



# The Impact of the Clinical Audit Cycle on the Implementation of Hospital Triage in the Emergency Department

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## Abstract

**Introduction:** As the first step in dealing with patients referring to the emergency department, the triage process prioritizes these patients and classifies them to different levels of triage based on the severity of their clinical conditions. This prioritization is aimed at distinguishing patients whose treatment can be delayed without experiencing any complications from those who need immediate action and delay in whose treatment will cause serious complications. Therefore, this study aimed to determine the effect of the clinical audit cycle on the implementation of hospital triage in the emergency department of Golestan Hospital in Ahvaz in 2018.

**Methods:** This was a quasi-experimental study the population of which included all events related to the way hospital triage was implemented for patients referring to the emergency department of Golestan Hospital of Ahvaz, southwest of Iran. The research sample included 385 triage events performed for patients referring to the emergency department. A researcher-made triage questionnaire was used to check nurses' accuracy in four dimensions, namely taking history, taking vital signs, determining triage level, and frequency distribution. SPSS version 23 was used to analyze the data. A significance level of  $\alpha = 0.05$  was adopted for this study.

**Results:** Before the intervention, the mean scores of the intervention group in terms of Checklist dimensions were as follow: taking history ( $11.26 \pm 1.89$ ), vital signs ( $15.62 \pm 2.21$ ), determining triage level ( $23.56 \pm 7.95$ ), determining the level of required facilities ( $9.11 \pm 3.27$ ), and doing the general triage of patients ( $55.56 \pm 10.17$ ). After the intervention, the mean scores in the intervention group were as follows: taking history ( $12.36 \pm 2.71$ ), vital signs ( $16.81 \pm 3.31$ ), determining triage level ( $30 \pm 0.051$ ), determining the level of required facilities ( $11.99 \pm 0.072$ ), and doing the general triage of patients ( $64.73 \pm 10.9$ ), which shows the positive impact of the intervention ( $P < 0.001$ ).

**Conclusions:** According to the findings of the present study, appropriate training in triage along with strict control and monitoring of the hospital triage implementation process and its prioritization will lead to provision of better medical services. Also, patients whose treatment can be delayed without experiencing any complications can be distinguished from those who need immediate action.

## INTRODUCTION

The emergency department is one of the most important hospital departments whose performance can play a vital role in patient satisfaction [1]. In recent

years, the number of emergency department visits has grown significantly, reaching 140 million visits per year in the United States in 2021, with an overall rate of 43

visits per 100 people [2]. Studies in Iran show that between 20 - 60 percent of all patients referred to the country's emergency department are referred to this department for urgent, yet simple, uncomplicated problems that can be treated immediately and effectively at lower-level medical centers [3, 4]. Considering the high number of patients referring to the emergency department, it is necessary to prioritize these patients and perform triage [5]. In terms of both quality and resource utilization, the triage process is considered a vital stage in the patient's workflow in the emergency department and a substantial factor in ensuring patient satisfaction and health policy planning. The accuracy and time of triage decision-making can affect the achievements of the emergency department [6]. It is necessary to assess the ability of nurses in conducting patient triage in order to have a correct picture of the emergency department at the time of crises. To this aim, it is important to scrutinize the corresponding reactions of nurses and how they use their triage capacities in these departments when there is patient congestion [7]. Several studies investigating the nurses' level of triage knowledge have expressed concern in this regard. Reisi et al. (2018), for example, found that the nurses working at teaching hospitals of Ahvaz were not familiar with the basic knowledge of hospital triage [8]. In a descriptive survey, Haghghi et al investigated emergency department nurses' level of awareness of hospital triage among 70 staff nurses in Ahvaz. According to their results, nurses' low level of knowledge of hospital triage can be attributed to the absence of any formal or specialized triage training courses and lack of obligation in emergency departments to make evidence-based decisions [9]. In another study conducted by Hosseini et al. to investigate the performance of Shahrekord emergency nurses in triage, the findings showed that the performance of nurses in performing triage was average in most case [10]. In different countries, various methods and tools have been used to ensure the safety of patients and improve the quality of healthcare, each of which has paid more attention to one aspect than the others. In the meantime, clinical audit has entered the field of hospital management as a process that can consider all aspects together and equally [11]. Audit is a tool for identifying areas of clinical care that need improvement, as a result, they focus on education, research, and quality improvement strategies to improve patient care and outcomes [12]. Clinical audit is a part of the continuous quality improvement process. It measures a clinical outcome or a process against well-defined standards and established principles of evidence-based medicine [13]. There are many benefits to conducting multiple clinical audits. They facilitate benchmarking against accepted standards, enable the identification and dissemination of best practices, and support the use of evidence in decision-making. They also foster a culture of quality improvement and patient-

centered care within healthcare organizations by encouraging accountability, transparency, and continuous learning [14]. Audit is done through a systematic review of the aspects of the structure, process, and outcomes of the selected care and its compliance with explicit standards, which is followed by clarification and conduction of an intervention in order to make the necessary changes [15]. After selecting the subject, the implementation of a clinical audit consists of five steps, which are fixed and unchangeable, and include selecting the subject, examining the current situation, comparing the current situation with the standard, making changes, and repeating the previous four steps to ensure that the quality of the desired process is improved [16]. Considering the challenges associated with clinical audit and the obstacles to its implementation, the most important solution is to pay attention to continuous education and nursing performance in both theoretical and clinical areas. This should be taken into serious consideration by managers in order to improve the quality of services and enhance the satisfaction of service providers and recipients in the treatment process. Implementation of clinical audit can provide solutions to many of the problems in this way [17]. Given the importance of clinical audit in improving nursing performance, it is imperative that a correct understanding of its supporting factors be established in order to increase its efficiency and effectiveness [18]. Today, the level of knowledge of health care recipients has increased, and they demand nursing services with good quality. Therefore, it behooves nurses to acquire the necessary skills to improve the quality of the care they provide and apply them in practice. The present study aimed to determine the effect of the clinical audit cycle on the implementation of hospital triage in Golestan Hospital, Ahvaz, in 2018.

## METHODS

This was a semi-experimental study comparing the pre- and post-intervention results using the clinical audit cycle method. The research site was the emergency department of Golestan Hospital of Ahvaz, southwest of Iran. The research population included all events related to the implementation of hospital triage for patients referring to the emergency department of this hospital. Golestan Hospital was chosen because it is the main trauma center in Ahvaz, and the patients visiting this center come from both Ahvaz itself and other cities in Khuzestan, as well as surrounding provinces.

### Sample size calculation

The following formula was used in order to calculate sample size:

$$n = \frac{z^2 \cdot \frac{p}{1-p} \times P(1-P)}{d^2} \rightarrow \text{For a confidence interval of 95}$$

Assuming that P=0.5 and d=0.05,

$$n = \frac{(1.96)^2 \times 0.5(0.5)}{(0.05)^2} \cong 385$$

According to this statistical formula and after consultation with a statistician, the sample size in each round of data collection (pre- and post-intervention) was 385 triage events. Thus, a total of 770 triage events were examined. The event sampling method was used in this study, and it was based on the number of observations that the researcher recorded. The samples were selected randomly. Samples were selected equally across all work shifts.

The research instrument included "checklist Triage by ESI". The checklist qualitatively measured the events in terms of three options, namely "done in a principled manner", "Not done in a principled manner", and "Not done at all", which were assigned scores of 2, 1, and 0, respectively. This checklist covers various aspects of triage including patient history, vital signs, triage, and required facilities. The questions are divided into; patient history (questions 1, 2, 11, 12, 13, 14, and 36), vital signs (questions 3, 4, 5, 6, 7, 8, 9, 10, and 15), patient triage (questions 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 34, 35, and 37), and required facilities (questions 28, 29, 30, 31, 32, and 33). Each item is given a score between 0 and 2. The total score for this tool is between 0 and 74. The content validity of the tool was investigated by ten faculty members of the Nursing Faculty of Ahvaz Jundishapur University of Medical Sciences, and the Content Validity Ratio (CVR) for all items was above 0.7 and their Content Validity Index (CVI) was above 0.80. The reliability of the tool was found to be dependable with a Cronbach's alpha of 0.84. After obtaining permission from the relevant authorities and obtaining the approval of the Research Ethics Committee of Ahvaz Jundishapur University of Medical Sciences, Ahvaz, the lead researcher introduced himself to the selected research center and obtained a permission from the officials of that center. In this study, the clinical audit method consisted of 6 stages.

#### **First Stage**

In the first stage, the topic of the audit was determined.

#### **Second Stage**

In the second stage, the criteria and standards were extracted for the selected topic.

#### **Third Stage**

The third stage involved identification of the current status of the selected process. For this purpose, the following tasks were carried out by the researcher: the lead researcher visited the research site on a daily basis in three work shifts (i.e., morning, evening, and night). Using the checklist "Triage by ESI", he made a structured observation of how the triage process was performed for patients referring to the emergency room. After each event was observed by the researcher, it was recorded by selecting checklist options. It should be

noted that the researcher first introduced himself and explained the research objectives to the nurses on duty, and then he fully observed the stages of the triage process. Subsequently, he immediately started filling the checklist.

#### **Fourth Stage**

In the fourth stage, the results of the current situation were compared against the standards. The following steps were taken at this stage: the scoring results were analyzed as quantitative data using SPSS version 23. The checklists were analyzed, and items that did not meet the standards were identified. During this stage, four training sessions on the triage cycle using the ESI method were provided to the selected nurses in the study; these sessions included:

##### **First session**

In this session, based on the objectives of the study, accuracy in taking vital signs and the necessity of implementing it based on triage using the ESI method was discussed with questions and answers from the participating nurses in this training session, and at the end, the date of the next session was announced.

##### **Second session**

Based on the content of the questionnaire, they were taught accuracy in taking the history of patients referred to the emergency room, and at the end, the training session was discussed with questions and answers from the participating nurses, and at the end, the date of the next session was announced.

##### **Third session**

This session began with questions from previous sessions, and regarding accuracy in determining the triage level, with training on triage levels, examples for determining triage levels, and at the end, the training session was discussed with questions and answers from the participating nurses, and at the end, the date of the next session was announced.

##### **Fourth Session**

This session began with questions from previous sessions and, based on the research objectives, the accuracy in determining the required facilities was explained to the nurses participating in this training session. Also, corrective measures were taken to bridge the gap between standards and actual performance. Accordingly, suggestions were made in order to alleviate the existing drawbacks. At the end of the session, the nurses were informed of the re-evaluation date by giving gifts to them.

##### **Fifth stage**

After three months of triage training to make improvements, the implementation of the triage process using the ESI method was again examined with the participation of selected nurses in the study on 385 patients who referred with the desired checklist.

**Sixth stage**

Finally, in the sixth stage, a re-audit was conducted to ensure the continuity and effectiveness of the promotion [13]. The results of the re-evaluation were imported into SPSS version 23 in form of quantitative statistical data. In order to analyze the data, descriptive statistics such as mean, standard deviation, percentage of frequency distribution tables, and paired t-test were used. A significance level of  $\alpha = 0.05$  was adopted for this study.

**RESULTS**

According to the findings of the present study, the majority of the participants were women (62.5%) and married (75%), had a bachelor's degree (100%), were employed based on a contract or program (37.5%), worked in rotating shifts (75%), and had work experience in other departments (50%). In addition, the participants had no experience of participating in research studies, and their mean age was 27 years (Table 1).

As shown in Table 2, the mean and standard deviation of the accuracy of the nurses in taking the history of the patients referring to the emergency room before the intervention were 11.26 and 1.89, respectively. Three months after the intervention, however, these figures rose to 12.36 and 2.71, respectively. Overall, the paired t-test ( $t = 6.37$  and  $p < 0.001$ ) shows that there is a significant difference before the intervention and three

months after it in terms of the accuracy of the nurses in taking the history of the patients referring to the emergency room.

**Table 1.** Demographic information of the nurses

	Number	Percentage
<b>Sex</b>		
Male	3	37.5
Female	5	62.5
<b>Marital status</b>		
Single	2	25
Married	6	75
<b>Educational attainment</b>		
Bachelor's degree	8	100
Post-graduate degree (MSc. or PhD)	0	0
<b>Employment status</b>		
Temporary-to-permanent	3	37.5
Contractual	2	25
Official	0	0
Program-based	3	37.5
<b>Work shift status</b>		
Morning	0	0
Evening	0	0
Night	2	25
Rotating	6	75
<b>Job history</b>		
Emergency department	1	12.5
ICU	3	37.5
Other	4	50
<b>History of research participation</b>		
Yes	0	0
No	8	100
<b>Average age (year)</b>	27	

**Table 2.** The mean and standard deviation of nurses' accuracy in taking history, vital signs, the triage level, the required facilities, and the overall triage of patients referring to the emergency room, before and after the clinical audit cycle

Variable	Pre-intervention	Post-intervention	Statistical test
Accuracy in taking history	11.26 ± 1.89	12.36 ± 2.71	$P0* < 0.001, t=6.37, df=385$
Accuracy in taking vital signs	15.62 ± 2.21	16.81 ± 3.31	$p0* < 0.001, t=6.62, df = 385$
Accuracy in taking the triage level	23.56 ± 7.95	30 ± 0.051	$p0* < 0.001, t=15.88, df = 385$
Accuracy in taking the required equipment	9.11 ± 3.27	11.99 ± 0.072	$p0* < 0.001, t=17.23, df = 385$
Accuracy in taking the overall triage	55.56 ± 10.17	64.73 ± 10.90	$p0* < 0.001, t=12.23, df =385$

\* Paired t-test

Data in tabl are presented as Mean ± SD

**Table 3.** Overall triage status in the research units before and three months after the training

	Pre-intervention	Post-intervention
Poor	16 (4.2)	13 (3.4)
Moderate	138 (35.8)	11 (2.8)
Good	231 (60)	361 (93.8)
Total	385 (100)	385 (100)
Statistical test	$P** < 0.001, df=4, X^2=27.86$	

\*\* Chi square

As far as the accuracy of nurses in taking the vital signs of patients referring to the emergency room is concerned, before the intervention, the results showed a mean of 15.62 and a standard deviation of 2.21. Three months after the intervention, these numbers rose to 16.81 and 3.31, respectively. According to the results of the paired t-test, there was a statistically significant difference regarding the accuracy of nurses in taking the vital signs of patients referring to the emergency room before and three months after the training ( $t = 6.62$  and  $p < 0.001$ ).

The accuracy of nurses in determining the triage level of patients referring to the emergency room before the intervention had a mean of 23.56 and a standard deviation of 7.95. These figures, three months after the intervention, rose to 30 and 0.051, respectively. The results of the paired t-test before and three months after the training showed a statistically significant difference in terms of determining the triage level of patients referring to the emergency room ( $t = 15.88$  and  $p < 0.001$ ).

The results related to the accuracy of nurses in getting the facilities needed by the patients referring to the emergency room before the intervention showed a mean of 9.11 and a standard deviation of 3.27. Three months after the intervention, these figures were 11.99 and 0.072, respectively. Overall, the paired t-test ( $t=17.23$  and  $p<0.001$ ) showed that there is a significant difference between before the intervention and three months after it in terms of the accuracy of nurses in getting the facilities needed by the patients referring to the emergency room.

Finally, with respect to the accuracy of nurses in the overall triage of patients referring to the emergency room before the intervention, the results indicated a mean of 55.56 and a standard deviation of 10.17. Three months after the intervention, these numbers were 64.73 and 10.9, respectively. The paired t-test ( $t=12.23$  and  $p<0.001$ ) showed that there is a significant difference between before the intervention and three months after it in terms of the accuracy of nurses in the overall triage of patients referring to the emergency room.

Table 1 shows that before the triage training, patient triage was in a good condition, and three months after the training, this condition was also good. The result of the chi square test shows a significant difference in this respect ( $p>0.001$ ).

## DISCUSSION

Tables 2 to 6 present the mean and standard deviation of nurses' accuracy in taking the overall triage of patients referring to the emergency room, before and after the clinical audit cycle in the research units. Javadi et al. evaluated the level of triage knowledge and performance of nurses working in the emergency departments of centers covered by Shahid Sadoughi University of Medical Sciences in Yazd. Their results showed that the nurses' familiarity with and command of triage is below average. The researchers recommended holding retraining courses for triage personnel in order to provide high quality services, which is consistent with the current study [19].

Another study in Iran conducted by Kimiaimehr et al. investigated the relationship between clinical audit performance and the improvement of the quality of nursing care in the surgery department. Their findings included solutions to improve clinical audit, namely identification of obstacles to the implementation of clinical audit, examining problems in teams, proposing solutions based on teamwork, proposing quality improvement solutions and implementing them correctly, and raising the awareness of nurses. According to their results, clinical strategies should be based on sufficient and solid scientific evidence in terms of their efficiency and cost-effectiveness in order to facilitate the implementation of the nursing process, provide

opportunities for clinical learning, teamwork, and improved communicative skills. The authors cautioned that this should be taken into serious consideration by nursing managers and educational planners, which is consistent with the results of the current study [20]. Newton-Brown et al conducted a study titled "Audit improves Emergency Department triage, assessment, multi-modal analgesia and nerve block use in the management of pain in older people with neck of femur fracture"; The results showed that, increase in the use of nerve blocks (NBs) as a mode of analgesia, rising from 24.3% to 53%, as well as in the medical documentation of NBs, which increased from 70.5% to 94% during the post-intervention phase. Additionally, there was a significant reduction in the use of morphine as the sole mode of analgesia, decreasing from 21.4% to 3%. The dosage of morphine administered to patients who received a nerve block also demonstrated a statistically significant decrease, from 7.75 mg to 5.11 mg ( $p = 0.03$ ). Also, there was a statistically significant reduction in the proportion of patients who received no analgesia, decreasing from 14.2% to 3% ( $p = 0.04$ ). Furthermore, there was a statistically significant increase in the use of oxycodone, which rose from 24% to 42.6% ( $p = 0.04$ ), and in the use of multi-modal analgesia, which increased from 58.6% to 74.2% ( $p = 0.03$ ) during the post-intervention phase [21]. Arslanian-Engoren et al. examined how an intervention called Aid to Cardiac Triage (ACT) is effective in improving emergency department nurses' cardiac triage decisions. Based on their findings, the training of nurses regarding how to triage cardiac patients has had a significant impact on promoting correct, appropriate and timely decision-making in the shortest time possible, which is consistent with the results of the current study [22]. Using a problem-based learning (PBL) method, another study investigated the effect of triage training based on the emergency severity index (ESI) on the length of stay of patients and the performance of nurses in the emergency department. To this aim, the pre- and post-intervention (2 weeks) triage level of 72 patients was recorded. Results showed that ESI triage training in a PBL fashion can cause a significant reduction in the time of triage by nurses in the emergency department and improve the performance of these nurses. Also, following the educational intervention, there was a significant reduction not only in the patient's time of door-to-triage done by the level-1 triage nurse and level-2 ESI triage, but also in door-to-doctor time for level-2 patients, which is consistent with the results of the current study [23]. Kalantari meibidi et al studied the effect of training on the knowledge and performance of emergency department nurses in relation to patient triage. To this aim, they collected triage data from 50 nurses before and six weeks after a nine-hour training workshop on ESI triage. They found that training can have a positive effect on increasing the awareness and

performance of nurses in relation to patient triage based on ESI method. Therefore, it is imperative that theoretical and practical triage training courses on patient triage be held for nurses working in the emergency department in order to improve their awareness and consequently the quality of service delivery. This is in line with the findings of the current study [24]. Mahmoudi et al. studied how triage training based on stabilization model for emergency department nurses affects the waiting time of patients. Their results showed that this type of triage training can have a positive effect on the waiting time of patients referring to the emergency department. Acquaintance with triage and implementation of triage training based on the stabilization model can provide a clear and well-defined framework for the nurses' knowledge of triage skills in other settings. By applying and implementing it, patient congestion and consequently waiting time of the patients in the emergency room will be reduced, the satisfaction of patients, physicians, and nurses will be enhanced, and the quality of emergency care will be improved. Their results are consistent with the findings of the current study [25]. Kezirian et al. investigated the impact of the doctor on the level of satisfaction of service providers and conducted a cost-benefit analysis from the hospital's point of view on the recruitment of pediatricians in ESI triage in the emergency department. According to their results, the correct and accurate use of the ESI five-level triage system promotes nurses' satisfaction with their career, improves the organization of the emergency department, reduces patient abandonment, and reduces the waiting time of clients [26]. Assessing the performance of nurses, especially in identifying areas that need improvement, determining nurses' training needs, and ensuring the optimal provision of care, is of great importance to the extent that it is referred to as the center of gravity of quality assurance systems, workforce planning, and human resource management, and is considered the most key responsibility of nursing managers in clinical settings [27]. This model will be very effective in analyzing and examining the current situation and then intervening appropriately to that situation to resolve issues and problems.

The first limitation of this study was the presence of confounding factors such as the experience of triage nurses, the number of patients per shift, and the level of stress in the emergency room environment, which could affect the results and were beyond the researcher's control. The second limitation of this study was the absence of a control group limits the ability to attribute the observed improvements solely to the clinical audit intervention. Including a control group in future studies would strengthen the internal validity of the findings. The third limitation of this study was the three-month follow-up period may not be sufficient to assess the long-

term impact of the intervention. A longer follow-up period would provide more robust evidence of the sustainability of the improvements. The fourth limitation was that the observation of incidents and data collection were carried out by the main researcher (one person), which raises the possibility of bias. Therefore, it is suggested that in future research, observation and data collection be carried out by two people, preferably outside the research team, to minimize the possibility of bias. Finally, for better and more effective use and to identify its strengths and weaknesses, it is suggested that this process be tested in other departments and hospitals so that it can be considered as an implementation model for implementing nurse training programs.

## CONCLUSION

According to the findings of the present study, triage training along with more detailed control and supervision over the hospital triage implementation process and its prioritization will lead to provision of better medical services. In this way, patients whose treatment can be delayed without experiencing any complications are distinguished from those who need immediate action, and thus death and injuries caused by delay in treatment are minimized. It seems that the audit cycle has a positive effect on the accuracy of nurses in the ESI triage of patients. Therefore, implementation of theoretical and practical triage training courses to improve the quality of service delivery in nurses working in the emergency department is necessary.

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## ETHICAL CONSIDERATION

Ethical approval of this research was obtained from the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences, Ahvaz [IRAJUMS.REC.1396.939].

## CONFLICT OF INTEREST

None were reported by the authors.

## AUTHORS CONTRIBUTIONS

Farzad Taban (first author), author of the introduction/discussion/lead researcher (35%); Abdul Ali Shariati (second author), statistical analyst/writer of the introduction (30%); Shahram Molavynejad (third author), statistical analyst/methodologist (20%);

Mohammad Hossein Haghghizadeh (fourth author), statistical analyst (15%).

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