

ORIGINAL ARTICLE

Accuracy among nurses in using COVID-19 visual triage in the Emergency Medicine Department of a Tertiary Hospital in the Kingdom of Bahrain

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ABSTRACT

Background: The novel coronavirus 2019 (COVID-19) emerged in December 2019 in Wuhan, China, and rapidly spread worldwide. The Bahrain National COVID Team has released a screening tool called Visual Triage to alert healthcare workers in the Kingdom of Bahrain about the possibility of occurrence of COVID-19 infections among patients presenting to healthcare facilities. The aim of this research is to identify the accuracy rate of nurses in using Visual Triage and to evaluate points of improvement among nurses using the Visual Triage system.

Methods: A cross-sectional study was conducted using a scenario-based questionnaire in the Emergency Department (ED) of Bahrain Defense Force Hospital in the Kingdom of Bahrain. The participants were all Visual Triage nurses and ED triage nurses. The data collected through the self-administered questionnaires were analyzed using Excel and SPSS version 26 programs.

Results: The number of nurses who participated was 57. Nurses rated 66.89% of the cases correctly. There was no difference in the rate of accuracy between emergency triage nurses and Visual Triage nurses. Years of experience did not affect the accuracy rate of using Visual Triage. A comparison was made between nurses with different levels of education, and the highest accuracy was obtained by those who held a Bachelor of Science degree in nursing. Nurses who had received education about Visual Triage had a higher rate of accuracy than those who had not. In choosing the appropriate destination, nurses rated 64.02% of the cases correctly.

Conclusion: The accuracy of nurses in using Visual Triage can be improved if factors leading to inaccuracy can be adjusted. The findings of this study could be used as a guide for improvement.

Keywords: Visual Triage, emergency, COVID-19, coronavirus, nurses.

Background

COVID-19 is an infectious disease caused by the newly discovered coronavirus. In December 2019, in Wuhan, China, a cluster of pneumonia cases was identified as being caused by a novel coronavirus [1]. This virus spread very quickly and resulted in an epidemic throughout China. The cases eventually started to increase in number in other countries worldwide. In February 2020, the World Health Organization (WHO) designated the disease as COVID-19, which stands for coronavirus disease 2019. The virus that causes COVID-19 is designated as SARS-CoV-2, which stands for severe acute respiratory syndrome coronavirus 2. On March 11,

the WHO upgraded the status of the COVID-19 outbreak from epidemic to pandemic in order to urge all countries

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to take action in preventing the spread of the infection. Most people infected with COVID-19 experienced respiratory symptoms like dry cough, difficulty in breathing, sore throat, and runny nose, along with fever. However, some of the infected people are asymptomatic and are identified after being tested in the context of their particular situation and their likelihood of contracting the infection. Most of the cases recover without requiring any treatment. A serious illness is more likely to develop among older people and those with medical problems, such as cardiovascular disease, hypertension, diabetes, chronic respiratory disease, and cancer [2]. Current data suggest that the mode of transmission between people is mainly by respiratory droplets. The virus is released by the respiratory secretions of infected people. If infected people cough, sneeze, or talk, they can infect others through their secretions if they come in direct contact with their mucous membranes. Others can be infected if they touch a contaminated surface and then touch their eyes, nose, or mouth. Droplets typically do not travel more than six feet (about 2 m) and do not linger in the air [2]. As asymptomatic and pre-symptomatic patients play an important role in the transmission of the infection, the Centers for Disease Control and Prevention recommended source control measures to identify patients suspected of having COVID-19 before their entry into healthcare facilities, regardless of symptoms. This is important for isolating suspected cases, preventing possible transmission from asymptomatic cases, and reducing patients' exposure to other patients and healthcare workers [3]. As a result, the Bahrain National COVID Team has followed the recommended source control measures and released a screening tool called Visual Triage to alert healthcare workers in the Kingdom of Bahrain about the possibility

of COVID-19 infection occurring in patients presenting to their healthcare facilities. Bahrain Defense Force (BDF) Royal Medical Services Hospital assigned Visual Triage staff to all entries in the hospital to screen patients. In this study, we evaluated Visual Triage nurses to identify their accuracy in using the Visual Triage system in the Emergency Department (ED) of BDF Hospital and to explore the factors that influence their judgment.

Methods

Study design, site, and participants

A cross-sectional study was conducted using a scenario-based questionnaire for all Visual Triage nurses and emergency triage nurses in the ED of BDF Hospital in the Kingdom of Bahrain. The participants were mainly two groups of nurses. The first group comprised Visual Triage nurses who were not emergency nurses and were newly assigned to the entry of the ED during the COVID-19 pandemic. The second group comprised emergency triage nurses who already worked in the ED and had experience with the emergency triage system. Both groups were included in this study, and they worked together and shared their final scores and choice of destination for all patients entering the ED according to the established Visual Triage checklist (Figure 1). The objectives and the outcomes of the research were explained to all the participants, and those who agreed to sign the consent form were included in this study. In this study, sampling was conducted according to the convenient sampling technique. The study was conducted between June 14 and June 20, 2020, in BDF Hospital. Responses were collected anonymously from the participants. Consent was obtained from all participating nurses before they answered the questionnaire. The survey questionnaire

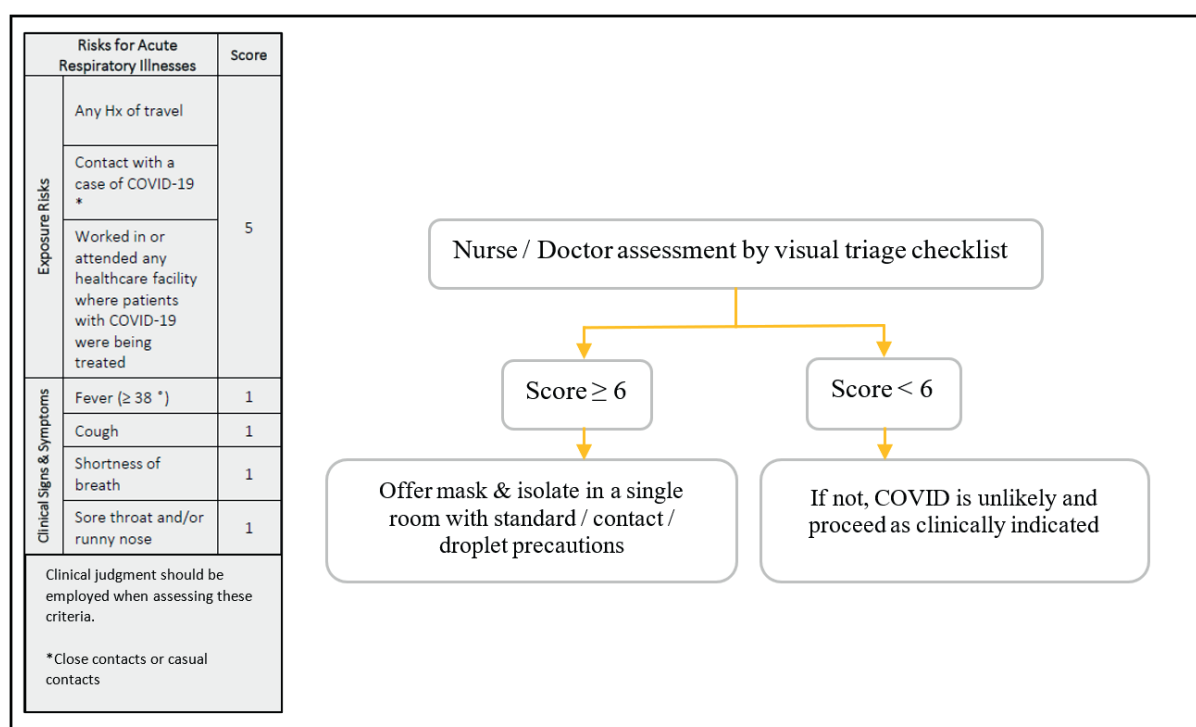


Figure 1. COVID-19 risk assessment and workflow for patients presenting to any healthcare facility.

had two sections. The first section included demographic data (such as age, gender, qualifications, amount of experience as a nurse, and whether they were an emergency triage nurse or Visual Triage nurse). The second section consisted of 10 case scenarios that were developed by the authors and validated by two expert emergency doctors and three expert emergency nurses. The scenarios were obtained from real cases visiting the ED of BDF Hospital. Reliability was defined as the degree of agreement among nurses using Visual Triage about the same clinical scenario. Participating nurses were asked to assign a Visual Triage level (scores from 0 to 9) for 10 written cases and also to choose the appropriate destination for each one. Participants were allowed to go through the Visual Triage checklist and algorithm while answering the questionnaire and no time limit was imposed for the completion of scoring.

Measurement methods

Accuracy was defined by the conformity of answers with the correct answers as defined by the authors for each triage scenario. The mean percentage of scenarios scored correctly was calculated.

Data analysis

Descriptive statistics were used to describe the socio-demographic characteristics of the participating nurses. To measure reliability among the number of raters included, Krippendorff's alpha was used with a 95% confidence interval (CI). Data sets rated ≥ 0.500 were considered reliable, whereas those rated < 0.500 were unreliable. The rate of accuracy was calculated as the mean percentage of correct responses for the scenarios. The accuracy was compared between nurses with different characteristics to identify factors that might influence the nurses' accuracy in using Visual Triage. The descriptive data were analyzed using the Statistical Package for the Social Sciences program (SPSS version 26) (IBM, Armonk, NY). Pearson's correlation was used to examine the relationships between continuous variables.

Results

Subjects

The participants' demographic characteristics are shown in Table 1. The subjects included a total of 57 potentially eligible nurses, and 88% (50) were female. ED nurses comprised 75.5% (43) and 24.5% (14) of the nurses were from other departments and had been recently assigned to work as Visual Triage nurses. Among emergency nurses, 58% (21) had more than 5 years of work experience as an emergency triage nurse. Regarding age, 44% (25) of the participating nurses were below the age of 30 years, 35% (20) were aged between 30 and 39 years, and 21% (12) were aged between 40 and 49 years. The majority of the nurses had more than 5 years of experience (89.47%, 51). Twenty-seven nurses had a Bachelor of Science in Nursing, 22 had a Diploma in Nursing, and nine were Trained Practical Nurses. Twenty-nine nurses stated that they had received hours of education about Visual Triage.

Table 1. Demographics of the participating nurses

Variable (n=57)	n (%)
Age	
Under 30 years	25 (44%)
30–39 years	20 (35%)
40–49 years	12 (21%)
Gender	
Male	7 (12%)
Female	50 (88%)
Nationality	
Bahraini	31 (54%)
Non-Bahraini	26 (46%)
Qualifications	
Bachelor of Science in Nursing	27 (47%)
Diploma in Nursing	21 (37%)
Trained Practical Nurse	9 (16%)
Work Experience	
< 5 years	6 (11%)
≥ 5 years	51 (89%)
Place of work	
Emergency nurse	43 (75%)
Non-emergency nurse	14 (25%)
Visual Triage education	
Received	29 (51%)
Not received	28 (49%)
Variable (n=36)	
Experience as ER Triage Staff	
Less than 1 year	3 (9%)
1–5 years	12 (33%)
More than 5 years	21 (58%)
Variable (n=14)	
Experience as Visual Triage Staff	
< 1 month	1 (7%)
1–2 months	8 (57%)
> 2 months	5 (36%)

Reliability of scoring

The reliability among the number of raters included (Krippendorff's alpha) was 0.626 (95% CI).

Accuracy of scoring

The nurses rated 66.79% of the cases correctly. Nurses who worked in the ED had an accuracy rate of 66.05%, and those who were from other departments had an accuracy rate of 64.09%. Nurses who had more than 5 years of experience had an accuracy score of 66.67%, and those who had less than 5 years of experience had an accuracy score of 65%. Nurses who had received education before working in Visual Triage had a higher accuracy rate of 69.31% in comparison to 63.57% for those who had not received such education. In comparison between the levels of education of the nurses, the highest accuracy was obtained by those who had a Bachelor of Science degree in Nursing, with an accuracy rate of 68.52%.

Table 2. Nurses' accuracy in using Visual Triage according to their characteristics.

Variables	Accuracy	SD	P Value
Age			
Under 30 years	64.8%	.10326	.777
30–39 years	69.5%		
40–49 years	65%		
Gender			
Male	65.7%	.04386	.882
Female	66.6%		
Nationality			
Bahraini	66.8%	.06656	.875
Non-Bahraini	66.2%		
Qualifications			
Bachelor of Science in Nursing	69%	.09745	.097
Diploma in Nursing	61%		
Trained Practical Nurse	66%		
Work Experience			
< 5 years	65%	.04101	.794
≥ 5 years	67%		
Place of work			
Emergency nurse	66%	.05752	.663
Non-emergency nurse	64%		
Visual Triage education			
Received	69%	.50437	.139
Not received	64%		
Experience as ER Triage Staff			
Less than 1 year	60%	.61083	.840
1–5 years	65.8%		
More than 5 years	66.2%		
Experience as Visual Triage Staff			
< 1 month	40%	.61125	.806
12 months	70%		
> 2 months	62%		

Table 2 summarizes the accuracy of the nurses using the Visual Triage checklist stratified by their characteristics.

Accuracy of choosing the destination

In choosing the appropriate destination, nurses rated 64.02% of the cases correctly. Most of the nurses directed the cases to the isolation room, despite giving them a low score.

Factors that affect accuracy

Nurses who received education before working with Visual Triage had a higher accuracy rate of 66.20% in comparison with 61.79% for those who did not receive such education. In comparing levels of education, the highest accuracy was obtained by those who had a Bachelor of Science in Nursing, with an accuracy rate of 66.67%. In choosing the appropriate destination, nurses who had less work experience had a higher accuracy score of 66.67% compared to 63.53% for those who had more work experience. However, when statistically

analyzed, variables of the characteristics of triage nurses were not found to significantly affect nurses' accuracy ($p < 0.01$, Table 2).

Discussion

To our knowledge, this is the first study intentionally designed to assess nurses' accuracy in using the Visual Triage system during the COVID-19 pandemic. To the best of investigators knowledge, no research has been conducted to identify nurses' accuracy in using Visual Triage in any pandemic event. The studies that were used as references and for comparison identified the accuracy of nurses in using emergency triage systems like the Emergency Severity Index [4,5], South African Triage Scale [6], and Manchester Triage in Sweden [7]. The destination chosen for patients depended on the score given. Cases with scores of less than 6 were considered to be low risk and did not need isolation. A score of 6 or more indicated a high-risk case that must be placed in an isolation room. The results showed that the average accuracy of nurses was 66.79%. In comparison with other research studies, the accuracy rate in this research study was higher. However, regarding the choice of an appropriate destination, the accuracy was 64.02%, despite there being only two options and despite the guidelines provided by the initial score. Nurses were over-isolating the patients, even if they had a low risk. In this study, none of the factors included was found to significantly affect the accuracy of nurses in using Visual Triage. However, two factors were found to have a better accuracy rate than others. Nurses who had a Bachelor of Science degree in Nursing had a better accuracy rate than the others. Also, nurses who had received education about Visual Triage had a better accuracy rate than those who did not receive such education. During the time of the study, one or two other algorithms were already being implemented for identifying high-risk patients who might be affected by the virus and should be isolated. This is believed to be a strong factor that was not incorporated in the study but is considered to have influenced the nurses' judgment.

Limitations

Three important limitations should be mentioned. First, no previous research study was conducted regarding nurses' accuracy in using Visual Triage during the COVID-19 pandemic or any other pandemic event. Thus, there is no previous research study similar to ours for use as a reference and for comparing results. Second, COVID-19 is a new disease, and there is still not much experience in dealing with it. Thus, any guidelines related to it are very new, under trial, and might change at any time. Third, the Visual Triage algorithm was newly implemented. There is no study on its accuracy in identifying high-risk patients who need to be in isolation. Therefore, it has been changed several times in the initial months of the pandemic and during the period of the research. This factor likely affected the accuracy rate of nurses, as some of them might have answered the questionnaire according to a newer algorithm rather than the older one that was used in this research.

Conclusion

The results of this study identified the accuracy rate of nurses in using Visual Triage and highlighted important factors that can influence nurses' judgment and accuracy in using Visual Triage. Nurses who have a Bachelor of Science degree in Nursing had a better accuracy rate. This most likely occurred because those nurses had more education, giving them more knowledge. Nurses who had been given hours of education about the use of Visual Triage had a better accuracy rate. It is recommended that these factors be considered in the future.

Recommendations

In order to improve the outcome of using the Visual Triage system and to raise the accuracy rate of nurses using it, it is suggested that nurses with higher education levels be chosen to work as Visual Triage nurses. Also, it is suggested that all Visual Triage nurses be given appropriate education on how to implement the Visual Triage algorithm and who to consider as a high-risk patient requiring isolation. As multiple Visual Triage algorithms were established during our research period, we advocate for studying the nurses' accuracy by using the latest Visual Triage algorithm. It is suggested to conduct a higher quality study in the future by increasing the number of participants and including more centers in the study.

List of Abbreviations

BDF	Hospital Bahrain Defense Force Hospital
COVID-19	Coronavirus disease 2019
ED	Emergency Department
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
WHO	World Health Organization

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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Consent for publication

Written consent was obtained from all the participants.

Ethical approval

Ethical approval was obtained from both the National COVID-19 Research Team and the Research Ethics Committee, Royal Medical Services, Bahrain Defense Force.

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