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ESI Triage Distribution in U.S. Emergency Departments

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Abstract
The accurate triage of arriving emergency department (ED) patients is a key component of emergency nursing practice. Overtriage assignment of patients misallocates scarce resources in a time of department overcrowding, whereas patient undertriage can create risks for negative patient outcomes secondary to care delays. Limited evidence is available regarding ED triage accuracy. It is estimated that appropriate adherence to the Emergency Severity Index (ESI) triage tool and assigning triage categories could be as low as 60% (McFarlane, 2019a, 2019b). The purpose of this retrospective observational study was to examine the 2019 triage distribution of 954,847 ED encounters at 25 hospitals. Comparisons were then made with the spreads identified in the *ESI Implementation Handbook* (Gilboy, Tanabe, Travers, & Rosenau, 2020). Study results reflect the presence of wide variations in distribution when compared with the expected spread published by Gilboy et al. (2020). These variations illustrate the need for further facility-level evaluation. ESI Level 2 percentages varied from as little as 2.6% to as high as 69% of each facility's ED visit population. Examining an individual facility's annualized triage distribution may serve as a swift method in determining whether additional investigation into triage accuracy is warranted. EDs must implement and sustain an ongoing quality control program to achieve and maintain triage inter- and intrarater reliability. Further research is needed on the value of triage inaccuracy with real-time feedback on nurses' clinical decision-making and patient outcomes. It is also imperative that the expected and observed ESI triage distribution in U.S. EDs is updated when established accuracy quality control programs are present. **Key words:** accuracy rate, emergency department, judgment and decision making, quality control program, triage decisions

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CONTRIBUTION TO EMERGENCY NURSING PRACTICE

- The current state of scientific knowledge indicates a growing concern of triage inaccuracies in emergency departments; wide variations exist in a facility's triage distribution when compared with the expected distribution identified in the *ESI*

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Implementation Handbook (Gilboy et al., 2020).

- Advanced practice registered nurses conduct and enhance quality improvement initiatives. Screening for systemic triage inaccuracies may be an effective method in identifying a larger quality issue.
- Key implications for emergency nursing practice include the need to develop methods to achieve and sustain accurate triage-level assignments in presenting emergency department patients.

BACKGROUND

Modern triage in the U.S. emergency department (ED) is aimed at properly sorting patients presenting for emergency care. In an era of ED overcrowding, proper sorting and early identification of patients with or at risk for immediate, life-threatening conditions are essential to providing timely interventions and minimizing risk for care delay-associated morbidity and mortality (Gilboy, Tanabe, Travers, & Rosenau, 2020).

Rapid and accurate triage in EDs is a critical component of emergency nursing practice. Undertriage, the practice of assigning a less acute designation than indicated, places patients at risk for worsening outcomes while waiting; overtriage, the practice of assigning a more acute designation than indicated, uses scarce resources and limits bed availability for potential arriving critical patients (Gilboy et al., 2020). Inaccurate triage creates an opportunity for increased morbidity and mortality (Hinson et al., 2018). Triage designations in many EDs impact patient flow patterns, care location, nursing assignments, and/or provider assignments.

The Emergency Severity Index (ESI) is the most widely used triage algorithm in U.S. EDs, accounting for 82% of departments surveyed in 2012 (Singer, Infante, Oppenheimer, West, & Siegel, 2012). Recent reports from the Emergency Nurses Association identified that ESI was utilized in approximately 80% of EDs in the United States (Dominis, 2020), whereas another recent study indicated its use in 94% of U.S. EDs (Worth, Davis, Wallace, Bartlet, & Travers, 2019). The 5-level scale has been deemed a reliable, valid tool with consistent and strong correlations to hospitalization, ED length of stay, and mortality. The tool has demonstrated strong interrater reliability when translated into other languages and excellent performance when looking at specific populations (e.g., geriatrics, pediatrics). This reliable and valid tool necessitates successful education, validation, and ongoing quality assurance programs (Gilboy et al., 2020).

Despite high-performance statistics, recent literature and professional discourse in the emergency nursing community indicated a growing concern of triage inaccuracies. One recent single-center retrospective study in Brazil ($n = 96{,}071$ patient encounters) identified inappropriate triage 17.1% of the time (Hinson et al., 2018). Dr. Lisa Wolf, a prominent emergency nursing researcher, estimated inaccuracies might be as high as 40% (McFarlane, 2019a, 2019b). More recently, Ivanov et al. (2020) conducted a two-site retrospective study ($n = 166{,}175$ patient encounters) to compare machine learning ESI acuity assignment accuracy against traditional nurse assignment through clinical judgment; the combined overall accuracies were 75.7% for the machine and 59.8% for nurses.

Wolf, Delao, Perhats, Moon, and Zavotsky (2018) suggested possible causes of inaccuracies as lack of an ongoing triage quality control program, lack of education, a culture of triaging to the department instead of the patient, and triage bias secondary to moral distress. Implicit bias by the triage nurse might also occur, as variations have been observed on the basis of race (Zook et al., 2014), ethnicity (Zhang et al., 2020), and being an older patient (Grossman et al., 2012), among others (Bagnis et al., 2020; Loner & Rotoli, 2018; Vigil et al., 2017). Worth et al. (2019) examined the outcome of triage accuracy as it related to proper structure and processes. Their findings indicated that a majority of EDs lacked appropriate policies and procedures,

contrary to recommendations in the ESI handbook (Gilboy et al., 2020).

EXPECTED AND OBSERVED ESI DISTRIBUTION

The Emergency Severity Index (ESI): A Triage Tool for Emergency Department Care (Gilboy et al., 2020), henceforth referred to as the *ESI Implementation Handbook*, provides an expected distribution of patients in a typical ED where ongoing education and quality assurance programs are in place. The same distribution, published in the 2011 edition, also appears in the 2020 edition; there were no updates. In addition, in 2017, the National Hospital Ambulatory Medical Care Survey (NHAMCS) reported observed distributions in 138.9 million U.S. ED visits (as cited in Table 7 in Rui & Kang, n.d.). Reportedly, the staging of 22.3% of patient visits was unknown or blank; therefore, the NHAMCS reporting appeared limited in providing an accurate understanding of this distribution. Table 1 offers a comparison of these two distributions.

Purpose

The purpose of this study was to examine the 2019 triage distribution of 25 hospitals. The distributions are then compared with the spreads identified in the *ESI Implementation Handbook* (Gilboy et al., 2020) and by the NHAMCS (Rui & Kang, n.d.).

METHODS

Design

This was a retrospective observational study of 25 U.S. EDs from 11 different health care organizations in 10 states. Nine facilities are in the northeast, four are in the southeast, three are in the Midwest, and nine are in central-southern states. Data included site-specific annual volume and ESI-level percentage distribution.

Measurement Methods

The study included patients who arrived in the ED requesting treatment during the 2019 calendar year. Data collection was limited to the total ED volume and the proportion of patients in each ESI category for each site. To maximize site anonymity, the annual volume of each site was subsequently rounded to the nearest thousand.

Data Collection Procedures

All 25 EDs submitted their raw visit data to a HIPAA-compliant applied analytics platform.

Table 1. Expected and observed ESI distribution

ESI level	ESI implementation handbook	NHAMCS 2017
1	1%–3%	0.9%
2	20%–30%	9.9%
3	30%–40%	33.9%
4	20%–35%	24%
	Combined	
5		3.9%
Unknown or blank	N/A	22.3%

Note. ED = emergency department; ESI = Emergency Severity Index; N/A = not available; NHAMCS = National Hospital Ambulatory Medical Care Survey. From "*Emergency Severity Index (ESI): A Triage Tool for Emergency Department Care*" (Version 4), by N. Gilboy, P. Tanabe, D. Travers, and A. M. Rosenau, 2020, Schaumburg, IL: Emergency Nurses Association. Copyright 2020 by the Emergency Nurses Association. Also, from "*National Hospital Ambulatory Medical Care Survey's 2017 Emergency Department Summary Tables*" (Table 7), by P. Rui and K. Kang, n.d. Retrieved from https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf.

Hospitals use this platform independently to facilitate staffing and process decisions as part of continuous performance improvement initiatives at their respective sites. The overall volume, as well as the triage distribution spread, was extracted from this platform.

RESULTS

Summary

The overall distribution summary is detailed in Table 2 and a facility-level summary is given in Table 3. The overall facility distribution reflected a bell-shaped curve, with ESI 3 as the most frequently observed category (n = 521,336; 54.6%). ESI 3 was also the most frequently observed category in 24 of the 25 hospitals. The presence of an ESI 6 designation was seen at three facilities. ESI 6 is not a recognized level by either the *ESI Implementation Handbook* (Gilboy et al., 2020) or NHAMCS data (Rui & Kang, n.d.). Further investigation into ESI 6 determined that the three facilities, all part of the same parent organization, used this code to delineate their trauma activations.

Interpretation

Patients Presenting With Potential for Life-Threatening and/or Emergent Conditions

Data from ESI 1 and ESI 2 patients suggest an overall undertriaging when compared with the ESI expected distribution. Only seven of 25 facilities had an ESI 1 assignment in the 1%–3% range; the remaining 18 facilities had less than 1% of their respective total volume categorized as ESI 1. More concerning, only six of 25 facilities had an ESI 2 within the range of 20%–30% indicated in the *ESI Implementation Handbook* (Gilboy et al., 2020). One facility reported ESI 2 encounters at 69%, markedly higher than any other reported facility, the *ESI Implementation Handbook*, or NHAMCS data (Rui & Kang, n.d.). The remaining facilities all reported a distribution of less than 20%. The distribution in these facilities suggests one of two circumstances. First, the facility has established an ongoing inter- and intrarater quality control triage program, the triage spread is accurate, and the facility is providing lower-acuity care to patients and does not routinely provide care to emergent patients. Second, there is significant undertriaging occurring in the department and patients are being assigned an ESI 3, which, by definition, should be an ESI 2. A false sense of security could be created in a department that has more acute patients in the waiting room who should have been assigned a higher level. An example of this disparity and potential risk was observed at Facility O. The ESI distribution of Facility O, including the comparison with the *ESI Implementation Handbook* (Gilboy et al., 2020) to identify potential risk, is further depicted in Figure 1.

Lower-Acuity Patients

Data from lower-acuity patients represent a potential for overtriaging of patients. Encounters within the ESI 4 and ESI 5 (combined)

Table 2. Overall ESI distribution summary

		ESI visit-level percentage						
	Rounded annual ED volume	1	2	3	4	5	6	None assigned
Combined data	955,000	0.7%	18.2%	54.6%	23%	1.9%	0.1%	1.4%
Facility Min	9,000	0.1%	2.6%	25.9%	4.2%	0.2%	0%	0%
Facility median	35,000	0.6%	14.6%	55.9%	24.8%	1.3%	0%	1%
Facility Max	87,000	1.9%	69%	68.3%	32.8%	7.7%	2.1%	5.1%

Note. ED = emergency department; ESI = Emergency Severity Index.

Table 3. ESI volume and distribution by individual facility

Facility	Rounded annual ED volume	Sparkline	ESI visit-level percentage						
			1	2	3	4	5	6	None assigned
ESI Implementation Handbook	N/A		1%–3%	20%–30%	30%–40%	20%–35% combined			
NHAMCS 2017	N/A		0.9%	9.9%	33.9%	24%	3.9%		22.3%
Facility A	9,000		0.4%	2.6%	67.6%	26.5%	1.7%	0%	1.3%
Facility B	12,000		1%	17.8%	59.8%	17.1%	1.3%	1.2%	1.7%
Facility C	15,000		0.2%	5.8%	55.9%	32.7%	4.6%	0%	0.7%
Facility D	21,000		0.1%	7.2%	63%	27.9%	1.1%	0%	0.7%
Facility E	21,000		0.3%	14.1%	44.1%	31.3%	7.7%	1.5%	1%
Facility F	23,000		0.3%	13.9%	57.8%	26.5%	0.7%	0%	0.8%
Facility G	27,000		1.9%	15.9%	67.6%	13.5%	0.6%	0%	0.6%
Facility H	28,000		0.7%	8.9%	60.5%	26.4%	2.9%	0%	0.7%
Facility I	31,000		0.3%	69%	25.9%	4.2%	0.2%	0%	0.4%
Facility J	31,000		0.2%	16.3%	51.5%	30.6%	0.9%	0%	0.5%
Facility K	32,000		1.4%	23.5%	61.4%	12.2%	0.8%	0%	0.6%
Facility L	34,000		0.9%	21.8%	53.8%	18.6%	2.2%	0%	2.7%
Facility M	35,000		1.7%	25.7%	57.1%	12.6%	1.4%	0%	1.5%
Facility N	35,000		0.3%	11.1%	54.3%	32.8%	0.7%	0%	0.8%
Facility O	41,000		0.4%	13.6%	68.3%	16.7%	1%	0%	0%
Facility P	43,000		0.7%	14.6%	55.1%	24.8%	1.7%	2.1%	1%
Facility Q	44,000		0.2%	13.6%	52.3%	27.7%	3%	0%	3.3%
Facility R	45,000		1.3%	27.5%	45.7%	22.7%	1.3%	0%	1.6%
Facility S	49,000		1%	14.7%	56.7%	23.9%	2.5%	0%	1.2%
Facility T	49,000		0.6%	22.1%	50.7%	23.8%	1.2%	0%	1.7%
Facility U	52,000		0.6%	9.7%	58.9%	29.1%	1.1%	0%	0.6%
Facility V	57,000		0.8%	11.4%	59.5%	25.9%	1.3%	0%	1.2%
Facility W	65,000		0.1%	5.1%	53.4%	32.4%	3.8%	0%	5.1%
Facility X	69,000		0.5%	19.4%	55.7%	21.4%	1.9%	0%	1.1%
Facility Y	87,000		1%	29.4%	48.8%	17.3%	2.2%	0%	1.3%

Note. ED = emergency department; ESI = Emergency Severity Index; NHAMCS = National Hospital Ambulatory Medical Care Survey.

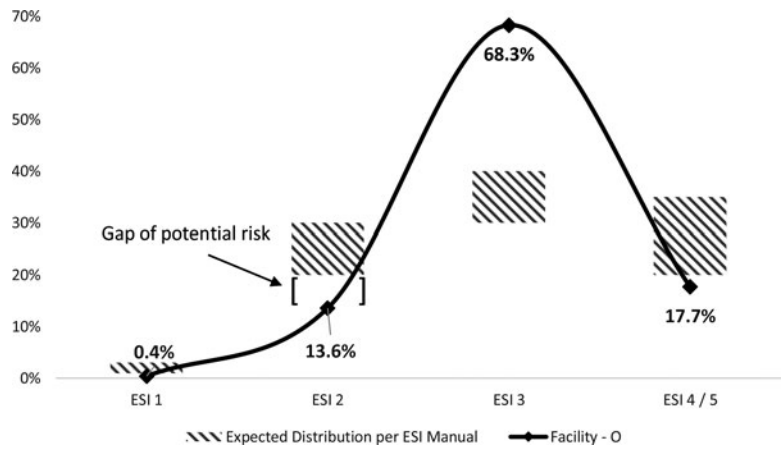

Figure 1. ESI distribution of Facility O compared with *ESI Implementation Handbook.* From the "*Emergency Severity Index (ESI): A Triage Tool for Emergency Department Care*" (Version 4), by N. Gilboy, P. Tanabe, D. Travers, and A. M. Rosenau, 2020, Schaumburg, IL: Emergency Nurses Association. Copyright 2020 by the Emergency Nurses Association. ESI = Emergency Severity Index.

range were expected to occur 20%–35% of the time (Gilboy et al., 2020); however, this distribution was only observed in 16 of the 25 EDs. ESI 4 patients represent similar results in NHAMCS data and study data at 24% and 24.8%, respectively. ESI 5 patients were below the NHAMCS data by 2.6% (Rui & Kang, n.d.). It should be noted, however, that many communities have implemented strategic initiatives to incentivize potential ESI 4 and ESI 5 visits to receive care elsewhere before their arrival at the hospital. These examples include but are not limited to urgent care partnerships and telehealth solutions, all with significant community advertising. Many of these initiatives have been developed in communities since the ESI expected distribution release in 2011. Further research is needed to identify the expected distribution in a community with these specific offerings.

ESI 3 Overall

Data findings are inconsistent with those published, as expected and observed in both the *ESI Implementation Handbook* (Gilboy et al., 2020) and NHAMCS data (Rui & Kang, n.d.). ESI 3 percentages account for the greatest variation between facilities and in relation to *ESI Implementation Handbook* and NHAMCS data. The facility median of ESI 3 patients was 55.9% compared with the *ESI Implementation Handbook*, which illustrates a 15.9% diversion from the range and a 22% deviation from NHAMCS data. It is hypothesized that these findings are a result of both undertriaging of high-acuity patients and overtriaging of low-acuity patients.

Limitations

This study was limited to 25 EDs using the aforementioned applied analytics platform. Although the analysis represents 954,847 ED visits in 2019, the lack of a randomized sampling method does limit generalizability.

This study did not utilize any standardized approach to validate triage accuracy such as triage observations at all sites, manual chart reviews, or machine learning analysis. However, nonscientific analysis of some facilities with distribution deviations did identify triage accuracy as a concern, except for one facility where the spread was verified.

CONCLUSION

Study results support earlier concerns identified in the research regarding ESI triaging

inaccuracies (Hinson et al., 2018; McFarlane, 2019a). Examining an individual facility's annualized triage distribution may serve as a quick method in determining whether additional investigation into triage accuracy is warranted. However, the goal of a facility should not be to simply align with the expected distribution. Many community factors can influence an ED's distribution including but not limited to urban/rural environment; hospital size/complexity and services offered; community socioeconomic mix; access to alternative care for low-acuity needs (e.g., urgent care, same-day primary care office visits); and presence/absence of community education on appropriate care locations.

EDs must implement and sustain an ongoing quality control program to achieve and maintain triage inter- and intrarater reliability. Further research is needed on the value of triage inaccuracy real-time feedback on nurse clinical decision-making and patient outcomes (Dominis, 2020; Ivanov et al., 2020). The expected ESI distribution in the *ESI Implementation Handbook* needs updating to reflect current observed distributions in facilities that have established inter- and intrarater reliability. Additional investigation is needed in testing whether this novel approach to assess a department's triage accuracy quickly is an appropriate screening tool.

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