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The national trauma triage protocol: how EMS perspective can inform the guideline revision

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ABSTRACT

Objectives The Field Triage Guidelines (FTG) support emergency medical service (EMS) decisions regarding the most appropriate transport destination for injured patients. While the components of the algorithm are largely evidenced-based, the stepwise approach was developed with limited input from EMS providers. FTG are only useful if they can easily be applied by the field practitioner. We sought to gather end-user input on the current guidelines from a broad group of EMS stakeholders to inform the next revision of the FTG.

Methods An expert panel composed an end-user feedback tool. Data collected included: demographics, EMS agency type, geographic area of respondents, use of the current FTG, perceived utility, and importance of each step in the algorithm (1: physiologic, 2: anatomic, 3 mechanistic, 4: special populations). The American College of Surgeons Committee on Trauma (ACS COT), in partnership with several key organizations, distributed the tool to reach as many providers as possible.

Results 3958 responses were received (82% paramedics/emergency medical technicians, 9% physicians, 9% other). 94% responded directly to scene emergency calls and 4% were aeromedical providers. Steps 2 and 3 were used in 95% of local protocols, steps 1 and 4 in 90%. Step 3 was used equally in protocols across all demographics; however, step 1 was used significantly more in the air medical services than ground EMS (96% vs 88%, $p<0.05$). Geographic variation was demonstrated in FTG use based on the distance to a trauma center, but step 3 (not step 1) drove the majority of the decisions. This point was reinforced in the qualitative data with the comment, "I see the wreck before I see the patient."

Conclusion The FTG are widely used by EMS in the USA. The stepwise approach is useful; however, mechanism (not physiological criteria) drives most of the decisions and is evaluated first . Revision of the FTG should consider the experience of the end-users.

Level of evidence V.

INTRODUCTION

The Guidelines for Field Triage of Injured Patients (FTG) were originally developed to assist emergency medical service (EMS) providers identify injured patients at the scene who would benefit from trauma center care and support EMS transport destination decisions. The FTG were originally developed in 1976 by the American College of Surgeons, with periodic revisions every 5–10 years.[1] The most recent revisions of the FTG were led by the US Centers for Disease Control and completed in 2011.[2]

The FTG were designed to be used in a stepwise fashion such that physiological criteria were evaluated first (step 1), followed by anatomic criteria (step 2), then mechanism of injury criteria (step 3) and lastly, special considerations related to specific patient populations (step 4). While the components of this algorithm were largely evidence-based or driven by expert consensus when evidence was not available, these guidelines were developed with limited input from the EMS providers who use them in the field. With this in mind, we actively sought input regarding the current guidelines from a broad group of EMS stakeholders by distributing an end-user feedback tool throughout the EMS community to gather input for future revisions of the FTG.

METHODS

An expert panel composed of nine members of the EMS subcommittee of the American College of Surgeons Committee on Trauma drafted a feedback tool consisting of 40 questions (online supplemental appendix A). The tool was separated into sections examining responder characteristics and FTG use specifically by step. The demographic section covered the respondent's role in EMS, the type of service where the respondent was currently working, and general geographic data based on the transport time to a trauma center. General questions were next and examined the perceived use of the current guidelines and the role of EMS judgment. Each step of the 2011 algorithm was then assessed by the next set of questions probing ease of use, importance in triage, and suggestions for improvement. For ease of analysis, questions, when possible, were limited to quantitative responses, however qualitative free-text answers were also allowed.

The feedback tool was then piloted in a small group of EMS providers to assess question understanding and refine any areas which caused confusion. Once the tool was complete, the goal was to widely distribute the tool to a diverse array of EMS providers from across the USA. This was accomplished by partnering with major national EMS organizations to widely distribute the feedback tool to their members via print, email, and social media (online supplemental appendix B). The tool was open for responses for approximately a 6-week period in the fall of 2020 on the Qualtrics platform and allowed respondents to answer the questions using smart phone or computer. Respondents were

Table 1 Primary role of respondent in EMS

Primary role at EMS	%	Count
Patient care provider	58	2231
Administrator/Manager	15	572
First-line supervisor	14	525
Educator	7	275
Other	5	181
Preceptor	1	29

EMS, emergency medical service.

not stopped from answering the questions twice and partial completion of the tool was permitted. Data was collected in the Qualtrics platform and analyzed using Qualtrics Stats iQ software and PivotTables. Free-text answers were individually reviewed by the expert panel and organized by theme.

RESULTS

A total of 3958 responses to the end-user feedback tool were submitted. Given that the tool was distributed widely across many organizations, a true response rate could not be calculated. The demographics of the respondents are shown in table 1. Most of the respondents were paramedics/emergency medical technicians and 94% responded to scene calls.

All steps of the current guideline (step 1: physiological parameters; step 2: anatomic factors; step 3: mechanisms of injury; step 4: special considerations) were used in local protocols (step 1 89%, step 2 94%, step 3 93%, and step 4 90%). Interestingly, step 1 was used more often in aeromedical service protocols than in ground services. The role of EMS judgment when applied to the FTG was also examined. Most respondents (62%) replied that their judgment overrode the FTG only 0%–20% of the time. When judgment did override, most of the time (52%) a patient was transported to a trauma center when the patient did not meet other criteria. Only 8% of the time did the respondents transport patients to a non-trauma center who met criteria to be triaged to a trauma center based on their judgment.

Eighty-eight per cent of the respondents felt the stepwise approach to trauma triage was useful. The importance of each step as judged by the respondent is shown in table 2. The order of the steps was also examined. Steps 1 and 3 were preferentially ranked number 1 when determining a patient transport destination. Steps 2 and 3 were ranked evenly at number 3 (table 3). When asked which step drives the *majority* of the decisions to triage a patient to a trauma center, the respondents chose step 3 which represents the mechanism of injury.

The respondents practiced in systems with variable access to trauma centers. Eighty-four per cent of the respondents said a major trauma patient in their area would be taken to the closest level 1 or 2 center, while only 6% said the closest hospital (non-trauma center). The average time to reach a level 1 or 2 trauma center by ground was 29 min (range 0.1– 800). The average time to reach any level trauma center was lower at 19 min (range 0.1–500). When asked how often a major trauma patient would be transported by air, over 70% replied only 0%–25% of the time. When stratifying the responses by time to a trauma center, the patient was more likely to be triaged to a non-trauma center and air transport used more often the further away EMS was from a trauma center (table 4). Step 3 drove the majority of the triage decisions regardless of transport time to the trauma center.

Table 2 Importance of each step of the criteria for appropriate triage as judged by the respondent

Triage importance	Step 1 (%)	Step 2 (%)	Step 3 (%)	Step 4 (%)
Extremely	45	40	26	23
Very	38	48	41	41
Moderately	14	10	27	28
Slightly	2	1	5	7
Not	1	1	1	1

Almost all questions on the end-user feedback tool provided the opportunity to place free-text responses, and over 6000 free-text answers were received. These responses were each individually evaluated and grouped into categories as best as possible. Data continued to suggest that while users felt the stepwise approach was easy to understand, the flow and usefulness of the tool in the field did not match the order of the steps in the guideline. Users provided feedback that step 3 was often used first in field triage. Furthermore, suggestions included simplifying step 1 by removing Glasgow Coma Scale (GCS) (as it is difficult to remember in the field) and adding age-specific physiological criteria. Multiple comments requested removing concrete diagnosis (eg, pelvic fractures) from step 2 and favored more 'suspicion' since definitive diagnosis cannot be made in the field. Multiple comments also requested clarifying the role of EMS judgment.

DISCUSSION

We gathered significant amounts of end-user feedback on the 2011 FTG. The feedback was primarily from providers who work in the prehospital setting and use the guidelines regularly. All steps of the current guideline were used in local protocols, although to varying degrees. While the rate of use was high (≥89%) for all steps, it certainly was not 100%. State and local EMS Medical Program Directors may make modifications to the guideline for local implementation. This is consistent with previous studies which have described variability in adoptions of the guidelines. Barnett *et al* found the most consistent use of the FTG was the physiological criteria while anatomic criteria were not as consistent.[3] Our results were slightly different demonstrating more use of the anatomic and mechanistic criteria in local protocol than the physiological criteria. When examining state adoption of the FTG 4 years after a major revision, only 17% had fully adopted all criteria.[4] Our study was conducted 8 years after the publication of the 2011 guidelines and is consistent with other studies demonstrating that increased time between survey and introduction will reflect a higher rate of implementation.[5]

An interesting finding was that the step 1 criteria were more likely to be integrated into air-medical protocols than ground services protocols. While the exact reasons for this could not be determined, it is plausible that these providers used the physiological data more often for triage due to inability to assess the severity of the mechanism. Often air-medical teams will rendezvous with ground services who will have the patient already in the ambulance and thus the air medical crews may not see the scene of the injury.

The concept of EMS provider judgment was added to the FTG in the 2006 revision and retained in the 2011 revision, however the parameters to guide decisions made by EMS outside of the algorithm were not described.[2] Sixty-two per cent of our respondents stated that their judgment overrode the FTG criteria <20% of the time. This is contrary to prior research showing that judgment was the most commonly used criterion when EMS providers were asked

Table 3 The end-user feedback tool asked the respondents to order the steps of the FTGs in terms of importance and use as a provider in the field determining patient transport destination

	Ranked #1		*Ranked #2*		*Ranked #3*		*Ranked #4*	
FTG step	Importance (%)	Use (%)	Importance (%)	Use (%)	Importance (%)	Use (%)	Importance (%)	Use (%)
1	38	38	31	30	23	24	8	9
2	23	21	43	45	29	29	5	5
3	36	38	22	21	31	31	11	10
4	3	3	4	4	17	16	76	76

FTG, Field Triage Guidelines.

immediately after transporting a patient.[6] Studies regarding the utility of EMS judgment are mixed. Some studies have shown that EMS judgment adds to the sensitivity of triage,[6–8] while others show no benefit.[9 10] Regardless of the accuracy, research shows that the 'gut feeling' of the provider is the primary reason for identifying a major trauma victim requiring trauma center triage.[11] Further revisions of the FTGs need to continue to recognize EMS judgment as an important part of the triage process and efforts should be made to help further develop the factors to be considered which may prompt a provider to transport a patient to a trauma center even when they fail to meet other criteria.

Our results show that as driving distance to a trauma center increases, the patient was less likely to be taken to a trauma center. This is despite data showing that major trauma patient transport directly to a trauma center improves survival.[12] There are likely multiple system issues effecting the transport decision. For example, many rural counties have a very limited number of ambulances and cannot allow for an extended transport time to a trauma center at the cost of leaving an area without any EMS support. In these circumstances, an ambulance will often take a major trauma victim to the closest hospital, which is often not a trauma center. These results are not unique. Newgard *et al* found that while the identification of high-risk patients did not differ between urban and rural environments, the transport decisions varied widely.[13 14] Any revision of the FTG must account for trauma center availability and geographical restraints within a system.

Mechanistic criteria are important in the current FTG. However, in the current design of the algorithm, the mechanism is not meant to be considered until after the physiological and anatomic criteria. Thus, if the FTG are used in the correct sequence steps 1 and 2 should drive the majority of triage decisions to a trauma center. However, this is not consistent with our findings of how the FTG are used in the field. Providers consistently ranked step 3 (mechanism) as the primary step driving most of the decisions to take a patient to a trauma center. These findings are consistent with a cognitive reasoning model described.[11] The mechanism criteria are often examined first based on dispatch information and visual cues on scene arrival. This finding was reinforced by one of the comments on the tool. The provider stated, "I see the scene before I see the patient." The current stepwise approach of the algorithm is more consistent with the evaluation of the patient in the hospital where vital signs are obtained first as part of the primary survey and are not consistent with the flow of information in the prehospital environment.

Table 4 Non-TC patient transport, use of air medical services, and step of FTGs driving majority of triage decisions stratified by average distance by ground to any level trauma center

Ground time to trauma center (min)	Non-TC transport (%)	Air transport (%)	Step driving majority of triage decisions
0–30	3	11	3
31–60	22	53	3
61+	59	69	3

FTG, Field Triage Guidelines; TC, trauma center.

There are a number of important limitations to the data presented. Based on our strategy to ensure wide distribution of the tool, we cannot determine the response rate as we do not know the denominator of the number of individuals that received the tool. We also cannot assess the demographics of those who did not submit responses. Furthermore, while the tool was piloted with EMS providers to ensure clarity, it is possible the questions were interpreted differently among respondents. With the large response, we hope that the EMS community was appropriately represented but there is the possibility of sampling error.

In conclusion, the current FTG are widely used across EMS agencies. Each step is well represented in local protocols. However, step 3, not step 1, drove the majority of the decisions to triage a patient to the trauma center likely secondary to the flow of information prehospital professionals receive in the field. Proximity to a trauma center also played a role in how trauma patients were triaged. FTG should be adjusted for field workflow and be adaptable based on specific local system requirements. Overall, end-user input is essential for future guideline revisions.

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