Original Article

Factors associated with hospital Triage decision making from the viewpoints of emergency nurses

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ABSTRACT

Background and purpose: In triage decision-making process, in addition to patient other factors such as knowledge and clinical skills of triage nurses, environment and also equipment have a major role. Ultimately through the effect of these factors triage nurse achieve maximum assurance about the accuracy of your decision making. This study aimed to determine the most important factors associated with hospital triage decision making from the viewpoint of emergency nurses. Materials and Methods: In this analytic–cross sectional study 291 nurses working in emergency departments were selected by convenience sampling method.for data collection a questionnaire was used that assessed personalized job information, personnel factors and non-personnel factors related to ward and patient. Data were analyzed by SPSS software version 23 and descriptive statistics, factor analysis, Friedman and Bonferroni methods. Results: An exploratory factor analysis showed 3 factors including equipment, triage nurses' location and responsibilities assigned to the triage nurse with 13 items. These 3 factors explained 60/90% of the variance of the questionnaire with Cronbach's Alpha 0.74. Friedman and Bonferroni tests also identified in personnel factors "experience", in non- personnel factors related to ward "unit crowdedness, shortage of nurses in each shift and work volume" and in non- personnel factors related to patient "pain, vital signs and type of injury respectively "as the most important factors. Conclusion: The results of this study showed that improvement of the management and physical structure of emergency departments, the use of experienced and trusted staff on triage, as well as the allocation of resources for the improvement of triage activities should be highlighted.

Keywords: Emergency nurse, triage, triage decision making.

Introduction

Many patients refer to emergency units in hospitals every day due to being exposed in high-risk situations, in which the physical or mental status of the individuals has been affected and they require immediate and appropriate actions [1]. As the important characteristics of the emergency unit are time restriction, high numbers of referrals, diversity in causes of referral, lack of primary information on patient, and urgency in selecting the type of treatment [2], these units are the most critical units of hospitals [3]. In general, 78% of hospital patients refer to emergency units, which minutes and even seconds are critical for them, since 75-85% of deaths occur in the first 20 minutes after incidences and these incidents are developing or controlled in first 10 minutes, when important decisions are made [4]. To achieve the main goals of treatment in these units, proper implementation of the triage process as a vital step during the patients referring emergency department is required. This process is challenging, but it is vital for patient safety in the emergency unit [1].

The triage is the first intersection point of the hospital emergency team with the patient and his caregivers [5]. This concept refers to the prioritization of patients based on the severity of the problem to make the best possible therapeutic actions in the shortest possible time. Proper triage finally results

Access this article online	
Website: www.japer.in	**E-ISSN:** 2249-3379

How to cite this article: Fatemeh Madani, Saghi Moosavi, Fateme Jafaraghaee, Ehsan Kazem Nezhad Leyli, Mohammad Ali Yazdanipour.Factors associated with hospital Triage decision making from the viewpoints of emergency nurses. J Adv Pharm Edu Res 2019;9(S2):169-175.
Source of Support: Nil, Conflict of Interest: None declared.

in increased quality of care services provided for patient, increased satisfaction, and increased efficiency and effectiveness of emergency units. To achieve these goals, an efficient triage system, which can make decision on each patient with high accuracy, is required [6, 7]. The triage nurse should extract and synthesize information immediately in order to assess patients through a systematic and standardized way to determine which of the patients are in priority to receive therapeutic measures and thus he or she archives the maximum confidence on accuracy of his or her decisions [8].

Although confidence on accuracy of triage decision making has been improved in light of availability of the standard triage scale along with the current equipment and facilities in the triage units, many still argue that the standard scale is limited to the multidimensional understanding of the nature of decision making [9]. In their review study, Stanfield, Dadashzadeh et al., Aloyce et al., and Fathoni et al., reported the effects of factors such as equipment and facilities, triage knowledge, employment history, clinical competence, nurses' personal skills and capabilities, workplace stress, high workloads, and overcrowding in unit on triage decision making in emergency unit [10-13]. Thus, triage decision and multidimensional factors affecting it have high importance, as this decision is often made with having incomplete information in time and place restriction [14].

At the beginning of each planning, the situation should be evaluated. If the goal is to reform the hospital triage structure, the factors affecting the decision-making process of the triage should be obtained in the large nursing community. Thus, as the effect of these factors varies in different emergency units in different situations, it seems that conducting this research in the emergency units of hospitals affiliated with Guilan University of Medical Sciences to yield different results is crucial and the results obtained from them could provide recommendations for managers of emergency units in order to improve the quality of services in the triage of these units. Thus, the objective of this study was to evaluate the most important factors related to decision making of hospital triage from nurses' perspective in these centers.

Methodology

The present study is an analytical and cross-sectional one. The research environment included emergency units of 18 hospitals affiliated with Guilan University of Medical Sciences including heart, surgery and traumatic, internal, burn, pediatric and obstetrics units. The research population included nurses working in these units. Research inclusion criteria included having at least bachelor's level of education in nursing and one year of employment history in the emergency unit. Given that in the analysis factor for each item in the questionnaire, 10 samples are considered, the sample size was determined to be at least 280 people [15]. Finally, 291 samples were included into study using convenient sampling method to increase the efficiency of the factor analysis.

The tool used in this research was a questionnaire based on the study of Dadashzadeh et al. [11]. The questionnaire included 4 sections. The first section included demographic information of nurses working in emergency units (included 7 questions), the second section relates to the personnel factors affecting the triage decision making (included 3 questions with a 5-point Likert scale and 1 question with a ranking of 1 to 7). The third section related to the non- personnel factors related to unit affecting the triage decision making (included 11 questions based on a 5-point Likert scale in 3 domains of planning, management and equipment, 4 questions for examining the current status of triage system in emergency units and 1 question with ranking 1 to 8) and fourth section included the non-personnel factors related to patient affecting the triage decision-making (included 1 question with a ranking of 1 to 10). About the rating questions in the whole tool, assigning a smaller number to each factor indicates the importance of that factor.

The questionnaire was given to 12 professors of Guilan University of Medical Sciences to confirm the content validity and their views were applied in the questionnaire. In the end, to determine the reliability of the instrument, the internal consistency method was used by measuring the Cronbach's Alpha [16].

Obtaining the allowance to attend in each of the hospitals, the researcher went to research environment and obtained the oral consent of the participants to participate in the study by providing a summary of the research goal and the way of answering the questionnaire questions. Owing to crowding emergency unit, adequate time was allocated for nurses and researcher attended the environment until the completion of the questionnaire. It should be noted that as the work shift was circular, the researcher attended in all work shifts throughout the day in the research environments. The length of the sampling lasted from 2017.9.23 to 2017.11.21.

Descriptive statistics (number, percentage, mean and standard deviation) were used in the research environments with regard to the demographic characteristics of the samples and the questions related to examining the current status of the triage system in the research environment. To classify different items and determine their factors and factor loads, exploratory factor analysis with a significant level of 0.05 was used, and to analyze the questions of the questionnaire which evaluated this view based on ranking, Friedman test was used for comparing the intergroup mean ranks in each domain Bonferroni test with a significant level of 0.06 was used for pairwise comparing of means and determining the significance or non-significance level of variables and finally to determine the most important ones through this comparison. Data were analyzed using SPSS version 23 software.

Results

In this study, 272 (93.5%) were female, 19 (6.5%) were male and 256 (91.1%) had bachelor level of education. Mean and standard deviation of age of samples were 31.77 ± 6.19 (Other

information on individual characteristics of the samples is shown in (Table 1).

Exploratory Factor Analysis was done by using principal components method on 24 items. The calculated KMO (Kasier-Meyer-Olkin) value was 0.760 which indicates that the sample is suitable for performing factor analysis. Bartlett's test was significant at the level of 0.001 which showed that the implementation of factor analysis based on the correlation matrix in the sample was justifiable and indicated that there were discoverable relationships between the variables analyzed (Table 2).

Table 1. Distribution of research subjects in terms of individual information

variable	Rating	n	%
education	bachelor	265	91.1%
	Master	25	8.6%
	PhD	1	0.3%
Employment history in emergency unit	1-3 years	97	33.4%
	3-5 years	76	26.2%
	5-10 years	70	24.1%
	10-20 years	41	14.1%
	More than 10 years	7	2.2%
Completing emergency educational workshop	no	144	49.5%
	yes	147	50.5%
Completing acute care course	no	269	92.4%
	yes	22	7.6%
Completing intensive care course	no	235	80.8%
	yes	56	19.2%
Completing crisis management workshop	no	219	75.3%
	yes	72	24.7%
Completing triage training workshop	no	115	39.5%
	yea	176	60.5%
Activity duration in triage	no	39	13.4%
	Less than one year	65	22.3%
	1-3 years	90	30.9%
	3-5 years	60	20.6%
	5-10 years	30	10.3%
	10-20 years	7	2.4%
	More than 20 years	0	0.0%
Time of delegating triage role	Without any employment history in emergency unit	39	13.5%
	Less than 6 months	88	30.6%
	6-12 months	65	22.6%
	12-18 months	23	8.0%
	18-24 months	18	6.3%
	More than two years	58	19%
	Sum of each item	291	100%

Table 2. KMO sampling index and Bartlett's test results

KMO statistic*	0.760	
Bartlett's test	Chi-square approximation	1533.293
	df	78
	P-value	<0.001

* KMO: Kaiser–Meyer–Olkin

Using the scree plot and after examining the internal consistency of the instrumentation clauses, 3 factors were identified with Eigen value above 1.6 that Explaining 60.9% of the total variance (Figure 1).

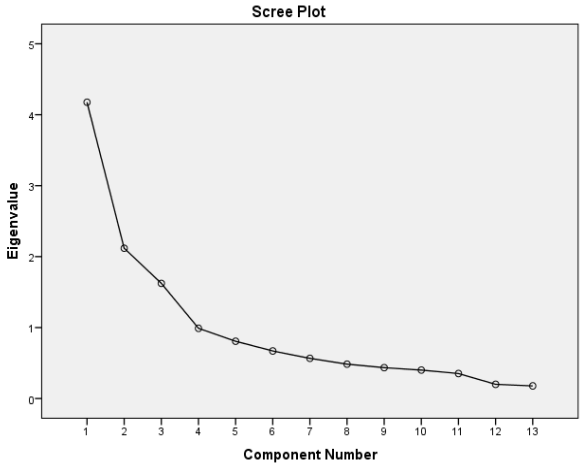

Figure 1. Scree plot based on exploratory factor analysis to determine the correlation between items

In the next step, the exploratory factor analysis by using the varimax rotation was used for better analysis of the factors. Based on the rotated matrix of the components, three factors were identified. Therefore, 3 factors that accounted for 60.9% of the total variance were accepted. At this stage, 11 items were deleted and the number of items in the questionnaire was reduced to 13 phrases. That way, 29.3% of common variance was explained by the first factor (equipment and facilities), 18.2% by the second factor (how the triage nurses were located) and 13.3% by the third factor (responsibility given to the triage nurse) (Table 3). In order to assess the reliability of the questionnaire using Cronbach's alpha coefficient, the coefficient of internal consistency of the whole tool was calculated as 0.748 (Table 4).

In the case of rating questions, the results of the mean ranks of each factor in each domain were calculated based on the Friedman statistical test (Table 5). With regard to scoring and scaling method of the questionnaire, the lower rank has high importance and higher rank had lower importance. After pairwise comparing of means and determining the level of significance or non-significance of variables through the Bonferroni test given the ranks obtained in the personnel domain, experience was reported as the most important and completing the training courses in triage and critical thinking were reported as the less important factors. In the non-personnel domain related to crowdedness of unit, shortage of nurses in each shift and the workload were reported as the most important factors and the rest of the factors in this domain were reported as moderate factors. In the non-personnel domain related to patient, pain, type of injury and vital signs were reported as the most important factors and gender was reported

as the least important factors and the rest of the factors in this domain were reported as moderate factors.

Table 3. Factors based on the rotational matrix of the components of the triage decision questionnaire and the factor load of each item

	Item	Factor		
		1	2	3
1	Wheelchair	0.784		
2	pulse oximetry	0.776		
3	stretcher	0.769		
4	Glucometer	0.768		
5	telephone	0.727		
6	Stethoscope and sphygmomanometer	0.694		
7	thermometer	0.591		
8	Observing all outpatient patients		0.908	
9	observing all patients referring to ambulance		0.885	
10	observing all patients in waiting room		0.745	
11	Delegating other responsibilities in addition to triage responsibility to the triage nurse			0.842
12	start of therapeutic interventions by triage nurse			0.757
13	performing the triage process by nurse, alone			0.583

Table 4. Cronbach's alpha coefficient of decision-making questionnaire subscales

Subscales	Number of phrases	Cronbach's alpha
Factor 1: Equipment	7	0.85
Factor 2: How the triage nurse is located	3	0.82
Factor 3: Responsibilities assigned to the triage nurse	3	0.56
Total	13	0.742

Table 5. Ranking of factors in 3 personnel, non-personnel related to unit and non-personnel related to the patient domains

	domain	factor	Rank
Friedman statistical test	Personnel	Experience	1.58
		Triage process management	3.91
		Decision making power	4.04
		Client examination skill	4.04
		The way of establishing communication	4.05
		Completing training courses in traige	4.73
		Critical thinking	5.66
	Non-personnel related to unit	Unit crowdedness	1.95
		Shortage of nurse in each unit	3.14
		workload	3.91
		Work space limitation	4.86
		Nursing team arrangement	5.10
		Shortage of physician in each shift	5.28
		Lack of facilities and equipment	5.46
		Non-clarity of prioritization scale guidelines	60.30
	Non-personnel related to patient	Pain	2.11
		Injury type	2.84
		Vital signs	2.88
		Time elapsed from problem or incidence	5.85
		age	6.38
		Behavior	6.50
		Potentiality of problem	6.60
		Apparent status	6.86
		Medical history	6.88
		Gender	8.11

Discussion

The factor analysis of the questionnaires showed that three main domains including equipment and facilities, the way of arrangement of triage nurses, and responsibilities delegated to nurses, respectively, had the highest factor load.

The first factor of domain of equipment with components of wheelchair, stretcher, telephone, Glucometer, Stethoscope and sphygmomanometer, thermometer and pulse oximetry was considered as one of the most important domains. In the research conducted by Dadashzadeh et al., more than 50% of the samples referred to the importance of the number of wheelchairs and stretcher in emergency rooms of hospitals [17]. In other similar studies, the availability of communication tools such as telephone and facilities required for patient transmission were reported as effective components in improving the quality of service and patient satisfaction [18, 19]. Research carried out by Aloyce et al also emphasized on the importance of equipment related to measuring blood glucose, arterial blood oxygen saturation, blood pressure and pulse in the triage unit [10]. The main step in any process is to have minimum facilities to perform the task delegated, and each of them plays an important role in facilitating the work process. Thus, it seems that the availability of equipment and facilities to be one of the most important factors affecting the process of decision making in triage unit and prioritization of cares so that nurses in emergency centers can evaluate patients comprehensively.

The second factor of planning domain with regard to arrangement of triage nurses showed that "observing and triage of all outpatient patients, referring to ambulance and monitoring all patients in the waiting room by triage nurse" were the most important components. In this regard, the research conducted by Dadashzadeh et al and Goransson emphasize on the point that the nurse is responsible for the triage of the outpatient and ambulance patients [17, 20]. Paying attention to issue of the way of arrangement of the triage nurses is very important, since it prevents waste of time and it leads to provision of high-quality and timely therapeutic interventions.

With regard to the third factor, 3 components of planning and personnel domains; " Delegating other responsibilities in addition to triage responsibility to the triage nurse" was reported as the most important components. Aloyce et al and Mirhaghi et al. emphasized on the necessity of presence of specialized nurse as triage nurse and prevention of role interference and his or her presence in other roles and positions

[10, 21]. The delegation of other responsibilities to the triage nurse is important since when his or her focus is merely on triage, the patients' evaluation would be more accurate leading to more accurate decisions to determine the priority of patients. "The beginning of therapeutic interventions by triage nurses" was also considered as one of the most important components, which is in line with the findings of the research conducted by Fallah and Hur and Pile Varzadeh [22, 23]. So we can say providing timely services by triage nurses is crucial to improve the safety and health of patients and to increases patient satisfaction. The nurse's triage process was mentioned alone as another important component of this factor. "The triage by nurse alone" was also reported as another important component in this factor. Emergency Unit Evaluation Checklist which is a monitoring means for Health and Medical Education Deputy has performed strict auditing. Accordingly, only one question is asked (is there a triage nurse for every thirty to forty thousand patients referring to the emergency unit annually), which is not able to evaluate the various aspects of the triage and does not provide proper information for health care managers to examine this issue [21]. Hence, investigating this issue is very important and it is necessary that ability of the nurses in triage of patients to be evaluated in order to have proper understanding of the emergency unit status during the crises and reaction of the nurses of these units and the way of using the triage capacities.

With regard to two-value items of Friedman and Bonferroni analysis, "experience" was considered as the most important factor in the personnel domain. In this regard, Dadashzadeh et al., Fathoni et al., and Hicks et al stated that the experience was one of the most important factors in triage decision [11, 12, 24]. In contrast, Considine et al stated that there was no significant relationship between experience and decision-making skills in triage [25]. Engoren (2005) stated that "experience has small role in triage decision making" [26], but in a qualitative research, the same researcher (2009) stated that triage nurses believe that employment history is necessary in triage decision [27]. Therefore, nursing managers are recommended to select the nursing staff of emergency units with considering the level of skill of nurses, obtained through experience.

In this domain "completing training courses" was considered as one of the least important factors, which it was in line with the research conducted by Aloyce et al., in which 13% of in-service training participants participated and stated that none of the completed training courses had supporting role in the triage [10]. In a research conducted in Australia, 42% of nurses were not trained for triage, and 14% stated that they were not ready enough for this work while they were trained in the triage classes [21]. However, the studies of Fathoni et al and Cone and Murray reported the positive relationship between the triage decision making skills and completing the training courses [12, 28]. As majority of participants (60.5%) of this study participated in triage training courses, they stated that completing the training courses was less important in triage decision-making process. This might suggest the poor quality of the courses offered to nurses, the distinction between these courses with the actual working conditions and the lack of retraining courses for them.

With regard to the effect of "critical thinking" on triage decision making, Stanfield and Garbez et al stated that critical clinical analysis of patient information is one of the factors affecting the triage decision making and priority allocation. This result was in contrast to that of present study on low importance of critical thinking from nurses' point of view [13, 29]. These conflicting results might be due to low sense of self-esteem, courage and determination for making decision in stressful conditions. For this reason, participants might refer experience as the most important factor, which this influential factor is gradually formed over time and in different situations.

In the non-personnel domain of ward "crowdedness of unit, shortage of nurses in each shift and workload" were considered as the most important factors. In this domain, none of the factors was considered less important from the viewpoint of nurses. The results of research carried out by Fry and Burr and Dadashzadeh et al confirmed the results of this study and it was reported that crowdedness is one of the most important internal factors affecting the decision of the triage [11, 14]. In addition, in another study conducted by Dadashzadeh et al., the most important cause was reported to be lack of triage system in emergency units and shortage of nursing staff [17]. Thus, it could be stated that the use of human resources in accordance to the number of patients referring to the emergency unit can play very important role in the process of controlling the non-personnel domain and subsequently creating an appropriate atmosphere for taking necessary actions.

In the non-personnel domain related to patient "pain, the type of injury, and vital sign" were reported as the most important factors and gender was considered as less important factor. In line with the results of this research, the results of Dadashzadeh et al, Patel and Castner stated that the pain, vital signs and type of injury to the patient were the most important factors and the gender of patients was reported as less important non-personnel factors related to the patient [11, 30, 31]. Garbez et al reported that the main complaint of patient, age, vital signs and the need for timely intervention (given the potentiality of problem) were very important factors in prioritizing [29, 32]. In contrast, Cooper et al reported that 92.1% of triage decisions were not affected by vital signs [33], which this result is in line with results of the present study. With regard to importance of pain in triage decision makings in this research, the results of research carried out by Aloyce et al showed that research subjects did not pay attention to factors of pain and the medical history of triage nurses, indicating low importance of this factor from the viewpoint of nurses in their study [10]. This result is in contrast to results of our study on the importance of pain factor in patients' triage.

With regard to examining the triage system status in the research environment in the management domain, 49.5% of the participants stated that triage scale of their unit is ministerial, 13.4% reported that triage scale of their unit is provincial, and 28.5% reported that triage scale of their unit is hospital, while

8.6% of the participants did not have information on it. Muaddab and Sepehri stated that 68.8% of the subjects believed that a single triage system was not provided in the healthcare system and multiplicity in the triage reduced the efficiency [34]. No national triage scale has been introduced to hospitals in Iran, and hospitals themselves determine the triage system, since there is no comprehensive university course for triage training, so that the share of triage in the course of nursing lessons is only one session in the emergency unit. In this regard, holding the workshops and referring to sporadic papers published in this regard have been considered as solution [21]. Thus, holding sessions and providing guidelines in this regard by nursing managers is emphasized.

Conclusion

Due to impact of various factors in personnel, management, planning, equipment and facilities dimensions in the implementation of triage process, more attention of health authorities in the implementation of the standard triage system through the modification of the management and physical structure of emergency units based on the standards, using skilled and experienced personnel on triage, and allocation of resources and facilities for improving the triage activities are emphasized in order to improve the quality of triage activities, quality of decision making and prioritization of patients in emergency units with better organizing as a result of improving the quality of clinical units.

Acknowledgment

This paper was derived from master's thesis of Surgical Internal Nursing. It was approved and registered in the meeting with Research Council at 2017.8.5, with the code number of 96051407. We thereby appreciate the honorable Research and Technology Deputy of Guilan University of Medical Sciences for funding this project. We also appreciate the management of hospitals, nursing managers and all colleagues and beloved ones who helped us in conducting this project.

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