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Research Article

Factors Affecting the Duration of Nurses' Decision Making in Triage in Japan

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Keywords

- Triage
- Triage decision
- Emergency nurses
- JTAS
- CTAS

Abstract

Purpose: In the present study, we aimed to identify the factors that affect nurses' decision making in triage.

Method: We used a predictive design in this survey, with triage records created by researchers and completed by triage nurses at five emergency hospitals. The survey was held for five days within January of 2012. We performed multiple linear regression analysis with triage duration as the dependent variable and all other factors as independent variables.

Result: We recovered 1331 triage charts, all of which belonged to walk-in cases. The distribution of patients by triage category was as follows: Level 2 (Emergent), 2.8% of patients; Level 3 (Urgent), 16.8%; Level 4 (Less-Urgent), 42.1%; and Level 5 (Non-Urgent), 38.3%. The number of patients in the waiting room during triage averaged 14.2 ± 8.4 people. The data showed that triage duration decreased when nurses used structured triage ($\beta = -0.27$, $p < 0.001$) and increased when they used traditional triage ($\beta = 0.53$, $p < 0.001$). Triage duration also decreased with every increase in the number of patients in the waiting room ($\beta = -0.04$, $p < 0.05$). The regression model yielded an R2 value of 0.56 ($F = 206.1$, $p < 0.001$).

Conclusion: Factors that affect decision making in triage include the presence of structured triage and the number of patients in the waiting room. These results highlight the importance of a structured triage system such as the JTAS in Japan where there is a limited history of formal triage.

ABBREVIATIONS

EDs: Emergency Departments; JTAS: Japanese Triage and Acuity Scale; CTAS: Canadian Triage and Acuity Scale

INTRODUCTION

Overcrowding in emergency departments (EDs) is an increasing global problem [1,2]. Studies from various countries have revealed that approximately 50%–80% of emergency patients visit the doctor for non-urgent reasons [3,4]. There are as many as ~75,000 emergency outpatient visits in Japan per year [5]. Walk-in patients alone (i.e., excluding patients who come by ambulance) are estimated to reach 59,000 [6]. Although most are milder cases, this total includes high-acuity patients as well. Most Japanese hospitals see patients in the order they arrive at hospital, creating the issue of delayed treatment for high-acuity patients. Low-acuity visits in emergency departments can cause significant problems since they consume resources that should be allocated to high-acuity patients [7]. These reasons have led to increased numbers of triage nurses in hospitals in recent years. However, the Japanese Triage and Acuity System (JTAS) written in Japanese, based on the Canadian Triage and Acuity System (CTAS), was introduced to standardize triage in Japan in 2012. Currently, some hospitals utilize the structured triage system, which supports nurses' decision making, whereas others continue to use traditional triage.

In addition, overcrowding of EDs is associated with factors that affect quality of care, such as diminished patient satisfaction, reduced productivity of care, and lowered morale of medical staff [8,9]. In addition, a large portion of patients bombard EDs with lesser acute complaints, sometimes occupying the time and resources of medical staff, and delaying the management of more acutely ill patients [10]. One might conjecture that EDs in Japan are afflicted by similar situations today. Because it is used to screen for high-acuity patients, nurse triage aims to help patients start treatment more quickly. However, clinical studies have recognized that prolonged triage processes may contribute

to adverse patient outcomes [11,12]. Prompt triage is necessary in order to start treatments quickly, but this strategy is predicted to be affected by several factors. Understanding these factors is an essential step to improving the efficiency of patient care. The purpose of the present study was to identify the factors that affect nurses' decision making in triage. The results provide suggestions on how to make nurses' triage decisions, a responsibility that to date has a short history in Japan, quicker and more effective.

METHODS

Data Collection

Triage charts were created to collect basic patient information, such as age, gender, chief complaint, and registration time as well as the number of patients in the waiting room. The charts also included a column to record information about the triage start time and the time taken for the assessment of the acuity level. In addition, the charts provided a space to record whether a decision-making support tool, such as the JTAS, had been used. We asked participating triage nurses working in five emergency hospitals to complete the triage charts for all self-referring patients treated on an emergency out-patient basis; however, nurses were asked to exclude patients if there were no patients in the waiting room or if the patient arrived by an ambulance because these patients were examined immediately by the emergency physician. Triage nurses completed the triage charts while taking medical histories and performing physical assessments.

Researchers calculated triage duration on the basis of the time when the nurse first reported contact with the patient on the triage chart and the time when triage was completed. Table 1 shows an overview of each emergency medical facility and the number of years of triage nursing experience of the participants. We conducted the survey in January 2012. This study was approved by the Japanese Society for Emergency Medicine and the Ethical Review Board at the Japanese Red Cross Kyushu International College of Nursing.

Summary of JTAS

The fundamental ideas of JTAS are based on the Canadian Triage and Acute Scale (CTAS) developed by the Canadian Association of Emergency Physicians. A prototype JTAS was made based on a translation of the CTAS. It was later evaluated by four official emergency healthcare associations: Japanese Society for Emergency Medicine, Japanese Association for Acute Medicine, Japanese Society of Emergency Pediatrics, and Japanese Association for Emergency Nursing. The scale also includes items related to medical conditions commonly seen in Japan, such as heat stroke.

Data Analysis

We first performed standard descriptive statistics to overview the triage cases. Triage duration at each level of urgency was compared using one-way analysis of variance (ANOVA); multiple comparisons were performed because there was a significant difference.

Next, to reveal the factors affecting triage duration, we performed multiple linear regression analysis with triage duration set as the dependent variable and other factors set as independent variables. Nominal data were input as dummy variables. Additionally, we excluded level of urgency from the independent variables in advance due to major variation in the number of cases per level. Independent variables were selected using forward-backward step-wise selection. Finally, based on the results of the multiple linear regression analysis, we analyzed the triage time for subgroups (traditional triage vs. structured triage) by t-tests. Statistical analysis was performed using SPSS statistical software (SPSS Base version 22.0 for Windows). Descriptive data are presented as mean ± standard deviation or as numbers and percentages.

RESULTS

Summary of triage cases

We recovered 1331 triage charts, all of which belonged to walk-in cases. Table 2 shows an overview of the triage cases. The mean age of emergency patients was 36.9± 26.3 years, and the gender ratio was 43.7% female and 56.3% male. The common presenting complaints included general problems such

Table 1: Overview of the hospitals and triage nurse attributes.

Hospital type	Community	Teaching	Teaching	Urban	Community
Triage nurses No. of people	11	14	15	19	18
Mean age ± SD	33.09±2.97	33.79±5.92	43.87±6.13	37.21±5.98	27.89 ± 4.85
No. of years of nursing experience					
≤3 years	1	0	0	0	3
4-5 years	1	3	0	2	3
6-10 years	5	4	0	3	9
10≤ years	4	7	15	14	3
No. of years of triage nursing experience					
≤3years	4	1	6	6	12
4-5 years	2	4	2	3	4
6-10 years	5	5	2	9	2
10≤ years	0	4	5	1	0

Table 2: Overview of Triage Cases.

	n=1331
	Mean±SD
Age	36.9±26.3
Age Categories	No. (and%) of cases
Pediatric (0-17y)	395 (29.7)
Adult (18-65y)	707 (53.1)
Elderly (>66y)	229 (17.2)
Female	582 (43.7)
Male	749 (56.3)
Presenting complains-Categories	
General and Minor	310 (23.3)
Gastrointestinal	259(19.5)
Neurologic	193 (14.5)
Orthopedic	119 (8.9)
Trauma	105 (7.9)
Respiratory	102 (7.7)
Cardiovascular	51 (3.8)
Others	192 (14.4)
Registration time	
8:01-17:00	586(44.0)
17:01-8:00	745(56.0)
Level of Urgency	
Level 1	—
Level 2	37(2.8)
Level 3	224(16.8)
Level 4	560(42.1)
Level 5	510(38.3)
	Mean±SD
Number of patients in waiting room	14.2±8.4
Triage duration	
All (min)	2.6±2.5
Level 1	—
Level 2	1.6±1.8
Level 3	2.8±2.5
Level 4	2.7±2.8
Level 5	2.6±2.6
Decision making in the triage	No. (and %)
Traditional triage	628(47.2)
Structured triage(JTAS)	703(52.8)

SD: Standard Deviation
JTAS: Japanese Triage and Acuity Scale
Level 1 (Resuscitation); Conditions that are threats to life or lim requiring aggressive interventions. **Level 2 (Emergent)**; Conditions that are a potential threat to life, limb or function, requiring rapid medical intervention or delegated acts. **Level 3 (Urgent)**; Conditions that could potentially progress to a serious problem requiring emergency intervention. May be associated with significant discomfort or affecting ability to function at work or activities of daily living. **Level 4 (Less-Urgent)**; Conditions that related to patient age, distress, or potential for deterioration or complications would benefit from intervention or reassurance within 1–2 hours). **Level 5 (Non-Urgent)**; Conditions that may be acute but non-urgent as well as conditions which may be part of a chronic problem with or without evidence of deterioration. The investigation or interventions for some of these illnesses or injuries could be delayed or even referred to other areas of the hospital or health care system.

as fever (23.3%), gastrointestinal complaints such as abdominal pain (19.5%), and neurological complaints such as headache (14.5%). Other complaints were orthopedic (8.9%), trauma (7.9%), respiratory (7.7%), and cardiovascular (3.8%) in origin. Structured triage (JTAS) and traditional triage were implemented in 52.8% and 47.2% of patients, respectively. The distribution of patients by triage category was as follows: Level 2 (Emergent), 2.8% of patients; Level 3 (Urgent), 16.8%; Level 4 (Less-Urgent), 42.1%; and Level 5 (Non-Urgent), 38.3%. The number of patients in the waiting room during triage averaged 14.2 ± 8.4 people.

Triage duration by degree of urgency was as follows: Level 2, 1.6 ± 1.8 min; Level 3, 2.8 ± 2.5 min; Level 4, 2.7 ± 2.8 min; and Level 5, 2.6 ± 2.6min. Thus, decision time was longest for Level 3. The results of one-way ANOVA and multiple comparisons revealed that triage took significantly less time for Level 2 than for Level 3, 4, and 5 cases (Table 3).

Factors Affecting Triage Duration

Figure 1 shows the results of multiple regression analysis with triage duration as the dependent variable. The data showed that triage duration decreased when nurses used structured triage ($\beta = -0.27$, $p < 0.001$) and increased when they used traditional triage ($\beta = 0.53$, $p < 0.001$). Triage duration also decreased with every increase in the number of patients in the waiting room ($\beta = -0.04$, $p < 0.05$). The regression model yielded an R^2 value of 0.56 ($F = 206.1$, $p < 0.001$). The correlation matrix of all explanatory variables did not reveal any highly correlated variables. Regression diagnostics showed no evidence of significant multicollinearity.

Comparison of Triage Duration

Table 4 lists the results of our comparison of the mean triage durations by traditional and structured triage. The mean triage durations by structured and traditional triage were 2.30 ± 1.86 min and 2.59 ± 2.60 min, respectively; the difference was significant. On comparing the different levels of acuity, we found that structured triage was shorter for levels 2 and 3 but that there was no significant difference for levels 4 and 5.

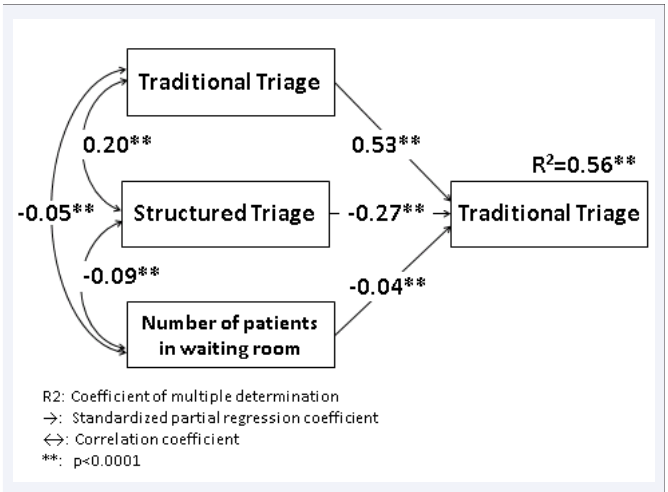

Figure 1 Multiple Regression Analysis with Triage Duration as Target Variable.

Table 3: Multiple Comparisons of Triage Duration by Degree of Urgency.

Analysis of variance

Source of Variation	Sums of squares	Df	Mean Square	*F*	*P*
Level of Urgency	137.85	3	34.46	5.48	<0.001
Error	11376.17	1810	6.29		

DF: Degree of Freedom

Multiple comparison

Level of Urgency	2	3	4	5
2				
3	-1.111 0.002			
4	-1.055 0.001	-0.056 0.998		
5	-0.938 0.006	-0.173 0.857	-0.119 0.907	

Upper stage: The difference between the average value
Lower stage: P Value

Table 4: Comparison of the duration of assessment between structured and traditional triage.

n=1331

	Traditional triage	Structured triage (JTAS)	*t*	*P*
	Mean time ± SD (min)			
All	2.59±2.60	2.30±1.86	2.366	0.018
Level 2	2.57±1.78	1.44±1.75	1.936	0.048
Level 3	3.28±2.13	2.44±1.80	3.055	0.003
Level 4	2.72±2.81	2.39±1.89	1.618	0.106
Level 5	2.10±1.84	2.35±2.54	1.144	0.253

DISCUSSION

In our survey, 80% of data were for lower urgency cases (i.e., JTAS levels 4 or 5), which may have impeded the appropriate allocation of medical resources, including personnel. Furthermore, those cases might include patients with high levels of acuity; thus, triage nurses might have had to spend additional time for decision making to avoid under-triage. In this study, however, there was no correlation between triage duration and acuity level. The results showed that level 3 determination took the longest time. This indicates that nurses require more time to distinguish between levels 3 and 2 as well as between levels 3 and 4. In other words, they require additional time to avoid under- and over-triage when assessing level 3. Next, the results of the t-test revealed that structured triage using the JTAS was significantly shorter than that using traditional triage. Based on these results, we believe that structured triage can reduce the triage time required before decision making by nurses, even in determining level 3 triage that requires more time. Given that the reliability and validity of the JTAS [13] and the CTAS [14] have already been confirmed, we can expect the use of these structured triage systems to improve the accuracy of acuity judgments over time.

The multiple regression analysis indicated that triage duration was affected by both the presence of structured triage and the number of patients in the waiting room. At the same time, we found that triage duration was prolonged in traditional triage. We assumed that these results were considerably affected by the clinical experience of the participating nurses, which is consistent with the findings of other research [15,16]. Although triage charts were not matched to triage nurses in the present study, it is likely that those with more years of experience were able to make decisions in a shorter time. However, it appears that triage duration among nurses with little experience would be affected by the presence of the JTAS system. A larger review is needed with the number of years of nursing experience as a variable and level 3 triage rating included as a variable among the factors affecting nurse triage. However, we observed a marked bias in the level of acuity and therefore excluded this as an independent variable in this study.

It has been reported that acuity judgments should be made using subjective and objective physiological assessment strategies [17,18], i.e., nurses' understanding of the "critical first look" and vital sign data. Recently, vital sign data have become a common item in international triage scales [19-22] and have been used as indices in decision making. Skyttberg et al., (2016) demonstrated that vital sign data were indispensable when identifying and prioritizing severely ill patients [23]. We believe that the critical first look employed by triage nurses probably does not differ between the structured triage and traditional triage methods. However, the use of the JTAS may shorten the time required to interpret vital sign data and to determine acuity. Facilities that allocate triage nurses in order to resolve emergency department overcrowding are increasing in Japan at present, but many facilities have not introduced structured triage. We must endeavor to spread structured triage like JTAS in Japan to help make faster and more-accurate triage decisions.

The number of patients in the waiting room also affected triage duration. Triage duration fell for every one-person increase in this number. We believe this finding demonstrates that nurses today perform triage while being mindful to start diagnosis and treatment more quickly with increasing patient numbers in the waiting room.

An R^2 of 0.56 for the regression model was ideal because it fulfills the criterion of >0.5. However, it will be necessary to re-examine urgency level after increasing sample size, then look at other factors not examined here.

CONCLUSION

Factors that affect decision making in triage include the presence of structured triage and the number of patients in the waiting room. When determining acuity levels, most time is required for level 3 triage, which may be attributed to the extra time needed to avoid under- or over-triage. Furthermore, we demonstrated that the time taken to determine level 3 triage is significantly shorter when using structured triage than when using traditional triage. These results highlight the importance of a structured triage system such as the JTAS in Japan where there is a limited history of formal triage.

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