



## The Emergency Severity Index (ESI) Usage: Triage Accuracy and Causes of Mistriage

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### ABSTRACT

Errors in determining triage criteria can endanger patient safety so the cause must be addressed. But it is not yet known the accuracy of triage and the cause of mistriage. This study aims to identify the accuracy of the level of gravity of the Emergency Severity Index (ESI) triage system and evaluate the causes of mistriage in the Emergency Department (ED). Descriptive research with the retrospective review was conducted for 20 days which were randomly selected between January 1st and December 31st, 2021 at a hospital in Jakarta. A total of 199 randomly selected ESI triage documentation from medical records and a self-developed triage precision observation sheet consisting of 17 items were given to three experts to examine the accuracy of the triage and the cause of the mistriage. The frequency distribution found the triage accuracy reach 124 (62,3%) triage documents, and the leading cause of mistriage is an error in applying the main complaint 32 (42,7%). ED nurses should improve their skills in determining triage levels. Hospital institutions should make efforts to improve the triage skills of ED nurses and for further research on methods to increase the accuracy of the triage.

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#### Kata kunci:

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### ABSTRAK

Kesalahan dalam menentukan kriteria triase dapat membahayakan keselamatan pasien sehingga penyebabnya harus segera diatasi. Namun belum diketahui ketepatan triase dan penyebab terjadinya mistriage. Penelitian ini bertujuan untuk mengidentifikasi akurasi triase menggunakan Emergency Severity Index (ESI) dan mengevaluasi penyebab mistriage di Instalasi Gawat Darurat (IGD). Penelitian deskriptif dengan tinjauan retrospektif dilakukan selama 20 hari yang dipilih secara acak antara 1 Januari hingga 31 Desember 2021 di sebuah rumah sakit di Jakarta. Sebanyak 199 dokumentasi triase ESI dari rekam medis dan lembar observasi presisi triase yang dikembangkan sendiri yang terdiri dari 17 item diberikan kepada tiga ahli untuk memeriksa keakuratan triase dan penyebab mistriage. Distribusi frekuensi ditemukan akurasi triase mencapai 124 (62,3%) dokumen triase, dan penyebab utama mistriage adalah kesalahan dalam menerapkan keluhan utama 32 (42,7%). Perawat UGD harus meningkatkan keterampilan mereka dalam menentukan tingkat triase. Institusi rumah sakit harus melakukan upaya untuk meningkatkan keterampilan triase perawat UGD dan untuk penelitian lebih lanjut tentang metode untuk meningkatkan akurasi triase.

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## INTRODUCTION

World Health Organization (2022) has called for stronger emergency response including in clinical care. Before the pandemic, there has been an increase in Emergency Department (ED) visits causing overcrowding and further delaying triage (Morley, Unwin, Peterson, Stankovich, & Kinsman, 2018). Triage is a way to classify patients based on their level of emergency, and subsequently will determine the effectiveness of their treatment and patient safety (Yancey & O'Rourke, 2021).

Triage activities in the ED include patients' assessment, treatment priorities, and assigning medical resources. Accurate triage is a way of ensuring patient safety and reducing ED crowding, but mistriage extends the length of stay in the ED and increases patient mortality (Farrohknia et al., 2011; Yurkova & Wolf, 2011). Patients who are classified below the level of emergency (under triage) will experience delays in treatment and are at risk for worsening. Meanwhile, patients who are selected to exceed their level of emergency (over triage) will take most of the valuable resources from the people who need them most (Davis, Dirks, Sue, & Kaups, 2017; Derlet, McNamara, Kazzi, & Richards, 2014). The accuracy of triage decisions and the achievement of patient safety is one of the implications of triage assessment. Therefore, the implementation of the triage system in the ED is important to improve patient safety which is also an effort to improve the quality of care.

Triage is using a 5-level triage system with some globally established assessment tools. Some of them are the Emergency Severity Index (ESI), Manchester Triage Scale (MTS), Canadian Triage and Acuity Scale (CTAS), and Australasian Triage Scale (ATS). Each of these triage systems has advantages and disadvantages. Compared to other systems, the ESI system is easier to implement because it does not require a long time and an in-depth examination to determine the needs of the medical resources needed by the patient. It focuses more on the urgency and how severe the patient's symptoms are, rather than evaluating how long the patient can wait before being seen. Another difference in the ESI system, is the requirement of nurses to also anticipate the needs of subacute patients, those who are deemed stable.

Globally, several studies have recorded the accuracy of triage. Other countries reported the accuracy ranged from 40% to 85% and have detailed the cause of the mistriage (AlSerkal et al., 2020; Hinson et al., 2018; Moon, Shim, Park, & Park, 2019). In Indonesia, several researchers have noted the accuracy ranged from 75% to slightly over 89% (Bahari, Suwaryo, & Setyaningsih, 2019; Kundiman, Kumaat, & Kiling, 2019). However, they have not detailed the mistriage and its cause.

Based on medical record data obtained during the preliminary study, it is known that the number of patients admitted to the ED of a hospital in Jakarta in the period January - March 2021 was 2.495 patients which further sent to inpatients services (1.065 patients), outpatients services (1.353 patients), and 42 patients died in the ED. A total of 29 patients came to the ER with DOA (Death on Arrival) conditions and six patients were referred to other hospitals. A preliminary study was also conducted to determine the accuracy of ESI triage in the ED. On December 8-12, 2021, an assessment of 10 ESI triage form documentation was carried out, the results obtained were 7 patients were categorized as accurate triage and 3 patients were categorized as mistriage. Based on data during the preliminary study, around 30% of documents were categorized as mistriage and the cause of

the mistriage was also unknown. This research aims to describe the accuracy of triage and evaluating the causes of mistriage using the Emergency Severity Index (ESI).

## METHOD

### *Participant characteristics and research design*

This descriptive study with a retrospective approach was conducted on the ESI triage documentation at a hospital in Jakarta, Indonesia. The inclusion criteria are the ESI triage form which was filled in after triage by an ED nurse who has a Basic Trauma and Cardiac Life Support (BTCLS) certificate, the ESI triage form for patients more than 18 years old, ESI triage form of patients who seek treatment in the ED, either outpatient, inpatient, or patients who died in the ED. The exclusion criteria are ESI triage form of patients who canceled treatment before triage, and incomplete documentation of the ESI triage form.

### *Sampling procedures*

The samples were determined by randomly selected 20 days between January 1 to December 31, 2021, using the Random Number Generator application. The triage documents on the selected days were gathered from the medical records of patients admitted to the ED.

### *Sample size, power, and precision*

The sample size was determined by assigning the estimated absolute precision population proportions with a 95% confidence level, 0.85 anticipated population proportion, and 0.05 absolute precision. The anticipated population proportion was determined by Moon et al. (2019) study that found 14.7% of mistriage. The required sample was 196 ESI triage forms plus an additional 10% was added. However, 17 ESI triage forms were incomplete so they were excluded. Thus, a total of 199 ESI forms were examined in this study.

### *Measures and covariates*

The instruments of this study are the hospital's ESI form and a self-developed triage accuracy observation. The ESI form contains chief complaint, time of arrival, mode of arrival, vital signs, oxygen saturation, pain score, triage level, patient placement decisions, and identity of the nurse performing triage. The observation form consisted of 17 items which includes ED condition, patient demographics, triage accuracy, and causes of mistriage. Interrater reliability of the observation form was 0.8 which shows agreement between researchers.

These two instruments were given to three experts. They are two senior emergency room nurses at the hospital, and one BTCLS instructor from Pro Emergency, all with over five years of experience. The instruments were sent to the experts separately to be reviewed. Each expert reviewed all the ESI triage forms. The results of the assessment that have been agreed upon were then collected for the researchers for data processing.

### *Data analysis*

A descriptive analysis were employed in this study to to assess the accuracy of triage and the cause of mistriage.

**RESULTS AND DISCUSSION**

This study found that most patients were male (112 patients, 56.3%), with an average age 43.41 years old (SD ± 15.31). The youngest age was 28.10 years old and the oldest age was 58.72 years old. The gender and age of ED patients varies. This findings are in accordance with other studies findings in Indonesia and other countries where more males and younger people admitted to the ER (AlSerkal et al., 2020; Moon et al., 2019; Sahensolar, Bidjuni, & Kallo, 2021). However, it is in contrast with other studies (Delinda, Halimuddin, & Nurhidayah, 2021; National Center for Health Statistics, 2019). Although there are differences, the percentage of both gender is almost proportional. Older people aged 65 years and over in United States in Amerika were more frequent to visit the ED, while other studies showed younger people tend to be admitted. The mode of arrival of patients to the emergency room was mostly using private vehicles (191 patients, 96.0%). It is far exceeds the use of private transportation in Korea (Moon et al., 2019).

The reason for visits was mostly non-trauma cases (188 patients, 94.5%). This data is much higher than other studies who found around 70 to 80% non-trauma cases (Moon et al., 2019; Sahensolar et al., 2021). The majority have no history of disease (120 patients, 60.3%), no history of surgery (179 patients, 89.9%), and no history of allergies (192 patients, 96.5%). This study findings are similar to the Korean study where the patients never been under surgery and no history of allergies (Moon et al., 2019). However, it is contrary with the Korean patients who mostly have underlying disease.

The number of ED visits is mostly non-traumatic cases have been shown consistently in this study and other studies except for the history of disease.

Most patients were conscious (192 patients, 96.5%). They were in pain (104 patients, 52.3%), with an average pain scale of 5.55 (SD ± 1.51) ranging from 4.04 to 7.06. This study corresponds with Moon, S.H, et al. (2019) who found over 90% of patients who arrived in the ED were conscious, had a slightly higher percentage of pain, and lower mean of pain. ER visits were dominated by patients who were conscious and experiencing pain. After ED discharge, most of them were sent to the inpatient unit (107 patients, 40.2%). This study is in line with other studies in Indonesia and Korea (Delinda et al., 2021; Moon et al., 2019; Wahab, Jak, & Kodyat, 2021) which found most patients were later sent to inpatient services.

The agreement of ESI level between emergency room nurses and the experts was noted in 124 ESI (62.3%), with the highest agreement was in ESI 3 triage (66 ESI, 33.1%) as shown in table 1. Data on triage accuracy vary in many countries. Brazil and South Korea reported the higher rate of accuracy with over 80% (Hinson et al., 2018; Moon et al., 2019) and also in a hospital in Indonesia (Bahari et al., 2019). Lower rate was found in this study and in United Arab Emirates (UAE) (AlSerkal et al., 2020). The accuracy of triage in the ED is mostly accurate triage, which has been consistently demonstrated in this study and other studies. However, the triage accuracy rate of the ER at this hospital needs to be increased.

**Table 1**  
**Triage agreements among ED nurses and experts**

Triage by ED nurses n (%)	Triage by ED experts n (%)					Total n (%)
	ESI 1	ESI 2	ESI 3	ESI 4	ESI 5	
ESI 1	4 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (2.1)
ESI 2	5 (2.5)	22 (11.0)	5 (2.5)	0 (0.0)	0 (0.0)	32 (16.0)
ESI 3	1 (0.5)	20 (10.1)	66 (33.1)	14 (7.0)	0 (0.0)	101 (50.7)
ESI 4	0 (0.0)	6 (3.0)	12 (6.1)	26 (13.1)	3 (1.5)	47 (23.7)
ESI 5	0 (0.0)	0 (0.0)	3 (1.5)	6 (3.0)	6 (3.0)	15 (7.5)
Total	10 (5.1)	48 (24.1)	86 (43.2)	46 (23.1)	9 (4.5)	199 (100.0)

Mistriage has noted a total of 75 documents detailed as under triage 53 documents (26.6%) and over triage 22 documents (11.13%). They were more likely to happen when the ED was overcrowded (Table 2). Under triage was more likely to happen when the expert team scored ESI 2 but the emergency room nurse scored ESI 3. Over triage was diagnosed when the experts scored ESI 4 but the emergency room nurse scored ESI 3. This result is similar to a study in Bazil where under triage were documented 32.5% (Hinson et al., 2018). On the contrary, over triage happened in 79.5% mistriage in UAE (Al Serkal et al., 2020). There is a lack of literature in detailing the mistriage.

The highest distribution was 137 (68.8%) patients who came for treatment in an overcrowded emergency department. This study is in line with the research of Kundiman, V., et al (2019) where it was found that 85 respondents (81%) who went to the ER were overcrowded in the ER condition. This study also found that 23.6% mistriage happened under an overcrowded condition, and 14.0% under a non-overcrowded condition. This finding corroborates with Kundiman et al. (2019) study that found that there is a relationship between overcrowding and the accuracy of triage. It is known that overcrowding will hinder triage in the ED (Morley et al., 2018).

**Table 2**  
**Triage accuracy based on ED condition**

ED condition n (%)	Triage accuracy n (%)			Total n (%)
	Under triage	Accurate triage	Overtriage	
Overcrowded	32 (16.1)	90 (45.2)	15 (7.5)	137 (68.8)
Not Overcrowded	21 (10.5)	34 (17.1)	7 (3.5)	62 (31.2)
Total	53 (26.6)	124 (62.3)	22 (11.0)	199 (100.0)

This study found that there were 6 causes of mistriage, the most common mistriage was a misjudgment in determining the patients' chief complaints which were found in 32 triages (42.7%) as described in table 3. For example, the emergency room nurse gave an ESI value of 3 to a male patient aged 70 years with complaints of weakness on the right side, and difficulty walking this morning had fallen out of bed, and there was an increase in blood pressure (BP) and blood sugar when. Other vital signs are still in stable condition. In this case, the assessment team assessed this case as under triage on the basis that the patient had signs of

a stroke and the assessment team gave an ESI score of 2 because further treatment must be carried out immediately to overcome the worsening of the disease.

On the other hand, Moon et al. (2019) found that there were 9 causes of mistriage. Errors in applying the pain scale 34.4% ranked first, while errors in applying the main complaint 25.3% ranked second. Meanwhile, Bahari et al. (2019) noted the cause was error in TTV assessment. The cause were differ among studies. Hinson et al. (2018) even detailed factor predictors of mistriage for further analysis.

**Table 3**  
**The cause of mistriage**

Cause of mistriage	Total n (%)
Applying pain scale	9 (12.0)
Applying chief complaint	32 (42.7)
Applying vital signs	11 (14.7)
Considering level of consciousness	0 (0.0)
Considering the onset of symptoms	10 (13.3)
Considering reference notes	0 (0.0)
Considering medical history	3 (4.0)
Considering the patient's needed resources	10 (13.3)
Total	75 (100.0)

#### LIMITATION OF THE STUDY

Several limitations of this study should be considered in reading the findings. This study focuses on the results of ESI levels determined by emergency room nurses using medical records. The assessment team could not see how the ED nurses performed an ESI triage assessment of patients. The causes of mistriage may be more clearly understood by combining the results of the ESI-level decision-making process with interviews with ED nurses in cases of mistriage. Researchers retrospectively analyzed medical records from randomly selected dates. One limitation of this retrospective study was that it did not obtain detailed information about the patient's symptoms and signs to determine the true triage. Another limitation is that this study does not reflect the entire study period because the dates were chosen at random. The ESI form does not contain documentation of pain and disease history, so there is a possibility that these two things are not accurately documented and affect the cause of the mistriage. The ESI form still contains the identity of the nurse who did the triage so that there is a possibility of subjective assessment results.

#### CONCLUSIONS AND SUGGESTIONS

Most of the triage accuracy in the ER is accurate triage. The causes of mistriage that are often found in the ED are errors in applying the chief complaint and more in overcrowded ER conditions. Efforts in managing the causes of mistriage should be put in place by increasing the triage skills of ED nurses and reviewing the clinical placement.

#### ETHICAL CONSIDERATIONS

This study has obtain ethical approval from the Faculty of Nursing, Universitas Muhammadiyah Jakarta. There is a difficulties contacting the patients, thus this study asked for consent to be waived.

#### Funding Statement

There was no funds, grants, or other support was received for conducting this study.

#### Conflict of Interest Statement

There is no conflict of interest in this study.

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