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The Impact of Standardized Triage Protocols on Nursing Performance in the Ophthalmology Emergency Department at King Khaled Eye Specialist Hospital

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ABSTRACT:

Background: Emergency departments (EDs) particularly specialized units such as ophthalmology require rapid, accurate patient prioritization to optimize clinical outcomes and resource allocation. However, triage consistency can be compromised by heterogeneous clinical presentations, subjective assessments, and nurse-related factors, including variations in experience, workload, and stress. Implementing structured, standardized protocols like the Manchester Triage System (MTS) mitigates these challenges by reducing cognitive load, standardizing decision-making, and enhancing overall patient safety.

Aim: This study aimed to assess the impact of the Manchester Triage System on nursing performance outcomes, including adherence protocol, workload, perceived stress, and decision-making self-efficacy in an ophthalmology emergency department.

Design: A quasi-experimental pre/post-test study was utilized in the current study.

Setting: Ophthalmology emergency department at King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia.

Sample: All triage nurses working in the emergency department during the study period.

Tool: Four validated instruments were used: a protocol adherence scale, the modified NASA Task Load Index (NASA-TLX), the Perceived Stress Scale (PSS) and the Decision-Making Self-Efficacy Scale (DMSSES).

Results: The results demonstrated statistically significant improvements following the implementation of MTS. Protocol adherence increased from a mean of 3.57 ± 0.90 pre-intervention to 4.40 ± 0.71 post-intervention ($p < 0.001$). Perceived stress significantly decreased from 3.39 ± 1.22 to 2.46 ± 1.09 ($p < 0.001$). Decision-making self-efficacy improved significantly from 2.53 ± 0.94 to 3.24 ± 0.96 ($p < 0.001$). Significant reductions were observed in workload dimensions, including mental demand (5.80 to 4.37, $p = 0.004$) and frustration (4.50 to 3.01, $p = 0.001$).

Conclusions: The implementation of the Manchester Triage System significantly improved multiple dimensions of nursing performance, including adherence to protocols, psychological well-being, and decision-making confidence.

1. INTRODUCTION

Emergency departments represent one of the most demanding areas within healthcare systems, characterized by high patient volumes, overcrowding, time pressure, and the need for rapid clinical decision-making. Triage is a critical component of emergency care because it enables patients to be prioritized according to the urgency and severity of their clinical condition. Recent evidence continues to emphasize the central role of triage in determining patient priority and supporting timely emergency care (Porto et al., 2024).

In specialized settings such as ophthalmology emergency departments, the wide range of clinical presentations and the presence of time-sensitive, vision-threatening conditions make accurate and consistent prioritization particularly important. Evidence from a tertiary eye hospital in Saudi Arabia demonstrated substantial variation in the urgency of ophthalmic presentations and showed that a structured ocular triage system could improve the prioritization of patients requiring urgent ophthalmic care (AlSamnan et al., 2023).

Nurses are at the forefront of triage processes, where their clinical judgment, experience, and decision-making skills directly influence patient outcomes. However, unstructured triage practices may lead to inconsistencies, reliance on intuition, and variability in patient prioritization. Such variability can result in under-triage or over-triage, potentially compromising patient safety and increasing system inefficiencies (Zaboli et al., 2024).

The Manchester Triage System (MTS) is a structured triage tool designed to standardize patient assessment and prioritization through evidence-based algorithms. It aims to reduce variability in clinical decision-making and enhance consistency across practitioners. Previous studies have demonstrated the effectiveness of structured triage systems in improving accuracy and efficiency in emergency departments; however, evidence in specialized fields such as ophthalmology remains limited (Zaloznik Djordjevic et al., 2026).

Saudi Arabia has made significant advancements in healthcare quality and patient safety, particularly in emergency services. Nevertheless, there is a lack of research examining the effectiveness of structured triage systems within specialized emergency departments. Given the increasing demand for ophthalmic emergency services, evaluating the impact of MTS implementation is essential (AlSamnan et al., 2023).

SIGNIFICANCE OF THE STUDY

This study addresses the need for consistent, accurate and evidence-based triage practices in specialized ophthalmology emergency care. Triage is a critical nursing responsibility because timely and accurate prioritization is essential for identifying patients who require immediate assessment and intervention. In the Saudi ophthalmology context, a previous study conducted at King Khaled Eye Specialist Hospital demonstrated the value of a structured ocular emergency triage system for identifying patients according to the urgency of their conditions and improving the prioritization of ophthalmic emergencies (AlSamnan et al., 2023).

This study is important because it evaluates the effect of implementing the Manchester Triage System (MTS) on nurses' protocol adherence, perceived workload, perceived stress, and decision-making self-efficacy. Standardized triage systems can provide nurses with a structured framework for assessing presenting complaints, identifying urgency, and making prioritization decisions consistently. A recent systematic review found that educational and implementation strategies can improve the quality of nurse triage, including triage knowledge and skills, although the sustainability of these improvements may depend on continued implementation support (Ouellet et al., 2025).

Variability in triage decisions may contribute to inappropriate prioritization of patients and may affect the timely delivery of emergency care. This is particularly relevant in ophthalmology emergency departments, where some presentations may be associated with time-sensitive threats to vision. Therefore, evaluating nurses' adherence to a standardized triage protocol may

provide useful evidence regarding consistency in clinical prioritization and support efforts to strengthen patient-safety practices (AlSamnan et al., 2023).

The study findings may assist nurse managers and hospital administrators in evaluating the feasibility and usefulness of standardized triage implementation within specialized emergency services. Evidence from Saudi Arabia indicates that structured triage education can improve nurses' triage knowledge and reduce registration-to-triage time, triage-to-decision time, and overall length of stay in an urgent-care setting (Alreshedi et al., 2025).

Finally, from a research perspective, this study contributes to the relatively limited evidence regarding standardized triage systems in specialized ophthalmology emergency departments. Although structured ocular triage has been evaluated previously in Saudi Arabia, particularly at King Khaled Eye Specialist Hospital, that work focused on the validity of an ocular triage system rather than the effect of MTS implementation on nurses' workload, stress, protocol adherence, and decision-making self-efficacy (AlSamnan et al., 2023). So, this study aimed to assess the impact of the Manchester Triage System on nursing performance outcomes, including adherence protocol, workload, perceived stress, and decision-making self-efficacy in an ophthalmology emergency department.

2. RESEARCH QUESTIONS

This study sought to answer the following research questions:

- 1- What is the level of protocol adherence among triage nurses before and after MTS implementation?
- 2- What is the level of workload experienced by triage nurses before and after MTS implementation?
- 3- What is the level of perceived stress among triage nurses before and after MTS implementation?
- 4- What is the level of decision-making self-efficacy among triage nurses before and after MTS implementation?
- 5- What is the relationship between protocol adherence and nurses' outcomes (workload, perceived stress, and decision-making self-efficacy)?

3. METHODOLOGY

3.1 Research Design

A quasi-experimental pre-test/post-test design was utilized in the current study.

3.2 Setting

Ophthalmology emergency department at King Khaled Eye Specialist Hospital in Riyadh, Saudi Arabia.

3.3 Sample

All triage nurses working in the emergency department during the study period. Inclusion criteria included active involvement in triage and willingness to participate.

3.4 Tools for Data Collection

Four validated tools were used: Protocol Adherence Scale, Modified NASA-TLX (Workload Assessment), Perceived Stress Scale (PSS) and Decision-Making Self-Efficacy Scale (DMSES)

4.5. Ethical consideration

Permission to conduct the study was obtained from Research Ethics Committee of Medical Sciences, AlMaarefa University and the concerned authoritative personnel in the study setting. Also, each eligible patient who met the inclusion criteria was informed about the purpose of the study and its importance. The researchers emphasized that participation in the study was entirely voluntary; anonymity and confidentiality were assured through coding the data. Informed consent was taken from patients who accept to be included in the study. The participants were assured that their data were not reused in another research without their acceptance.

3.4 Procedure

After obtaining the necessary ethical approval from the relevant Institutional Review Board and administrative permission from King Khaled Eye Specialist Hospital, Riyadh, the researcher initiated the study procedures. The study was conducted in sequential phases, including preparation, pre-intervention assessment, implementation of the standardized triage protocol, and post-intervention assessment.

Phase I: Preparation and Baseline Assessment

Before implementation of the intervention, the researcher met with the nursing administration and triage nurses in the ophthalmology emergency department to explain the purpose, procedures, expected benefits, and duration of the study. Eligible nurses were invited to participate, and written informed consent was obtained from each participant before data collection. Participation was voluntary, and nurses were informed that they could withdraw from the study at any time without any effect on their employment or professional evaluation.

During the baseline phase, demographic and professional characteristics of the participating nurses were collected. These characteristics included variables such as age, gender, educational qualification, years of nursing experience, emergency nursing experience, and previous experience with standardized triage systems, as applicable.

The participants then completed the pre-intervention assessment using the study instruments. The assessment included the protocol adherence scale, modified NASA Task Load Index (NASA-TLX), Perceived Stress Scale (PSS), and Decision-Making Self-Efficacy Scale (DMSES). The baseline assessment was conducted before exposure to the standardized triage intervention to establish the participants' initial levels of protocol adherence, workload, perceived stress, and decision-making self-efficacy.

Phase II: Implementation of the Standardized Triage Protocol

Following completion of the baseline assessment, the researcher implemented a structured educational and training program on the Manchester Triage System (MTS). The training was designed to provide participating nurses with standardized knowledge and practical skills required to apply the MTS consistently in the ophthalmology emergency department.

The training included an overview of the principles and objectives of standardized triage, the structure and priority categories of the MTS, assessment of presenting complaints, identification of clinical discriminators, determination of urgency, prioritization of patients, appropriate documentation, and escalation of patients presenting with potentially sight-threatening or life-threatening conditions. Particular attention was given to the application of standardized triage principles to ophthalmic emergency presentations.

The educational component consisted of interactive theoretical sessions supported by clinical examples, case-based learning, discussion, and practical exercises. Ophthalmology-specific clinical scenarios were incorporated to allow nurses to practice assigning appropriate triage categories according to standardized criteria.

Following the educational sessions, nurses participated in practical case-based exercises and/or simulation activities. The researcher provided feedback and clarification regarding triage decisions, documentation, and appropriate escalation procedures. Nurses were given opportunities to discuss challenging or ambiguous ophthalmic presentations and to practice applying the protocol consistently.

To support implementation in routine practice, the standardized triage protocol and relevant supporting materials were made available to participating nurses in the ophthalmology emergency department. The researcher monitored implementation during the intervention period and provided clarification when necessary while avoiding interference with routine clinical decision-making.

Phase III: Intervention/Implementation Period

After completion of training, the Manchester Triage System was implemented as the standardized triage approach in the ophthalmology emergency department for the predetermined intervention period.

During this phase, participating nurses applied the standardized protocol when assessing and prioritizing patients according to their presenting complaints and clinical condition. Nurses were expected to follow the established assessment sequence, identify

relevant clinical discriminators, assign the appropriate urgency category, document the triage decision, and escalate patients according to established clinical and institutional procedures.

The researcher monitored implementation to assess consistency with the protocol and to identify practical barriers or difficulties encountered during routine application. Any questions related to the interpretation or application of the protocol were addressed through standardized clarification to maintain consistency throughout the intervention period.

Phase IV: Post-Intervention Assessment

At the completion of the predetermined implementation period, the same outcome measures used during the baseline assessment were administered to the participating nurses.

The post-intervention assessment included the protocol adherence scale, modified NASA Task Load Index (NASA-TLX), Perceived Stress Scale (PSS), and Decision-Making Self-Efficacy Scale (DMSES). The purpose was to determine changes in nurses' protocol adherence, perceived workload, perceived stress, and decision-making self-efficacy following implementation of the standardized triage protocol. The post-intervention assessment was conducted under conditions comparable to those of the baseline assessment, as far as practicable, to reduce the influence of differences in data-collection conditions.

3.6 Data Analysis

Data were analyzed using SPSS. Descriptive statistics and inferential tests (Spearman correlation and paired comparisons) were used. Significance level was set at ($p < 0.05$).

4. RESULTS

4.1 Participants' Characteristics

Table 1 presents the demographic and professional profile of the research participants. The mean age was 34.81 years, with a standard deviation of 5.10. The range was between 25 and 46 years, with a median age of 34. The professional profile showed a slight predominance of males, with 53% being male and 47% being female. In terms of experience, the mean experience for emergency nursing was 6.50 years, with a standard deviation of 3.87. The range was between 6 months and 20 years. In ophthalmology triage, the mean experience was lower, with a mean of 5.23 years and a standard deviation of 3.53. The range was between 6 months and 17 years.

In relation to formal training in triage systems, most participants (84%) received instruction in both the ESI and the MTS. A smaller proportion of participants received instruction in ESI alone (4%), whereas 8% had not received instruction in either triage system. In relation to the workforce, nearly one-third of the participants (31%) spent 30 hours or more per week on triage activities, followed by 27% who spent 10-19 hours, 22% who spent 20-29 hours, and 20% who spent 5-9 hours on triage activities.

Table 1: Participants' Demographic Data

Demographic information	Number	(Percentage)
		%
Age	Value	
Mean	34.81	
Median	34.00	
Standard Deviation	5.102	
Min Value	25	
Max Value	46	
Gender		

Male	53	53.0
Female	47	47.0
Years of experience in emergency nursing		Value
Mean	6.50	
Median	6.00	
Standard Deviation	3.868	
Min Value	6	
Max Value	20	
Years of experience in ophthalmology triage		Value
Mean	5.23	
Median	4.00	
Standard Deviation	3.530	
Min Value	6	
Max Value	17	
Have you received formal training in any of the following triage systems?		
Emergency Severity Index (ESI)	4	4.0
Manchester Triage System (MTS)	4	4.0
Both	84	84.0
Neither	8	8.0
Average hours per week spent performing triage		
5-9	20	20.0
10-19	27	27.0
20-29	22	22.0
30 or more	31	31.0

Pre-Intervention Assessment under Emergency Severity Index (ESI) Protocol

The level of adherence to the ESI protocol by the nurses was found to be moderate for all items. The highest level of adherence was found in the updating of the triage decisions, as well as the conformance to the documentation standards, while the lowest level of adherence was found in the adherence to the wait time guidelines, as well as the minimizing of the use of intuition. The overall mean score for protocol adherence was 3.57 ± 0.90 , indicating a moderate level of adherence. Based on the above, it is evident that the overall potential for improvement is substantial, thereby providing the baseline for the evaluation of the impact of the MTS intervention (Table 2).

Table 2: Descriptive Statistics for Protocol Adherence Pre-Intervention (ESI Phase)

No.	Item	Mean	Std. Deviation	Rank	Rating
1	I consistently follow the main decision algorithm of the triage protocol	3.62	0.92	6	Moderate
2	I use the defined criteria to determine the triage level	3.68	0.88	2	Moderate
3	I consider the predicted resource needs as described in the protocol	3.65	0.85	5	Moderate
4	I avoid relying on clinical intuition alone	3.40	1.05	9	Moderate
5	I apply triage levels consistently across similar patient presentations	3.48	0.90	8	Moderate
6	I consult the triage chart or flow diagrams when in doubt	3.55	0.87	7	Moderate
7	I adhere to wait-time guidelines associated with each triage level	3.35	1.00	10	Moderate
8	I feel confident in applying protocol to ophthalmic emergencies	3.60	0.88	4	Moderate
9	I update my triage decisions if the patient's condition changes	3.70	0.80	1	Moderate
10	I follow documentation standards when applying the protocol	3.68	0.85	2	Moderate
Total		3.57	0.90	-	Moderate

Table 3 showed the baseline workload of the nurses performing the triage role according to the Emergency Severity Index (ESI) protocol. The results indicated high levels of mental demand, effort, and frustration, while the level of temporal demand was very high. The level of perceived performance was also high, offering an overall view of the workload of the nurses before the implementation of the Manchester Triage System (MTS) intervention, which is essential in the evaluation of the intervention's effectiveness. The overall mean workload score was 5.80 ± 2.83 , indicating a high level of workload.

Table 3: Descriptive Statistics for Modified NASA-TLX Workload Assessment Pre-Intervention (ESI Phase)

No.	Item	Mean	Std. Deviation	Rank	Rating
1	Mental demand- How mentally demanding was triage?	5.80	2.80	2	High
2	Temporal demand- How hurried or rushed was the pace of triage?	6.90	3.10	1	Very High
3	Effort- How hard did you have to work to accomplish your triage tasks?	5.60	2.85	3	High
4	Frustration- How insecure, discouraged, or stressed did you feel?	4.50	2.60	4	High
5	Perceived performance- How successful do you think you were?	6.20	2.80	5	High
Total		5.80	2.83	-	High

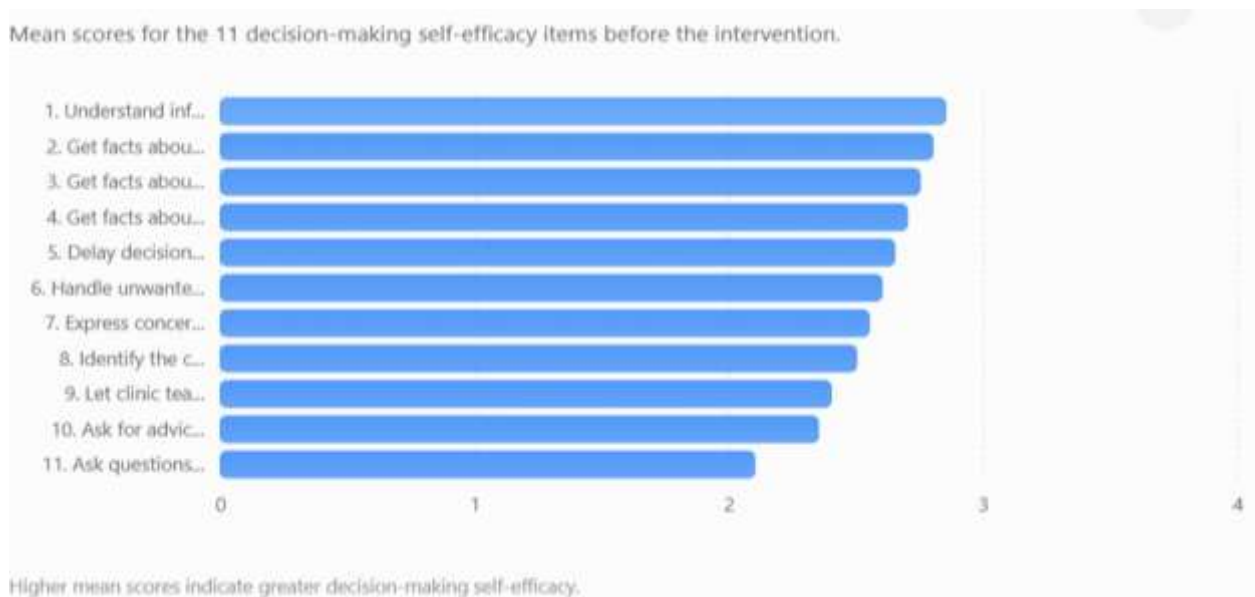
Table 4 presented a summary of the basic levels of stress experienced by nurses during triage according to the Emergency Severity Index (ESI) protocol. The results show moderate to high levels of stress in all dimensions. These results create a baseline for the evaluation of nurses' stress before the implementation of the Manchester Triage System (MTS). The overall mean stress score was 3.38 ± 1.22 , indicating a moderate level of perceived stress.

Table 4: *Perceived Stress Scale (PSS) Pre-Intervention (ESI Phase)*

No.	Item	Mean	Std. Deviation	Rank	Rating
1	I felt unable to control important things in my work	3.45	1.25	3	Moderate
2	I felt confident about handling triage challenges	3.10	1.30	5	Moderate
3	I felt nervous and stressed during triage	3.65	1.20	2	High
4	I felt I could not cope with all the demands in the emergency department	3.80	1.10	1	High
5	I felt things were going my way in triage	3.00	1.35	6	Moderate
6	I was angered by things beyond my control in the emergency setting	3.50	1.25	4	High
7	I felt difficulties were piling up so high that I could not overcome them	3.60	1.15	2	High
8	I felt I could manage time effectively under pressure	3.05	1.30	6	Moderate
9	I found myself thinking about triage stress after work	3.40	1.20	4	Moderate
10	I had trouble sleeping or relaxing due to work-related stress	3.25	1.10	5	Moderate
Total		3.38	1.22	-	Moderate

Figure 1 showed the baseline level of decision-making self-efficacy for nurses who perform triage according to the ESI protocol. Using the DMSE scale, nurses demonstrated moderate levels of confidence in all areas except in asking questions and seeking advice. These results serve as a benchmark to measure potential gains in self-efficacy after implementation of the Manchester Triage System (MTS). The overall mean decision-making self-efficacy score was 2.65 ± 0.94 , indicating a moderate level of self-efficacy.

Figure 1: *Decision-Making Self-Efficacy - Pre-Intervention (ESI Phase)*



Post-Intervention (MTS Phase)

Research question one: What is the level of adherence of triage nurses to standardized triage protocols (MTS Protocol)?

After the successful implementation of the Manchester Triage System (MTS) through the training program, the results showed that the level of adherence to the triage protocols among the triage nurses was high. As illustrated in Table (5), the mean level of adherence to the different items ranged from 4.11 to 4.61 on the Likert scale. All the items were categorized as "High," showing that the nurses were adhering to the protocols in the real-world context. The highest level of adherence was noted in the items that pertained to critical patient safety concerns such as updating the triage decisions in cases where the patient's condition changes (Item 9; Mean = 4.61, SD = 0.665), documentation (Item 10; Mean = 4.57, SD = 0.714), and the implementation of the protocols for ophthalmic emergencies (Item 8; Mean = 4.48, SD = 0.772). Other items that showed high levels of adherence to the protocols were the use of criteria in making triage decisions (Item 2; Mean = 4.42, SD = 0.867), consideration of the resource needs (Item 3; Mean = 4.43, SD = 0.320), and the compliance with the primary decision algorithm (Item 1; Mean = 4.40, SD = 0.888).

Overall, the results following the intervention suggest that the MTS training program had a positive influence on the nurses' levels of adherence to the standardized triage protocol. The overall mean protocol adherence score was 4.38 ± 0.71 , indicating a high level of adherence following the intervention.

Table 5: Descriptive Statistics for Protocol Adherence (Post-Intervention)

No.	Item	Mean	Std. Deviation	Rank	Rating
1	I consistently follow the main decision algorithm of the triage protocol	4.40	0.888	2	High
2	I use the defined criteria to determine the triage level	4.42	0.867	1	High
3	I consider the predicted resource needs as described in the protocol	4.43	0.320	1	High
4	I avoid relying on clinical intuition alone	4.16	1.098	5	High
5	I apply triage levels consistently across similar patient presentations	4.21	0.018	4	High
6	I consult the triage chart or flow diagrams when in doubt	4.38	0.789	3	High
7	I adhere to wait-time guidelines associated with each triage level	4.11	0.963	6	High
8	I feel confident in applying protocol to ophthalmic emergencies	4.48	0.772	1	High
9	I update my triage decisions if the patient's condition changes	4.61	0.665	1	High
10	I follow documentation standards when applying the protocol	4.57	0.714	1	High
Total		4.38	0.71	-	High

Research question Two: What is the level of workload perceived by triage nurses when performing protocol-based triage?

As can be noted from the results of the assessment following the deployment of the Manchester Triage System (MTS) intervention, the overall workload for the triage nurses, as measured by the modified NASA-TLX scale, is found to be moderate to high. As can be noted from the results presented in Table (6), the mean workload scores for the different dimensions ranged from 3.01 to 7.79. All the dimensions had a workload rating that ranged from Moderate to Very High. The dimension for perceived performance had the highest perceived workload (Mean = 7.79, SD = 2.768, Rating = Very High), indicating that the nurses had a general feeling of success in meeting their triage duties. Similarly, the dimension for temporal demand had a relatively high mean (Mean = 6.08, SD = 3.024, Rating = High), indicating that the nurses had a general feeling of experiencing time pressure while executing the protocol-based triage. It is interesting to see that the dimension for effort had a moderately high mean (Mean = 5.38, SD = 2.763, Rating = High), indicating that the process of executing the triage protocol had a substantial workload. At the same time, the dimension for mental demand had a moderate mean (Mean = 4.37, SD = 2.658,

Rating = Moderate), indicating that the process of executing the protocol had a balanced workload. The overall frustration levels had a low to moderate mean (Mean = 3.01, SD = 2.402, Rating = Moderate), indicating that despite the workload pressure and time constraints, the nurses had a low rate of frustration.

Table 6: Descriptive Statistics for Modified NASA-TLX Workload Assessment (Post-Intervention)

No	Item	Std.		Rank	Rating
		Mean	Deviation		
1	Mental demand- How mentally demanding was triage?	4.37	2.658	4	Moderate
2	Temporal demand- How hurried or rushed was the pace of triage?	6.08	3.024	2	High
3	Effort - How hard did you have to work to accomplish your triage tasks?	5.38	2.763	3	High
4	Frustration- How insecure, discouraged, or stressed did you feel?	3.01	2.402	5	Moderate
5	Perceived performance- How successful do you think you were?	7.79	2.768	1	Very High
Total		5.33	2.72	-	High

Research question Three: What is the level of stress experienced by triage nurses during the implementation of standardized triage protocols?

The results, following the intervention (Table 7), showed that the overall level of stress experienced by triage nurses in the process of protocol-based triage was low to moderate, with an average score of 2.456 (SD = 0.418). The nurses reported low levels of stress in relation to lack of control over work tasks (M = 1.89, SD = 1.034), coping with departmental demands (M = 1.75, SD = 1.009), feeling nervous or overwhelmed during the triage process (M = 2.06, SD = 0.930), experiencing frustration or anger caused by uncontrollable situations (M = 2.06, SD = 1.062), and experiencing stress after work (M = 1.84, SD = 1.070). The nurses reported moderate levels of stress in relation to feeling confident in dealing with triage challenges (M = 3.99, SD = 1.235), effective time management in the triage process (M = 3.88, SD = 1.276), and the perception that the triage process was running smoothly (M = 3.44, SD = 1.274). The lowest levels of stress were reported in relation to experiencing difficulties in coping with the accumulation of challenges (M = 1.84, SD = 1.002) and the experience of disturbances in sleep or relaxation caused by work (M = 1.81, SD = 1.022). The results suggest that the implementation of the triage protocols, including the transition from the ESI to the MTS, did not result in significant levels of stress among triage nurses. Rather, the majority of the nurses reported feeling capable, confident, and in control in the triage process. The nurses reported moderate levels of stress, which may be related to the inherent challenges in time and decision-making in the triage process. The overall mean perceived stress score was 2.47 ± 1.09 , indicating a moderate level of stress following the intervention.

Table 7: Descriptive Statistics for Perceived Stress Scale (PSS) Post-Intervention

No.	Item	Std.		Rank	Rating
		Mean	Deviation		
1	I felt unable to control important things in my work	1.89	1.034	9	Low
2	I felt confident about handling triage challenges	3.99	1.235	2	Moderate
3	I felt nervous and stressed during triage	2.06	0.930	8	Low
4	I felt I could not cope with all the demands in the emergency department	1.75	1.009	10	Low
5	I felt things were going my way in triage	3.44	1.274	3	Moderate

Table 7: Descriptive Statistics for Perceived Stress Scale (PSS) Post-Intervention

No.	Item	Mean	Std. Deviation	Rank	Rating
6	I was angered by things beyond my control in the emergency setting	2.06	1.062	7	Low
7	I felt difficulties were piling up so high that I could not overcome them	1.84	1.002	11	Low
8	I felt I could manage time effectively under pressure	3.88	1.276	4	Moderate
9	I found myself thinking about triage stress after work	1.84	1.070	12	Low
10	I had trouble sleeping or relaxing due to work-related stress	1.81	1.022	13	Low
Total		2.47	1.09	-	Moderate

Research question Four: What is the level of decision-making confidence among triage nurses when applying triage protocols in emergency situations?

As presented in Table 8, descriptive statistics for the self-efficacy in decision-making among triage nurses were computed. From the results, a general high level of confidence in decision-making while applying triage protocols in emergency cases can be noted. The highest mean score was recorded for the item “I feel confident that I can understand the information enough to be able to make a choice” ($M = 3.47$, $SD = 0.797$), which was ranked as the highest, indicating High. This shows that the majority of triage nurses perceive themselves as capable of understanding the information needed for effective decision-making. This was closely followed by the level of confidence in getting facts about the choices of medications ($M = 3.46$, $SD = 0.784$).

Further, a high level of confidence was recorded for nurses in understanding the benefits ($M = 3.39$, $SD = 0.751$) as well as the risks or side effects ($M = 3.33$, $SD = 0.739$) for each choice. Moreover, a high level of confidence was recorded for nurses in delaying decisions ($M = 3.32$, $SD = 0.984$) as well as withstanding pressure ($M = 3.30$, $SD = 0.859$) from other people. This shows that triage nurses generally possess a high level of professional judgment despite the emergency situation that may demand a decision. However, a relatively lower level was noted for nurses in communication skills as well as interpersonal assertiveness. The lowest mean score was recorded for the item “I feel confident that I can ask questions without feeling uncomfortable or foolish” ($M = 2.78$, $SD = 1.488$), which was ranked as Moderate. This was followed by the level of confidence in soliciting advice ($M = 3.21$, $SD = 0.977$) as well as informing the clinic team about what was best for them ($M = 3.22$, $SD = 1.060$). The overall mean decision-making self-efficacy score was 3.30 ± 0.96 , indicating a high level of self-efficacy following the intervention.

Table 8: Descriptive Statistics for Decision-Making Self-Efficacy- Post-Intervention

No.	Item	Mean	Std. Deviation	Rank	Rating
1	I feel confident that I can understand the information enough to be able to make a choice.	3.47	0.797	1	High
2	I feel confident that I can get the facts about the medication choices available to me.	3.46	0.784	2	High
3	I feel confident that I can get the facts about the benefits of each choice.	3.39	0.751	3	High
4	I feel confident that I can get the facts about the risks and side effects of each choice.	3.33	0.739	4	High
5	I feel confident that I can delay my decision if I feel I need more time.	3.32	0.984	5	High

6	I feel confident that I can handle unwanted pressure from others in making my choice.	3.3	0.859	6	High
7	I feel confident that I can express my concerns about each choice.	3.29	0.844	7	High
8	I feel confident that I can figure out the choice that best suits me.	3.28	0.877	8	High
9	I feel confident that I can let the clinic team know what's best for me.	3.22	1.06	9	Moderate
10	I feel confident that I can ask for advice when making my decision.	3.21	0.977	10	Moderate
11	I feel confident that I can ask questions without feeling uncomfortable or foolish.	2.78	1.488	11	Moderate
Total		3.30	0.96	-	High

Research Question five: What is the relationship between protocol adherence and nurses' outcomes, including stress level, workload, and decision-making confidence?

However, before examining the relationships between protocol adherence and the outcome variables of nurses, the normality of the variables was examined through the Kolmogorov-Smirnov and Shapiro-Wilk tests. The findings of the tests (table 9) indicated that Protocol Adherence and Decision-Making Self-Efficacy were not normally distributed since both variables were significant at 0.000 and 0.004, respectively, which is < 0.05 . Conversely, Workload (Modified NASA-TLX) and Perceived Stress Scale (PSS) were almost normally distributed since they were significant at 0.054 and 0.132, respectively, which is close to 0.05.

Since the independent variable, protocol adherence, was not normally distributed, non-parametric correlation analysis, such as Spearman's rho correlation, could be used to determine the relationships between protocol adherence and stress levels, workload, and decision-making self-efficacy confidence.

Table 9: Test of Normality for Study Variables

No.	Variable	Kolmogorov-Smirnov Statistic	K-S Sig.	Shapiro-Wilk Statistic	S-W Sig.	Normality	Decision
1	Protocol Adherence	0.152	0.00	0.892	0.00	Not Normal	Non-Parametric
2	Modified NASA-TLX - Workload Assessment	0.091	0.038	0.975	0.054	Approximately Normal	Parametric
3	Perceived Stress Scale - PSS	0.098	0.019	0.98	0.132	Approximately Normal	Parametric
4	Decision-Making Self-Efficacy	0.119	0.001	0.961	0.004	Not Normal	Non-Parametric

Pre- and Post-Intervention Comparison of Triage Nurses' Outcomes

Table 10 showed the pre- and post-intervention findings of triage nurses after implementing the Manchester Triage System (MTS). The findings show significant improvement in protocol adherence from 3.57 to 4.40 ($p < 0.001$), while perceived stress was reduced from 3.39 to 2.46 ($p < 0.001$). There were significant improvements in various aspects of workload, including mental demand from 5.80 to 4.37 ($p = 0.004$), temporal demand from 6.90 to 6.08 ($p = 0.032$), and frustration from 4.50 to 3.01 ($p = 0.001$). Perceived performance was also increased from 6.20 to 7.79 ($p = 0.001$). Decision-making self-efficacy was also enhanced significantly from 2.53 to 3.24 ($p < 0.001$). Overall, these findings show that the MTS intervention was effective in improving triage nurses' protocol adherence, confidence, and performance, and reducing perceived stress and workload.

Table 10: Pre- and Post-Intervention Comparison of Triage Nurses' Outcomes

Variable	Item	Pre-Mean (SD)	Post-Mean (SD)	Change	Test Used	P-value	Effect Size
Protocol Adherence	Overall Adherence	3.57 (0.90)	4.40 (0.76)	+0.83	Wilcoxon Signed-Rank	< 0.001	d= 0.60 (Large)
Workload (NASA-TLX)	Mental demand	5.80 (2.80)	4.37 (2.66)	-1.43	Paired t-test	0.004	d = 0.51 (Medium)
	Temporal demand	6.90 (3.10)	6.08 (3.02)	-0.82	Paired t-test	0.032	d = 0.27 (Small)
	Effort	5.60 (2.85)	5.38 (2.76)	-0.22	Paired t-test	0.452	d = 0.08 (Negligible)
	Frustration	4.50 (2.60)	3.01 (2.40)	-1.49	Paired t-test	0.001	d = 0.58 (Medium)
	Perceived performance	6.20 (2.80)	7.79 (2.77)	+1.59	Paired t-test	0.001	d = 0.57 (Medium)
Perceived Stress (PSS)	Overall Stress	3.39 (1.15)	2.46 (0.42)	-0.93	Paired t-test	< 0.001	d = 0.81 (Large)
Decision-Making Self-Efficacy (DMSES)	Overall Confidence	2.53 (0.97)	3.24 (0.95)	+0.71	Wilcoxon Signed-Rank	< 0.001	r = 0.55 (Large)

DISCUSSION

The results showed a significant improvement in the outcomes following the implementation of MTS. The above findings clearly show that the adoption of structured triage approaches, like the MTS, can lead to multiple benefits in terms of performance by enhancing the cognitive, behavioral, and psychological abilities of nurses. In essence, the approach did not only increase the compliance of the nurses but allowed for a more overall change in their way of processing information, decision-making, and dealing with the stresses associated with their work environments.

The most important finding was the increase in nurses' compliance with the protocol, where the result was reflected in the increase from a pre-intervention mean of 3.57 to a post-intervention mean of 4.40 ($p < 0.001$, $r = 0.60$). This reflects an increase in the level of compliance with standardized decision criteria based on the training received on the Manchester Triage System (MTS). This result supports previous findings that triage guidelines and protocols result in a more consistent and accurate triage performance (Manayer *et al.* 2024), thereby supporting the hypothesis that educational interventions increase nurses' competence in performing triage procedures.

In addition, recent evidence supports the use of the Manchester Triage System (MTS) as a structured approach to emergency patient prioritization, while highlighting variability in its reliability and performance across clinical and operational settings (Zaloznik Djordjevic *et al.*, 2026). This change could be viewed from the perspective of standardization theory, which asserts that the reduction of variability within clinical decision-making results in higher reliability and less bias. When it comes to emergencies, which require quick decisions to be made amidst uncertainties, structured decision-making serves as an anchor for clinical decision-making processes. Therefore, increased adherence does not represent procedural improvement alone, but also represents a significant improvement in clinical decision-making (Zaboli *et al.*, 2025).

The inconsistencies in triage results have been identified as a weakness in unstructured systems, which can cause inconsistencies in patient care and increase waiting times, thus illustrating the importance of training and standardization like MTS (Porto *et*

al., 2024). In terms of patient safety, better adherence is vital in reducing under triage and over triage, which can lead to negative patient outcomes. With proper categorization of patients, the MTS can provide an effective means of resource utilization in the emergency department. It also reduces waiting times for patients with high acuity needs, resulting in better operational efficiency in the emergency setting (Mitchell et al., 2024).

Significant workload outcome results revealed considerable improvements in post-intervention, including a significant decrease in mental demands and a significant decrease in frustration. These results clearly showed that triage support can help alleviate mental demands on nursing staff. These results are also consistent with Manayer et al., (2024) who demonstrated that a well-defined process is essential to alleviate cognitive demands, thus improving efficiency. Although cognitive demands are a natural component of emergency nursing, a well-structured training program provides a nurse with a clear process to follow, reducing ambiguity, which is a common source of frustration for emergency nursing staff.

The provision of guidelines allows for the reduction of uncertainties and the cognitive demands of processing the information, thus facilitating nurses' focus on decision making and critical thinking without being distracted by decision uncertainties. Cognitive load reduction becomes more important in stressful situations where increased cognitive loads have negative impacts on performance and patient outcomes.

The relative decrease in perceived time pressure might be attributed to increased efficiency in workflow processes after implementing MTS. These results are in line with previous studies that highlighted the importance of training as a means to enhance efficiency and accuracy of triage decisions (Alreshedi et al., 2025). It is important to note that effort did not significantly change ($p = 0.452$), which means that the physical demands of triage procedures remain constant despite using more formalized decision support tools. This implies that while Mobile Triage Systems (MTS) improve cognition and procedural effectiveness, they cannot reduce the inherent physical work involved in the emergency situation (Ouellet et al., 2025).

The most notable post-intervention finding was the increase in perceived performance. High perceived performance signifies that the nurses perceived themselves to be competent and capable of performing their triage duties, and this could be attributed to the training they received and their familiarity with the protocol framework. This is supported by the literature, which asserts that competencies and guideline-based training significantly impact clinical actions and attitudes (Ghoneim et al., 2024). Improved perception of performance could also be an indication of increased role clarity and reduced uncertainty in the process of making decisions clinically.

Another interesting finding was the decrease in perceived stress levels. The large effect size indicates a substantial decrease in stress levels after the application of the MTS intervention. Emergency nursing practice is recognized as a highly stressful work setting where ambiguity and high cognitive load are key factors in creating emotional stress (Surendran et al., 2024). The application of clear decision guidelines and triage protocols may have contributed to reducing stress levels in the intervention group, which is supported by studies on the role of protocols in reducing occupational stress (Jiao et al., 2023). The reduced stress level indicates the benefits offered by a systematic approach to treatment. MTS minimizes ambiguity and uncertainty, giving patients a feeling of certainty, which is one of the important factors that help reduce occupational stress. The results are especially significant for preventing burnout and ensuring the sustainability of the medical workforce in emergency departments.

Decision making self-efficacy also revealed a statistically significant improvement. This improvement in self-efficacy is of special interest to note as self-efficacy directly relates to the accuracy of decisions made during the process of triage and ultimately to the effectiveness of the nurse's practice. The enhancement of self-efficacy is a recurring motif in the literature on emergency nursing practice, emphasizing the role of educational interventions on self-efficacy in decision making (Manayer et al., 2024). Hence, the increase in self-efficacy can be considered not only as an improvement in psychology but also as a critical factor for enhanced clinical practice.

Moreover, the correlation analysis in the present study revealed that higher compliance with the protocol was associated with lower perceived stress and higher self-efficacy, suggesting an interrelationship between adherence to structured decision-making processes, psychological well-being, and professional confidence. In Saudi Arabia, Alreshedi et al. (2025) reported that structured triage training significantly improved nurses' triage knowledge and was associated with reductions in registration-to-triage time, triage-to-decision time, and overall length of stay. Similarly, Hinds et al., (2025) found that triage refresher training was associated with improvements in triage accuracy, knowledge, self-efficacy, and clinical decision-making skills. These

findings suggest that adherence to standardized triage protocols may extend beyond procedural compliance by supporting nurses' confidence and consistency in clinical decision-making. Thus, improving protocol compliance may have interconnected benefits across clinical performance, professional confidence, and the perceived demands of emergency triage practice.

Demographic variables, such as age and years of experience, had a negative relationship with stress levels, implying that more experienced nurses might be better able to cope with the demands of emergency triage nursing. This is also in line with more universal research findings that experience is a key determinant for effective psychological adaptation to emergency situations (Montero-Tejero et al., 2024). This finding indicates that experiential learning plays a significant role in helping nurses develop their coping skills and intuitive abilities in practice. While formal education provides structured teaching, experience provides exposure to complicated situations, giving nurses an opportunity to build their confidence and competence through repeated experiences (Alruwaili et al., 2022).

Overall, the results of this study suggest that the MTS intervention had a multi-faceted positive effect on triage nurse outcomes, including better adherence to protocol, reduced workload stress, increased perception of nurse performance, and increased confidence, all of which support the efficacy of triage systems, particularly when comprehensive training is also undertaken. These results are also in line with more universal research findings that triage training programs are effective for improving accuracy and efficiency in emergency nursing practice and that triage systems significantly improve emergency department performance (Manayer et al., 2024),

Despite these positive outcomes, however, there are also challenges to implementing this intervention, including research findings that, despite its efficacy, well-researched systems such as the MTS are also vulnerable to human error, requiring ongoing training to ensure high-level system performance and to eliminate potential bias (Kakulapati et al., 2025).

LIMITATIONS OF THE STUDY

Regarding the limitations, the study design was non-randomized without a control group, which limits the certainty with which cause-effect relationships can be determined. While there was improvement after the intervention, other factors such as organizational factors, experience gained from time and environmental factors cannot be totally excluded.

The second limitation is related to the conduct of the study within one specialized hospital, which may limit its generalization to other emergency departments, particularly those that differ in patient characteristics, staff configurations, and/or healthcare systems.

Furthermore, although demographic variables are considered, potential confounding variables such as workload fluctuations across seasons, patient characteristics, and/or staff configurations are not considered in this study.

RECOMMENDATIONS

Based on the study findings, the researchers recommend the following:

- Replication of the study on a larger probability sample selected from different geographical areas in Saudi Arabia to obtain more generalizable findings.
- Implementation of the Manchester Triage System (MTS) should be promoted across all specialized emergency settings, with the aim of improving compliance with the triage protocols and the confidence of clinical decision-making.
- Triage training programs, including simulation, should be integrated into nursing education. Stress management aspects should be considered to be included in the training programs to increase the psychological strength of the nursing staff.

CONCLUSIONS

The research findings revealed that there were statistically significant improvements in protocol adherence and decision-making self-efficacy. Moreover, there were statistically significant reductions in stress levels, along with workload factors such as mental demands and frustrations, as well as increases in perceived performance. The research findings suggested that standardized triage systems can have a positive influence on the performance and psychological outcomes of emergency department nurses.

Despite the fact that there are some methodological flaws in the research design, the research findings are extremely valuable in supporting the integration of standardized triage training in specialized emergency settings. The research findings support the importance of standardized triage systems in improving the practice of emergency nursing care.

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