



Triage Knowledge and Practice and Associated Factors Among Emergency Department Nurses

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Mohammad AlShatarat, RN, MsN¹, Ahmad Rayan, RN, CNS, PhD² ,
Nidal F. Eshah, RN, CNS, PhD³ , Manal Hassan Baqeas, RN, MSN⁴,
Mohammad Jamil Jaber, RN, MsN⁵
and Mohammed ALBashtawy, PhD, MPH, RN⁶

Abstract

Objective: The study aims at assessing the triage knowledge and practices and their associated factors among emergency department nurses employed in King Fahad Medical City (KFMC), Saudi Arabia.

Method: The study employed a cross-sectional, descriptive, and correlational design. Data collection was carried out from February 11, 2021, until April 27, 2021. The study included all emergency department nurses who were working in the KFMC during the data collection period and excluded those who were on leave at the time of data collection. A self-reported questionnaire with adequate validity and reliability was used. Statistical analysis was performed using the IBM SPSS Version 25 employing descriptive statistics, independent *t*-test, one-way ANOVA, and Pearson correlation test.

Results: A total of 147 emergency department nurses completed the study. Participants demonstrated generally high levels of triage knowledge and triage practice. However, knowledge deficit and incorrect practice related to some aspects were noted. There were no significant differences in triage knowledge and practice according to participants' demographics including gender, job title, qualification, emergency nursing training, and previous training in triage ($P > 0.05$). Most participants ($n = 141$, 95.9%) had access to their triage systems and the majority ($n = 79$, 53.7%) utilize triage systems on a daily basis. Half said that only professional nurses performed the triage role ($n = 69$, 46.9%). There was a significant positive relationship between triage knowledge and practice ($r = 0.486$, $P < 0.01$).

Conclusion: The respondents had a high level of triage knowledge and practice. However, they have some areas of knowledge deficit and some deficiencies in the conversion of their knowledge into practice. The study recommends the development of further training and education in emergency nursing to address knowledge deficits and incorrect triage practices.

Keywords

triage, knowledge, practice, emergency department, nurse

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Introduction

The emergency department (ED) is a crucial component of the healthcare delivery system. Healthcare workers in ED are frontline staff who deal with patients presenting with acute life-threatening conditions (Rayan et al., 2022). The quality of services provided in the ED has significant consequences not only on patients' survival but also on their hospital experience, care satisfaction, and psychological well-being (Morley et al., 2018). Optimal ED functioning has the potential to improve patient flow across hospital

¹King Fahad Medical City, Riyadh, Saudi Arabia

²Faculty of Nursing, Zarqa University, Al-Zarqa, Jordan

³Faculty of Nursing, Zarqa University, Al-Zarqa, Jordan

⁴School of Nursing and Midwifery, La Trobe University, Bundoora, Australia

⁵King Fahad Medical City (KFMC), Riyadh, Kingdom of Saudi Arabia (KSA)

⁶Faculty of Nursing, Community Health Nursing, Al al-Bayt University, Al-Mafraq, Jordan

Corresponding Author:

Ahmad Rayan, Faculty of Nursing/Zarqa University, Faculty of Nursing, Al-Zarqa, Jordan.

Emails: ahmed_rayan87@yahoo.com; arayan@zu.edu.jo



units, especially for those who will require life-saving procedures (Jarvis, 2016).

The primary challenge of ED services is to maintain the level of quality despite the large volume of patient admissions presenting in the ED at any point of the day and to be able to individualize treatment according to the needs of each patient (Al-Kalaldehy et al., 2021; Hinson et al., 2018). Triage is a process that consists of timely and accurate identification of patients who require immediate treatment and distinguishes them from those who also present with diseases or illnesses but whose conditions can wait (Mistry et al., 2018). Effective triage ensures that healthcare organizational capacity meets overall patient demand, especially during disasters, pandemics, and other public health emergencies (Farcas et al., 2020). However, there are occasions when there are under- and overtriage scenarios. Under-triage occurs when patients with rapidly deteriorating clinical conditions are not identified and missed while over-triage occurs when patients with acute but not life-threatening illnesses get prioritized resulting in a waste of medical equipment and manpower (Hinson et al., 2018).

Because of the clinical nature of the ED, nurses are expected to possess skills, knowledge, and qualities that allow them to meet the high demands and expectations of patient care in this area (Yuwanich et al., 2016). Nurses need to be able to prioritize those who require immediate treatment from those whose clinical conditions will not deteriorate if assessed at a later time (Mollaoglu & Celik, 2016).

Despite systems in place and the availability of validated tools that aim to increase the accuracy of triaging patients presenting in the ED, research has shown that correct identification of patients and appropriate resource allocation remain a significant challenges for ED nurses (Chang et al., 2016). Although computerized systems and acuity tools help in determining triage level, the process is dynamic and relies significantly on the decision-making skills and critical thinking capacity of the ED nurse who has to perform focused assessments and make decisions about patient care under pressure of time, limited information, and a tense environment (Hammad et al., 2017). Such prompt decision-making that has to occur in a snapshot of time depends on the knowledge and skills of ED nurses on patient triage.

To date, there is a paucity of empirical data on triage knowledge and resulting triage practice among ED nurses in Saudi Arabia. In addition, research data on individual sociodemographic and organizational factors that can influence their triage knowledge and practice are scarce. Examples of these sociodemographic and organizational factors are education level, years of experience, and triage training (Afaya et al., 2017; AlMarzooq, 2020; Duko et al., 2019). Thus, it is unclear whether ED nurses were able to translate triage knowledge acquired from education and training to their ED practice, and what factors affect such knowledge translation on the implementation of care. Therefore, the current study aims to assess the triage knowledge and practices and

associated factors among emergency department nurses employed in King Fahad Medical City (KFMC), Saudi Arabia. Since most studies on this topic were conducted in either Western or low-income countries (Duko et al., 2019; Phukubye et al., 2019; Wolf et al., 2018), this study can contribute to the growing literature that examines the delivery of triage services by ED nurses in the region. The results of the study could also help ED nurses, nurse managers, and hospital administrators find ways to develop and improve triage knowledge and practices and fuel the gap between knowledge acquisition and its translation to practice.

Methods

Design

The study utilized a descriptive, cross-sectional, correlational research design.

Setting

The study was performed in the ED of a large tertiary hospital in Saudi Arabia, namely King Fahad Medical City (KFMC). KFMC is a tertiary hospital with a research center. It has the capacity of 100 beds to admit, assess and treat all acute life-threatening conditions across all age groups. ED is divided into two sections: Adult and Pediatric. Under these two sections, there are seven units that provide various types and levels of care. These units are (1) Adult Critical Care (2) Adult Acute Care (3) Adult Acute Care Extension (4) Respiratory Zone (5) Triage Area (6) Pediatric Critical Care, and (7) Pediatric Acute Care.

Patients who visit ED in KFMC pass first through the visual respiratory triage to obtain the respiratory score. Then, they continue to the triage area. In the triage area, patients are categorized according to their conditions using the Canadian Triage Acuity Scale (CTAS). The applied CTAS has two versions; adult and pediatric. The CTAS is the standard system used across all Saudi Arabia hospitals. Nurses in the triage area are mixed in their experience; senior and junior nurses. After categorizing patients, the most intense symptoms are treated as fast as necessary.

Sample

The target population was all nurses working in the ED of KFMC. The KFMC Emergency Department employs 172 nurses. Utilizing the G* Power software, and setting error rate (α) at 0.05, confidence interval at 95%, moderate effect size, and power (β) at 0.80, the minimum sample size for the study is 85 nurses. These parameter values were consistent with those found in previous research that used the same measure (Phukubye et al., 2019). However, due to the possibility of a high refusal rate to join the study among ED nurses who are usually busy; the sample

size was substantially increased to 147. To obtain this sample size, we used a convenient sampling technique and included all emergency department nurses who were working in the KFMC at the time of data collection and excluded those who were on leave at the time of data collection.

Instrumentation

Participant Information Sheet

The participant information sheet asks about the sociodemographic characteristics of the ED nurses namely age, sex, educational attainment, length of years as an RN, and job title. Moreover, it contains questions about the professional characteristics of the ED nurses “Have you received training in triage?,” “How would you rate the training?,” and “How much would you rate your triage knowledge?” (Kerie et al., 2018; Phukubye et al., 2019). The last two questions were rated on a scale from 1 to 10, with a higher score indicating a better-perceived quality of training or triage knowledge. In the current study, the scale was administered in English. For face validation, the scale was sent to five experts on the topic of triage and pre-tested on 30 senior nurses to assess its clarity, readability, and usability. From their responses and comments, a few changes were made in terms of layout and formatting features to ensure that the items were easy to understand and clear.

Triage Knowledge and Practices

Triage knowledge and practices were assessed using scales developed by Phukubye et al. (2019). The Triage Knowledge Scale consists of 18 items and The Triage Practice Scale consists of 14 items, all items being answerable with either “Agree” or “Disagree.” When participants had a correct answer, a score of 1 is given, when participants had incorrect answer, a score of 0 is given. Total scores can range from 0 to 18 for triage knowledge and from 0 to 14 for triage practice, with a greater total score indicates better triage knowledge or practice. Reverse-worded items are reverse coded before calculating the total score. The tool includes additional six multiple-choice items asking for the organizational characteristics of the triage system in the hospital where the ED nurses work. The measure has well-established internal consistency reliability and content validity (Phukubye et al., 2019). In the current study, Cronbach’s α value was 0.88 for triage knowledge and 0.74 for triage practice.

Data Collection

Owing to the ongoing COVID-19 pandemic, data were collected online to the participants with the consent form. The researcher coordinated with the appropriate nursing research links and ED nursing management for the distribution of the

online informed consents and questionnaires. Link to the survey was distributed with a letter of invitation to participate via the participant’s work email addresses. In consideration of their busy schedules, participants were given one month to answer the questionnaires. Reminders to complete the questionnaires and submit them online were sent every 10 days. The online survey format has a “Save and Continue” option that will allow ED nurses to answer items, save their work, and come back at a later time. There was no requirement for the identification of ED nurses as all data were anonymized, and the study did not perform any randomization.

Ethical Considerations

Ethical approval was sought from the research ethics board of The KFMC (IRB registration number: H-01-R-012/ Approval Date: 19 JAN 2021). Written informed consent was obtained from eligible participants prior to joining the study. All eligible participants were allowed to ask questions about the study. Participation in the study was voluntary. Data were protected using password-enabled software.

Data Analysis

Statistical analysis was performed using the IBM SPSS Version 25. Descriptive statistics were performed to analyze individual sociodemographic characteristics, nominal organizational triage characteristics, and item analysis of triage knowledge and practices. *T*-tests and one-way ANOVA were utilized to determine differences in triage knowledge and practices based on sociodemographic characteristics. Pearson correlation test was used to assess the relationship between triage knowledge and practice. Internal consistency reliability of the triage knowledge and practice scales was assessed using Cronbach’s alpha.

Results

Sociodemographic Characteristics

Table 1 illustrates the sociodemographic characteristics of the participants. A total of 147 ED nurses completed the study. Of the nurses who participated, 84% ($n = 124$) were female, and their mean age was 36 years ($SD = 5.60$). Among them, 81% ($n = 119$) had a Bachelor’s degree in nursing, 85.7% ($n = 126$) were registered nurses, 69.4% ($n = 102$) had prior triage training, and 42.9 (63%) had in-service triage courses.

Triage Knowledge

The overall mean score of triage knowledge was 11.78 ($SD = 3.01$). Table 2 shows the number of participants who agreed or disagreed with each ED triage knowledge statement. Participants had the highest agreement with statements

Table 1. Sociodemographic Characteristics ($n = 147$).

Characteristics	Mean	SD
Age	36	8.1
Years of experience	8.9	5.6
	Frequency (n)	Percentage (%)
Gender		
Male	23	15.6
Female	124	84.4
Job title		
Registered nurse	126	85.7
Nurse specialty	19	12.9
Educational attainment		
Diploma	16	10.9
Bachelor's degree	119	81
Postgraduate diploma	4	2.7
Postgraduate degree	8	5.4
Prior triage training		
Yes	102	69.4
No	45	30.6
Additional emergency nursing training or courses		
None	65	44.2
In-service course in triage	63	42.9
Emergency nursing certificate	31	21
Others	2	1.4

pertaining to triage as sorting of patients into a priority of injuries or illness ($n = 145$, 98.6%), the purpose of triage as prevention of deterioration or death of patients ($n = 145$, 98.6%), patients with the social status being treated more urgently even if triaged as color green ($n = 129$, 87.8%) and that triage knowledge is not important ($n = 116$, 78.9%). When asked to rate their knowledge on triage on a scale of 1–10, 1 being lowest and 10 being highest, participants gave a mean score of 7.3 ($SD = 1.7$). It is noteworthy to mention that 68.7% of the participants agreed on item number 10 related to (AVPU), which is a wrong answer since the letter “P” is related to pain not pulse. The self-rating score was similar to the score participants gave to the quality of training they received in ED triage (mean score = 7.3, $SD = 2.1$).

Triage Practice

The overall mean score of triage practice was 9.98 ($SD = 2.29$). Table 3 illustrates the number and percentage of participants who agreed and disagreed with each statement. Participants had the highest agreement with statement 11 which stated that delays in waiting time can negatively impact outcomes of the patient's condition ($n = 137$, 93.2%) and statement 13 which stated that shorter waiting times resulted in less overcrowding and better patient

Table 2. Triage Knowledge.

Statement	Agree (n , %)	Disagree (n , %)
1. Triage is the sorting of patients into priority of injuries or illness.	145 (98.6)	2 (1.4)
2. The purpose of triage is to prevent deterioration or death of a patient while waiting on the queue for their turn.	145 (98.6)	2 (1.4)
3. Triage Early Warning Signs is short- Triage Early Warning Signs.	136 (92.5)	11 (7.5)
4. There are two Canadian Triage & Acuity Scale charts, one for child and adult.	127 (86.4)	20 (13.6)
5. If an emergency sign is identified in the first step the patient is taken vital signs first.	117 (79.6)	30 (20.4)
6. If no emergency signs are identified in step 1, but an urgent sign is identified in step 2, the patient is immediately triaged yellow and asked to wait.	99 (67.3)	48 (32.7)
7. Canadian Triage & Acuity Scale priority level yellow should be referred to designated area for non-urgent.	95 (64.6)	52 (35.4)
8. Patient triaged color WHITE should wait for 10 min before being attended.	73 (49.7)	74 (50.3)
9. Nursing auxiliary are not allowed to triage.	92 (62.6)	55 (37.4)
10. AVPU is short for Alert, Verbal, Pulse, Unresponsive.	101 (68.7)	46 (31.3)
11. Adult Triage Early Warning Score consists of the following parameters: Mobility, Respiratory rate, Heart rate, Diastolic blood pressure, Temperature and AVPU.	123 (83.7)	24 (16.3)
12. A tiny baby under two months should always be referred to the senior health care practitioner once they have been comprehensively triaged.	102 (69.4)	45 (30.6)
13. Patients color green or (Priority 4) should be attended first when triaging.	49 (33.3)	98 (66.7)
14. Canadian Triage & Acuity Scale has 5 color coding or priorities.	127 (86.4)	20 (13.6)
15. Triage is difficult and costly to implement in district emergency units.	62 (42.2)	85 (57.8)
16. Patients with high social status e.g., town mayor, school principals, politicians etc. should be treated as very urgent even if triaged as color green.	18 (12.2)	129 (87.8)
17. Discriminator list is not important for triage purpose.	90 (61.2)	57 (38.8)
18. Triage knowledge is not important.	31 (21.1)	116 (78.9)
Overall Knowledge score	M (SD) 11.78 (3.01)	

Table 3. Triage Practice.

Statement	Agree (n, %)	Disagree (n, %)
1. Triage process should be practiced by professional nurses only.	89 (60.5)	58 (39.5)
2. Practice of triage starts with taking of vital signs of the patient.	102 (69.4)	45 (30.6)
3. Allocating a triage code is the last step in triage process.	90 (61.2)	57 (38.8)
4. Calculation of Triage Early Warning Signs is done after allocating a triage code.	73 (49.7)	74 (50.3)
5. Comparing of discriminator list and Triage Early Warning Signs score is done before allocating a triage code.	110 (74.8)	37 (25.2)
6. Triage reduces waiting time of patients in emergency units.	128 (87.1)	19 (12.9)
7. Waiting time should not be considered when rendering emergency care.	83 (56.5)	64 (43.5)
8. Waiting time is one of the six ministerial priority in Saudi Arabia.	124 (84.4)	23 (15.6)
9. Patients triaged as Yellow should wait for 10 min to be seen.	76 (51.7)	71 (48.3)
10. Patients triaged as Green should wait for 1 h or less.	128 (87.1)	19 (12.9)
11. Delays in waiting time can impact negatively on the outcome of the patient's condition.	137 (93.2)	10 (6.8)
12. Waiting time can never be improved in rural hospital due to shortage of human resource.	70 (47.6)	77 (52.4)
13. Short-waiting time in emergency units reduces overcrowding and the results is patient satisfaction.	137 (93.2)	10 (6.8)
14. It is illegal to delay triage in patients within emergency units.	120 (81.6)	27 (18.4)
	M (SD)	
Overall Practice score	9.98 (2.29)	

satisfaction ($n=137, 93.2\%$). Participants had the lowest agreement with statement 4 which stated that calculation of triage early warning score was done after allocation of triage code ($n=73, 49.7\%$) and statement 12 which stated that waiting times can never be improved in rural areas due to shortages in manpower ($n=70, 47.6\%$). It is noteworthy to mention that 87.1% of the participants agreed on item number 10 which indicates that patient triaged as green should wait for 1 h or less, which is a wrong answer since the correct time is 2 h.

Organizational Characteristics of Triage Systems

The majority of participants had access to their triage systems ($n=141, 95.9\%$) and utilize it on a daily basis ($n=79, 53.7\%$). In terms of triage systems utility, almost three-fourths of the sample said that they used their triage systems according to patients' needs ($n=113, 76.9\%$). On the other hand, half of the sample said that all ED staff members performed the triage role in their hospitals ($n=74, 50.3\%$) while almost half said that only professional nurses performed the triage role ($n=69, 46.9\%$). Regarding the place of using the triage system, the majority of the sample utilized it in the waiting or sorting area ($n=118, 80.3\%$) while the rest utilized it in consultation rooms ($n=29, 19.7\%$).

Triage Knowledge and Practices and Sociodemographic Characteristics

When tested for differences in scores based on groups, no significant differences were found between triage knowledge and practice, and gender, job title, qualification, additional emergency nursing training or courses obtained, and previous training in triage ($P>0.05$). Table 4 lists the p values

Table 4. P Values for Tests of Comparisons.

Sociodemographic Characteristics	Triage Knowledge p Value	Triage Practice p Value
Gender	0.29	0.15
Job title	0.73	0.92
Qualification	0.44	0.46
Additional emergency nursing training or courses obtained	0.70	0.30
Previous training in triage	0.28	0.34

for tests of comparison (i.e., independent t test or one-way ANOVA wherever applicable) in each sociodemographic group.

The Relationship Between Triage Knowledge and Triage Practice

The results of Pearson correlation revealed a significant positive moderate relationship between triage knowledge and triage practice ($r=0.486, P<0.01$), indicating that increased triage knowledge is associated with better triage practices (Table 5).

Discussion

The results of this study showed that multinational ED nurses had overall high levels of ED triage knowledge and practice, and their scores were relatively higher than those identified in previous research (Duko et al., 2019; Haghhigh et al., 2017; Phukubye et al., 2019; Reisi et al., 2018). Measured ED triage knowledge also coincided with participants' self-rated

level of knowledge. High levels of triage knowledge and practice have the potential of translating into lesser ED overcrowding, shorter waiting times, better patient flow across the ED, and higher patient satisfaction (Morley et al., 2018). The high levels of triage knowledge and practice among the participants can be attributed to the frequent practice and usage of the Canadian Triage Acuity Scale within the hospital and applying it daily. High levels of triage skills among emergency nurses were also reported in studies that targeted other triage protocols, such as Manchester Triage System, and were attributed to the clinical experience of the nurse (Souza et al., 2018; Steiner et al., 2016). In addition, high levels of triage knowledge and practice could be due to the effective implementation of organizational policies that mandate the requirement for ED nurses to be kept updated with their triage knowledge and skills. On the other hand, continuous quality improvement in the form of audits, evaluations, and regular assessments could enhance triage knowledge and practice of nurses. Furthermore, the availability of a valid and reliable triage system that participants used in their workplaces informed their knowledge and skills with regard to the correct steps of performing triage.

Despite the generally overall high level of triage knowledge and practice, knowledge deficit was observed in some items related to knowledge (i.e., the AVPU abbreviation was wrongly answered by 68.7% of the participants) and practice (waiting time for patient triaged as green was wrongly identified by 87.1% of the participants). This suggests that the study participants still need further education and training in emergency nursing to improve their triage knowledge and practice.

The highest agreement scores on triage knowledge were seen with items pertaining to the definition of triage and to the significant role of triage in preventing death and further disability to patients. The high agreement scores reflected the overall high levels of triage knowledge of participants. In addition, it also underscored the fact that the foundation of the knowledge of every triage nurse is the correct definition of triage and the recognition of its beneficial effects on patients presenting in the ED (Murphy & Tuot, 2021). Moreover, the highest disagreement scores on triage knowledge were seen on the provision of treatment based on social status and the perception that triage knowledge is not important. These results showed that participants countermanded the traditional practice of ED nurses that gave priority to persons with high social status, recognizing that such practices should stop because they can create ethical challenges given the allocation of resources and supplies to individuals that are not clinically unwell but simply expected to receive entitled treatment for being VIPs or very important persons (Harmon, 2020).

The highest agreement scores on triage practice were on the recognition that longer waiting times can negatively impact the health of patients and that shorter waiting times can result in less overcrowding and better patient satisfaction. These results demonstrated that participants in their practice

did their best to immediately and correctly triage patients presenting in the ED and have those patients seen according to standard waiting times. In addition, participants had the lowest agreement scores on the incorrect calculation of triage early warning scores and the statement that rural triage can never be improved because of low manpower. Participants recognized that the correct use of early warning scores provided the benefit of predicting which patients will experience episodes of clinical deterioration and allowed clinicians to implement early detection and treatment. Also, participants recognized the importance of improving rural ED triage even and, in spite of, lack of manpower.

No differences were found in triage knowledge and triage practice based on gender, job title, educational qualification, additional emergency nursing training or courses obtained, and previous training in triage. This suggests that the sample was homogenous in terms of triage knowledge and practice, regardless of their sociodemographic characteristics. This was contrary to the results of other studies which found significant associations between triage knowledge and job title (Phukubye et al., 2019), years of experience and triage knowledge (Afaya et al., 2017), triage knowledge and work history in nursing (Kalantarimeibidi et al., 2014), and triage knowledge and educational level (Duko et al., 2019).

Few studies looked at the relationship between triage knowledge and triage practice. In consistency with the previous available literature which showed that triage knowledge predicted triage skills in practice (Kerie et al., 2018), our study revealed a positive relationship between triage knowledge and triage practice. This may suggest that additional emergency nursing education on triage knowledge could improve triage practice. Future research can explore the role of conducting emergency nursing education programs on triage practice among Saudi Arabian ED nurses.

Study Limitations

The triage practice was measured as a self-report which risked response bias because respondents know that their actual practice was being assessed. In addition, there were no attempts to measure triage skills or any other behavioral components that might affect actual triage practice. Such unmeasured variables could be important in this regard.

Implications of the Study

Nurses should find ways of sustaining high levels of triage knowledge and practices and not allow competencies to

Table 5. Relationship Between Triage Knowledge and Practice.

Variables	r	P
Knowledge Practice	0.47	0.00

depreciate. As shown by the results of the study, other unmeasured factors that predict triage knowledge and practice might be in play. Research efforts can be directed towards unraveling these factors so that healthcare organizations can revise strategies to improve triage knowledge and practice. In addition, future research may want to examine the impact of triage knowledge and practice on patient and organizational outcomes. Policy makers can use the results of the study in formulating guidelines that direct triage practice among ED nurses. In addition, nurse managers and hospital administrators can craft frameworks that mandate the constant updating of triage knowledge and skills among ED nurses. Nurse managers need to provide educational and training opportunities that contribute to professional learning development in triage and maintain the quality of care that patients and their families receive.

Conclusions

The emergency department is a highly stressful and tense environment owing to the pressures faced by ED nurses from the urgency and acuity of the presenting patients and their families. Without organization and efficient processes, the ED can be easily overwhelmed by vulnerable and sick patients, especially during pandemics, disasters, and accidents. Triage plays an important role in ensuring that patients are prioritized according to the urgency of the need for treatment, that flow across the ED is unhampered with patients being discharged to appropriate areas within short waiting times and that resources are allocated judiciously based on patients' needs. Since ED nurses often take on the triage role, their knowledge and practice of triage concepts need to be in an acceptable level in order to be able to effectively perform their roles. Overall, emergency nurses in this study demonstrated high levels of triage knowledge and practice. Despite that, the study results revealed the existence of some knowledge gaps and deficiencies in triage practice among the study respondents. This suggests that the study participants still need further education and training in emergency nursing to improve their triage knowledge and practice. Therefore, the study recommends the development of further training and education in emergency nursing to address knowledge deficits and incorrect triage practices.

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ORCID iDs

Ahmad Rayan  <https://orcid.org/0000-0002-8377-2297>

Nidal F. Eshah  <https://orcid.org/0000-0001-6392-4655>

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