RESEARCH

A 30-DAY RISK ASSESSMENT OF GERIATRIC PATIENTS IN THE EMERGENCY DEPARTMENT: A COMPARISON OF ISAR AND TRST SCORES

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Abstract

Introduction: The aim of this prospective observational study was to compare the predictive ability of the Triage Risk Stratification Tool and Identification of Seniors at Risk in identifying elderly people at risk of adverse outcomes (return to the emergency department, hospital admission, and death) within 30 days following discharge from the emergency department.

Materials and Methods: 396 patients aged between 65 and 98 (mean 76.89±7.59) accessing the emergency department were evaluated over a 1-month period. Both screening tool were administered in the emergency department by emergency specialist physicians. Risk factors were assigned a score based on their regression co-efficient estimate and a total risk score was created. This score was evaluated for sensitivity and specificity.

Results: Of the 396 participants, 198 (50%) were female. A significant correlation was not observed between risk of adverse outcomes and characteristics of the participant (p>0.005). The Identification of Seniors at Risk (cutoff of ≥3) was positive in 61.3% of the patients, whereas 79% were Triage Risk Stratification Tool-positive (cutoff of ≥2). The two scores were significantly correlated and had similar areas under the receiver operating characteristic curves in predicting hospital admission (Identification of Seniors at Risk, 0.63; Triage Risk Stratification Tool, 0.59).

Conclusions: The predictive accuracy of the scoring systems for hospital admission after 30 days was significant at cutoff values of ≥3 for Identification of Seniors at Risk and ≥2 for Triage Risk Stratification Tool. The Identification of Seniors at Risk had slightly higher sensitivity and lower specificity than the Triage Risk Stratification Tool.

Key Words: Emergency Service, Hospital; Geriatric Assessment; Risk Assessment; Aged.

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INTRODUCTION

The population of elderly people who pose great risk for hospitalization, unintended admission to the emergency department (ED) and death are enormously growing, resulting in huge economic and accommodation encumbrance for the healthcare organizations. Conducive to recognition of these target groups, healthcare workers need to perform some sort of risk evaluation to concentrate their exertions, taking into account that the elderly people are far reaching diversified in terms of operating and disease load. We do lack enough specialized units in our EDs to receive geriatric patients. We also do not have specific care providers for these patients. Certain standards should be established in care areas for this age group of patients who are also physiologically fragile due to their age. One of these standards should be scoring systems to be used in emergency services. Unfortunately, the importance of these scoring systems is not considered. With the increase in the elderly population, both admission to the ED and the economic burden brought about will increase significantly. In many countries, various measures have been tried to identify risk groups, prevent recurrent presentations, and reduce the economic burden. Efforts have been done to evolve different scoring systems to recognize risk groups, and these are being modified over time. In many countries, readmission rates are discussed as quality indicators; therefore, governments seek various ways to take measures (1).

There isn't enough agreement in the literature regarding the most proper introductory try-out examinations to be used. Several screenings for risk, including the Identification of Seniors at Risk (ISAR), the Dismiss of the Aged people from the urgent section (ED) and lately the Silver Code, have been advanced to point out older ED patients bearing more risk. The ISAR and the Triage Risk Screening Tool (TRST) are two of the most conventional risk assessment implements for elderly patients admitted to ED. The foretelling accuracies of the ISAR and TRST scores are sustained, remarking replicability of these scores (2).

The ISAR was developed to pick out seniors at risk of disadvantageous health consequences, including but not limited to functional turn down, admission to the ED, being inpatient, staying in hospital for longer term and finally morbidity during three, six and nine months after being admitted into ED with a discontinued score of 2 (3). ISAR screening foresees a broad spectrum of unfavourable health results, such as morbidity, hospital readmission, assets utilizing and corporeal or cognitive function (4). The ISAR score consists of six uncomplicated bipartite questions (functional decline, mortality, hospitalization, community service utilization), making it momentary, straightforward, and bearable for patients and health workers (5). Assuming patients have two or more positive responses (≥ 2 scores) on the ISAR screening test indicates an increased risk for the geriatric population. This test can be applied for advanced geriatric evaluations and treatments to improve prognosis and reduce the likelihood of poor outcomes (6). The anticipating credibility of the ISAR regarding death and complicate results was marked as poor to fair. It is not acceptable to employ ISAR test solely for picking up elderlies at risk of unfavourable outcomes in the ED (7). It should be used while taking clinical conclusions and for the purpose of the levelling and adoption of patients to be part of clinical assessments (4).

The TRST test was enhanced to recognize aged ED patients with higher possibility of returning to the ED, staying in hospital, or admission to a convalescent home between 30- and 120-days after dismissing from ED of hospital (8). The TRST should not be implied alone to recognize seniors at risk of ED revisits or inpatient (9). The goal of the attending examination was to compare the ISAR with the TRST in terms of performance in predicting 30-day return to ED, hospital admission and death in elderly who admitted to the ED.

METHODS

Study design, follow-up and end point

The ED of Odemis State Hospital treats approximately 200,000 patients per year. All patients who were above 65 years old and admitted to our ED facility and were followed up in the monitored observation unit were put into in the evaluation analysis. Patients who did not give their approval for the use of their information for scientific grounds in writing or vocally were eliminated from the bracket. Demographic and social input (age, sex, education, family status, decreased functional capacity, residency, arrival at the ED and contact person) and stay in the ED were extracted from the electronic documentation of all entries to our ED between 1 November 2022 and 1 December 2022. Outcomes were confirmed through telephone follow-up by emergency specialist physicians within one month of the index ED visit (1 December 2022 to 1 January 2023). The primary end-points were return to the ED, hospital admission or death.

Measurements

Same individual (SS) carried out both the diagram reviews and data obtainment. The ISAR is a risk assessment implement which consist of six components used to identify aged patients posing higher risk of unfavourable results after an admittance to the ED. ISAR is a self-report implement consist of six straightforward "yes/no" elements regarding functional reliance, current hospitalization, flawed reminiscences and sight, and polypharmacy. The overall scale span is between 0 to 6, as each component is scored as 1 if the patient demonstrates having a difficulty and 0 provided reports not (5). The five-item (cognitive disability; strained walking, recorded moving hardship and plummet, taking five or more medicaments, treatment history or documented ED entries, and assessment by the health worker of other reasons) TRST rule submits a feasible score between 0 and 5 (each element scoring 1 if existing or 0 if not attending) (8).

The author ascertained that ISAR and TRST scores of at least 2 identify patients who has greater risk for adverse outcomes.

Statistical methods

Frequencies and percentages were assigned for categorical changeable, while average, standard deviation (SD), median and range (minimum–maximum) values were provided for numerical variables as descriptive statistics. The relationship between two categorical variables was analysed applying Pearson's chi-squared assessment. Group comparisons for arithmetic variables were performed with the dependent sample t-test or the Mann–Whitney U test. In the Mann–Whitney U test evaluation, significance, and cut-off values for ISAR and TRST scores were determined only for the hospital admission value at the end of 30 days. The receiver operating characteristic (ROC) curve was implied to assay the scores' capability to assess the relationship between screening tools (ISAR ≥ 3 and TRST ≥ 2). The area under the curve (AUC) was summarized with 95% confidence intervals (CIs). The ROC curves of the scores were compared implying DeLong's test for two correlated ROC curves. The Youden index was applied to ascertain the break off point that optimized the variable's discerning capability by providing equal value to sensitivity and specificity. Rigorous binomial confidence limits were determined for sensitivity, specificity and positive and negative predictive values for scores transformed into binary based on cut-off values.

Ethical considerations

The study was confirmed, and the ethics commission of Izmir Katip Celebi University's Non-Interventional Clinical Studies Institutional Review Board deferred the necessity of obtaining informed written consent from patients (#0253).

RESULTS

In the present study, 396 patients (mean age 76.89 ± 7.59, interquartile range 65–98; 50% men) were enrolled. Their characteristics are summarized in Table 1. The mean age of the males was 71 ± 6.65, and the mean age of the females was 78.08 ± 8.27. The most common isolated presentation complaints were dyspnoea, abdominal pain and cough, as determined in 68 (17.2%), 19 (4.8%) and 8 (2%) persons, respectively. The three most common final diagnoses were chest diseases in 101 (25.5%), cardiovascular diseases in 86 (21.7%) and neurological diseases in 54 (13.6%). The ED outcomes were discharge in 261 (65.9%), hospitalization in 98 (24.7%), transfer to another hospital in 28 (7.1%), refusal of treatment in 8 (2%) and death in 1 (0.3%). The hospital outcomes were discharge in 104 (26.2%), death in 21 (5.3%) and referral in 1 (0.3%). The outcome of the referred patient is unknown. The numbers of returns to the ED, hospitalizations, deaths, decreases in functional capacity and clinic visits at the end of 30 days are shown in Table 2. The average length of stay in the ED was 5.11 hours. The mean ISAR score was 3.08, and the mean TRST score was 2.67. The correlation coefficient between ISAR and TRST was 0.657. There were no significant differences in ISAR and TRST scores for sex, age, marital status, living environment, level of education, mode of application, 30-day hospitalization, return to the ED or death status ($p > 0.05$).

Table 1. Participant baseline characteristics

Demographic and social data		N	%
Gender	Female	198	50
	Male	198	50
Family Status	Married	223	56.3
	Widow/er	167	42.2
	Divorced	3	0.8
	Unmarried	3	0.8
Education	Did not go to school	134	33.8
	Primary	252	64.4
	Secondary	2	0.5
	High	5	1.3
Residency	Alone	27	6.8
	With spouse	141	35.6
	Extended family	210	53.0
	Other	18	4.6
Arrival at the ED	With 112(911)	130	32.8
	Own possibilities	264	66.7
	Other	2	0.5
Contact person	Self	34	8.6
	Relative	355	89.6
	Neighbors	2	0.5
	Other	5	1.3

Table 2. Evaluation of the participants at the end of 30 days

Criteria	Yes (n, %)	No (n, %)	ISAR score* p	TRST score* p
Return to ED	125 (3.4)	249 (66.6)	0.233	0.174
Hospital admission	43 (11.5)	331 (88.5)	**0.004**	**0.042**
Death	13 (3.5)	361 (96.5)	0.059	0.295
Decreased functional capacity	73 (19.5)	301 (80.5)	0.265	0.371
Outpatient admission	242 (64.7)	132 (35.3)	0.127	0.187

ISAR: Identification of Senior at Risk, TRST: Triage Risk Screening Tool

Among the patients included in the study, 22 people (mean age was 80.41 years), including 12 females (mean age was 82.08 years), 10 males (mean age was 78.40 years), 1 in the emergency department and 21 in the hospital after the emergency department died. The primary end point at 30 days was evaluated in a total of 374 participants (mean age was 76.68 years), 186 women (mean age was 77.82 years) and 188 men (mean age was 75.56 years). While 11.5% of the patients (n = 43) in our cohort were admitted to hospital, 33.4% (n = 125) returned to the ED within 30 days. There were 13 deaths (3.5%) within 30 days (4%). No significant relationship was observed between the primary endpoints and the characteristics of the participants (age, gender, education, family status, residency, arrival at the emergency department) ($p > 0.005$). ISAR screening of the 396 ED patients revealed that 294 (± 1.26) were ISAR positive (≥ 2), and 102 (± 0.47) were ISAR negative (< 2). TRST screening of the 396 ED patients showed that 313 (± 1.32) were TRST positive (≥ 2), and 83 (± 0.28) were TRST negative (< 2). Table 3 shows the predictable value of ISAR (≥ 2) and TRST (≥ 2) for the primary end points for 374 patients. A significant correlation was observed for hospital admissions.

Table 3. Predictable value of ISAR and TRST for primary end points for 374 patients.

	Screening Tools											
	ISAR						TRST					
Primary end points	**Sensitivity (%)**	**Specificity (%)**	**PPV (%)**	**NPV (%)**	**AUC (95%CI)**	**P**	**Sensitivity (%)**	**Specificity (%)**	**PPV (%)**	**NPV (%)**	**AUC (95%CI)**	**P**
Return to ED	80	30.9	36.8	75.5	0.53 (0.47-0.59)	0.23	84.8	24.9	36.2	76.5	0.54 (0.48-0.60)	0.18
Hospital admission	88.4	29.3	14	95.1	0.63 (0.55-0.71)	**0.005**	90.7	23.3	13.3	95.1	0.59 (0.50-0.67)	**0.04**
Death	92.3	28	4.4	99	0.65 (0.52-0.77)	0.63	92.3	22.2	4.1	98.8	0.58 (0.44-0.72)	0.30

AUC: Area Under the Curve, CI: Confident Internal, ISAR: Identification of Senior at Risk, NPV: Negative Predictive Value, PPV: Negative Predictive Value, TRST: Triage Risk Screening Tool, ED: Emergency Department

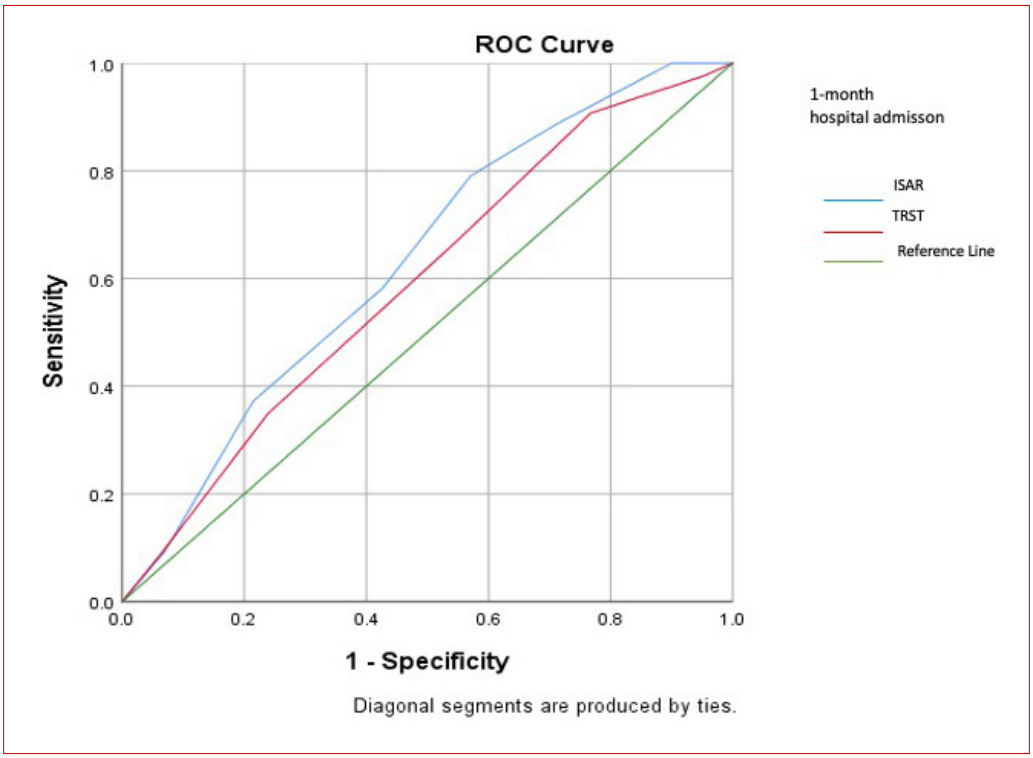

Figure 1. Receiver operating characteristic (ROC) curve of Identification of Seniors at Risk (ISAR) and Triage Risk Screening Tool (TRST) in predicting the 1-month hospital admission of 43 older patients. The ISAR shows an area under the curve of 0.63 (95% CI 0.55-0.71), where as the TRST shows an area under the curve of 0.59 (95% CI 0.50-0.67)

In this study, when comparing the predictive ability of the ISAR and TRST for the primary endpoint, significance was found only for hospital admissions. The optimum subjective ISAR cut-off score for hospital admission was ≥ 2, with a sensitivity of 88.4% and a specificity of 29.3%. Using the subjective ISAR tool, the AUC was 0.66. The optimum objective ISAR-related hospital admission cut-off score for screening was ≥ 3, with a sensitivity of 79.1% and a specificity of 42.9%. Using the objective ISAR-related tool, the AUC was 0.63. The optimum subjective and objective cut-off for TRST was ≥ 2. The ISAR showed slightly better performance in predicting 30-day hospital admission compared with the TRST, as shown in Figure 1. ISAR ≥ 3 showed an AUC of 0.63 (95% CI 0.55–0.71), a positive predictable value of 15.2% and a negative predictable value of 94%. TRST ≥ 2 showed an AUC of 0.59 (95% CI 0.50–0.67), with a sensitivity of 90.7%, a specificity of 23.3%, a positive predictable value of 13.3% and a negative predictable value of 95.1%.

DISCUSSION

The predictability of two risk assessment tools (ISAR and TRST) in terms of adverse clinical outcomes (return to ED, hospital admission and mortality) during 30 days in aged patients who presented to the ED was evaluated. Schwab et al. examined five scoring systems in their review, including 12 studies related to unplanned readmission at the end of 30 days. In that review, in which AUC values were

reported to be betwixt 0.445 and 0.69, the ISAR and TRST scoring systems were studied and confirmed (2).

In a meta-analysis of ISAR scoring including 32 studies, Galvin et al. reported as 0.83 (95% CI 0.75–0.90) for hospitalization and 0.97 (95% CI 0.89–0.99) for morbidity. In our study, these values were 0.88 and 0.92, respectively. Although these values were close to each other, the difference may have been due to the heterogeneity of the studies in the review (10). Buurman et al. (11) expressed predictive validity for the return to the ED of ISAR120. Sensitivity was 56%, and specificity was 4%; positive predictive value (PPV) was 19%, and negative predictive value (NPV) was 90%; AUC of the ROC curve was 0.59 (95% CI 0.51–0.67). In our study, sensitivity was higher (80%), and the AUC value was similar.

Since it is more difficult to estimate the risk over a long-term interval in older individuals, it is expected that the one-month estimation of our study will be higher than that of the six-month period. In their study using Revised ISAR (ISAR-R), McCusker et al. reported a sensitivity of 81% and a specificity of 40% for ED return at 90 days for the cut-point of 2+ in 386 patients. They defined the specificity value as low (5). In a review in which Galvin et al. included 32 studies, at 30 days, pooled appraises of sensitivity at a cut-off point of ≥ 2 were 81%, and specificity was 29% for ED return (10). In their study conducted with 333 patients in a population similar to the one in our study, Demir Akca et al. (12) reported that one-month sensitivity was 69%, and specificity was 40% for ISAR. In our study, these values were 80% and 30.9%, respectively. These values are compatible with the results of the review by Galvin et al. and McCuster et al. and have higher sensitivity values, unlike the results reported by Demir Akca et al. a higher sensitivity value indicates higher accuracy in identifying high-risk patients.

In a study conducted with 794 patients over 70 years of age, AUC values for return to ED were found to be 0.49 for ISAR and fTRST after 30 days. For hospitalization, these values were reported as 0.62 for ISAR and 0.56 for fTRST (13). In another study conducted with 200 patients over the age of 67, the AUC values were evaluated for the same period (1 month) and the same outcomes (return to ED, hospitalization) and were found to be 0.50 and 0.62 for ISAR. For TRST, both values were reported as 0.55 (14). In a study in which 2,057 people over 65 years of age were evaluated prospectively, the one-month AUC values for getting back to the ED and hospitalization calculated as 0.63 and 0.61, and 0.68 and 0.66, respectively, for ISAR and TRST (15). In our study, these values were as follows: return to ED ISAR 0.53 (0.47–0.59), TRST 0.54 (0.48–0.60); hospital admission ISAR 0.63 (0.55–0.71), TRST 0.59 (0.50–0.67). The results of our study were similar to Gretarsdottir et al. and Heeren et al. and lower than that of Salvi et al. We think that the lower values in our study, which was conducted with individuals of similar mean age, may have been due to the smaller size of the sample.

Rizka et al. (16) reported that for one-month mortality for 771 patients, the ISAR showed an AUC of 0.62 (95% CI 0.57–0.68), whereas the TRST showed an AUC of 0.58 (95% CI 0.52–0.64). Salvi et al. (15) reported a one-month mortality AUC for ISAR of 0.74 and for TRST of 0.68 in 2,057 individuals. In our study, these values were 0.65 (0.52–0.77) for the ISAR and 0.58 (0.44–0.72) for the TRST. The results of our study are similar to those reported by Rızka et al. and lower than those reported by Salvi et al. Although we have a similar sample size as the study of Rizka et al., our study has a much higher sample size than Salvi et al. We can say that as the number of samples increases, the level of predictability increases.

Studies reveal that the predictive value for the ISAR at 30–90 and 120 days ranges from moderate to poor, while the TRST has average diagnostic correctness at 30 days (11, 15–20). In the study by Suffoletto et al. (21) conducted with 202 patients, 84% of the participants had an ISAR score ≥ 2,

with up to 91% of sensitivity and almost 19% of specificity. In our analysis, in which the AUC value was 0.66, the rate of poor outcomes was 23% at the end of 30 days. Researchers found a cut-off value of ≥ 3 in the optimal objective ISAR risk scoring for poor outcomes (revisit-hospitalization and death). According to this cut-off value, specificity increases to 40% (21). In our study, for ISAR score ≥ 2 in 74% of the participants, ED sensitivity was 80%, and specificity was 30.9%; death sensitivity was 92.3%, and specificity was 28%; and sensitivity was 88.4%, and specificity was 29.3% for hospitalization.

The AUC values were similar to those in our study. In our study, the cut-off value of the ISAR score for hospital admission was ≥ 3. The specificity at this cut-off value was very close to the value found by Suffoletto et al. (21). As the cut-off value of the ISAR score increased, the specificity increased.

The anticipating ability of the ISAR and TRST at the common cut-off ≥ 2 points to recognize seniors at risk for return to the ED, hospital admission and mortality for adverse health outcomes is limited. In our study, significant results were obtained only for hospital admission in predictive ability analyses for ISAR cut-off ≥ 2–6 and TRST cut-off ≥ 2–5. The cut-off value for hospital admission was evaluated as ≥ 3 for the ISAR and ≥ 2 for the TRST. Although similar results were obtained for cut-off ≥ 2 values (sensitivity, specificity, AUC) for both scores, as stated in the paragraphs above, the different cut-off points determined for predictive ability emphasize the originality of the study.

Strengths and Limitations

The major limitation of our study was that it included to only one centre. At the end of 30 days, evaluations made by telephone were recorded, so they depended on the responses of the interviewees. These responses may not be objective.

One of the strengths of the study was that it was a prospective study, and three risks of unfavourable results (return to ED, hospital admission and death) were evaluated. In an ageing community, a narrower endpoint, such as one month, is required to look over the unbiased impact on the return to ED. The more protracted the observation period, the likelier new illnesses or aggravation of co-morbidities will bias the initial outcomes. Another fortitude of our review was that multivariable regression analysis was carried out to check for feasible confounders, which lowered bias. As a result of these analyses, different cut-off points were determined from the literature for both screening tools.

CONCLUSION

The risk scoring of the geriatric patient group needs to be reconsidered in order to reduce re-presentations to the ED, as well as the financial burden of these presentations, and patients in the risk group should be identified and followed up more closely. Although the ISAR and TRST have various limitations, they can be used as simple, standardized, auxiliary instruments to differentiate elderly patients during clinical decision making and practice and to identify high-risk patients. Both instruments demonstrated poor foretelling ability, however the ISAR presented greater attainment in anticipating the one-month hospital admission of elderly patients visiting the ED.

Meeting presentations

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Declaration of competing interest

None of the authors has a conflict of interest to declare.

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