EFFECT OF IMPLEMENTING TRIAGE TRAINING COMPETENCIES ON NEWLY GRADUATED NURSES WORKING IN EMERGENCY HOSPITAL

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Abstract:
Triage is one of the most important managerial and decision making concepts in emergency, it brings the most benefit to the greatest number of patients. Triage is important for redistributing and reducing waiting times and enhancing patient and family satisfaction and improving the quality of health care. Therefore, the **aim of this study** to determine the effect of implementing triage training competencies on newly graduated nurses (NGNs') working in emergency department (ED) at emergency hospital. **Patients and Methods:** A quasi experimental research design was utilized during the current study and it was conducted on 50 NGNs' who have a bachelor degree of nursing and are involved in providing direct care for emergency patients in the Emergency Hospital at Mansoura University and who are willing to participate in the study was constitute the study sample (study group). While control group of (25 nurses) who have a bachelor degree of nursing and are involved in providing direct care for emergency patients in Talkha Hospital. **Results**: The mean triage knowledge score increased immediately and post program implementation for the study group from (32.9±1.73 to 32.6±1.78 out of a total score of 35) compared with (13.44±1.78) to (13.52±2.04) for the control group. Also, triage performance increased immediately and post program implementation for the study group from (135.5±4.26 to 134.42±2.41 out of a total score of 140) compared with (56.44±8.21) to (56.76±7.79) for the control group. Moreover, there was a highly statistical significance difference between the study group and control group in relation to NGNs' knowledge and practice in post and two month post program implementation *p = 0.001. While there was no statistical significant difference between study group and control group in pre program implementation. **Conclusion:** The findings of this study indicated that there are deficits in triage knowledge and skills of NGNs' working in the ED of the emergency hospital. With these findings it is therefore imperative to establish proper triage training program that will help to establish and improve NGNs' knowledge and skills on triaging in emergency hospital.

Key words: Triage, Triage Knowledge, Performance, Triage Education, Training Experience, Triage Nurse, Emergency Nurse, Triage Competencies

Introduction:

Emergency department (ED) is an integral unit of the hospital, it is designed to provide immediate care twenty four hours every day to patients who are suffering from acute injuries and illnesses as well as patients with life threatening conditions. Worldwide, the number of patients arriving at ED has increased over the past few years.

This raised a concern of the need for a system that assessed and classified patients in the order of urgency. This classification process is termed triage. Triage is the process of rapidly sorting and prioritizing

emergency department patients according to their need for medical care, irrespective of their order of arrival [1,2,3,4,5].

Triage is one of the most important managerial and decision making concepts in emergency, it brings the most benefit to the greatest number of patients. Triage is important for redistributing and reducing waiting times and admission rates, enhancing patient and family satisfaction and improving the quality of health care [2,6,7].

An effective triage system classifies patients into groups according to acuity of illness or injury and aims to ensure that the patients with life threatening illness or injury receive immediate intervention and greatest resource allocation. There are various types of triage scales have been developed to classify emergency patients consistently and to achieve acceptable health outcomes. Triage scales usually have 3 to 5 categories. The most commonly used scale is the Australian Triage Scale (ATS), which has 5 categories with their corresponding level of treatment acuity. The five levels are: level one- immediate life threatening, level two Imminently life threatening, level three-urgent, level four- semi urgent and level 5-non urgent [2,8,9].

The other international triage scales in common use are the Canadian Emergency Department Triage and Acuity Scale (CTAS), The Manchester Triage Scale and Emergency Severity Index (ESI). The current trend now is towards the use of five level systems based upon the growing evidence that five level triage acuity data are more reliable and valid than three level triage system [10,2,11].

Triage is the first pathway to competency therefore triage needs to be applied in all ED. In depth continuing education has been associated with maintaining clinical competency for NGNs'. They have limited experience when they enter the work force

and fearful of making mistakes and feel incompetent to deal with emergency patient [12,13]. Competency refers to ongoing ability of a nurse to integrate and apply the knowledge, skills, judgement and personal attributes required to practice safely and ethically. Assessing the competence of NGNs' is essential in order to identify areas for professional development and educational needs and develop nurses knowledge and skills over time through education and experience. Many methods of assessing competency, including knowledge tests, lab simulations and clinical bedside observation [14,15,16,17,18].

Although triage was used in many ED there was no available evidence demonstrating its benefits and no standardization of the triage process [19]. Many studies found that there is a serious concern in terms of nurses' knowledge on triage. In this regard, several studies reported that poor level of knowledge and performance on triage among emergency triage nurses which emphasizes the need for more triage training to be provided for the emergency triage nurses [20,21]. Further research recommended to test the effectiveness of educational programs and training courses on triage knowledge and skill for emergency nurses [3,22,23]. Therefore, this study will be carried out to determine the effect of implementing triage training competencies on NGNs' working in ED at emergency hospital.

Aim of the study:

The aim of this study was to determine the effect of implementing triage training competencies on NGNs' working in ED at emergency hospital.

Research hypothesis:

Implementation of triage training program will be expected to increase knowledge and practice score level of NGNs' post program implementation.

Subject and Methods
Study Design:

A quasi experimental research design was utilized to determine the effect of implementing triage training program on the on NGNs' knowledge and practice.

Setting:

This study was conducted at the emergency departments of Talkha Hospital (Ministry of Health) and Emergency Hospital of Mansoura University.

Subjects:

All newly graduated nurses' (50 nurses) who have a bachelor degree in nursing and are involved in providing direct care for emergency patients in the Emergency Hospital at Mansoura University and who are willing to participate in the study constituted the study sample (study group). While control group included (25 nurses) who have a bachelor degree in nursing and are involved in providing direct care for emergency patients in Talkha Hospital.

Ethical Approval:

All NGNs' gave a informed oral consent and the study was approved by the Research and Ethics Committee of the Faculty of Nursing, Mansoura University.

Tools:

Data were collected using three tools in order to achieve the aim of the study.

Tool one: It consists of two parts:

Part I:"Socio-demographic data "

This part consisted of nurse's age, marital status, educational level, job title, years of working experience, working hours/week.

Part II:"Nurse's Knowledge Assessment Questionnaire"

This Questionnaire adopted from Salem and modified by the researcher based on the reviewing of the literature [24,25,26,27,28,29,30,31]. It was used to assess and evaluate NGNs' knowledge about triage process in the ED and it was used pre and post program implementation. It included 35 multiple- choice questions divided into triage safety (3 questions, triage process (6 questions), across the room assessment (2 questions), primary assessment (14 questions), secondary and focused assessment (10 questions).

Scoring system of nurse's knowledge was done as follows, each question had a group of answer points, each correct answer had (one grade), while, no or wrong answer had (zero). Total score for all questions was 35 scores. The total score was classified into three categories as follow: poor knowledge 20.9 (<60%), good knowledge 21-26.21 (60%-74.9%), and very good knowledge 26.25-35 (75%-100%).

Tool two "Nurse's Practice Observational checklist" This tool was developed by the researcher based on the reviewing of the literature [32,33,17,28,7,34]. It was used to assess and evaluate the competency level of NGNs' performance in triage process. Total competencies for the checklist was (70). It was distributed as the following: triage safety (10), triage process (7), across the room assessment (1), primary assessment (21), secondary and focused assessment (31).

Scoring system: each item of nurse's performance scored on the bases of "*Not done*": (zero) or "*Done*" {Incompetent (incomplete and incorrect): (1 point) and Competent (done complete and correct): (2 point)}. The total competencies for the observation checklist was (70), it was scored out of 140 (100%). It was classified into the following categories: poor competency <70 (<50%), quiet good competency 70-<91 (50- <65%), good competency 91-<105 (65- <75%), and scores ≥105 (≥ 75%) a very good competence.

Tool three "Nurse's Communication and interpersonal relationships Observational checklist" This tool adopted from *Salem (2006), Hurme (2007)* and modified by the researcher based on the reviewing of the literature[32,14,35,11,36]

.It was used to assess and evaluate NGNs' interpersonal and communication skills when performing triage process.

each item of nurse's performance scored on the bases of "*Not done*"*:* (zero) and "*Done*" {Incompetent (incomplete and incorrect): (1 point) and Competent (complete and correct): (2 point)}. The total competencies for the observation checklist was (20), it was scored out of 40 was classified into the following categories: It was classified into the following categories: poor competency <20 (<50%), very low competency 20-<26 (50-<65%), good competency 26-<30 (65-<75%), and scores ≥30 (≥75%) a very good competence.

Method:

Permission to conduct the study was obtained from the hospital administrative authority of (Emergency Hospital of Mansoura University and Talkha hospital). after explanation of the aim of the study. Tools were tested for their reliability and validity, were reviewed by a jury composed of 5 experts in the field of Critical Care& Emergency Nursing and Critical Care Medicine for revision of its content validity and clarity. Moreover, the reliability of the tools was estimated using the Cronbach's Coefficient alpha test. The reliability of the tools showed higher level of internal consistency (0.91,0.98&0.98) for tool I,II,III respectively. A pilot study was carried out on 10 nurses to test clarity, feasibility, objectivity and consistency of the tools. The study was carried out The study was conducted at first June 2013 till the end of March 2014. It was conducted on four phases; assessment phase, program preparation phase, implementation phase and evaluation phase.

Phase one: Assessment phase

During this phase, the researcher assessed NGNs' knowledge and skills for both groups (control & study) regarding triage process. a) The researcher assessed *NGNs' knowledge* about triage process in ED. It was performed for the study and control groups pre program implementation by using tool I and lasted about 35 minutes according to their working shifts to assess their knowledge. b) the researcher assessed *NGNs' practice* about triage process by direct observation of nurses' competent performance and NGNs' were observed according to their working shifts to assess their performance. It was done for both groups in preprogram implementation by using tool II. c) the researcher assessed NGNs' communication and interpersonal relationship by using tool III. It was done in pre program implementation for the study and control groups.

Phase two:" program preparation phase" The researcher designed triage training program and triage training booklet. The teaching triage training program was composed of 10 sessions (Theoretical and practical training sessions). *Theoretical sessions* focused on: important, principles of triage, triage safety, triage process and systems, important of communication, and role of triage nurse. *Practical sessions* focused on: triage categories, communication skills, critical look, primary assessment, and secondary assessment. Designed triage training program were tested for content-related validity by 5 experts in the field of Critical Care& Emergency Nursing and Critical Care Medicine. A booklet containing the content of the program was designed and translated into a simple Arabic language by the researcher. Triage tag was designed by researcher and it was distributed for NGNs' to be used during triage process according to the urgency of the patient's condition.

Phase Three " Implementation of triage training program" This program was implemented in the Emergency Hospital at Mansoura University and it was done for the study group only. It were delivered throughout five weeks periods, every week involved two sessions, and every session

took fifty to sixty minutes approximately. This time is between morning and afternoon shift. ***Theoretical sessions*** explained by using simple, brief and clear words; the researcher summarized each session at the end with NGNs' and emphasizing the most important points included in each session. Teaching methods were used including lectures, open discussion, and brain storming. Also, the researcher was used other audio visual material such as slide presentation, simple pictures, and booklet. Each NGNs' received " Triage training booklet" to attract her attention, motivate her and support her teaching. ***Practical sessions*** has lasted from thirty to forty minutes during the shift work. The audio visual material were used including, demonstration, and re-demonstration. The study was conducted at first June 2013 till the end of March 2014.

Phase Four" Evaluation phase"

During this phase, the researcher evaluated NGNs' knowledge and skills for the study and control groups regarding triage process. A) The researcher evaluated knowledge of NGNs' about triage process in ED. It was performed for the study and control groups in pre, post and two month post program implementation by using tool I and comparing results of assessment pre and post, two month post program implementation. B) the researcher evaluated skills of NGNs' practice about triage process by direct observation of nurses' competent performance. It was done for the study and control groups in pre, post and two month post program implementation by using tool II and comparing results of assessment pre and post, two month post program implementation. C) the researcher evaluated NGNs' communication process by using tool III. It was done in pre, post and two month post program Implementing.

Statistical analysis

The collected data were organized, tabulated and statistically analyzed using the statistical package for social studies SPSS (Statistical Package for the Social Sciences) version 16.0 Figures were made using Excel software. The quantitative data were presented as a mean and standard deviation. Student t-test was conducted to compare the mean of continuous variable for two different groups of individuals and paired t test used for comparison between paired groups. The qualitative data were presented as number and percentage. The chi-square ($\chi2$) was used to find the association between variables of qualitative data. The P value of < 0.05 and ≤ 0.001 indicate significant and highly significant results respectively. Pearson correlation used for correlation between continuous parametric data .

Results:

This part presents study findings regarding the effect of implementing triage training competencies on NGNs working in ED at emergency hospital. The results will be presented in 9 tables.

Table   5.1:   Illustrates   frequency distribution of the NGNs in the study and control groups according to their socio-demographic data. This table shows that all NGNs for the study and control group were in the age groups from 20 to 30 years and had a Bachelor degree. Regard to the marital status, 78.0% of the study group, compared to 60.0 % in the control group were married. While 22.0% of the study group are single compared to 40.0% in the control group. Concerning to years of experience, it was found that, all NGNs for the study and control groups had less than 5 years of experience in the ED. It can also be noted that, 42.0 % of the nurses worked 40 to less than 45 hours per week, compared to 60.0 % in the control group. While 58.0% of the study group working 45 hours and more, compared to 36.0% in

the control group. In relation to the triage training in ED, It can also be observed that the majority of nurses 90.0% in the study group not attend any triage training compared to 80.0% for the control group. While 10.0% of the study group practiced triage in an ED compared to 20.0% for the control group. There is no any statistically significant difference between the study and control groups in relation to socio-demographic data.

Table 5.2: Illustrates comparison between the study and control groups regarding triage knowledge mean score in pre, immediately and two months post program implementation. This table reveals that, there were highly statistical significant difference between the study and control groups regarding to the total mean score for all items of triage knowledge in pre, immediately and two months post program implementation.

There were highly statistical significant difference between the study and control groups regarding triage knowledge safety, triage knowledge process, across the room assessment, primary and secondary assessment immediately and two month post program implementation *p = 0.001. While there was no statistical significant difference between the study group and control groups in relation to triage knowledge safety, across the room assessment, and secondary assessment in pre program implementation.

In relation to triage safety (total score 3), it should be pointed that, total knowledge mean score of the study group were increased immediately and two month post program implementation respectively 2.86±0.4 and 2.78±0.42 with highly statistical significant difference in pre, immediately and two month post program implementation, *p = 0.001.

Concerning triage process, it can be observed that, triage knowledge mean score increased immediately and post program implementation for the study group from 5.66±0.52 to 5.58±0.61 out of a total score of 6 compared with 3.24±0.88 to 3.12±0.88 for the control group.

In relation to primary assessment knowledge (total score 14), It was observed that total knowledge mean score of the study group was increased immediately and two month post program implementation. There were highly statistical significant different between the study and control group after applying sessions.

Concerning to secondary assessment knowledge (total score 10), it was found that, total knowledge mean score of the study group was increased immediately and two month post program implementation respectively 9.4±1.14 and 9.38±1.16 with highly statistical significant difference in pre, immediately and two month post program implementation.

Table 5.3: Illustrates comparison between the study and control groups regarding triage practice mean score in pre, immediately and two months post program implementation. This table reveals that, there were highly statistical significant difference between the study group and control groups regarding to the total mean score for all items of triage practice in pre, immediately, and two months post program implementation.

It was observed from the table that there were highly statistical significant difference between study and control groups regarding practical competency of triage safety, triage process, across the room assessment, primary and secondary assessment immediately and two months post program implementation. There was no statistical significant difference between study and control groups in pre program implementation regarding across the room assessment. In addition, there were highly statistical significant difference between the study and control group in pre program implementation

regarding triage safety, triage process, primary and secondary assessment.

Concerning triage safety competencies (total score 20), it should be pointed that, total practical competency mean score of the study group was increased immediately and two months post program implementation respectively 19.52±2.73, and 18.92±0.75 compared with the control group immediately and two months post program implementation respectively 6.68±1.41, and 6.84±1.4. There were highly statistical significant difference between the study and control groups in pre, immediately and two month post program implementation.

In relation to triage process competencies, it was found that the total competency mean score was increased immediately and two months post program implementation for the study group from 13.88±2.81 and 13.36±0.69 out of a total score of 14 compared with 4.84±1.1 and 4.88±1.05 for the control group.

Concerning primary assessment competencies (total score 42), It can be observed that the total competency mean score of the study group was increased immediately and two months post program implementation. There were highly statistical significant different between the study and control groups after applying sessions where p values were.

In relation to secondary assessment competencies (total score 62), it should be pointed that, total competency mean score of the study group was increased immediately and two months post program implementation respectively 60.76±1.48 and 60.58±1.55 with highly statistical significant difference in pre, immediately and two months post program implementation.

Table 5.4: Presents total triage knowledge mean score of NGNs between the study and control groups in pre, immediately and two months post program implementation. This table reveals that total knowledge mean score of the study group in relation to NGNs knowledge regarding triage safety, triage process, across the room assessment, and primary and secondary assessment were very good knowledge immediately and two months post program implementation, while control group were poor knowledge in pre, immediately and two months post program implementation.

Table 5.5: Presents total triage competency mean score of NGNs between the study and control groups in pre, immediately and two months post program implementation. This table shows that total competency mean score between the study group and control group in relation to NGNs practice regarding triage safety, triage process, across the room assessment, primary and secondary assessment, it was found that there were poor and quiet good competent pre program implementation. While there were increase in competency level of the study group from poor competency to very good competency immediately and two months post program implementation.

Table 5.6: Presents comparison between the study and control groups regarding communication process mean score in pre, immediately and two months post program implementation. This table shows that total competency score between the study group and control groups regarding communication process, it was found that there were poor and quiet good competent pre program implementation. While there were increased competency level of the study group from poor competent to very good competency immediately and two months post program implementation.

Table 5.7: Correlation between knowledge score and practice score in study and control groups. This table shows strong positive correlation between knowledge score and practice score in study group. Increase in knowledge in NGNs is associated with increase in their practice.

No correlation between knowledge score and practice score in control group.

Table 5.8: Correlation between knowledge score and communication score in study and control groups. This table shows strong positive correlation between knowledge score and communication score in study group. Increase in knowledge in NGNs is associated with increase in their communication. No correlation between knowledge score and communication score in control group.

Table 5.9: Correlation between practice score and communication score in study and control groups. This table shows strong positive correlation between practice score and communication score in study group. Increase in NGNs practice is associated with increase in their communication. No correlation between practice score and communication score in control group**.**

Table (1):- Frequency distribution of the NGNs in the study and control groups according to their socio-demographic data.

Socio-demographic and clinical data	Study group N= 50		Control group N= 25		Test of sig	P
	No	%	No	%		
Age in years						
• 20-30 years	50	100	50	100	0	0
• ›30- 40 year	0	-	0	-		
• ›40- 50	0	-	0	-		
Marital status						
• Single	11	22	10	40	0.1	2.7
• Married	39	78	15	60		
Education level						
• Bachelor in Nursing	50	100	50	100	0	0
• Master in Nursing	0	-	0	-		
• Doctorate in Nursing	0	-	0	-		
Job title						
• Staff nurse	50	100	25	100	-	-
• Head nurse	0	-	0	-		
Working area						
• Medical	9	18	3	12		
• Recovery	12	24	10	40	0.3	2.1
• Surgical emergency and trauma	29	58	12	48		
Years of working experience						
• 1-<4years	50	100	24	96		
• 4-<5years	0	-	1	4	2.03	0.2
• 5 years and more	0	-	0	-		
Working hours per week						
• 35-<40 hour	0	-	1	4		
• 40-<45	21	42	15	60	0.09	4.7
• 45 hours and more	29	58	9	36		
Previous triage training in ED						
• Previous education	45	90	20	80	1.44	0.23
• Practiced triage in an ED	5	10	5	20		

Table (2): comparison between the study and control groups regarding <u>triage knowledge</u> mean score in pre, immediately and two months post program implementation.

Triage knowledge	Score of items	Study group N= 50			Control group N= 25			Significance test		
		Pre mean ±Sd.	Immediately post mean ± Sd.	2months post mean ± Sd.	Pre mean ± Sd.	Immediately post mean ± Sd.	2months post mean ± Sd.	P1	P2	P3
Triage safety	3	1.28±0.81	2.86±0.4	2.78±0.42	1.6±0.5	1.44±0.51	1.4±0.58	0.109	<0.001**	<0.001**
Triage process	6	2.74 ±1.03	5.66±0.52	5.58±0.61	3.64±1.41	3.24±0.88	3.12±0.88	0.004	<0.001**	<0.001**
Critical look	2	0.92±0.6	1.92±0.27	1.88±0.33	0.84±0.62	0.8±0.41	0.88±0.6	0.477	<0.001**	<0.001**
Primary assessment	114	6.32±2.07	13.06±0.98	12.98±0.99	5.44±1.16	5.08±0.95	5.24±1.09	0.031	<0.001**	<0.001**
Secondary assessment	10	3.26±1.14	9.4±1.14	9.38±1.16	2.96±0.93	2.88±0.72	2.88±0.72	0.146	<0.001**	<0.001**
Total Score	(35)	14.52±3.31	32.9±1.73	32.6±1.78	14.48±2.58	13.44±1.78	13.52±2.04	.958	<0.001**	<0.001**

P1= Comparing study and control group pre program implementation
P2= Comparing study and control group immediately post program implementation
P3= Comparing study and control group two month post program implementation

Table (3): Comparison between the study and control groups regarding triage practice mean score in pre, immediately and two months post program implementation.

Triage competencies	Score of items	Study group N= 50			Control group N= 25			Significance test		
		Pre mean ±Sd.	Immediately post mean ± Sd.	2months post mean ± Sd.	Pre mean ± Sd.	Immediately post mean ± Sd.	2months post mean ± Sd.	P1	P2	P3
Triage safety	20	10.12±1.33	19.52±2.73	18.92±0.75	9.08±1.93	6.68±1.41	6.84±1.4	0.008**	<0.001**	<0.001**
Triage process	14	5.28±1.46	13.88±2.81	13.36±0.69	4.16±1.03	4.84±1.1	4.88±1.05	<0.001**	<0.001**	<0.001**
Critical look	2	0.96±0.19	1.94±0.24	1.92±0.27	0.88±0.33	0.92±0.27	0.92±0.27	0.195	<0.001**	<0.001**
Primary assessment	42	21.18±2.11	39.84±1.25	39.64±1.22	17.04±2.54	18.52±2.58	18.56±2.53	<0.001**	<0.001**	<0.001**
Secondary assessment	62	33.92±4.49	60.76±1.48	60.58±1.55	27.04±3.69	25.48±5.48	25.56±5.45	<0.001**	<0.001**	<0.001**
Total score	(140)	71.46±6.43	135.5±4.26	134.42±2.41	58.2±5.56	56.44±8.21	56.76±7.79	<0.001**	<0.001**	<0.001**

P1= Comparing study and control group pre program implementation
P2= Comparing study and control group immediately post program implementation
P3= Comparing study and control group two month post program implementation

Table (4): Total triage knowledge mean score of NGNs between the study and control groups in pre, immediately and two months post program implementation.

Triage knowledge Score	Study group N= 50			Control group N= 25		
	Pre mean ± Sd.	Immediately post mean ± Sd.	2 months post mean ± Sd.	Pre mean ± Sd.	Immediately post mean ± Sd.	2 months post mean ± Sd.
Triage safety **(3)** ▪ Poor knowledge <1.8 ▪ Good 1.8-<2.25 ▪ Very good ≥2.25	1.28±0.81 —— ——	—— —— 2.86±0.4	—— —— 2.78±0.42	1.6±0.5 —— ——	1.44±0.51 —— ——	1.4±0.58 —— ——
Triage process **(6)** ▪ Poor knowledge <3.6 ▪ Good 3.6-<4.5 ▪ Very good ≥4.5	2.74±1.03 —— ——	—— —— 5.66±0.52	—— —— 5.58±0.61	3.64±1.41 —— ——	3.24±0.88 —— ——	3.12±0.88 —— ——
Across assessment **(2)** ▪ Poor Knowledge <1.2 ▪ Good 1.2-<1.5 ▪ Very good ≥1.5	0.92±0.6 —— ——	—— —— 1.92±0.27	—— —— 1.88±0.33	0.84±0.62 —— ——	0.8±0.41 —— ——	0.88±0.6 —— ——
Primary assessment **(14)** ▪ Poor Knowledge <8.4 ▪ Good 8.4-<10.5 ▪ Very good ≥10.5	6.32±2.07 —— ——	—— —— 13.06±0.98	—— 12.98±0.99	5.44±1.16 —— ——	5.08±0.95 —— ——	5.24±1.09 —— ——
Secondary assessment **(10)** ▪ Poor Knowledge <6 ▪ Good 6-<7.5 ▪ Very good ≥7.5	3.26±1.14 —— ——	—— —— 9.4±1.14	—— —— 9.38±1.16	2.96±0.93 ——	2.88±0.72 —— ——	2.88±0.72 —— ——
Total Knowledge score (35) ▪ Poor knowledge <21 ▪ Good knowledge 21-<26.25 ▪ Very good knowledge ≥26.25	14.52± 3.31 —— ——	—— —— 32.9±1.73	—— —— 32.6±1.78	14.48±2.58—— ——	13.44±1.78—— ——	13.52±2.04——
Total Knowledge score (35)	**14.52±3.31**	**32.9±1.73**	**32.6±1.78**	**14.48±2.58**	**13.44±1.78**	**13.52±2.04**

- ▪ Poor knowledge <21 (<60%)
- ▪ Good knowledge 21-<26.25 (60%-74.9%)
- ▪ Very good knowledge ≥26.25 (>75%)
- ▪

Table (5): Total triage competency mean score of NGNs between the study and control groups in pre, immediately and two months post program implementation

Triage practice score	Study group N= 50			Control group N= 25		
	Pre mean ± Sd.	Immediately post mean ± Sd.	2 months post mean ± Sd.	Pre mean ± Sd.	Immediately post mean ± Sd.	2 months post mean ± Sd.
Triage safety **(20)** Poor competency <10 Quiet good competency 10-<13 Good competency13-<15 Very good ≥15	9.82±2.27 10.21±.95 ----- ——	—— —— —— ١٩,١٢±0.63	—— —— —— 18.92±0.75	8.82±1.8 12±0 —— ——	6.62±1.41 8±0 —— ----	6.79±1.41 8±0 —— ----
Triage process **(14)** Poor competency <7 Quiet good competency 7-<9.1 Good competency9.1-<10.5 Very good ≥10.5	4.18±2.27 5.59±0.96 ----- ——	—— —— —— 13.88±2.81	—— —— —— 13.36±0.69	4.13±0.97 4.5±2.12 ----- ——	4.83±1.13 5±0 —— ----	4.87±1.07 5±0 ----- ——
Across assessment **(2)** Poor competency <1 Quiet good competency 1-<1.3 Good competency1.3-<1.5 Very good ≥1.5	0.82±0.4 1±0 ---- ——	—— —— —— 1.94±0.24	—— —— —— 1.92±0.27	0.91±0.29 0.5±0.71 —— ——	0.92±0.28 1±0 —— ——	0.92±0.28 1±0 —— ——
Primary assessment **(42)** Poor competency <21 Quiet good competency 21-<27.3 Good competency27.3-<31.5 Very good ≥31.5	20.27±2.76 21.43±1.86 ----- ——	—— —— —— 39.84±1.25	—— —— —— 39.64±1.22	16.74±2.18 20.5±4.95 —— ——	18.29±2.37 24±0 —— ——	18.33±2.31 24±0 —— ——
Secondary assessment **(62)** Poor competency <31 Quiet good competency 31-<40.3 Good competency40.3-<46.5 Very good ≥46.5	28.09±4.72 35.56±2.74 ------ ——	—— —— —— 60.67±1.48	—— —— —— 60.58±1.55	26.48±2.63 33.5±9.19 —— ——	24.92±4.79 39±0 —— ——	25±4.78 39±0 —— ——
Total practice score Poor competency <70 Quiet good competency70-<91 Good competency91-<105 Very good ≥105	٦٣,١٨±7.79 73.79±3.45 ----- ——	--- ----- ---- ١٣٥.١٤±2.08	---- ----- ---- 134.42±2.41	57.08±4.17 71±1.41 ----- ——	٥٥,٥٨±7.15 77±0 ---- ----	55.91±6.91 77±0 ---- ----
Total Practice score (140)	**71.46±6.43**	**135.5±4.26**	**134.42±2.41**	**58.2±5.56**	**56.44±8.21**	**56.76±7.79**

- Low competency <70 (< 50 %)
- Quiet good competency 70-<91(50- <65%),
- Good competency 91-<105 (65- <75%)
- Very good competence ≥105 (≥ 75 %)

Table (6): Comparison between the study and control groups regarding communication process mean score in pre, immediately and two months post program implementation.

Communication	Study group N= 50			Control group N= 25		
	Pre mean ± Sd.	Immediately post mean ± Sd.	2 months post mean ± Sd.	Pre mean ± Sd.	Immediately post mean ± Sd.	2 months post mean ± Sd.
Poor competency <20 **Quiet good competency 20-<26** **Good competency26-<30** **Very good ≥30**	14.09±3.51 15.84±2.52 ---- ----	---- --- ---- 39.1±0.79	--- --- ---- 38.7±0.95	14.30±4.12 14.5±6.36 ---- ----	14.42±2.72 13±0 ---- ----	14.5±2.67 13±0 ---- ----
Total communication score(40)	**15.46±2.82**	**39.1±0.79**	**38.7±0.95**	**14.32±4.15**	**14.36±2.67**	**14.44±2.63**

- Low competency <20 (< 50 %)
- Quiet good competency 20-26 (50- <65%),
- Good competency 26-<30 (65- <75%)
- Very good competence ≥30 (≥ 75 %)

Table (7): Correlation between knowledge score and practice score in study and control group

Study group		Control group	
R	P	R	P
.957	≤0.001*	.088	.453

Table (8): Correlation between knowledge score and communication score in study and control group

Study group		Control group	
R	P	R	P
.946	≤0.001*	.058	.621

Table (9): Correlation between practice score and communication score in study and control group

Study group		Control group	
R	P	R	P
.981	≤0.001*	.033	.778

Discussion

The ED is one of the essential hospital departments, It is the preliminary point of contact with the hospital for any kind of patient who has a need for immediate interventions [37]. The number of patients presenting to ED is intensifying, and this tendency is not likely to change. As EDs

are struggling to cope with overcrowding there is a critical need for a valid, reliable triage system in order to sort these incoming patients more rapidly and accurately. Triage is the process of determining the priority of patients' treatments based on the severity of their conditions. This helps treating patients efficiently when resources are insufficient for all to be treated immediately [38,1]

In relation to triage training in ED, the current study was found that the majority of nurses' for study group did not attended triage training courses in pre program implementation. It may be attributed to lack of refresher conferences during employment, and unavailability of handouts to be used as a nursing guide. This result is in agreement with findings of the study by Fathoni (2010) [3] ;Carrion (2011) [22], Hegazy et al., (2010) [35] and Rutto (2011) [39] who found that the importance of theoretical and practical triage training to improve nurses' knowledge and skills post training sessions and consequently improve the quality of care. In this regard, Rahmati et al., (2013) [40] who reported that emergency triage nurse must have appropriate training and experience in emergency nursing triage, decision making and emergency nursing cares. El-Zalabany et al., (2011) [7] agreed with this results as they reported that nurses should be competent and functioning autonomously in all aspects of emergency nursing prior to undertaking triage role based upon education programs.

The current study showed that, there were highly statistical significant difference between the study group and control group regarding the total mean score of knowledge and total mean score of practice of NGNs in pre, immediately and post triage training program .

In relation to total mean score of triage knowledge, it was found that there was a highly statistical significant improvement of total knowledge score among the study

group as compared to the control group following program implementation. This may be due to updating of nurses' knowledge about triage in emergency care unit and increase their awareness of the importance of the triage in ED. This result is consistent with findings of the study done by De Lacy (2011) [41]; Miller (2011) [42] who mentioned that lack of knowledge leads to inconsistencies in provision of appropriate and timely care and recommended that emergency staff should be provided with triage training to enhance level of understanding, knowledge and competence. Also, Ali et al., (2013) [37] found that knowledge of triage among nurses is inadequate and there are learning requirements of nurses' working in ED which need to be satisfied by providing proper training and education.

Concerning total mean score of triage practice, the present study showed that the total competency score of the study group were improved following program implementation. This may be due to proper training and evaluation of nurses' performance. These results are consistent with Forsman et al., (2009) [43] ; Rautava et al., (2013) [44] who suggested that the regular training of triage could improve skill of nurses to handle stressful work situation. In this regard, Considine et al., (2007) [45] reported that nurses' knowledge and practice were improved post triage training sessions. In contrast to previous reports, a study carried out by Abd-Hamid, (2011) [23] to determine the level of nurses' knowledge and practice regarding triage in emergency care in Ismailia university hospital mentioned that the attendance of triage training courses was not shown to have a significant effect on nurses' practice.

Triage nurse is responsible for safety of the patients and others in the waiting area. Knowledge of triage safety is essential role for the triage nurse. The present study revealed that the total mean

scores for nurses' knowledge and practice of the study group were increased in post program implementation as compared to preprogram implementation. It may be attributed to increase awareness about the importance of triage safety prior to undertaking triage role. These results are consistent with El-Zalabany et al., (2011) [7]; Australasian College for Emergency medicine (2013) [46] who mentioned that maintenance patient safety and security prior to triage assessment and treatment is essential competency for triage nurse.

Concerning the presence of emergency equipment, it was noticed that there was a highly statistical significant improvement of the total mean scores of triage knowledge and practice of the study group regarding assessment of emergency equipment following program implementation as compared to the control group. It may be due to increase in the number of patients for each nurse with overloaded by more duties and having more work hours. These findings are consistent with Ahmed (2011) [47] who have emphasized that equipment used for emergency situations should be available for use and placed in a designated location that is accessible to all emergency nursing personnel.

Assessment of environmental hazards, is the first step to safe practice at triage. The current study showed, decrease in the level of triage knowledge and practice of study and control groups regarding environmental hazards assessment immediately program implementation. There were highly statistically significant improvement of nurses' knowledge and practice in post program implementation. This may be due to lack of time and overlapping of nursing activities because the emergency triage nurse may be responsible for many patients at the same time. This is in the line with Gerdtz (2009) [11]; Hoyt (2008) [48] reported that assessment of environmental

hazard is the first step to safe practice at triage. Also, Australasian College for Emergency medicine (2013) stressed that the triage environment must be safe for both patient and nurse and non-threatening physical environment.

Regarding assess the environmental hazards, the current study showed that, the majority of nurses' of the study group did not assess the environmental hazards in pre program implementation. While, the nearly all of study group assessed the environmental hazards following program implementation. This may be due to lack of time and overlapping of nursing activities because the emergency triage nurse may be responsible for many patients at the same time. This is in the line with Gerdtz (2009) [11]; Hoyt (2008) [48] reported that assessment of environmental hazard is the first step to safe practice at triage. Also, Australasian College for Emergency medicine (2013) [46] who stressed that the triage environment must be safe for both patient and nurse and non-threatening physical environment.

In relation to triage process, the current study found that poor level of nurses' knowledge and practice of the study and control groups regarding triage process in pre program implementation. While increase the total competency level of the study group following program implementation. It may be due to lack of triage training courses that were conducted in hospitals, and not all nurses are included. This finding is supported by Safari (2012) [1]; Rahmati et al., (2013) [40] who found that knowledge deficit about patients categorization according to their urgency as resuscitation, emergency, urgent, semi urgent or non-urgent categories. This result is consistent with Fathoni et al., (2010) [3] who emphasized that continuing education and training courses related to triage process among emergency nurses should be provided for

them to improve their knowledge and skills and allow emergency nurses to conduct triage tasks more effectively, thus resulting in better patient outcomes and enhancing the quality of emergency care and patient safety.

Concerning triage assessment time, the present study found a poor level of nurses' knowledge and practice of study and control groups about triage assessment time in pre program implementation as compared to immediately program implementation. This may be due to lack of awareness and high workload especially when the ED was occupied to its full capacity. This result was in accordance with Rominski et al., (2014) [49]; Aloyce et al., (2014) [50] who found that lacking knowledge on triage assessment time can potentially result in harmful delays in rendering timely emergency care and increase the risk of avoidable deaths and disabilities and ensure that each patient is treated in the order of clinical urgency and that the treatment is appropriate and timely.

Regarding triage reassessment, it was observed during the present study that the lower level of triage knowledge and practice of study and control groups regarding triage reassessment in pre program implementation. There were highly statistically significant improvement of nurses' knowledge and practice regarding triage reassessment immediately program implementation. It may be due to lack of time and shortage of triage nurses to reassess emergency patients regularly. These results are in accordance with Aloyce et al., (2014) [50] and Ropert (2010) [51] who found that no reassessment on regular basis of emergency patients after triaging to determine if the conditions of the patients had deteriorated and need to be seen more urgently.

Concerning triage documentation, it was noticed that there was a highly statistical significant improvement of total mean score of triage knowledge and practice of the study group regarding triage documentation immediately triage training program. It may be due to increase in their awareness of the importance of triage documentation in ED. This result is supported by Gerdtz (2009) [11]; Harding et al, (2013) [52]; Parenti et al., (2013) [38] who emphasized that triage documentation is essential practical competency for triage nurse and should include the following data: the patient's age and gender, original nurse's triage category, presenting complaint, mode and time of arrival, past diseases, vital signs and pain score.

Regarding critical look, it was found during the present study the level of nurses' triage knowledge and practice of the study group regarding to critical look were improved following program implementation. It may be attributed to increase of awareness of the importance of critical look of emergency patients and providing information on triage algorism related to triage process. This finding is consistent with Molyneux et al., (2005) [53]; Warren et al, (2008) [54]; Jelinek (2009) [55]; Wyer et al, (2011) [56] who reported that an experienced triage nurse can take one look at a patient and, based on general appearance, assessment airway, work of breathing, circulation and decide whether immediate care is required.

In relation to primary assessment, the current study showed that the lower level of triage knowledge and practice of study and control groups regarding primary assessment in pre program implementation. There were highly statistically significant improvement of the study group of nurses' knowledge and practice immediately program implementation. It may be due to deficiency in their education as well as lack of in service training about primary

assessment. This finding is consistent with Salem (2006) [14] who stated that the lowest scores for triage nurse were assigned regarding to primary assessment. Wilson (2008) [57]; Middleton (2010) [58]; Miller (2011) [60]; Sammons (2012) [59], added in their studies that the all items of primary assessment (airway, breathing, circulation, disability, and exposure) as essential nurses' competencies.

Concerning opening airway and resuscitation procedures, it was noted decrease level of triage knowledge and practice of study group regarding opening airway in pre program implementation. There were highly statistical significant difference following program implementation. It may be due to inadequate facilities and equipment needed for applying resuscitation procedures. This result is in agreement with findings of the study by Salem (2006) [14] who reported that more than half of nurses demonstrated poor level of competency in resuscitation procedures.

Regarding assessment of the level of consciousness, it was noticed that there was a highly statistical significant improvement of triage knowledge and practice score regarding neurological assessment among the study group following program implementation. This may be due to updating their knowledge and enhancing their practice. This result is consistent with findings of the study by Abdul-Hamid, (2011) [23] who reported that the majority of nurses didn't assess the level of consciousness as a part of the primary assessment of triage.

In relation to pain assessment, throughout the study it was observed lack of pain assessment of the study group in the pre program implementation and increase in the total competency level of the study group following program implementation. The difference in relation to pain assessment is highly significant. This may be related to inadequate pain assessment knowledge and skills. This result is in agreement with findings of the study by Ropert (2010) [51], who found that pain assessment and treatment by health care professional in ED receive little attention.

As regards to secondary assessment (head to toe assessment), the current study found that there was a highly statistical significant improvement of total mean score of triage knowledge and practice of the study group regarding secondary assessment immediately triage training program. This may be related to attended refreshing courses and continuous in-service training programs. This result is consistent with Jones (2009) [62]; who reported that the majority of emergency nurses had competent performance regarding head to toe assessment. Also, this finding is in contrast with Salem (2006) [14] who found that poor level of competency of emergency nurses regarding secondary assessment.

Effective communication is essential in enhancing the effectiveness and accuracy of the triage process. It was observed that the lower level of triage knowledge and practice of study group regarding communication skills in the pre program implementation. While increase in the total competency score of the study group following program implementation. This may be due to lack of communication skills between health care provider. This result is supported by Ahmed (2011) [47] who found that the majority of the study nurses in ED were incompetent in performing communication process. Also, (2008) [63] stated that the majority of nurses didn't offer time to communicate with conscious patients nor select the proper way for communication properly. This finding is contradict with Mahmoud (2007) [61] reported that the majority of nurses demonstrated good scores in their performance regarding communication process in ED.

Provision of highly qualified and competent care is the elusive goal of any health care organization. Because the ED receives large numbers of patients who suffered from life threatening conditions which require a system that assesses and classifies patients in the order of urgency. There is a significant need for implementing triage training program for improving the competencies of NGNs working in emergency hospital. Therefore, this study was carried out to determine the effect of implementing triage training competencies on NGNs working in ED at emergency hospital.

Conclusion:

The findings of this study show that there is lack in triage knowledge and skills of newly graduated nurses (NGNs) working in the emergency hospital of Mansoura University. Therefore it was imperative to establish triage training program based on the finding of need assessment that helped to establish and improve nurses knowledge and skills in emergency hospital.

The results of this study reflect that total knowledge scores of nurses in relation to triage safety, triage process, across the room assessment, primary and secondary assessment were very good immediately post triage program implementation, and there were highly statistical significant differences between the study and control groups. On the other hand, the total mean competency score of NGNs practice in relation to primary and secondary assessment and communication process were either poor or quiet good competent pre program implementation. Where there was an increase competency level of the study group from poor competency to very good competency immediately post triage program implementation, also, there were highly statistical significant differences between the study and control groups.

Recommendations

Based on the findings of this study, the following recommendations were suggested:

- Designing an educational handout about triage process must be provided to nurses to be used as a reference guide in their practice.
- Establishment of an accurate and available documentation system
- The ED should have a standard for facilities, equipment, and care.
- Classifying the emergency rooms according to triage categories and urgency of the patient's condition.
- Creating a triage algorithm to be applied in clinical practice.
- Increase ratio of emergency nurses working at emergency department.
- Conducting a regular staff meeting and conferences for the discussion of work problems, and difficulties

Recommendations regarding clinical practice

- Assessment of environmental hazards to maintain safe practice at triage.
- Prioritizing all patients presenting to the ED according to their urgency as Resuscitation, Emergency, Urgent, semi urgent or Non urgent categories.
- Training nurses staff how to assess pain by visual analog scale (VAS) to measure pain severity.
- Emphasizing on the importance of effective communication with the patients/family/other health staff for benefits of quality of care served to the emergency patients.

Recommendations regarding future research

- Develop a clear evidence based triage system and related policies and procedures to study the effect of implementing triage training program on nurses knowledge and practice.

- Further research should focus on evaluating patient outcomes following appropriate triage implementation.

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