

## Handling Times of Patients at a Level-1 Academic Trauma Center

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ARTICLE INFO	ABSTRACT
<p><b>Article type:</b> Original Article</p> <hr/> <p><b>Article History:</b> Received: 21-Mar-2022 Accepted: 07-May-2022</p> <hr/> <p><b>Key words:</b> Emergency wards, Nursing, Time, Trauma center.</p>	<p><b>Introduction:</b> The patient handling time can affect a patient's access to critical care; also, there is a relationship between patient handling time in the emergency ward and recovery rates. Nurses and staff of emergency wards are essential factors affecting patient flows in emergency wards.</p> <p><b>Materials and Methods:</b> This cross-sectional study focused on the flow of patients referring to the level-1 Academic Traumatic Emergency Ward during 2018-2019. Nurses were divided into two categories of group and small-group training, each receiving two training rounds one month apart. The Revised Form of Timing and Workflow Emergency checklist was used for evaluation.</p> <p><b>Results:</b> Evaluating 600 patients showed that the average time from patient entry to level 3 triage up to file creation was 24.8 minutes before interventions, and the same was 19.6 minutes for small groups and 17.6 for group training category (<math>p &lt; 0.05</math>), pointing to the fact that the group training category showed a significant reduction in average time from patient entry to triage to file creation.</p> <p><b>Conclusion:</b> The present study found that the training of nurses is practical for the flow times of patients hospitalized in emergency wards.</p>
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## Introduction

The Emergency Department is one of the most critical departments in a hospital, and its performance can considerably impact on patients' satisfaction (1-3).

The speed of service provision in medical centers, particularly in the emergency departments, significantly reduces disability and mortality rates (4,5). Prolonged patient handling procedures in emergency departments are a severe issue with significant adverse complications and impacts, reflected in various aspects of hospital processes (6,7).

The patient handling time can affect a patient's access to critical care. In addition, there is a relationship between patient handling time in the emergency department and recovery rates (8,9).

Studies have shown that prolonged patient handling times in emergency departments point to issues and disorders in the overall policies, administrative protocols, current procedures, and processes in hospitals; thus, hospitals with prolonged emergency department workflows are generally characterized by prolonged overall hospital workflows beyond the standard or expected limits (7,10,11).

Some of those critical times are as follows: physician access time, nurse access time, the interval between sample submission and lab report delivery, the interval between requesting a radiology image and its actual preparation, and patients' wait time in emergency departments before they receive cares (12-14).

Due to the lack of sufficient and regional evidence of the workflow of patients admitted to the emergency department and due to the effectiveness of educational interventions, this study was conducted to investigate the effect of nurse training on the duration of the workflow of patients admitted to the level-1 academic trauma emergency department of Shahid Hasheminejad Hospital in Mashhad.

## Material and Methods

### Study design

This quasi-experimental study was designed to evaluate the effects of training nurses on handling times of patients

hospitalized at level-1 Traumatic Emergency Department of Shahid Hasheminejad Hospital for one year (2018-2019).

We included all multiple-trauma patients' files in the ED and excluded if the file data was incomplete.

### Setting and Sample

After obtaining informed consent from the nurse colleagues to participate in this study, 40 nurses were divided into two similar groups, which were similar in age, sex, and work experience. These participants were working in ED; these groups included group and small-group training receiving two training rounds one month apart.

Training interventions were performed by one of the emergency medicine residents at the hospital premises in coordination with the ward manager and under the supervision of an assistant professor of emergency medicine.

### Ethical Consideration

The study was approved by the Ethics Committee of Mashhad University of Medical Science (approval No. IR.MUMS. MEDICAL.REC.1397.575).

### Data Collection

Data were collected using The Revised Form of Timing and Workflow Emergency checklist, the validity and reliability of which were also confirmed by ten professors of emergency medicine.

The checklist included the time of patient entry into triage, file creation, visit by emergency medicine specialist, making the final decision (discharge or dispatch to other wards/ hospitals), and dispatching of patients to other wards or discharging patients from the emergency department.

The data collected before and after the relevant interventions were studied, and their effects on service access procedures were analyzed. There was a limited number of patients in levels 1 and 5; therefore, by consulting with an epidemiologic specialist, workflow time analysis of patients of levels 1 and 2 and those of levels 4 and 5 were done in one single group, which did not affect the result.

### Sample Size

This study was performed with a simple sampling method for one year.

## Data Analysis

Descriptive statistics techniques such as mean  $\pm$  standard deviation and frequencies were used to describe the collected data. The Kolmogorov-Smirnov test examined the normality of variables. In order to examine the differences between mean patient flow times in groups before and after the intervention, the one-way ANOVA test was used after intervention in group training and small groups due to normal variable distributions. Also, the Chi-squared test was used to compare differences in the frequency of qualitative variables in study groups. The significance level for this study was less than 0.05, and all reported P-values were of a two-sided type.

## Result

Overall, the workflows of 600 patients were evaluated by their hospital files in this study. They were evaluated in three groups: 200 files before, 200 after intervention in small groups, and 200 in in-group training categories. The average age of studied patients was  $26.80 \pm 17.14$  before the intervention,  $28.75 \pm 15.32$  in small groups, and  $30.73 \pm 21.07$  in in-group training, with no significant difference among their age averages ( $p = 0.094$ ). Regarding gender distribution, 411 (68.5%) participants were male, and 189 (31.5%) were female. In addition, a significant frequency difference was observed in the gender distribution of participant groups ( $p < 0.05$ ) (Table-1).

**Table 1:** Participants demographic data

Variables		Studied groups			P-Value
		Before intervention	Small group	Group training	
Sex	Men	136	152	123	0.007
	Women	64	48	77	
Age		26.8(9.4-44.2)	28.75(13.43-44.7)	30.73(9.66-51.08)	0.094

The results on overall patient files showed that the average time from patient entry into triage to file creation, visit by a physician, and the final decision was 19.9, 8.0, and 153.9 minutes, respectively. Results of efficiency assessment on nurse training programs on time between patient entry

into triage to file creation in level-3 triage were 24.8 minutes before interventions, 19.6 minutes for small groups, and 17.6 for group training category ( $p < 0.05$ ), pointing to the fact that the group training category showed a significant reduction in average time (Table-2).

**Table 2:** Handling times of patients in emergency ward.

	Triage Level	STUDY GROUPS			PVALUE
		Before intervention	Small group	Group training	
Time from triage entry to file creation (minutes)	Level 1&2	18.5 $\pm$ 12.5	23.4 $\pm$ 21.1	24.6 $\pm$ 19.2	0.35
	Level 3	17.6 $\pm$ 9.7	19.6 $\pm$ 11.0	24.8 $\pm$ 15.2	0.01**
	Level 4&5	9.2 $\pm$ 9	12.8 $\pm$ 8.1	28.7 $\pm$ 22.3	0.007**
Time from triage entry to physician visit (minutes)	Level 1&2	1.7 $\pm$ 0.7	2.2 $\pm$ 1.1	2.3 $\pm$ 1.1	0.04*
	Level 3	8.6 $\pm$ 1.1	9.4 $\pm$ 2.4	10.1 $\pm$ 1.2	0.032*
	Level 4&5	10.3 $\pm$ 2.8	12.2 $\pm$ 2.5	15.4 $\pm$ 3.4	0.01*
Time from triage entry to final decision (minutes)	Level 1&2	187.7 $\pm$ 70.9	172.7 $\pm$ 58.9	174.1 $\pm$ 82.3	0.416
	Level 3	162.7 $\pm$ 85.5	151.2 $\pm$ 107.6	171.0 $\pm$ 162.0	0.293
	Level 4&5	102.6 $\pm$ 87.1	108.8 $\pm$ 130.1	154.1 $\pm$ 105.9	0.808
Time from first visit to final decision	Level 1&2	186.0 $\pm$ 104.3	170.4 $\pm$ 85.1	171.8 $\pm$ 129.0	0.631
	Level 3	154.0 $\pm$ 107.6	141.7 $\pm$ 83.6	160.9 $\pm$ 137.2	0.437
	Level 4&5	92.2 $\pm$ 71.3	96.5 $\pm$ 42.6	138.7 $\pm$ 86.0	0.288
Time from disposition to discharge/exit from ward(minutes)	Level 1&2	19.7 $\pm$ 10.5	21.9 $\pm$ 14.6	22.8 $\pm$ 12.8	0.156
	Level 3	25.8 $\pm$ 19.8	27.3 $\pm$ 27.0	35.0 $\pm$ 28.4	0.294
	Level 4&5	45.6 $\pm$ 27.3	44.7 $\pm$ 25.6	48.5 $\pm$ 23.4	0.4

\*Statistically significant at the level  $< 0.05$ , \*\*statistically significant at the level  $< 0.01$

In level 4,5 triage, the average time from patient entry to file creation was 28.7 minutes before interventions, 12.8 minutes for small groups, and 9.2 minutes for group training ( $p<0.05$ ). At this triage, level there was no significant difference between the two training categories (small groups and group training) ( $p>0.05$ ). There was no significant difference for levels 1 and 2 triage ( $p<0.350$ ). The average time from patient entry to triage and the first visit by a physician at various triage levels showed significant differences among the training group ( $p<0.05$ ). The average time from patient entry into triage to a final decision on their file at triage levels 1 and 2 was 187.7 minutes before the intervention, which changed after intervention to 172.7 minutes and 174.1 minutes respectively, for small groups and group training ( $p<0.416$ ). This finding indicated that nurse-training programs did not affect the reduction of those times. There was no significant difference at other triage levels ( $p<0.05$ ). Also, the average time between the first physician visit to a final decision at triage levels 1 and 2 was 186.8 minutes before interventions, which was changed after the intervention to 170.4 and 171.8 for small groups and group training categories, respectively, showing no significant statistical difference ( $p=0.631$ ). The average time between the first physician visits to a final decision showed no significant difference at other triage levels. Analysis of the average times from final decision to discharge at triage levels 1,2 was 22.8, 21.9, and 19.7 minutes, respectively, before the intervention, in small groups, and in in-group training, showing that the group training category had a tangible reduction in the time between final decision and discharge. However, the difference was not statistically significant ( $p=0.156$ ). Also, at triage level 3, the average time from final decision to discharge from the ward was 35.0, 27.3, and 19.7 minutes, respectively, before the intervention, small groups, and group training categories.

## Discussion

Patients flow and wait time in emergency departments is one of the factors affecting the service quality and patient satisfaction

(15,11). Reduced patient flow time is one of the most effective approaches to quality improvement and should be taken seriously to provide primary services to patients and to increase patient satisfaction (4,7,16). Results of this study, which focused on evaluating the efficiency of nurse training and feedback provision on patient flow times in emergency departments, demonstrated that the patient flow times improved after training interventions. Numerous studies have been conducted on patient flow in emergency departments, and their results were in line with those of the present study (7,14,16). According to international indices, the wait time from entry to triage is less than 10 minutes, and the time from triage to physician visit is 15 minutes (17). In this study, the average time from patient entry into triage to the first visit by a physician was 12.33 minutes, which is slightly higher than the international indices, which could be due to the high number of visits to our hospital. Tabibi et al. (18) showed that the overall time from patient entry into triage to the first visit was 13.1 minutes and the average time from the first visit to first treatment action was 105.3 minutes, which was related to the hospital being overcrowded with patients. In the present study, there was a significant difference between the times of patient entry into triage at all levels and the first visit by a physician among study groups. Hosseini et al. (4) demonstrated that the average time from triage entry to the first visit by 32 minutes, which was higher than the results of the present study. Also, Ramazankhani et al. (7) showed that the average time between triage entry and the first emergency departments visit was 13.5 minutes. Jabbari et al. (17) reported 8.4 minutes as the time between triage entry and first visit in their study. According to international standards, the time for making a final decision on emergency patients is less than 6 hours (19). In this study, despite the reduction in the time from patient entry into triage to a final decision in the group training category in comparison to pre-intervention results, there was no significant difference between average times from triage entry to a final decision in any study category or group, indicating that nurse training did not

influence on those times. In the works of Movahednia et al. (20) and Ramazankhani et al. (7), the values were reported at standard levels, which goes with the results of this study. Don Liew et al. reported a standard index for patient presence time (first visit to final decision) in emergency departments to be less than 8 hours. In this study, the same index was within the standard range, and it was in line with the results of Jabbari et al. (17), Asgharpour (21), and Kamrani et al. (22). Kezirian et al. (23) demonstrated in their study that using a 5-level ESI triage system could result in improved job satisfaction in nurses, improved emergency departments management, reduced patient abandonment rates, and reduced patient wait times. Also, Beirami (24) showed in his study that the execution of OCUS-PDCA had a very positive effect on the performance of emergency departments and resulted in the reduced transfer and handling times of emergency patients and increased satisfaction among nurses. The present study demonstrated that training interventions on treatment staff resulted in increased workflow speed and reduced wasted times, resulting in increased patient satisfaction and reduced morbidity.

### Limitation

Since no study has been done so far on the training of emergency department nurses and its simultaneous effect on patients' flow time, it is a novel topic, and the limitations are because of this fact. Due to the busy schedule and multiple shifts, some nursing colleagues were reluctant to work overtime, even for short training.

### Conclusion

Based on the present study, it seems like the training of nurses is effective in the flow times of patients hospitalized in emergency departments, at least from triage entry to file creation and from triage entry to the first visit by a physician. In such a way, in most cases, the studied average times were reduced after intervention in the group training category. Therefore, the fact that the target groups of this study included nurses could be observed in the produced results. Hence the triage to file creation and triage to the first visit times, which are affected by

more minor distorting factors (particularly the role of other treatment staff), improved considerably compared to other times after intervention (i.e., nurse training). Therefore, holding training programs as a straightforward and low-expense step can influence workflow and reduce patient wait times in emergency departments, and this, in turn, results in higher satisfaction among physicians, nurses, and patients, and finally in the promotion of the quality of health services at emergency departments.

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### References

1. May L, Franks P, Jerant A, Fenton J. Watchful waiting strategy may reduce low-value diagnostic testing. *J Am Board Fam Med.* 2016; 29(6):710-7.
2. Chepenik L, Pinker E. The impact of increasing staff resources on patient flow in a psychiatric emergency service. *Psychiatric Services.* 2017; 68(5):470-5.
3. Unwin M, Kinsman L, Rigby S. Why are we waiting? Patients' perspectives for accessing emergency department services with non-urgent complaints. *International emergency nursing.* 2016; 29:3-8.
4. Hosseini M, Shaker H, Ghafuri H, Shokraneh F. Chronometric study of patients workflow and effective factors on it in emergency department 7th tir martyrs hospital of tehran. *Journal of Health Administration.* 2010, 13(40): 13-22 .
5. Bleetman A, Sanusi S, Dale T, Brace S. Human factors and error prevention in emergency medicine. *Emergency Medicine Journal.* 2012; 29(5): 389-93.
6. Chen S-S, Chen J-C, Ng C-J, Chen P-L, Lee P-H, Chang W-Y. Factors that influence the accuracy of triage nurses' judgement in emergency departments. *Emergency Medicine Journal.* 2010; 27(6): 451-5.
7. Ramazankhani A, Mahfouz pour S, Marzban S, Naghibzadeh- Tahami A, Sarani A. Assessing waiting time patients in emergency ward of Kerman University of Medical Sciences. *Journal of Health Promotion Management.* 2016;5(2): 20-30.

8. Fraser J, Atkinson P, Gedmintas A, Howlett M, McCloskey R, French J. A comparative study of patient characteristics, opinions, and outcomes, for patients who leave the emergency department before medical assessment. *Canadian Journal of Emergency Medicine*. 2017; 19(5): 347-54.
9. Gorski JK, Batt RJ, Otles E, Shah MN, Hamedani AG, Patterson BW. The impact of emergency department census on the decision to admit. *Academic Emergency Medicine*. 2017;24(1): 13-21.
10. Black D, Pearson M. Average length of stay, delayed discharge, and hospital congestion: A combination of medical and managerial skills is needed to solve the problem. *British Medical Journal Publishing Group*. 2002; 325:610-11.
11. Represent H. Reducing patient time in the emergency department. *The Medical Journal of Australia*. 2003;179(10):516-517.
12. Leading and managing an emergency department-A personal view. [Journal of Acute Medicine](#). 2013; 3(3):61-66.
13. Strauss RW. *Strauss and Mayer's emergency department management*: McGraw-Hill Education Medical; 2014.
14. Jadidi A, Zand S, Khosravi M, Harorani M, Bayati A, Amni T, et al. Evaluating the Timing of Emergency Department Services in Hospitals of Arak City. *Iranian Journal of Emergency Medicine*. 2017;4(2):57-62.
15. Storm-Versloot MN, Vermeulen H, van Lammeren N, Luitse JS, Goslings JC. Influence of the Manchester triage system on waiting time, treatment time, length of stay and patient satisfaction; a before and after study. *Emerg Med J*. 2014;31(1):13-8.
16. Guttman A, Schull MJ, Vermeulen MJ, Stukel TA. Association between waiting times and short term mortality and hospital admission after departure from emergency department: population based cohort study from Ontario, Canada. *Bmj*. 2011;342:d2983.
17. Jabbari A, Jafarian M, Khorasani E, Ghaffari M, Majlesi M. Emergency department waiting time at Alzahra Hospital. *JIM*. 2011; 8(4(20)): 500-11.
18. Tabibi SJ, Najafi B, Shoaie S. Waiting time in the emergency department in selected hospitals of Iran University of Medical Sciences in 2007. *Pejoughesh dar Pezeshki*. 2009;33.(2)
19. Forster AJ, Stiell I, Wells G, Lee AJ, Van Walraven C. The effect of hospital occupancy on emergency department length of stay and patient disposition. *Academic Emergency Medicine*. 2003; 10(2):127-33.
20. Movahednia S, Partovishayan Z, Bastanitehrani M. A survey of timing indicators of emergency department at Firoozgar hospital: 2012. *Journal of Health Administration (JHA)*. 2013; 16(51):95-102.
21. Fazel AA, Barfi DA, Mirhaghi A, Shakeri MT, Kianian T. The effect of implementation of cardiac triage scale on time indices of triage in patients with chest pain. 2016.
22. Kamrani F, Ghaemipour F, Nikravan M, Alavi Majd H. Prevalence of miss triage and outcomes under triage of patients in emergency department. *Journal of Health Promotion Management*. 2013; 2(3):17-23.
23. Kezirian J, Muhammad WT, Wan JY, Godambe SA, Pershad J. Cost analysis and provider satisfaction with pediatrician in triage. *Pediatric emergency care*. 2012;28(10):971-6.
24. Mousazadeh Y, Pourranjbari S, Jafarabadi MA. The Effects of FOCUS-PDCA Methodology on Emergency Department Patient Disposition Index. *Iranian Journal of Emergency Medicine*. 2015; 2(2): 82-7.