

## Original Article

### Factors Associated with Patient Triage Accuracy in the Emergency Department

T. Abdur Rasyid<sup>1\*</sup>, Rani Lisa Indra<sup>1</sup>, Bayu Saputra<sup>1</sup>, Sandra Sandra<sup>1</sup>

<sup>1</sup> Department Keperawatan Medikal Bedah, Keperawatan Gawat Darurat dan Keperawatan Kritis, Prodi S1 Ilmu Keperawatan & Profesi Ners, Fakultas Kesehatan, Universitas Hang Tuah Pekanbaru, Pekanbaru, 28288, Indonesia

#### Article Information

Received: 7 May 2024  
Revised: 25 May 2024  
Accepted: 20 June 2024  
Available online: 02 July 2024

#### Keywords

The accuracy of triage; mode of transportation; type of emergency; gender; age

#### Correspondence\*

Phone: (+62)81378410592  
E-mail:  
[tengkuabdurasyid@htp.ac.id](mailto:tengkuabdurasyid@htp.ac.id)

#### Website

<https://journal.umtas.ac.id/index.php/healthcare/index>

#### Doi

[10.35568/healthcare.v6i2.4719](https://doi.org/10.35568/healthcare.v6i2.4719)

©The Author(s) 2024

This is an Open Access article distributed under the terms of the Creative Commons Attribution-Non Commercial 4.0 International License

#### ABSTRACT

Triage in the Emergency Department (ED) aims to provide timely emergency interventions based on the urgency of the patient's condition. This study aimed to identify factors associated with the accuracy of patient triage in the ED of Arifin Achmad Regional General Hospital in Riau Province, Indonesia. A quantitative approach with a descriptive analytic design and a cross-sectional approach was utilized. The study population consisted of adult patients aged 18 years and above who came to the ED, with a sample size of 80 patients selected through consecutive sampling. Triage data were collected using an observation sheet, and triage accuracy was assessed by comparing nursing triage decisions with those of the attending ED physician. Data analysis included univariate and bivariate (Fisher's exact test), and multivariate analysis (logistic regression). Most respondents were adults aged 18-59 years (70.0%), male (68.8%), non-trauma emergency status (81.2%), self-transported (82.5%), and 85% had accurate triage results. Fisher's exact test showed significant associations between age, gender, mode of transportation, type of emergency, and triage accuracy. Male gender (OR 8.237, p-value 0.005) and adult age (OR 5.270, p-value 0.022) were the most significant factors. Regular monitoring and evaluation of triage implementation are necessary to improve triage accuracy and patient outcomes in the ED.

#### INTRODUCTION

The Emergency Department (ED) serves as the frontline of healthcare delivery in

hospitals. Emergency services in the ED operate 24 hours a day and involve multidisciplinary teams (Kementerian



Kesehatan Republik Indonesia, 2018; World Health Organization/ WHO, 2019). The influx of patients to the ED is unpredictable, leading to simultaneous arrivals with varying emergency conditions. Hence, patient selection through triage becomes necessary. Triage plays a crucial role in screening patients with critical illnesses or injuries to facilitate immediate care. Various triage systems are employed in EDs worldwide, including the Emergency Severity Index (ESI), Manchester Triage System (MTS), Australasian Triage Scale (ATS), and Canadian Triage and Acuity Scale (CTAS) (Habib et al., 2016; Ruttanaseeha et al., 2020).

Accurate triage processes can enhance patient care outcomes in the ED. Triage accuracy involves categorizing patients appropriately based on their actual urgency levels. Inaccurate triage contributes to delays in time-sensitive interventions, clinical deterioration, morbidity, and mortality. Both over-triage, placing less urgent patients in higher urgency levels, and under-triage pose risks to patients (Hinson et al., 2018).

Several studies have identified triage accuracy by both nurses and physicians in EDs using various triage systems. Additionally, previous research aimed to identify factors associated with triage accuracy, focusing on ED nurse factors. These factors include triage training, years of experience, nurse education, and triage methods, whether paper-based or computerized (Chen et al., 2010; Firdaus et al., 2018). Only a small fraction of studies have identified patient factors related to triage accuracy in the ED. These patient-related factors include age, gender, trauma and non-trauma cases, and the mode of arrival at the ED.

Research by Ameri et al. (2021) suggests that male gender is associated with higher triage accuracy compared to females, with a p-value < 0.001 and an odds ratio of 2.5. Hinson et al. (2018) found that under-triage incidents increase, particularly in patients

aged  $\geq 70$  years (OR 1.50, 95% CI 1.30-1.74). Soontorn et al. (2018) reported only 52.4% of trauma patients with accurate triage. Ruttanaseeha et al. (2020) indicated that patients arriving at the ED by emergency ambulance showed more accurate triage, though statistically insignificant with an OR of 1.05 and P=0.951.

Arifin Achmad Regional General Hospital (RSUD) in Riau Province operates an ED categorized as level III (Rumah Sakit Umum Daerah Arifin Achmad Provinsi Riau, 2018). Since early 2016, the ED at RSUD Arifin Achmad has been utilizing a modified ATS as its triage scale. All ED nurses have undergone triage training (in-house training) using the internal ATS version conducted by the Hospital Training and Research Division in 2018 and 2019. Based on interviews with the head of the ED department, there have been no studies regarding factors related to patient triage accuracy by nurses in the ED of RSUD Arifin Achmad in Riau Province. Given this background, this study aims to identify factors associated with patient triage accuracy in the ED of RSUD Arifin Achmad in Riau Province.

## METHODS

This study employed a quantitative research design with a descriptive analytic approach utilizing a cross-sectional method. A cross-sectional study assesses independent variables or predictors and dependent variables or outcomes simultaneously at a single time point (Dharma, 2011). The aim was to identify patient factors, including independent variables such as age, gender, mode of arrival, and type of emergency, as well as the dependent variable, which is the accuracy of patient triage by nurses, and subsequently analyze the relationships between these factors.

The population comprised all patients aged  $\geq 18$  years who visited the ED of Arifin Achmad Regional General Hospital, Riau Province, during the period from December to February 2021. Sampling was conducted

using consecutive sampling. Inclusion criteria included all patients aged  $\geq 18$  years visiting the ED, while exclusion criteria included patients with pregnancy and gynecological cases, patients with known or established psychiatric disorders (psychosis) based on previous medical records or physician's examination notes, and patients arriving at the ED in a state of biological death.

Sample size calculation utilized the rule of thumb with a correction formula, where  $n = (\text{number of independent variables} \times 10) / \text{prevalence of the dependent variable}$  (Dahlan, 2010). The prevalence of the dependent variable was based on the literature review study by Rasyid, Kosasih & Mirwanti titled "The Reliability and Accuracy of International Triage Scale in the ED: A Literature Review," which reported a 50% inaccuracy rate in ED triage. Based on this formula, a total of 80 samples were obtained. The study was conducted in the ED of Arifin Achmad Regional General Hospital, Riau Province, from November 2021 to October 2022.

Data were collected through observation sheets containing patient characteristics and triage data by triage nurses using a checklist format of the Australasian Triage Scale (ATS) implemented in the ED of Arifin Achmad Regional General Hospital. Triage decisions by nurses were compared with those of attending ED physicians (considered the gold standard). Observational data collection of patient triage by ED nurses obviated the need for validity and reliability testing. Univariate analysis was employed to obtain a profile of the respondents.

Bivariate analysis was conducted to examine the relationship between each independent variable (patient age, gender, mode of arrival, type of emergency) and the dependent variable (accuracy of patient triage by ED nurses) using the Fisher Exact test due to expected count values of less than 5 for the four analyzed factors. This study utilized a significance level of 5%

(0.05). Multivariate analysis was employed to identify the factors most associated with triage accuracy. Age, gender, type of emergency, and mode of arrival were all included in logistic regression analysis. Ethical approval for the study was obtained from the Health Research Ethics Committee of Hang Tuah University, Pekanbaru, as evidenced by letter No: 447/KEPK/STIKes-HTP/VI/2022.

## RESULTS

### 1. Respondent Characteristics

Table 1. Respondent Demographics and Triage Accuracy in ED

Characteristic	Frequency (n)	Percentage (%)
Age		
• Adult (18 - 59 years)	56	70.0
• Elderly ( $\geq 60$ years)	24	30.0
Gender		
• Male	55	68.8
• Female	25	31.2
Type of Emergency		
• Trauma	15	18.8
• Non-trauma	65	81.2
Mode of Arrival		
• Self-transported	66	82.5
• Referred	14	17.5
Triage Accuracy		
• Inaccurate	12	15.0
• Accurate	68	85.0

Source: Authors' own research

Based on data collected from 80 respondents, the majority fell within the adult age range (18 – 59 years), comprising 56 individuals (70.0%). Additionally, there was a predominance of male respondents, totaling 55 individuals (68.8%). A significant proportion of respondents, amounting to 65 individuals (81.2%), presented to the ED with non-trauma emergency status. Notably, the majority of patients, accounting for 66 individuals (82.5%), arrived at the ED via self-transport. Analysis of triage accuracy conducted by ED nurses

revealed that 68 respondents (85%) underwent precise triage assessments.

However, 12 respondents (15%) received inaccurate triage assessments.

## 2. Bivariate Analysis

Table 2. Relationship between Age, Gender, Type of Emergency, Mode of Arrival, and Triage Accuracy in the ED

Variable		Accurate triage		Inaccurate triage		p	OR	95% CI	
		n	%	n	%			Min	Maks
Age	Adult (18 - 59 years)	4	33,3	52	76,5	0,005	0,154	0,041	0,579
	Elderly (≥60 years)	8	66,7	16	13,5				
Gender	Male	3	25,0	52	76,5	0,001	0,103	0,025	0,425
	Female	9	75,0	16	23,5				
Mode of Arrival	Self-transported	7	58,3	59	86,8	0,031	0,214	0,056	0,820
	Referred	5	41,7	9	13,2				
Type of Emergency	Trauma	5	41,7	10	14,7	0,043	4,143	1,096	15,656
	Non-trauma	7	58,3	58	85,3				

Source: Authors' own research

The table provided demonstrates that 52 (76.5%) respondents within the adult age range (18-59 years) received accurate triage assessments from nurses, with a p-value of 0.005 (p-value < 0.05). This supports the indication of a correlation between respondents' age categories and the precision of triage. Specifically, adult respondents (aged 18-59 years) were 0.154 times more likely to have precise triage statuses. Moreover, 52 (76.5%) male respondents were correctly triaged, with a p-value of 0.001 (p-value < 0.05), indicating a significant link between respondents' gender and triage accuracy. Male respondents were 0.103 times more likely to have accurate triage statuses.

Additionally, the data indicates that 59 (86.8%) respondents who independently arrived at the ED underwent accurate triage, with a p-value of 0.031 (p-value < 0.05), suggesting an association between respondents' mode of arrival at the ED and triage precision. Independently arriving respondents were 0.214 times more likely to have accurate triage statuses. Furthermore, the data reveals that 58 (85.3%) respondents presenting non-trauma emergencies upon ED

arrival were accurately triaged, with a p-value of 0.043 (p-value < 0.05), indicating a significant relationship between respondents' emergency types and triage accuracy. Respondents with non-trauma emergencies were 4.143 times more likely to have accurate triage statuses.

## 3. Multivariate Analysis

Table 3. Factors Most Associated with Triage Accuracy in the ED

Variable	Category	Accurate Triage		
		P	OR	95% CI
Age	Adult (18 - 59 years)	0,022	5,270	1,267
	-			
Gender	Male	0,005	8,237	1,875
	-			
				36,199

Source: Authors' own research

The table above illustrates that the most influential factors affecting accurate triage among respondents in the ED are age and gender, with respective p-values of 0.022 and 0.005. The strength of the relationship between the adult age group (18-59 years) and accurate triage, as indicated by the odds

ratio (OR), is 5.270 (95% CI= 1.267 – 21.927). This implies that individuals in the adult age group (18-59 years) visiting the ED are 5.270 times more likely to undergo accurate triage by nurses. Meanwhile, the OR for respondent gender is 8.237 (95% CI= 1.875 – 36.199), indicating that male respondents are 8.237 times more likely to undergo accurate triage by nurses. Based on these factors, male gender demonstrates a stronger association with accurate triage, followed by the adult age group (18-59 years).

## **DISCUSSION**

### **1. Respondent Characteristics**

The study findings indicate that the majority of respondents fall within the adult age category (18 – 59 years), comprising 56 individuals (70.0%) compared to the elderly age group ( $\geq 60$  years). There is a lack of detailed research or reference sources describing the proportion of patient visits to the Emergency Department (ED) based on age categories in Indonesia. According to data from the Badan Pusat Statistik (BPS/2022, the population of Riau Province aged 20 – 59 years is 7.8 times higher than those aged  $\geq 60$  years. This also correlates with the higher number of ED visits among adults compared to the elderly. The study reveals that the majority of respondents are male, totaling 55 individuals (68.8%). BPS data from 2022 indicates a male-to-female population ratio of 1.05:1, meaning there are more males than females. Based on Kementerian Kesehatan Republik Indonesia (2017), 69.90% of the total disease burden in Indonesia is attributed to non-communicable diseases (NCDs), which may also correlate with more ED visits for non-traumatic emergencies compared to trauma-related visits. Additionally, the data shows that the majority of patients arrive at the ED independently, totaling 66 individuals (82.5%). Based on information from the Directorate General of Medical Services of Kementerian Kesehatan Republik Indonesia in 2007, 13.3% of all visits to general hospitals are ED visits, with 12.0% of these visits being

referrals. This suggests that independently arriving patients may outnumber referred patients (Kementerian Kesehatan Republik Indonesia, 2009).

Regarding the accuracy of triage statuses assigned by ED nurses, 68 respondents (85%) underwent accurate triage, while 12 respondents (15%) experienced inaccurate triage. Comparative literature reviews by Rasyid, Kosasih, and Mirwanti (2021) titled "The Reliability and Accuracy of International Triage Scale in the ED: A Literature Review" reported triage accuracy using the ATS in EDs ranging from 46.2% to 58.3%. However, the accuracy of triage at RSUD Arifin Achmad ED was higher than reported in the literature. This discrepancy may be attributed to various factors, including sample size and training received by ED nurses.

### **2. Association of Age, Gender, Mode of Arrival, Emergency Type with Triage Accuracy**

The study results indicate a correlation between respondents' age categories and triage accuracy. Specifically, adult respondents (aged 18 - 59 years) were 0.154 times more likely to have accurate triage. This finding is supported by studies showing higher triage accuracy among adult patients compared to other age groups. Additionally, the study reveals a correlation between respondents' gender and triage accuracy, with male respondents being 0.103 times more likely to have accurate triage statuses. This is consistent with research Ameri et al. (2021) indicating higher triage accuracy among male patients, particularly in cases such as myocardial infarction (MI). Furthermore, there is a correlation between respondents' mode of arrival at the ED and triage accuracy, with independently arriving respondents being 0.214 times more likely to have accurate triage. Despite some studies suggesting higher triage accuracy among patients arriving via emergency medical services (EMS), statistical significance was not observed in this study (Binsama et al, 2021). However, it's noted that patient arrival

mode does not determine the severity level or treatment plan in the ED. Finally, there is a correlation between respondents' emergency type and triage accuracy, with non-traumatic emergencies showing higher accuracy. This aligns with existing literature indicating higher accuracy in triaging non-traumatic cases.

### 3. Factors Most Associated with Triage Accuracy

The study identifies age and gender as the most influential factors associated with triage accuracy in the ED. Male respondents were 8.237 times more likely to have accurate triage statuses, while adult respondents (aged 18 - 95 years) were 5.270 times more likely to have accurate triage statuses. Male gender exhibited a stronger association with triage accuracy, followed by the adult age group. However, the literature lacks studies specifically addressing patient factors related to triage accuracy, making this research significant in contributing to this knowledge gap.

### CONCLUSIONS AND RECOMMENDATION

The research findings indicate that the age, gender, mode of arrival, and emergency type of respondents are associated with the accuracy of triage conducted by ED nurses. Among these patient factors, male gender exhibits a stronger association with accurate triage, followed by the adult age group (18 – 59 years). The study suggests the need for monitoring and evaluation of triage implementation by nurses to optimize triage accuracy. It is hoped that all patients presenting to the ED will be triaged accurately, receive appropriate emergency care, and be treated promptly.

### ACKNOWLEDGEMENT

Authors We extend our gratitude to P3M Hang Tuah Pekanbaru University for affording us the opportunity to receive the Hang Tuah Pekanbaru DIPA grant for 2021.

### REFERENCES

- Ameri, M., Shahhoseini, S., Goli, S., Kharatha, M., & Esmaeili, F. A. (2021). Factors affecting triage accuracy in patients with a definitive diagnosis of acute myocardial infarction. *Australasian Emergency Care*, 24(2), 81-83. doi: 10.1016/j.auec.2020.09.004.
- Badan Pusat Statistik. (2022). *Jumlah Penduduk Menurut Kelompok Umur dan Jenis Kelamin, 2022*. Jakarta: BPS.
- Binsama, S., Naka, K., & Khupantavee, N. (2021). Factors Influencing the Accuracy of Triage in Non-Trauma Patients by Emergency Nurses. *Princess of Naradhiwas University Journal*, 13(3), 24-39.
- Chen, S. S., Chen, J. C., Ng, C. J., Chen, P. L., Lee, P. H., & Chang, W. Y. (2010). Factors that influence the accuracy of triage nurses' judgment in emergency departments. *Emergency Medicine*, 27, 451-455. <https://doi.org/doi:10.1136/emj.2008.059311>
- Dahlan, M. S. (2010). *Statistik untuk kedokteran dan kesehatan (Edisi 4)*. Jakarta: Salemba Medika.
- Dharma, K. K. (2011). *Metodologi penelitian keperawatan: Panduan melaksanakan dan menerapkan hasil penelitian*. Jakarta: Trans Info Media.
- Firdaus, M. N., Soeharto, S., & Ningsih, D. K. (2018). Analysis of Factors Affecting the Application of Australasian Triage Scale (ATS) in Emergency Departement Ngudi Waluyo Wlingi Hospital. *Jurnal Ilmu Keperawatan*, 6(1), 55–66. [https://doi.org/10.21776/ub.jurnalilmuk eperawatan\(journalofnursingscience\).2018.006.01.6](https://doi.org/10.21776/ub.jurnalilmuk eperawatan(journalofnursingscience).2018.006.01.6)
- Habib, H., Sulistio, S., Mulyana, R. M., & Albar, I. A. (2016). *Triase Modern Rumah Sakit dan Aplikasinya di Indonesia*. *Research Gate*, 3(2), 112-115.
- Hinson, J. S., Martinez, D. A., Schmitz, P. S. K., Toerper, M., Radu, D., Scheulen, J., & Levin, S. (2018). Accuracy of

- emergency department triage using the Emergency Severity Index and independent predictors of under-triage and over-triage in Brazil: a retrospective cohort analysis. *International Journal of Emergency Medicine*, 11(1), 3. <https://doi.org/10.1186/s12245-017-0161-8>
- Kementerian Kesehatan Republik Indonesia. (2009). Keputusan Menteri Kesehatan Republik Indonesia Nomor 856/Menkes/SK/IX/2009 tentang Standar Instalasi Gawat Darurat (IGD) Rumah Sakit. Jakarta: Kementerian Kesehatan RI.
- Kementerian Kesehatan Republik Indonesia. (2017). Rencana Aksi Kegiatan Pengendalian Penyakit Tidak Menular Revisi I - Tahun 2017. Jakarta: Kementerian Kesehatan.
- Kementerian Kesehatan Republik Indonesia. (2018). Peraturan menteri kesehatan republik indonesia nomor 47 tahun 2018 tentang pelayanan kegawatdaruratan. Jakarta: Kementerian Kesehatan RI.
- Rasyid, T. A., Kosasih, C. E., & Mirwanti, R. (2020). The reliability and accuracy of International Triage Scale in the Emergency Department (ED): A literature review. *Journal of Nursing Care*, 3(1), 26-40.
- Rumah Sakit Umum Daerah Arifin Achmad Provinsi Riau. (2018). Profil RSUD Arifin Achmad Provinsi Riau. Retrieved from <http://rsudarifinachmad.riau.go.id/>.
- Ruttanaseeha W, Serewiwattana N, lenghong K, Buranasakda M, Apiratwarakul K, Tiamkao S. Accuracy of Triage by Nurses and Doctors in the Emergency Department. *J Med Assoc Thai* 2020;103(Suppl.6): 1-3.
- Soontorn, T., Sitthimongkol, Y., Thosingha, O., & Viwatwongkasem, C. (2018). Factors influencing the accuracy of triage by registered nurses in trauma patients. *Pacific Rim International Journal of Nursing Research*, 22(2), 120–130.
- World Health Organization. (2019, October 1). Emergency and trauma care. Retrieved from <https://www.who.int/health-topics/emergency-care>.