TRIAGE KNOWLEDGE LEVEL AND SKILLS AMONG EMERGENCY NURSES IN JORDAN: A QUASI-EXPERIMENTAL STUDY

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Abstract

Background: Literature indicated that the level of triage knowledge among Jordanian emergency nurses is at its substandard level. Recommendations were made for continuing education and training courses in triage to improve knowledge and skills in this regard. **Aim:** This study aimed to assess the effectiveness of the Triage Educational program upon triage knowledge and skills among emergency departments nurses in Jordan. **Methods:** The study used a one-group pretest-post-test design. Data were collected from 102 emergency nurses as a convenience sample by distributing a merged pre-designed questionnaire that assessed nurses' Triage knowledge about Emergency severity index (ESI) and Triage Skills (TSQ) before and after the online triage educational program using the Zoom application. **Result:** After the administration of the triage educational program, there was a significant improvement in the post-test mean scores of both triage knowledge and skills (M ± SD =13.70 ± 1.7; M ± SD =155.6 ± 9.6 respectively) compared to the pre-test scores of triage knowledge and skills (M ± SD =7.80 ± 4.4; M ± SD =105.65 ± 35.01 respectively). Based on their socio-demographics, a significant difference in Triage Knowledge and Skills Mean Scores among emergency nurses in Jordan was only for triage knowledge related to training courses or workshops about Basic Trauma Life Support (BTLS) during the previous year (p= 0.019), and Ambulance protocol (p= 0.02). **Conclusion:** Training and educational programs in the field of Triage are important to improve nurses' knowledge and skills in this aspect of emergency care. **Implications:** Findings of this study reinforced the importance of education about triage in the emergency departments. As well, as the integration of triage training in the undergraduate nursing education curriculum.

Keywords: Triage, Emergency Department, Educational Program, Knowledge, Skills, Jordan.

INTRODUCTION

Triage is the allocation of the patient in the right place at the right time to receive the right level of care along with the allocation of appropriate resources to meet the patient's emergent medical needs. Patients with varying degrees of severity present at the same time in the emergency departments (EDs), necessitating the employment of successful decision-making and proper patients allocation to reduce morbidity and mortality rates [1].

Emergency nurses are at the forefront of hospital service who are considered the main anchors of triage in hospitals ERs [2]. Triage nurses' decisions directly affect the time of providing medical care, thereby, reducing patients waiting time and improving the quality of patient care [3]. Failure to provide triage services may lead to serious consequences in patients' health conditions [4].

Accordingly, the triage nurses should have sufficient knowledge and skills to follow a triage steps and determine the acuity of cases, determine their priority for admission to the ED and treatment, and which patient should be seen first [5,6]. Nurses' Triage Knowledge and skills are strongly emphasized to be a critical element in the actual triage demonstration [7]. Previous studies in Jordan highlighted the level of triage knowledge and skills as to be "insufficient" to appropriately mange patients in the ED [8]. Recommendations made from these studies as to conduct educational sessions and training to enhance ED nurses knowledge in this regard. Moreover, the World Health Organization (WHO) [9] recommended triage training and education. This study responded to these recommendations and planned to fill this gap in knowledge and assess the Jrdanian EDs nurses triage knowledge after educational program for nurses at the ERs in Jordan.

METHODS

Specific aims: The study was planned to a) admister a triage educational program, b) assess the effectiveness of the triage educational program upon nurses triage knwoeldge and skills, c) determine if there are differences in triage knowledge and skills level based on socio-demographic variables and sample characteristics. The researchers formulated the following hypotheses (H) to be tested throughout the study: H1: There will be an improvement in Triage knowledge and skills among Jordanian nurses' after the administration of the Triage educational program and H2: There are differences in triage knowledge and skills among Jordanian nurses based on their characteristics and socio-demographics.

Design and Setting: A quasi-experimental one-group pretest-posttest design was used to meet the objectives of this study. The study took place in Amman, the capital of Jordan. It was conducted in collaboration with the Jordanian Nurses' Council (JNC)[10], which is one of the organizing bodies for the nursing profession in Jordan and has a mission as to improve the nursing profession and optimize the level of patient care. It offers continuing training courses to all nurses to attain the highest standard of patient care. Due to the COVID-19 pandemic restrictions, in-class sessions would be hazardous and threaten the safety of the participants. Accordingly, the Zoom application was used as an alternative way to conduct the educational program online. The JNC posted the meeting links to the recruited hospitals. Then, the link has been passed to the emergency Registered Nurses (RNs) in the selected hospitals.

Sample and Sampling: A convenience sampling technique was used for the purpose of this study. To make sure that the sample size is sufficient to get statistical significance, the sample size was calculated using G* power 3.1 software analysis program 3.1.9.7 11. An Alpha probability level of 0.05, a power of 0.80, and a medium effect size (0.30) were assigned. Based on that, the final sample size of 102 RNs working in EDs was recruited for this study.

Inclusion criteria: the study included RNs working in the adult ED in the Jordanian hospitals, who wo have spent a minimum of 1 year in the ED to obtain sufficient experience in triage, available at the time of data collection, and willing to participate in the study, having a smartphone or computer to contact; and having the zoom application and able to use it. Whereas, RNs who have no direct contact with patients such as RNs with administrative roles were excluded from the study.

Data Collection Procedure: Data were collected using an electronic structured Emetgency Severity Index (ESI)-based test. The principal investigator himself collected the data from RNs. During COVID-19 pandemic, RNs were unable to leave their work and attend educational sessions. The test was delivered to the RNs via the Zoom application to be answered and sent back to the researcher before and after the educational program administration. The researcher explained the way of completing the test after voluntary approval for participation by the RNs. An invitation letter and the information sheet were administered prior the the start of the study with clarification about the study and its purpose. Voluntary completion of the electronic test and program attendance was considered a consent to participate in the study as it was hard for the participants to give an electronic signature. A pilot study on 10% of the sample size (40 participants, excluded from the final analysis) was performed to make sure that the test is clear and understood. Based on piloting, no changes were necessary. The test-retest-reliability coefficient was 0.84. Moreover, the reliability of the test was checked by measuring the Cronbach's Alpha for the two sections and for the total test. The knowledge subscale has a Cronbach's Alpha of 0.71, the skills subscale 0.87, and the total score 0.82. Based on these results, the test was considered as valid and reliable.

Measurement of the variables: The variables under study were measured as follows:

Demographic Data: a 6-item Demographic Data Sheet questions was developed by the authors to collect data about the partcicipants' characteristics (Age, Gender, Educational level, Work experience, previous exposure to triage/training courses).

Triage knowledge: a 15-item test was used to asses RNs knowledge about the ESI. The questions were adopted from the ESI triage tool guide version 4's practice cases and competency cases [12]. Each question involves five multiple-choice options based on acuity levels of cases. A score of "1" was assigned for the correct answer whereas a score of "0" was assigned for the incorrect answer. The overall score for triage knowledge ranged from 0 to 15. To estimate the level of knowledge, the RN was considered as having a low level of knowledge if he/she scored below 7, moderate level if the total score was 7-10, and high knowledge level if the score was >10.

Triage Skills: a 37-item Triage Skills Questionnaire (TSQ) developed by Fathoni, Sangchan, Songwathana [13] was used to asses RNs Triage skills level. It measured the RNs' perceived ability in making decisions accurately and timely in the following areas of triage: rapid assessment, patient categorization, and patient allocation. Questions were answered using a 5 points Likert scale where 1= "needs improvement ", 2= "poor", 3= "fair", 4= "good", and 5= "very good". The total score for triage skills might be anything between 37 and 185. The overall score was transformed into percentage. The respondent was considered to have low skills level if he/she scored below 60%, moderate skills if the score was 60–80 %, and high level of skills if the score was above 80% [14-16].

The Educational Program: The Educational program was developed based on the Emergency Severity Index (ESI) handbook [12] that provided instruction related to ESI implementation, practice cases, and competency cases mechanisms, level of factual and procedural knowledge, some physiological and pathophysiological of acute and urgent cases: cardiac, advanced traumatic injury, acute pulmonary, fall cases, some special urgent medical cases, and how to implement triage system using an algorithm

that had been tested rigorously and deemed a valid and reliable five-level triage scale. The program was administered for RNs working in the emergency departments (EDs) in Powerpoint presentation lecture form. The material included an introduction to and the definition of triage in the ED, types, and its importance for patients and staff; Rapid Patient Assessment, Patient Categorization, and Patient Allocation based on Priority from 1 to 5. After being structured, the Triage educational program was submitted to the JNC to be approved. Then, the JNC facilitated the training by providing a lecture room for webinar meetings using the Zoom application.

The ESI [17], which was developed by Wuerz and Eitel in the United States in 1997, is a five-level triage scale that guides the nurse to prioritize emergency patients by answering questions such as who should be seen first and how long each patient can safely wait [12]. The assessment of a patient's airway, breathing, circulatory, neurological, and pain acuity. At first, the triage nurse merely looks at the patient's acuity level. If a patient does not meet the criteria for a high acuity level (ESI level 1 or 2), the triage nurse assesses the patient's expected resource demands to assist determine a triage level (ESI level 3, 4, or 5). The use of ESI requires special triage experience or a comprehensive educational program [12]. The algorithm asks the following questions: Does this patient require immediate lifesaving intervention? Is this a patient who shouldn't wait? How many resources would this patient require before the doctor can decide on him or her? and What are the patient's vital signs?

The five priority levels of patient categorization are explained as follows by Gilboy, in the Emergency Severity Index Handbook [18]:

Priority 1 - These patients require treatment right away or within two minutes. They are said to be in a life-threatening situation right now. Patients with cardiac arrest, respiratory arrest, and SPO2 deficiency are examples.

Priority 2 - They are patients who are facing a life-threatening situation. They should not be kept waiting for more than ten minutes. Patients with severe fractures, breathing difficulties, severe pain, signs of a stroke but not meeting level-1 criteria, patients on chemotherapy who are immunocompromised and have a fever, oncology patients with severe pain, patients with 10/10 flank pain who are writhing at triage, and a needle stick in a health care worker are examples. They're labeled as "instant" and have a yellow tint.

Priority 3- patients are those who have a potentially life-threatening ailment. They can wait up to 30 minutes (for example, for patients with significant fractures or who are dehydrated), but they require the most resources (laboratory or radiological studies, specialty consultation) before a decision can be made on the patient. They are marked with a green color code and are classified as urgent.

Priority 4 - Chronic complaints, medical maintenance, or medical disorders that do not pose a risk of death, limb, or vision loss. They have roughly an hour to wait. Ankle sprains and migraines are two examples. They are blue.

Priority 5 - Patients in this group are currently stable and do not require laboratory or x-ray services. They can wait for more than two hours.

Ethical Considerations: The authors of the ESI were contacted to have a permission to use the material. The study was approved by the Institutional Review Board (IRB) committee at the Applied Science Private University (ASPU) and the JNC, Amman, Jordan. Moreover, the study was totally anonymous, and no identifications were

required from the participants. The participation in the study was voluntary and the participants joined the educational program voluntarily and filled the questionnaires after a detailed explanation about the study and its purposes. Participants were assured that they have the right to withdraw from the study at any time, with no obligation to give a rational for withdrawal. All collected data were coded and entered to a pass-word protected computer with access only to the principal investigator and the co-investigators. Only aggregate data were used for the publication purposes.

Data Analysis

The 26th edition of the Statistical Package for Social Sciences (IBM Corp IBM, 2019) was used to analyze the data. All data were coded and entered to the software. Categorical variables (gender and level of education) were expressed as frequencies and percentages; continuous variables (level of Triage knowledge and Skills were expressed as means ± SD. To test the first hypothesis, the dependent (paired) t-test was employed. To test the second hypothesis, It was tested by performing an independent sample t-test which was used to examine the differences in knowledge and skills (for two- categorical variables), and a one-way ANOVA test (for variables of more than 2 categories). A P-value of 0.05 was preset for statistical significance.

RESULTS

One hundred sixty test/questionnaire were sent to the participants depending on the eligibility criteria before the administration of the online courses on Google Forms. A total of 111 test/questionnaires were completed for the pre-test (response rate= 69%), 102 completed test/questionnaires were returned back in the post-test (response rate = 64%). Incomplete test/questionnaires (58 ones) were declined.

Sample Characteristics

From 102 participants, 55 (53.9 %) were Female RNs and 47 (46.1 %) were male RNs. The age of the participants ranged from 25-40 years. Most of the participants have a bachelor's degree (56. 9 %) and 15.7 % have a Postgraduate degree. The maximum experience of RNs in ED was 1-3 years (3.1 %). In addition, the highest percentage of the RNs (38.2%) have an experience of 2 years in triage in the EDs (Table 1).

Table 1: Descriptive Statistics of Sample Characteristics

Variables	F (%) or M ± SD
Age	
25-30	43 (42.2%)
31-35	25 (24.5%)
36-40	21 (20.6%)
Above 40	13 (12.7%)
Gender	
Male	47 (46.1%)
Female	55 (53.9%)
Highest Educational Background	
Diploma in Nursing	28 (27.5%)
Bachelors in nursing	58 (56.9%)
Postgraduate in Nursing	16 (15.7%)
Experiences Nurse in the ED	
1-3 years	44 (43.1%)
4-6 years	41 (40.2%)
7-10 years	12 (11.8%)

above 10	5 (4.9%)
Nurse Experiences in Triage	
1 year	33 (32.4%)
2 years	39 (38.2%)
3 years	21 (20.6%)
4 years	6 (5.9%)
5 years	3 (2.9%)
Training and Continuing Education	
Basic Cardiac Life Support (BCLS)	
Yes	102 (100%)
No	-
Advanced Cardiac Life Support (ACLS)	
Yes	84 (82.4%)
No	18 (17.6%)
Basic Trauma Life Support (BTLS)	
Yes	41 (40.2%)
No	61 (59.8%)
Advanced Trauma life support (ATLS)	
Yes	9 (8.8%)
No	93 (91.2%)
Triage course	
Yes	8 (7.8%)
No	94 (92.2%)
Trauma in Nursing Care	
Yes	12 (11.8%)
No	90 (88.2%)
Ambulance Protocol	
Yes	8 (7.8%)
No	94 (92.2%)
Disaster Management	
Yes	9 (8.8%)
No	93 (91.2%)
Emergency Care	
Yes	57 (55.9%)
No	45 (44.1%)
Working Environment	
The Number of Nurses in ED Per Shift	12.03 ± 3.05
The Number of Doctors in the Triage Room Per Shift	1.77 ± 0.52
The Number of Patients Who Come to ED Per Shift	102.84 ± 38.34
The Number of Nurses in the Triage Room Per Shift	1.66 ± 0.48
Sum Skills and Knowledge	
Sum Pretest Triage Skills	105.65 ± 35.00
Sum Post Triage Skills	155.56 ± 9.6
Sum Pretest Triage Knowledge	7.80 ± 4.84
Sum Post Triage Knowledge	13.68 ± 1.7

Data in table 1 also shows the number of RNs in ED per shift at the hospital sectors showed a maximum of "20" and a minimum of "6". The mean was 12.03 ± 3.05. Moreover, the number of doctors in the triage room per shift at the hospital sectors showed a maximum of "3" and a minimum of "1", the mean = 1.77 ± 0.52. In addition, the number of RNs in the triage room per shift at the hospital sectors showed a maximum of 2 and a minimum of 1, the mean was 1.66 ± 0.48. Also, the number of patients who comes to ED per shift is a maximum of "200" and a minimum of 50, the mean was 102.84 ± 38.34. The number of triage knowledge questions in the questionnaires is 15, the total pre-test knowledge mean is 7.80 ± 4.84, and the scores

range is between "0.00" and "15.00". There was also a sum post-triage knowledge mean is 13.68 ±1.7, with a range of scores between "6.00" and "15.00".

The statistical analysis in a table (1) revealed that 102 participants (100%) had attended a BCLS course, 92.2% had not attended triage training in the previous year, whereas, more than half of the participants (55.9%) have attended an emergency care training course. Table (1) also shows the pre-post skills, the sum pre-test mean± SD of "105.65 ±35.01", and the range scores at a minimum of "37.00" and a maximum of "161.00". Also, table 1 shows the sum post-test skills mean of "155.65 ± 9.6", and the range scores at a minimum of "128.00" and a maximum of "179.00". This means that the participant engaged in courses had a range of triage knowledge and skills that have been improved in triage at the emergency department. The other characteristics of the participants are summarized in **Table 1**.

To test H1, an analysis of paired sample t-test has been performed. Analysis of paired sample t-test indicates that there was a significant difference in score for pretest triage knowledge mean =7.80 ± 4.84 and post-test knowledge mean =13.7 ± 1.7. Coadditions; t (101) = -12.04, p=0.000. Regarding Triage Skills, there was a significant difference in score for pretest triage skills mean =105.65± 35.01 and posttest skills mean =155.6 ± 9.6 coadditions; t (101) = -12.09, p=0. 000. Based on the result of the paired t-test, the H1 is accepted.

Table 2: Paired Sample t-test Analysis for Triage Knowledge and Skills Pre- and post-Triage Educational Program Administration

Variables	T-test:	M ± SD	T	Df	Sig
Triage Knowledge	Pre test	7.80 ± 4.84	-12.04	101	*0.000**
	Post test	13.7 ± 1.7			
Triage Skills	Pre test	105.65 ± 35.01	-12.9	101	*0.000**
	Post test	155.6 ± 9.6			

The mean difference is significant at p-value below   0.05 (0.000*)

Also, table 2 shows that there is a statistically significant increase in triage skills post-administration of the triage educational program (mean=155.6 ± 9.6) compared with the pretest scores (mean=105.65± 35.01). This difference in the Triage skills mean scores (49.95) is statistically significant t (101) = -12.9, p = 0.000. Results from table 2 support the first hypothesis (H1: There will be an improvement in triage knowledge and skills among Jordanian EDs RNs after the administration of the triage educational program).

To verify whether differences could have occurred by chance or not (effect size statistics) Eta square has been calculated, Eta square = tˆ2/tˆ2+N-1. The Eta square to pair 1 and 2 = 0.59 and 0.62 respectively. These values are considered as having a moderate effect on the guideline of Cohen (ref).

In the post-test, there was a significant difference in the triage knowledge mean scores between those who had BTLS (mean =13.90 ± 1.42; t (100) = -1.65, p=0.019) compared to those who did not attend BTLS (mean=13.34 ± 2.01). Moreover, there was a significant difference in the triage knowledge mean scores in the post-test triage between those who had Ambulance protocol training (mean =15.00 ± 0.00) and those who had not knowledge and those who did not have (mean =13.65 ± 1.72; t (100) = 2.35, p=0.02. Accordingly, H2 was accepted or differences in triage knowledge among Jordanian RNs based on BTLS and Ambulance protocol after the administration of the

triage educational program, while the H2 is rejected as related to differences in triage knowledge and skills among Jordanian RNs based on gender, any previous training course, or workshops conducted in the previous year, including BCLS, ACLS, ATLS, Triage course, Trauma Care Nursing Care, Disaster Management, and Emergency Care.

Table 3: Independent sample t-test Analysis for Triage Knowledge and Skills Pre- and post-Educational Program Administration Based on RN**s' Socio-Demographics**

Category	Variables	M ± SD	T	Df	Sig
Triage knowledge	**Basic Trauma Life Support (BTLS)** Yes No	13.34 ± (2.01) 13.90 ± (1.42)	-1.65	100	*0.019**
Triage skills	**Basic Trauma Life Support (BTLS)** Yes No	156.90 ± (10.6) 154.7 ± (8.84)	1.16	100	0.12
Triage knowledge	**Ambulance protocol** Yes No	15.00± (0.00) 13.56±(1.72)	2.35	100	*0.02**
Triage skills	**Ambulance protocol** Yes No	154.5± (6.46) 155.65± (9.84)	-0.324	100	0.08
Triage knowledge	**Gender** Male Female	13.9 ± (1.5) 13.51 ± (1.9)	1.08	100	0.36
Triage skills	**Gender** Male Female	156.51± (9.84) 154.75 ± (9.4)	0.93	100	0.71
Triage knowledge	**Basic Cardiac Life Support (BCLS)** Yes No	13.7 ± (1.7) 0.0 ± (0.0)	0.0	0.0	-
Triage skills	**Basic Cardiac Life Support (BCLS)** Yes No	155.6± (9.6) 0.0± (0.0)	0.0	0.0	-
Triage knowledge	**Advanced Cardiac Life Support (ACLS)** Yes No	13.9 ± (1.5) 13.51 ± (1.9)	-.74	100	0.09
Triage skills	**Advanced Cardiac Life Support (ACLS)** Yes No	156.31± (9.71) 152.1 ± (8.44)	1.72	100	0.07
Triage knowledge	**Advanced Trauma Life Support (ATLS)** **Yes** **No**	13.7± (1.7) 13.7 ± (1.71)	-0.18	100	0.54
Triage skills	**Advanced Trauma Life Support (ATLS)** **Yes** **No**	153.22 ± (10.13) 155.8 ± (9.6)	-.763	100	0.72
Triage knowledge	**Triage course** **Yes** **No**	14.13 ± (1.13) 13.64 ± (1.73)	.78	100	0.32

Triage skills	Triage course Yes No	151.63 ± (11.71) 155.9± (9.4)	-1.211	100	0.87
Triage knowledge	Trauma Care Nursing Yes No	13.66 ± (1.56) 13.7 ± (1.72)	-0.021	100	0.68
Triage skills	Trauma Care Nursing Yes No	154.6± (8.62) 155.7 ± (9.76)	-0.37	100	0.51
Triage knowledge	Disaster management Yes No	13.89± (1.4) 13.7± (1.73)	0.39	100	0.93
Triage skills	Disaster management Yes No	154.0± (11.76) 155.71± (9.42)	-0.51	100	0.22
Triage knowledge	Emergency Care Yes No	13.89± (1.4) 13.7± (1.73)	0.874	100	0.611
Triage skills	Emergency Care Yes No	156.33± (9.8) 154.6± (9.4)	0.92	100	0.34

The mean difference is a significant at p-value level below 0.05 (0.000*)

Also, H2 is rejected in case of Triage skills as related to BTLS and Ambulance protocol.

Moreover, as per the result of the one-way ANOVA, the H2 is rejected where there were no differences in triage knowledge and skills among Jordanian RNs based on age, highest educational background, experience in the emergency department, and experience in triage.

To make sure that whether the differences could have occurred by chance, effect size statistics was calculated by Eta square $=t^2/t^2+(N1+N2-2)$, The Eta square to triage knowledge for those with previous BTLS = 0.03. This value is a small effect on the guidelines of Cohen (REF).

Additionally, there was a significant difference between the triage knowledge based on training courses or workshops about the Ambulance protocol during the past year.

However, there was no significant difference between the triage skills based on any training, courses or workshops about Ambulance protocols during the past year.

The Eta square to triage knowledge based on the training for Ambulance protocol $=t^2/t^2+(N1+N2-2)$ = 0.05. This value is a small effect on Cohen's guideline (REF). The magnitude of the differences was small eta square to knowledge (BTLS) =0.03 and eta square for Ambulance protocol =0.05.

According to RNs' gender, there is no significant difference in triage skills and knowledge based on gender.

Additionally, there was no significant difference in triage skills and knowledge based on any training, course, or workshop conducted in the previous year, including BCLS, ACLS, ATLS, Triage course, Trauma Care Nursing, Disaster Management, and Emergency Care.

Table 4: One way ANOVA test Analysis for Triage Knowledge and Skills Pre- and post-Educational Program Administration Based on RNs' Socio-Demographics

ANOVA	Variables	M ± SD	F	Sig
Triage Knowledge	**Age** 25-30 31-35 36-40 Above 40	13.8 ± (1.41) 13.00± (2.5) 14.05 ± (1.3) 14.00 ± (1.00)	1.94	1.29
Triage Skills	**Age** 25-30 31-35 36-40 Above 40	155.05± (8.64) 155.84± (10.8) 155.14± (11.24) 157.4 ± (8.1)	0.21	0.89
Triage Knowledge	**Highest educational background** Diploma in Nursing Bachelor in Nursing Postgraduate in Nursing	13.96 ± (1.4) 13.45± (1.92) 14.00 ± (1.21)	1.23	.298
Triage Skills	**Highest educational background** Diploma in Nursing Bachelor in Nursing Postgraduate in Nursing	157.71± (7.52) 154.6 ± (10.21) 155.44 ± (2.62)	1.03	0.36
Triage Knowledge	**Experience** of RNs **in the ED** 1-3 years 4-6 years 7-10years Above 10	13.66 ± (1.43) 13.5 ± (2.14) 14.33 ± (0.78) 13.80 ± (1.30)	0.78	0.511
Triage skills	**Experience of** RNs **in the ER** 1-3 years 4-6 years 7-10years Above 10	155.8± (9.36) 155.00± (9.86) 156.33 ± (10.47) 156.60 ± (10.11)	0.95	0.96
Triage knowledge	**Experience of** RNs **in Triage** 1 year 2 years 3 years 4 years 5 years	13.52 ± (1.50) 13.74 ± (1.7) 13.62 ± (2.18) 14.67 ± (0.81) 13.00 ± (1.00)	0.72	0.58
Triage skills	**Experience of** RNs **in Triage** 1 year 2 years 3 years 4 years 5 years	157.03± (9.05) 155.82± (9.13) 150.91± (9.9) 161.00 ± (9.7) 157.67 ± (13.6)	2.04	0.096

One-way ANOVA was calculated to examine the differences in knowledge and skills among RNs based on their age, highest educational background, the experience of RNs in the EDs, and experience of RNs in Triage among RNs. As shown in table 4, there are no significant differences in triage skills and knowledge among RNs based on those listed SDs and characteristics of RNs.

DISCUSSION

This is while there is no comprehensive university course for triage systems in Jordan. The ER RNs must obtain training in order to avoid delays in patient care . The outcome triage RNs will be well in emergency triage, decision-making, and emergency nursing

care, especially since triage training is a required aspect of emergency nursing education [19]. Therefore, effective educational methods should be developed and provided to improve the decision-making skills of the RNs in the triage process.

In the USA organization called Emergency RNs Association (ENA), advises that triage RNs have a minimum of 6 months of experience in an emergency department, as well as didactic and clinical orientation with competent instructors [20].

In the current study, the triage knowledge mean score was found to be increased after the educational program compared to the pretest. Consistent findings were available in the literature [15,21,22]. Knowledge is an important background for any practice. Having a certain level of knowledge in triage is essential for RNs in the EDs. It can assisst RNs improve patient health outcomes. It also can assisst RNs minimize the patients' waiting times, reducing hospital stays, and enhancing patient flow [3,20]. Suffecient knowledge in triage can ensure that patients are recognized, classified, treated, and discharged as quickly as possible [16,23]. In general, knowledge is gained and accumulated through learning processes which may involve formal or informal instruction [24]. This was the theoretical baseline for this study as to give basic knowledge about triage to be transferred into practice.

The EDs are the areas of the first encounter with the patients in the hospitals. The most critical patients with the most emerging needs are seen in the EDs. Miss or near tmiss of cases can happen there because they are misdiagnosed due to incompetent triage attempts by RNs or doctors. So, having knowledgeable RNs in patient sorting areas can save the lives of these patients [25]. It is critical for triage RNs to accurately perform brief initial assessments to speed up transferring patients to the right treatment areas. Based on clinical results, patients are assigned to different treatment areas, such as a quick-care section or the main EDs treatment area.

The world health organization [9] emergency care recommendations indicate that standardized short courses for RNs working in emergency care should be provided to strengthen their knowledge and skills in triage [9]. Moreover, several international studies have indicated a low percentage of emergency RNs' knowledge regarding triage in the ER which suggests a gap that can be enhanced through the emergency staff personnel's capacity building [26,27]. Recommendations made by these studies emphasized that there should have a standardized training system to appropriately train RNs in the EDs about triage and other emergency care systems [28].

Moreover, result from this study were further confirmed by Tran et al. [15] who implemented an educational program about triage using the ESI framework. Following an educational session, it was found that the participants' test results have improved, indicating that the nursing staff may benefit from longer and more targeted exposure to the ESI educational program. It has also been demonstrated that educational programs improve knowledge and skills in making triage decisions [29]. RNs were also found to have improved triage knowledge, practice, and attitudes in the post-intervention evaluation compared to their pre-intervention levels [19]. Not only RNs can benefit from triage education, medical interns demonstrated an improvement of knowledge and decision-making after ESI triage-based teaching [22].

Adoption of triage modalities is necessary to guide the RNs in the EDs. The ESI triage guidelines is the most commonly used one in the EDs for assigning patients to their appropriate segment of care. Its integration into the practices and training activities of RNs can improve patient care whereas lack of a formal triage system impacts timely

intervention and mortality [30]. Furthermore, emergency departments can enjoy a more systematized and organized manner of managing their patients. Consequently, with the improved knowledge of the RNs about triage and ESI, their confidence might be increased as well. As a result, the patients can recognize enhanced service and quality of care.

In the current study, the program showed its positive impact upon triage knowledge. Similar findings were found [31]. However it was not a marked increase, this can be explained by the shortened duration of the program and the way of delivering knowledge because of the COVID-19 restrictions. Longer duration programs, face-face or in-house sessions might be of better outcomes. Studies in this regard and evaluation of their effects are indicated. Moreover, training with different instructional methodologies and educational approaches must be included such as demonstration as advocated by the available studies [32,33]. However, in-house learning might be encouraging for learning and interaction, the use of new technologies in teaching and learning has been proven to benefit healthcare systems in case of physical availability if the classroom are not possible. For example, it was reported that using current technology, such as online learning, where a web-based course was used, triage knowledge and skills were optimized [34]. In one of the studies, the findings show that there was no significant difference in knowledge scores between the mobile health and workshop groups before the intervention, but there was a significant difference after 2 weeks, and electronic programs were an appealing education method for emergency nurses because educators empower nurses to take more responsibility for their learning in these methods. As a result, it is proposed that authorities adopt mobile health in conjunction with ordinary training because it is less expensive and takes less time [35]. Further studies in different settings are indicated.

In Jordan, triage is still a growing national concern and recognized standardized Jordanian national guidelines for triage in ER are not available. Clear triage protocols are indicated to be disseminated and applied at the national level. Some health organizations started to raise concerns and start planning for triage standardized guideline in EDs, especially after the COVID-19 pandemic. Jordanian Nursing Council (JNC) conducted on-line workshops to increase knowledge about triage in EDs [10].

In the current study also, although moderate, there was a significant difference in the mean score of triage skills after the implementation of the triage educational program. This result came congruent with another study that observed the improvement of triage skills among the participants and the accuracy of triage decision-making across time [36]. Triage education has been found to help skilled emergency department professionals perform the job of triage [37]. A scenario-based education that has been used in this study could contribute to the increased and upgraded triage skills levels as rated by the participants themselves. This was advocated in the literature [38], and consistent findings were reported indicated that ED RNs had a moderate level of triage skills before training which was improved after scenarios training. Based on that, practical scenarios and triage drills or simulations are recommended to keep RNs prepared for critical situations in ER [39].

Traditionally, it has been assumed that knowledge is automatically translated into behavior [40], despite studies indicating that this is not necessarily true [41]. Having a certain level of knowledge might be reflected on the individual's attitudes, skills, and practice. On the other hand, attitude involves evaluative concepts associated with the

way people think, feel, and behave [41]. In the nursing field, RNs must gain knowledge of proper patient care through different channels of learning that encompass a positive change in their attitudes toward patient care. Skills refer to how people demonstrate their knowledge and attitude through their actions [42]. This framework is acknowledged to be adopted and integrated with nursing education in order to achieve a better outcome of the educational process, thus, better patients care by RNs. To some extent, this approach was implemented to equip RNs with sufficient knowledge necessary for triage in an attempt to improve their skills in triage. Measurement of attitudes in relation to triage is advised in further studies.

In order to assign patients to the appropriate region for adequate care, triage needs a high degree of clinical assessment skills [43]. Moreover, there are the EDs nurses must have triage skills, which are based on the ability to prioritize patients into the most appropriate urgency-of-care categories in a short amount of time. Because of information gaps, nurses' triage skills may be inadequate. Therefore, the accuracy of triage decisions may aid in the smooth flow of patient treatment in the emergency department, but inaccuracy may result in overcrowding, delayed care, and an extended stay in the emergency department .

The current study evaluated self-reported skills levels. RNs may overestimate their abilities to encounter emergencies and properly triage them. Observational studies and audit checklist evaluations in real situations are indicated for better assessment of the triage skills.

The current study found a significant improvement in RNs' total triage knowledge based on the training course or workshop on the Ambulance protocol and BTLS in the previous year after the triage educational program. Whereas, there was no significant differences in total triage skills among Jordanian RNs based on BTLS and Ambulance protocol. The current investigation discovered a statistical difference in the levels of knowledge and skills among socio-demographics, where no previous studies had substantiated and profounded a discussion on this issue.

At the same time, no significant differences in triage knowledge and skills were found among Jordanian RNs based on their age, gender, highest educational background, experience in the EDs, experience in triage, any training, course, or workshop conducted in the previous year, including BCLS, ACLS, ATLS, Triage course, Trauma in Nursing Care, Disaster Management, and Emergency Care.

In the current study, there is no difference in knowledge and skills between male and female RNs as they are both joined the same nursing schools. The vast majority of the sample were holders of a Bachelor degree in nursing, thus, have the same curriculum. Based on that, female and male RNs in Jordan are prepared at the same level. Consistent findings [44,45] and contradictory findings [44] were found in this regard. Age also could make no differences in the triage knowledge and skills. One of the studies in Saudi Arabia showed a positive relationship between age and triage knowledge, whereas, no significant relationship was revealed between age and triage knowledge. Within the same study, the years of experience showed a significant positive relationship with triage knowledge among EDs RNs. The statistical results showed that training courses, gender, and educational level are not factors that influence triage knowledge among RNs [45]. Triage knowledge, motivation, and years of work were found to be positively associated with the implementation's accuracy of triage in the ED [44].

The working experience in a specific care setting might upgrade the RNs ' knowledge and skills. So, most of the skilled RNs are those with a high number of working years in the emergency department or the triage room. There is a common adage that says: "practice makes perfect". Therefore the work experience gained over time leads to the enhancement of skills, and performance [46]. Benner's theory stipulates that a competent RNs must have more years on the job in the same field [47]. Experience is a well-recognized source of knowledge. Its role in enhancing knowledge and skills was emphasized by several studies in the recent literature in the field of triage. Good triage skills were the most experienced RNs with more than 10 years of working experience in the emergency departments [48]. It has been reported that one of the factors that influenced the accuracy of triage implementation is the years of experience [44]. In addition, the role of experience was showed alongside passing educational courses as factors that affected triage decisions has been emphasized [49], and a significant positive correlation between triage skill and working /training experience was found [50]. Unexpectedly, the findings of the current study failed to confirm this notion. There were no statistically significant differences in triage knowledge and skills following an education program related to emergency department experience and triage experience. These results could be explained by that the vast majority of the participants' experiences are clustered in 1-6 years in nursing and 1-2 working in the ED. Studies with larger sample size investigating triage knowledge as related to experience are indicated.

A possible interpretation for the results in the current interpreted as progress in nursing education improving RNs' knowledge of emergency cases and triage. Limited settings can explain these findings no differences in triage knowledge and skills Based on socio-demographics. Experimental studies with a larger sample size are indicated and heterogeneous disruption.

Sutriningsih, Wahyuni, Haksama 20 The findings of the study on the level of factual and procedural awareness required by emergency nurses to undertake rapid evaluations, patient categorization, and allocation are referred to as triage knowledge. Nurses' expertise was backed up by their participation in several triage decision-making training programs, such as emergency Disaster management, BLS, BTLS, and ECG resuscitation. The level of factual and procedural awareness required by emergency nurses to undertake rapid evaluations, patient categorization, and allocation was referred to as triage knowledge 14.

CONCLUSION

The results of this study showed that the RNs triage knowledge and skills have been improved after the administration of the ESI-based triage educational program. These findings highlighted the emergency personnel should be continuously trained, to be able to professionally perform their work to assign patients to the right place at the right time to receive the right care. Furthermore, previous training courses are of certain importance so they could agonize RNs triage knowledge and skills aquisition. Age, gender, highest educational background, experience in the ER, or experience in triage made non-significant differences in triage knowledge and skills. Various training approached triage drills are continuously recommended.

LIMITATION

This study used a self-reported skills evaluation tool. Participants may over-rate themselves. Accordingly, repeating the study using observational studies that include audits/ observation checklists in the field is indicated to give more valid and reliable results.

RECOMMENDATIONS

The implications of this study and the recommendations for future nursing research, practice, education, and administration are presented as follow:

- Clinically / practice: This kind of program should be frequently repeated as indicated by the results of this study that triage-related education/training programs are important and beneficial for improving the knowledge as well as the readiness of EDs RNs to manage cases in this area of care.

- This topic could be included in continuous nursing education especially in the orientation phase and mainly for those who are assigned to work in EDs.

- Educationally: It is recommended that authorities in education include classes about triage at EDs into their existing curricula. In addition, using different educational modalities such as simulations, virtual triage drills, and case scenarios in triage training.

- Administratively: health authorities such as hospitals and the Ministry of Health must strengthen triage in EDs practices by providing adequate education for health personnel through triage training/drills. Training can also strengthen RNs knowledge and skills, and as a result, strengthens their readiness and needs the light of stander for triage in EDs.

- Research: Future research is indicated to repeat the study using experimental designs, with larger samples, and including diverse settings of care to get statistically significant and generalizable results. In addition, using more advanced statistical tests such as multivariate analysis to analyze socio-demographic factors, predictions of triage response areas, with larger sample size, and more settings of EDs from all hospitals in Jordan. Furthermore, the experience of RNs and the method of qualitatively detecting obstacles for triage in EDs may be useful.

- Also, it is recommended to conduct a control group design and/or an experimental gr to examine the educational program in both groups. This may increase the possibility of generalizability of the study findings.

Triage Knowledge:

It is well known that adequate and extensive clinical knowledge and emergency nurses' skills regarding triage can help to provide optimal emergency care. Also, Knowledge and action have a strong relationship since they are backed by good experience and training, allowing them to be used in the workplace in actions based on triage labeling [51]. Guidelines indicate training as a component for improving emergency care.

Gurning, Karim [52] showed that there is a relationship between knowledge and triage skills based on priority, showed that there is the significant relationship. Understanding the Better implementation of triage requires knowledge and skills with continuing education and training related to triage [50]. Moreover, with professional knowledge, triage nurses must possess clinical skills which include technical skills [53].

AlMarzooq [45] The results showed significant differences between nurses who received triage courses and their overall knowledge about triage

Khrawish, Abu-Shahrour [8] results showed that the level of triage knowledge among Jordanian emergency nurses is poor, while the level of total triage skills among Jordanian EDs nurses is excellent. Also, there was a positive relationship between triage knowledge and all nurse-related characteristics (age, experience in nursing, experience in emergency department, experience in triage room) and a positive relationship between triage knowledge and working experience as nurses in the EDs triage room and working experience as a nurse in the with total triage skills.

In Indonesia's East Java province, Fathoni, Sangchan, Songwatthana [14] The results obtained show that there are significant positive correlations between triage skill and working experience (r =.27, p.01), training experience (r =.37, p.01), and triage knowledge (r =.38, p.01), and a better understanding of triage skills among ED nurses, implying that continuing education and training courses related to triage and advanced management of medical emergencies for emergency registered nurses are required to increase and update triage skills in enhancing the quality of emergency care and patient safety.

Bijani, Torabizadeh, Rakhshan, Fararouei [54] A triage nurse must also be able to reliably measure and record a patient's vital signs, evaluate a patient's level of consciousness, perform (CPR), and (ECG), according to them, B) teamwork skill: According to the interviewees' experiences, triage nurses must be adept at not only inter-professional communication, but also management and leadership (making inter-departmental arrangements, organizing and guiding personnel), task assignment, and time management in team wound situations, because conditions in emergency departments are unpredictable.

Zamanpour, Ebrahimibakhtavar, Parsian, Abdollahi, Rahmani [22] The findings of the study showed that ESI triage-based teaching had a positive impact on medical interns' knowledge and decision-making. Theoretical and practical educational courses for medical students are proposed based on the findings of this study and the necessity of triage. Zamanpour recommended that it may be more effective if education is continuous, and students are driven to learn more.

Al-Faqeer, Yehia, Malak [55] There was a strong link between triage knowledge and participants' educational level, emergency experience, triage training course, duration of triage training course, triage skills, and triage practices related to an emergency experience, according to the study. Practices, according to the author, should be used as a basic

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