elsayed, Ahmed, and Abdelhamid (2014)* to assess the nurses' attitude toward triage activities. It was a three-point Likert-type scale that consisted of 10 statements. It includes such statements as nurses' attitude toward triaging, patient care delay, patient reception. The scale Alpha Cronbach reliability test equal to 0.87.

Scoring system

Each statement evaluated against a three-point scale ranged from agreeing (3 scores), neither agree nor disagree (2 scores), and disagree (1 score). The total score summed and categorized as a positive attitude when the score equal or exceed 80% of the total, indifferent attitude from 60 - ≤80%, and a negative attitude if the total score was <60% of the total. The nurses` attitude total score equal 30.

4.5. Procedures

The operational design in this study started with the preparatory phase. It included ethical consideration, validity, and reliability of the study tools, pilot study, and fieldwork. The preparatory phase commenced with literature reviewing to develop and adopt the relevant study instruments. Ethical considerations involve strict confidentiality throughout the study process. The study subjects assured that all data would be used only for research. They were also well-informed about their right to withdraw from the study at any time without giving any reason. The researcher clarified the aim and objective of the study to the nurse participants.

Content and face validity performed by 2 Pediatric Nursing professors, one Obstetrics and Gynecology Nursing professor, and two Medical-Surgical Nursing professors from the Faculty of Nursing, Beni-Suef, and Tanta performed content and face validity Universities. The experts reviewed the tools for their relevance, clarity, comprehensiveness, simplicity, and applicability. The reliability test was established using the Cronbach alpha

and Pearson correlation, which presented good internal consistency (construct validity Cronbach alpha = 0.87, and 086).

The selected emergency departments and hospitals have been chosen based on an assessment record developed by the researchers to assess the frequency, numbers, categories, and characteristics of the recurring patients (adult, pediatric, and pregnant or gynecologic emergency cases) selected emergency departments. The record also includes such data as the number of recurring patients in each of the three shifts. This collected data to ensure the suitability of the study setting to achieve the study aims. The record also included calculating the waiting time for triaging to evaluate the learning need of emergency department staff.

Official approval was gained from the administrators of the study settings to carry out the study. A clear explanation has been given about the aim, nature, importance, and predictable outcomes of the study. The pilot study was conducted on 10% of the total study sample (15) nurses to test the applicability of the study tools, estimate the time required for completion of each study tool, and test the feasibility of the study process. The pilot study sample is then excluded from the mainstream sample as some modifications have been done.

After official permission is obtained from the settings mentioned above, the study was carried out over six months, starting from August 2018 to the end of January 2019. The average time spent filling in the tools was 30 minutes for the self-administered questionnaire, 10 minutes for Likert scale assessment, and 45 minutes for the observational checklists. The settings were visited by the researchers three days/week (Saturdays, Mondays & Wednesdays).

The data collection process continued throughout five phases of pre-assessment to assess the emergency department nurses' learning needs, developing an educational program based on their needs, implementing the training program in the settings mentioned above. The process ended with evaluating the nurses' knowledge, practice, and attitude, and then they were followed up three months later to test their retained knowledge and practice. The theoretical content covered the following items: definition of triage, principles of triage, triage scale, triage assessment and allocates a triage category, prioritize patients based on clinical presentation, triage decision, risk factors of patient's condition, objective data collection, subjective data collection, and communication, and appropriate nursing interventions.

The content of the practical part included the following: The essential competencies of emergency assessment such as visual assessment, determination of critical urgency, and determination of chief patients` complaint. The competency of clinical decision-making encompassing such activities as determination of patients` critical needs. The triage intervention competencies such as vital signs and determination of triage level. The program covered such activities as awareness for appropriate referrals and emergency reception team members' schedules

during the shift concerning leadership and management activities. Simultaneously, the patients` safety in the waiting area includes ensuring a safe environment and preventing falls. Finally, avoiding environmental hazards such as protective clothing and decontamination procedures were also enclosed.

Implementation of the educational guideline commanded at the previously stated settings in five sessions. At the beginning of the first session, an educational guideline orientation and its purpose were presented. Nurses were divided into groups, and each group involved between 9 and10 nurses approximately. Each session started with a summary of what had been given through the previous sessions and the objectives of the new topic, taking into consideration the use of simple language to suit the level of nurses' qualifications. As well, the session ended with a summary of its content and feedback gained from others.

According to the nurses' needs and circumstances of the group work, the time of each session ranged between 30-45 minutes, according to the nurses` needs and circumstances. The theoretical part of the guideline was presented in three sessions in the form of lectures/discussions, followed by the practical part. It consisted of two sessions in demonstration and re-demonstrations using role-play, simulator, real objects, discussions, and brainstorming. The researchers used media of conveying information as PowerPoint presentations, posters, and printed guidelines that were developed and offered for nurses as a reference to use after guideline implementation ended.

The evaluation phase did twice, immediately post-implementation of the educational guidelines and at one month later (follow up) by comparing changes in nurses' knowledge, practices, and attitudes regarding educational guidelines for triage implementation in pediatric, obstetric, and adult emergency departments.

4.6. Data analysis

Data collected, scored, summed, organized, tabulated, and analyzed by a personal computer using the "Statistical Package for the Social Science" (SPSS windows) version 19. Numerical data expressed as mean±SD and range. Qualitative data expressed as frequency and percentage. Chi-square ($X2$) and relations between different numerical variables were tested using the Pearson correlation. A P-value less was than (0.05) was considered significant, and less than 0.001, considered highly significant.

5. Results

Table 1 shows the socio-demographic characteristics of the studied nurses. It indicates that the higher percentage of the nurses' age ranged between 25-<30 years. 76%, 80%, and 84% of nurses working at pediatric ED, obstetric ED, and nurses working at adult ED were married. Concerning their rotation shift, 60%, 64%, and 60% of nurses working

at pediatric, obstetric ED, and an adult ED respectively had worked all shift rotations. Regarding their level of education, 50% and 54% of nurses working at obstetric ED and nurses working at adult ED respectively had secondary nursing education. In comparison, 52% of nurses working at pediatric ED had technical nursing education. As regards nurses' years of experience, 54.0% and 46.0% of nurses working at obstetric ED and adult ED respectively have more than five years of experience, whereas 52% of nurses working at pediatric ED have1- < 5 years of experience with a non-significant difference between nurses working at the three emergency department regarding their socio-demographic characteristics.

Table 2 points out that the studied nurses' knowledge had improved through education guideline phases as 95% and 90% had unsatisfactory knowledge related to triage scale, triage assessment, triage decision, risk factors of patient's condition, objective data collection, subjective data collection and communication, and nursing interventions during triage implementation before the program implementation, which improved to be most of them had satisfactory knowledge post-program implementation and at follow up respectively.

Figure 1 describes the studied nurses' total knowledge score. The majority of them (84%) had unsatisfactory level before the program implementation, which improved for most of them (94.0%) converted into the satisfactory level of knowledge immediately after implementation of triage education, too (88%) satisfactory knowledge one month after program implementation, with a highly statistically significant difference (P<0.0001).

Table 3 demonstrates that the studied nurses' practices improved throughout guideline implementation phases as most of them (90%) do not practice satisfactorily before triage education regarding emergency assessment, clinical decision making and, and environmental hazards, which improved to reach most of them (96.0% and 90%) practices satisfactorily all the triage competencies immediately post-program implementation and at follow up.

Figure 2 illustrates that, regarding the studied nurses' total practices score, most of the studied nurses (90%) had an incompetent level before the program implementation, which improved for most of them (88%) to have competent practices immediately post-program implementation. Furthermore, the same figure shows that most studied nurses (85%) maintained the competent level in their total scores of practices in the follow-up phase of program implementation with a highly statistically significant difference (P<0.0001).

Table 4 reveals an improvement in nurses' total attitude immediately, after, and at follow-up program implementation scores for most of them. As (90%) and 88% of studied nurses showed a positive attitude toward triage, compared to 20% preprogram implementation, with statistically significant differences between the three phases (P < 0.001).

Table (1): Comparison of socio-demographic characteristics of the studied nurses at the various emergency department (n = 150).

Items	Nurses working at the pediatric Emergency department (n=50)		Nurses working at obstetrics Emergency department (n=50)		Nurses working at the medical Emergency department (n=50)		X^2	P-Value
	n	%	n	%	n	%		
Age in years								
< 20	10	20.0	5	10.0	4	8.0		
20-<25	15	30.0	12	24.0	14	28.0	2.10	0.08
25-<30	20	40.0	18	36.0	22	44.0		
≥30	5	10.0	15	30.0	10	20.0		
Mean±SD	22.48±3.83		23.68±4.33		23.26±3.97			
Marital status								
Single	12	24.0	10	20.0	8	16.0	1.88	0.26
Married	38	76.0	40	80.0	42	84.0		
Rotation shift								
Morning	5	10.0	6	12.0	7	**2.07**		
Night	15	30.0	12	24.0	13	26.0		0.19
All	30	60.0	32	64.0	30	60.0		
Educational qualification								
Secondary nursing education	20	40.0	25	50.0	27	54.0		
Technical nursing education	26	52.0	20	40.0	20	40.0	2.45	0.18
Bachelor of nursing	4	8.0	5	10.0	3	6.0		
Years of experience in the emergency department								
<1	6	12.0	3	6.0	5	10.0		
1-<5	26	52.0	20	40.0	22	44.0	1.64	0.27
≥5	18	36.0	27	54.0	23	46.0		
Mean ±SD	5.46±4.21		5.96±4.23		6.56±3.78			

Table (2): Percentage distribution of the studied nurses' knowledge about triage in diverse emergency departments (n = 150).

| Knowledge related to the implementation of triage	Pre-program		Post-program		Follow up	
	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory
	%	%	%	%		%
Triage definition	40.0	60.0	95.0	5.0	92.0	8.0
Triage Principles	37.0	63.0	96.0	4.0	95.0	5.0
Triage Scale	5.0	95.0	88.0	12.0	85.0	15.0
Triage assessment and allocate a triage category	5.0	95.0	88.0	12.0	85.0	15.0
Prioritize patients based on clinical presentation	20.0	80.0	90.0	10.0	90.0	10.0
Triage decision	6.0	94.0	87.0	13.0	85.0	15.0
Risk factors of patient's condition	5.0	95.0	88.0	12.0	85.0	15.0
Objective data collection	15.0	85.0	95.0	5.0	92.0	8.0
Subjective data collection and communication	10.0	90.0	95.0	5.0	95.0	5.0
nursing interventions;	10.0	90. 0	95.0	5.0	92.0	15.0
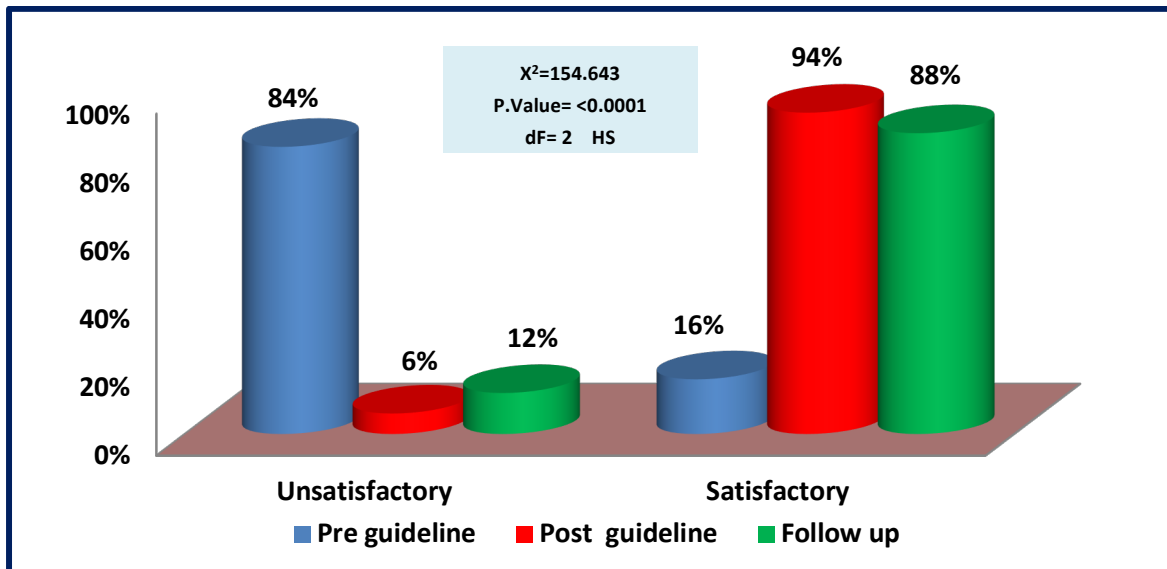
Figure (1): Comparison of total knowledge score of the studied nurses about triage in diverse emergency departments (n = 150).

Table (3): Percentage distribution of studied nurses' practices of triage competencies in diverse emergency departments (n = 150).

| Nurses practice	Pre-program		Post-program		Follow up	
	Done	Not done	Done	Not done	Done	Not done
	%	%	%	%	%	%
Emergency assessment	10.0	90.0	88.0	12.0	85.0	15.0
Clinical decision making	10.0	90.0	75.0	25.0	85.0	15.0
Triage intervention	35.0	65.0	96.0	4.0	96.0	4.0
Leadership and management activities	15.0	85.0	90.0	10.0	85.0	15.0
Safety of patients in the waiting area	15.0	85.0	90.0	10.0	85.0	15.0
Environmental Hazards	10.0	90.0	88.0	12.0	85.0	15.0
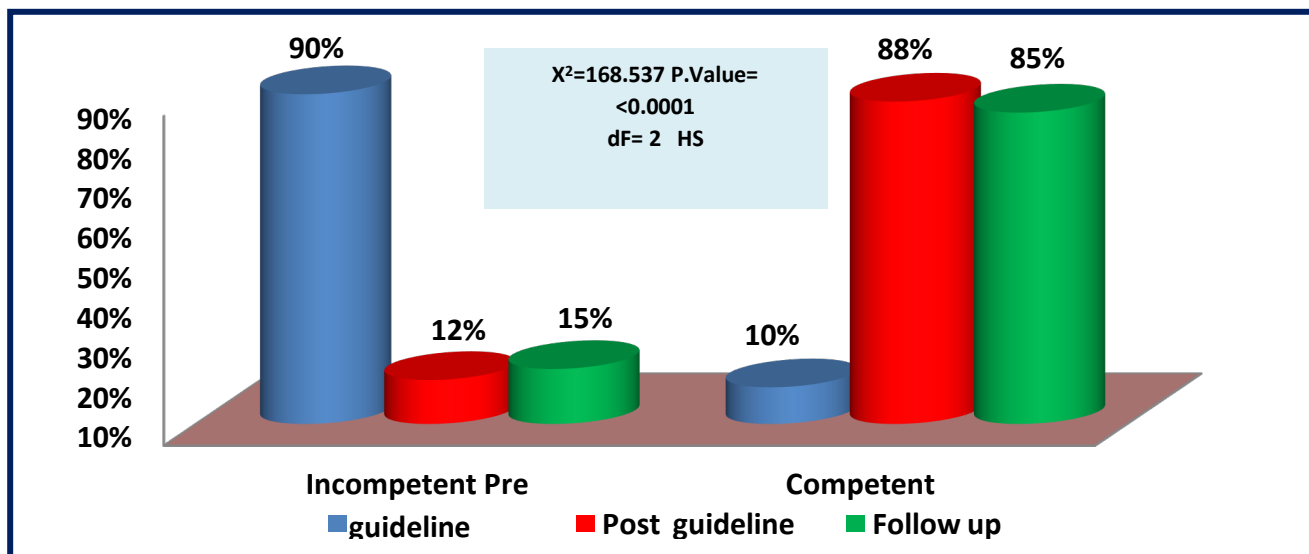
Figure (2): Comparison of total practices score of the studied nurses about triage in diverse emergency departments (n = 150).

Table (4): Frequency and percentage distribution of nurses' attitude toward triage in diverse emergency departments (n = 150).

Items	Total Attitude					
	Pre guideline		Post guideline		Follow up	
	No	%	No	%	No	%
Positive	10	20.0	45	90.0	44	88.0
Negative	40	80.0	5	10.0	6	12.0
Mean attitude score	0.612±0.44		2.46±1.06		2.22±0.86	
X²/p-value	$X^2 (1) = 15.02$ $X^2 (2) = 18.20$ $X^2 (3) = 10.04$				P value < 0.001	

X^2 (1) Pre-intervention versus post intervention, X^2 (2) Pre-intervention versus follow up, X^2(3) Post-intervention versus follow up

6. Discussion

Triage is an autonomous nursing role vital to patient security and the efficient delivery of emergency care. The triage nurse must establish the capacity for critical thinking in environments where available data is inadequate, incomplete, or vague *(Elsayed, Ahmed, & Abdelhamid, (2014))*. Education has a crucial role in improving the performance of emergency department nurses. Therefore, this study aimed to evaluate the effect of triage education on nurses' performance in diverse emergency departments.

The current study reveals that the higher percentage of nurses` age ranged between 25-≤30 years with the mean age of the studied nurses in three groups, was found to be 22.48±3.83, 23.68±4.33, and 23.26±3.97years. Similar findings were reported by *Duko et al. (2019)*, who mentioned that 86.1% were under 30 years. Regarding their marital status, more than three-quarters of nurses working at pediatric ED, obstetric ED, and nurses working at adult ED respectively married.

These results disagree with *Kerie, Tilahun, and Mandesh (2018),* who stated that nearly two-thirds of the respondents were single in their study. More than half of Kerie's studied sample had not completed their high education and had secondary and technical nursing education. This finding is similar to the present study findings. About half of nurses in Obstetric ED and Adult ED had secondary nursing education, plus more than half of nurses in Pediatric ED had technical nursing education. This finding represents a particular Egyptian situation of increasing numbers of technical nurses than their faculty graduated colleagues. This finding could be explained by the vast numbers of secondary schools (either three or five years) and technical institutes compared to the number of nursing faculties all over the country. It was not the case with *Duko et al.'s (2019)* study when more than two-thirds of their study completed a bachelor's degree in nursing.

As regards nurses' years of experience, more than half and more than one-third of nurses working at obstetric ED and nurses working at adult ED respectively have five or more years of experience, whereas 52% of nurses working at pediatric ED have one to less than five years of experience in emergency departments. This finding agreed with *Kerie, Tilahun, and Mandesh (2018) and Duke et al. (2019)* found that about 49.2% and 79.2% of the respondents had working experience of less than one year and less than three years respectively in the emergency department. Only 19.6% of participants worked in the triage room with a minimum of 1 month and a maximum of 48 months.

Moreover, the current study shows that more than two-thirds of the studied nurses' knowledge about triage was unsatisfactory before the program implementation. This knowledge level was significantly improved in the current study for most of them after program implementation and maintained at the follow-up evaluation, as regards triage definition, triage principles, triage scale, triage assessment and allocate a triage category, prioritizing patients based on clinical presentation, triage decision, risk factors of patient's condition, objective data collection, subjective data collection and communication, and appropriate nursing interventions. This finding may be because the study settings do not follow any guidelines or even allow attending programs regarding triage principles or application, which negatively affected their awareness and performance.

Similarly, *Mohey and Alazmi (2017)* illustrated in a study entitled "Primary Healthcare Emergency Services in Alexandria" that all the Primary Healthcare (PHC) facilities had no written clinical practice guidelines for providing primary emergency services, no plans for pediatric emergency triage, assessment or treatment, and no clear referral procedures. This finding also supported *Ebrahimi, Ghanbarzehi, Gorgich, Darban, and Shirzadi (2016),* who found that the performance of triage nurses in the identification of triage level before training on emergency severity index (ESI) was 42.3% accuracy before the intervention and improved to 93.9% after training in Khatam-al-Anbia hospital (Iranshahr). Hence, the first hypothesis was supported. This finding is also reinforced by a recent study done by *Reisi, Saberipour, Adienh, Hemmatipour, and Shahvali (2018)*, who detect a low-level knowledge score among emergency nurses employed in triage.

The present study demonstrates that the studied nurses' practices improved throughout the education guideline implementation phases as most of them do not practice triaging before the guideline implementation, particularly for emergency assessment, clinical decision making, triage intervention, leadership and management activities,

patients' safety in the waiting area, and environmental hazards. This deficient practice greatly improved to reach most of them had practices correctly immediately after program implementation and follow-up evaluation.

This finding was also agreed with *Kerie, Tilahun, and Mandesh (2018),* who stated that greater than half of the nurses had a moderate level of triage skills before training in a study conducted in Addis Ababa, Ethiopia. *Aloyce, Leshabari, and Brysiewicz. (2014)* reported a similar result. They indicated that the level of triage nurses' skill was 52% before triage education in a study conducted in Dar Es Salaam, Tanzania. This result was following *Rahmati, Azmoon, Meibodi, and Zare (2013),* who found that the level of knowledge and practice in triage after the intervention was higher than before training with a statistically significant difference between phases of program evaluation in a study conducted in Vali Asr Hospital of Fasa University of Medical Sciences. *Haghdust, Safari, and Yahyavi (2010)* when reported comparable findings. The studied nurses showed moderate to excellent performance before training, but none of the participants exhibit poor performance after training.

The poor performance before training in the current study might be due to their deficient knowledge, absence of orientation for newly graduated and newly recruited nurses, lack of job training, continuous education. Besides, unavailability of resources, and insufficient materials, equipment in most governmental hospitals. Plus, overcrowding in governmental hospital's emergency departments leads to an increase in the workload on nurses caring for such a group of patients that result in inappropriate nursing care. Several studies emphasize this explanation.

Goransson, Ehrenberg, Marklund, and Ehnfors (2006) reported that 65.4% of emergency nurses did not attend training regarding triage skills in Indonesia. In Sweden, 60.3% of the nurses did not attend any triage training *(Fathoni, Sangchan, & Songwathana, 2010).* A study conducted in Switzerland reported a comparable finding of 59.6% of the nurses lacking the appropriate triage training *(Jordi et al., 2015).* This finding is supporting the second research hypothesis. *Jahromi & Dost (2017)* reported similar findings and emphasized that the educational training of triage is essential than work experience (that is not grounded on a sound base) in triage decision making *(Considine, Botti, & Thomas, 2007).*

The current study also denotes the stability of knowledge and performance improvement with a slight decrease when comparing the post and follow-up evaluations of the studied nurses. Nurses clarified this finding of forgetting some non-important, less familiar topics and focusing only on the typical case situations. The stability of the performance level has been examined in many studies. One of these studies is *Corner & Wilson-Barnett's, 1992)* study. They reported a nurses' performance level declining after three months of training. An earlier study by *Gould & Chamberlain (1994)* explained that most of the nurses forgotten or pay less attention to the practical part of the training, hence affecting their performance. This finding emphasized the need for continuous education, particularly in critical care areas *(Rahmati, Azmoon, Meibodi, & Zare, 2013).*

The current study shows an improvement in nurses' whole attitude immediately post and one month after program implementation. The number of nurses with a positive attitude increased with a highly statistically significant difference (P<0.001) between pre, post, and follow-up. This finding may be because the triage education had a noticeable effect on enhancing nursing performance through the program implementation phases. A strong positive attitude was revealed by *Afaya, Azongo, and Yakong (2017)*. The majority of nurses (92.3%) supposed the triage system should be implemented in ED and all hospital departments. A higher number of nurses, 62 (95.5%), agreed and strongly agreed that nurses at ED should undergo training/workshops on triage.

Furthermore, *Mohey and Alazmi (2017)* stated that about half of the studied physicians (49.8%) agreed, and 47.1% of nurses strongly agreed that emergency services were an essential component of primary health care. This finding further supports the third study hypothesis. Augmenting the current study results shows that education and training courses have a vital role in improving nurses' knowledge, performance, and attitude toward triage education.

7. Conclusion

Based on the findings of the present study, it could conclude that the nurses who are subjected to triage education improved in their knowledge, practice, and attitude at the post-intervention evaluation compared to their pre-intervention level. Moreover, they showed a higher knowledge, competent practice, and positive attitude maintained at one month follow up with a statistically significant difference among the three phases of the study. So, it could be evidenced that the triage education program improved nurses' performance regarding the application of triage for adult, pediatric, and obstetric emergency departments.

8. Recommendations

Based on the findings of the study, the following recommendations suggested:
- Publication and dissemination of the guideline educational program in ED service improve nurses' performance about triage for adult, pediatric, and obstetric patients.
- There is a constant need to foster and sustain the improvements in practices regarding triage in ED by the orientation of new nurses, on-the-job training, and continuous education.
- A further longitudinal study should be done to evaluate the effect of the researchers' guideline educational program on the nurses' performances toward triage in ED.

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