

# Nurse-Physician Agreement on Triage Category: A Reliability Estimation of Emergency Severity Index

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## Abstract

**Background and Objectives:** The Emergency Severity Index (ESI) triage is commonly used in clinical settings to determine the patients' emergency severity. However, the reliability of this index is not sufficiently explored. The present study examines the inter-rater reliability of ESI by comparing triage ratings as performed by nurses and physicians.

**Methods:** This prospective cross-sectional study was performed in Imam Reza hospital in Tabriz, Iran. The stratification of 588 patients by the triage nurses were compared with that by the physicians. Cohen's un-weighted Kappa, and linear-weighted Kappa, and quadratic-weighted Kappa were used to quantify the agreement between the two groups.

**Findings:** While the un-weighted Kappa was calculated to be 0.172 (95% CI: 0.115- 0.228), the linear-weighted Kappa and the quadratic-weights Kappa were obtained as 0.312 (95% CI: 0.253- 0.370) and 0.482 (95% CI: 0.363- 0.601), respectively.

**Conclusions:** Compared with data from the literature, the inter-rater reliability of ESI triage between the surveyed nurses and physicians was low to moderate. This finding emphasizes the need for retraining the triage staff on robust stratification of the patients in order to achieve a higher reliability in ESI triaging. Our results also provide motivation for further large-scale studies to estimate the average reliability of triage in Iranian emergency departments (EDs) and if proven to be low, taking interventional measures.

**Keywords:** Triage, Emergency Severity Index (ESI), Inter-rater reliability, Nurse-physician agreement

## Background and Objectives

Among various types of triage system have been proposed and implemented by EDs around the world,<sup>1-4</sup> the Emergency Severity Index (ESI) triage system has been identified as a suitable system for Iranian health environment and recommended for implementation.<sup>2</sup> ESI is a five-level triage algorithm that allows categorizing emergency department (ED) patients based on their acuity and the estimated resources required.<sup>5</sup>

Reliability is a major component of triage system quality. A reliable triage system is expected to

produce the similar categorization results for the same patients, irrespective of the individuals who perform the triage task.<sup>6,7</sup> Reliability is an important criterion to compare the performance of EDs.<sup>8</sup> A high triage reliability is essential to achieve high patient safety and services quality.<sup>6-10</sup>

Of the particularly important aspects of triage reliability is the agreement between physicians and nurses on patient ranking and allocation of healthcare services. Indeed, disagreement between these two groups of clinicians may result in inappropriate referral of patients, and thereby patient dissatisfaction, reduced patient safety, or discharge against medical advice.<sup>11</sup>

The reliability of triage system is usually assessed

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using the Kappa value.<sup>12-14</sup> The Kappa coefficient evaluates the agreement between the raters after removing the effect of the chance,<sup>14</sup> i.e. the inter-rater reliability. To gain insight into the level of reliability in the Iranian EDs, in this study, we investigate the inter-rater reliability of ESI triage by comparing the patient acuity rating performed by triage nurses and physicians.

## Methods

This prospective cross-sectional study was performed in Imam Reza hospital of Tabriz (Northwestern Iran). The target ED is the largest in the province (Tabriz), situated in a tertiary care teaching hospital. The triage of patients is performed by nurses. The triage rating was extracted from hospital information system. The physicians' opinion on the triage of the patients was inquired immediately after the first visit of each patient. The inter-rater reliability was evaluated by Kappa ( $\kappa$ ) coefficient. Because previous studies have used different types of Kappa coefficient to measure the triage reliability, we calculated the nurse-physician agreement by various types of this coefficient, including Cohen's un-weighted, linear weighted, and quadratic weighted  $\kappa$ s to facilitate inter-study comparison.<sup>15</sup> The  $\kappa$  ranges from -1 to 1, with the positive values indicating agreement and the negative values showing disagreement.<sup>14</sup> The degree of agreement was determined by qualitative ranking of the  $\kappa$  values: 0-0.2, poor; 0.2-0.4, moderate; 0.4-0.6, good; 0.6-0.8, very good; 0.8-1, excellent.<sup>16</sup> The calculations were carried out using STATA 10 software.

## Ethical Issues

The study protocol was reviewed and approved by the Institutional Review Board, which function as the Ethics Committee of Tabriz University of Medical Sciences.

## Results

Of 588 patients surveyed, 334 (58.5%) were male. The

average age of the study subjects was  $41.32 \pm 21.11$  years.

Table 1 compares the nurse-assigned and the physician-assigned triage categories. As seen, there is not a high level of agreement between the two groups.

The un-weighted Kappa was observed as  $\kappa = 0.172$  (95% CI: 0.115-0.228) (standard error: 0.028) whereas the linear weighted Kappa and the quadratic weighted Kappa were calculated to be 0.312 (95% CI: 0.253-0.370) (standard error: 0.029) and 0.482 (95% CI: 0.363-0.601) (standard error: 0.060), respectively.

Interview by the nurses of the triage system revealed that with the exception of the two-hour retraining course held two months prior to the study; they had not attended any other training program on ESI triage during the last year.

## Discussion

Reliability is a key characteristic of high quality triage system, which is defined as the reproducibility of the triage rating independent of the setting and the triageur.<sup>17</sup>

The calculated Kappa values in our study indicated a poor to moderate inter-rater reliability of ESI triage in the ED of the teaching hospital surveyed. As expected,<sup>13</sup> the weighted Kappa coefficient was greater than the un-weighted one. The linear weighted Kappa suggested a fair agreement and the quadratic weighted Kappa showed a moderate agreement between the nurses and physicians.

The level of inter-rater reliability in the surveyed ED was lower than that in several previous studies.<sup>14,18</sup> Travers et al<sup>19</sup> reported a linear weighted Kappa of 0.68 (good agreement) in their survey of US clinical settings. Grossmann et al from Germany also reported greater triage reliability as compared with ours (linear weigh Kappa = 0.898).<sup>20</sup> Relatively high inter-rater reliability has also been reported from Iran (Kappa of 0.87).<sup>21</sup> Also the study on the pediatric patients in the Tabriz Children's hospital showed a Kappa of

**Table 1.** Comparison of ESI-Based Stratification of Patients as Performed by Nurses and Physicians

Stratification by Nurses	Stratification by Physicians					Sum
	1	2	3	4	5	
1	14	9	0	0	0	23
2	8	4	1	1	0	14
3	11	82	181	96	7	377
4	0	12	64	79	19	174
5	0	0	0	0	0	0
Sum	33	107	246	176	26	588

0.82 for ESI in which the nurses had taken a training course before the study.<sup>22</sup> Training of triage staff may potentially influence the reliability of triage.<sup>17</sup> Studies suggest that attending regular retraining courses can improve the reliability of the triage ratings.<sup>23</sup> Relatively high Kappa coefficient has been reported from EDs whose triage nurses have already attended a re-training course on ESI triage.<sup>21,22</sup> The fact that our nurses had not taken any training courses (except a two-hour workshop) may contribute to the low level of inter-rater reliability in the present study.

About half of the nurses working in the surveyed ED (27 individuals) periodically contribute to the triage task. This shows that the triage system is question is not administered professionally. Although all nurses have to know how the triage works and have the relevant skills, appointing specialized nurses on the triage system management may help improve its reliability.<sup>2</sup>

### Study Limitations

Evaluation of the inter-rater reliability using Kappa coefficient has its own limitations. This, together with the small sample size and does not allow to conclude that the average inter-rater reliability of Iranian EDs is low. Our results, however, highlights the need for further large-scale studies to estimate reliability of triage in Iranian health settings and if proven to be low, take interventional measures.

### Conclusions

Compared with data from the previous studies, the inter-rater reliability of ESI-based triage between the surveyed nursing and medical groups was low to moderate. On the other hand, the surveyed ED nurses stated that they had attended only a limited two-hour course on triage operation. These observations emphasize the need for retraining the nurses (and the physicians) in order to promote a common view of the triage category of the patients among them, and achieve a higher reliability in ESI-based triaging. Our results provide motivation for further large-scale studies to evaluate the average reliability of triage in Iranian hospitals and if proven to be low, devising improvement strategies.

### Abbreviations

(ED): emergency department; (ESI): emergency severity index.

### Competing Interests

The authors declare no competing interests.

### Authors' Contributions

FP contributed to conceiving and designing the study, analysis and interpretation of the data, critical revision of the manuscript. AD contributed to data collection and analysis, interpretation of the results, and drafting the manuscript. JST contributed to critical revision of the manuscript. AA contributed to analysis and interpretation of the data.

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