

INTERNATIONAL EMS

EFFECTIVENESS OF A SIMPLE INTERNET-BASED DISASTER TRIAGE EDUCATIONAL TOOL DIRECTED TOWARD LATIN-AMERICAN EMS PROVIDERS

Amado Alejandro Báez, MD, MSc, Matthew D. Sztajnkrycer, MD, PhD, Pablo Smester, MD, Ediza Giraldez, MD, Luis E. Vargas, MD

ABSTRACT

Background. A previous survey demonstrated a lack of standardization related to disaster triage among Latin-American providers. **Objective.** To assess the effectiveness of a short Internet-based educational intervention in disaster and mass-casualty triage. Using three Spanish Internet emergency medical services (EMS) forums, Latin-American providers were invited to participate in the study. The tool consisted of two educational modules: an introduction to disaster triage module and a START (simple triage and rapid treatment) module. Pre- and postintervention tests were administered, each consisting of five standardized scenarios. Factorial analysis was used to measure the weight of each scenario. The first and fifth scenarios were identical for intraclass correlation. Skill retention was assessed through a one-month follow-up survey. Statistical analysis was performed using chi-square and Fisher's exact test. A total of 55 EMS providers participated in the study. Five of 55 (9.1%) participants correctly answered four or more scenarios on the pretest intervention, compared with 53 of 55 (96.4%) on the posttest [$p < 0.001$, relative risk 10.60 (95% CI 4.59–24.49)]. Similar findings were obtained for those accurately triaging all five scenarios, with zero of 55 (0%) in the pretest compared with 49 of 55 in the posttest ($p < 0.001$). Follow-up at one month was 69%. Four or more scenarios were correctly answered at follow-up by 34 of 38 (89.5%) respondents. No significant difference was noted compared with the immediate postcourse survey ($p = 0.18$). Although

initial ability of the cohort to accurately triage patients was suboptimal, a short Internet-based educational tool significantly impacted the cohort's ability to perform triage in a simulated patient environment. This improvement was maintained after one month. **Key words.** disaster; traum; triage; Internet; education; prehospital; Latin America.

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Triage is one of the most important activities in the initial medical management of mass-casualty victims. The term "triage" originates from the French verb *trier*, meaning "to sort." Disaster triage is defined as: "a method of quickly identifying victims who have immediately life-threatening injuries and who have the best chance of surviving." Several disaster triage protocols, scales, and algorithms exist.^{1–6} The current literature demonstrates the importance of an adequate triage during a disaster,^{7–13} showing how improper triage can adversely affect outcome.

The most commonly encountered multicase triage system in the United States is the START (simple triage and rapid treatment) system.^{1,2} Developed in the 1980s by Hoag Memorial Hospital and the Newport Beach, California, fire department,¹ this system has become increasingly popular due to its inherent simplicity and rapidity of use. The initial step in the START triage process is to identify ambulatory patients, who are categorized as minor (green), and direct them to a remote treatment and reassessment area (Figure 1). After this step, START categorizes patients based on determination of three physiologic components: respiratory rate, pulse (perfusion), and mental status. Although not incorporated into the START system text, it has been suggested that this triage tool include the color blue to categorize actual and potentially contaminated patients.

In the United States, START has been found to be quick to perform and easy to teach.¹⁴ In Latin America, several triage tools have been proposed and implemented, but a previous unpublished Internet-based informal survey conducted by the Dominican Society of

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Address correspondence and reprint requests to: Amado Alejandro Báez, MD, MSc, Department of Emergency Medicine Generose-G410, Mayo Clinic, 200 First Avenue SW, Rochester, MN 55905. e-mail: <baez.amado@mayo.edu>.

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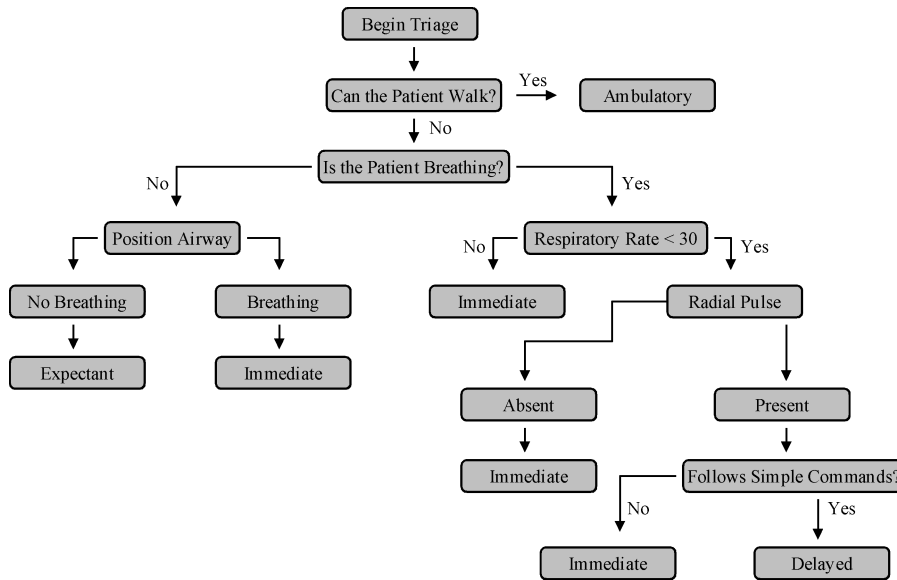


FIGURE 1. Schematic of the simple triage and rapid treatment (START) triage algorithm.

Prehospital Medicine revealed a persistent lack of standardization related to disaster triage among respondent Latin-American EMS providers. The objective of this study was to assess the effectiveness of a short Internet-based educational intervention in disaster and mass-casualty triage.

METHODS

A convenience sample of Latin-American emergency care providers were invited to participate in the study by means of recruitment through three popular Spanish-language Internet prehospital care forums. Countries of origin identified by participants included Columbia, Cuba, the Dominican Republic, Puerto Rico, and Venezuela.

The educational tool consisted of two Internet-based teaching modules: an introduction to disaster triage module and a START module. The course was initially located at <http://www.prehospitalaria.org/inicio.triage.htm>, but after completion of the pilot study the site became inactive. Each module had a maximum completion time of 15 minutes. A consent and confidentiality form with general demographic information was obtained for each participant prior to enrollment in the course. Pre- and postintervention tests were administered, each consisting of five standardized scenarios based on the START system (Figure 2, Table 1). Factorial analysis was utilized in an effort to measure and distribute the difficulty weight of each scenario in the pre- and posttest assessment. For intraclass correlation, the first and fifth scenarios were identical. In order to assess short-term skill retention, a one-month follow-up survey was administered.

Descriptive statistics and confidence intervals (CIs) were used to present group characteristics. For cate-

gorical variables, chi-square testing and Fisher's exact testing were used to assess associations, with odds ratio used as the measure of strength of association. Levine's test for equality of variances was used to assess homogeneity of variance for continuous variables, and Student's t-test was used for the assessment of associations between these variables. For all tests, statistical significance was set at the 0.05 level. All analyses were performed with SPSS for Windows 9.01 standard version (SPSS Inc., Chicago, IL, 1989-1999).

As a multinational Internet-based research project, institutional review board approval was obtained from the Dominican Society of Prehospital Medicine.

RESULTS

A total of 55 EMS providers participated in the study. Demographic information is presented in Table 2. The mean ± standard deviation number of years of EMS

CASO-3

- No puede mover las piernas ROJO
- Respiraciones <30/min AMARILLO
- Pulso radial presente VERDE
- Alerta NEGRO

FIGURE 2. Modified black and white sample screen shot of the Internet-based triage educational tool. A patient scenario in Spanish as presented to the participants, with the simple triage and rapid treatment (START) triage classification choices provided as colors on the right-hand side of the screen. This scenario corresponds to case 3 in Table 1.

TABLE 1. Five Sample Scenarios from the Preintervention Assessment Tool

Case 1
Complex fracture, left femur
Respirations over 30 breaths/min
Radial pulse absent
Awake
Case 2
Sucking chest wound
Respirations >30 breaths/min
Unable to maintain open airway
Radial pulse present
Unconscious
Case 3
Unable to move legs
Respirations <30 breaths/min
Radial pulse present
Awake
Case 4
No apparent major injuries
Respirations normal
Present radial pulse
Awake
Walking toward you
Case 5
Fracture left femur
Respirations over 30 breaths/min
Radial pulse absent
Awake

experience reported by the respondent group was 5.9 ± 3.6 years. Twenty-five of 55 (45.5%) identified themselves as first responders, while 30 of 55 (54.5%) reported a more advanced level of training [e.g., emergency medical technician (EMT), nurse, or physician]. Actual disaster experience was reported by 20 of 55 (36.4%), while 19 of 55 (34.5%) reported previous knowledge of the START system.

Four or more scenarios on the pretest intervention were correctly answered by only five of 55 (9.1%) par-

ticipants, as compared with 53 of 55 (96.4%) participants on the posttest intervention [$p < 0.001$, relative risk (RR) 10.60 (95% CI 4.59–24.49)]. Similar findings were obtained for those accurately triaging all five scenarios, with zero of 55 (0%) found on the pretest compared with 49 of 55 (89.1%) on the posttest ($p < 0.001$). When assessing intrarater reliability, 14 of 55 (25.5%) scored the duplicate scenarios correctly on the pretest, compared with 55 of 55 (100%) on the posttest [$p < 0.001$, RR 3.93 (95% CI 2.50–6.18)]. When asked about the color designation for contaminated patients, 13 of 55 (23.6%) correctly chose the color blue on the pretest survey, while 55 of 55 (100%) chose this color postintervention [$p < 0.001$, RR 3.46 (95% CI 2.19–5.47)].

Thirty-eight of the initial 55 subjects participated in the one-month follow-up. Characteristics of both the initial group and the 30-day follow-up group are delineated in Table 2. No significant educational or experience difference was noted between the two groups. No statistical difference was found in subgroup analysis comparing the immediate postintervention scores of the 38 subjects who participated in the one-month follow-up with the 17 participants who did not. Four or more scenarios were correctly triaged by 37 of 38 (97.4%) subjects who participated in the one-month follow-up, compared with 15 of 17 (88.2%) who did not follow up [$p = 0.09$, RR 1.13 (95% CI 0.95–1.45)].

At one-month follow-up, 34 of 38 (89.5%) participants correctly triaged four or more scenarios compared with 53 of 55 (96.4%) immediately postintervention [$p = 0.18$, RR 0.93 (95% CI 0.82–1.05)]. All 38 (100%) participants accurately scored the duplicate scenarios and all 38 (100%) chose the color blue as that indicative of contaminated patients.

TABLE 2. General Demographic Data of the Study Participants

	Initial Assessment	30-Day Follow-Up Assessment
Level of education		
High school	17/55 (30.9%)	13/38 (34.2%)
EMT*	13/55 (23.6%)	9/38 (23.7%)
College (non-health-related degree)	14/55 (25.5%)	10/38 (26.3%)
College (health-related degree)	6/55 (10.1%)	2/38 (5.3%)
MD	11/55 (20.0%)	8/38 (21.1%)
Years of service in EMS/disaster management—mean \pm SD	5.9 ± 3.6 years	5.7 ± 4.2 years
Previous disaster medicine/management experience		
Previous experience	20/55 (36.3%)	13/38 (34.2%)
No previous experience	35/55 (63.7%)	25/38 (65.8%)
Prior knowledge of the START system		
Yes	19/55 (34.5%)	13/38 (34.2%)
No	36/55 (65.5%)	25/38 (65.8%)

*Some of the "high school" respondents were included in the emergency medical technician (EMT) category.

EMS = emergency medical services; START = simple triage and rapid treatment; SD = standard deviation; MD = MD degree.

DISCUSSION

Mass-casualty incidents (MCIs) in essence are a deviation from the EMS norm, and confusion is an expected complication. The three main medical activities in a major disaster are referred to as the three "Ts": triage, treatment, and transport. Without appropriate triage, improper utilization of scarce medical resources may occur, with resultant inadequate medical care. Several studies have demonstrated a significant improper triage rate in major incidents and the effects of inadequate triage on patient outcome. While there has been no formal field validation for START, several studies have focused on the physiologic variables utilized by START and how these relate to outcomes.^{15–17}

A 2001 study by Risavi et al. demonstrated how a short educational intervention can be an effective tool in the education of out-of-hospital emergency care providers in disaster triage.¹⁴ This particular study utilized the START system as the main triage tool. Significant attention has been focused on the development

of Internet-based training in disaster medicine education, as a means of reaching more individuals.¹⁸⁻²¹ Several training modules have been developed, focusing on terrorism response, general disaster management, and disaster medical care, but limited validation instruments for these tools have been found. No module to date has specifically targeted Latin-American emergency care providers.

Although the majority of Latin-American EMS providers have an understanding of the concepts of disaster and mass-casualty triage, a lack of standardization and a general unawareness of objective tools have been noted. The purpose of the current study has been to develop an Internet-based course tailored to Latin-American providers, in order to provide a means of formally standardizing disaster triage.

Our preintervention results again suggest that the ability of Latin-American prehospital care providers to triage patients in a mass-casualty incident is less than optimal. Only five of 55 (9%) respondents were initially able to correctly triage four or more of the scenarios. However, regardless of experience or level of training, triage ability significantly improved after participating in the short modular Internet-based educational instrument, with 53 of 55 (96.4%) successfully triaging four or more patients correctly. At the one-month follow-up, adequacy of triage skills was maintained.

LIMITATIONS AND FUTURE STUDIES

Limitations of this study include the potential for selection bias in being able to easily navigate the Internet, being able to access the three prehospital care forums, and choosing to undertake the training modules. Further, the study was performed based on the honor system, and the potential exists for violations during the assessment periods. Another potential limitation of the study was that only 38 of 55 (69.1%) of the initial participants completed the 30-day follow-up assessment. No statistically significant difference was noted among the participants who chose to follow up at 30 days versus those who did not, with respect to initial postintervention triage ability. Nevertheless, the limited follow-up may have resulted in selection bias, as perhaps only those retaining knowledge opted to complete the 30-day surveys. These limitations may have contributed to the dramatic differences observed after only modest training interventions. Nonetheless, they demonstrate that a simple, short tool, directed at a motivated audience, can have a substantial and presumably beneficial impact in the management of disaster patients.

Future studies include extended follow-up at six months, one year, and beyond, to determine skill retention, as well as inclusion of other triage modules including pediatric triage using the JumpSTART system.⁴

CONCLUSION

The initial ability of a cohort of Latin-American EMS providers to accurately triage patients was suboptimal. The implementation of a short Internet-based educational tool significantly impacted the cohort's ability to triage in a simulated patient environment. This improvement was maintained after one month.

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