

MMWR



Continuing Education Examination available at <http://www.cdc.gov/mmwr/cme/conted.html>.

TheMMWR



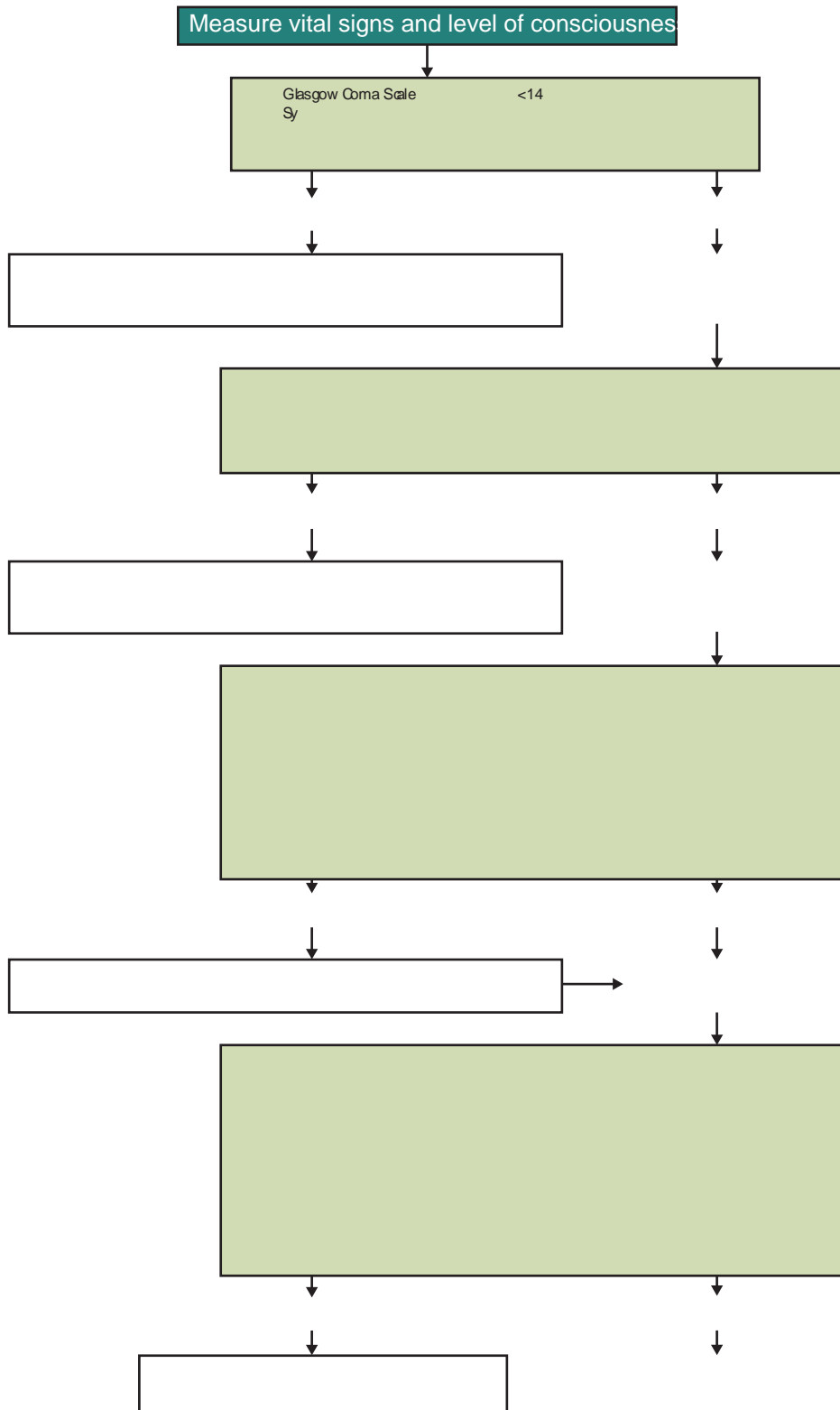
Introduction

Purpose of This Report

Emergency Medical Services (EMS) providers in the United States make decisions about the most appropriate destination hospital for injured patients daily. These decisions are made through a decision process known as "field triage," which involves an assessment not only of the physiology and anatomy of the injury but also of the mechanism of the injury and special patient considerations. The goal of the field triage process is to ensure that injured patients are transported to a trauma center* or hospital that is best equipped to manage their specific injuries, in an appropriate and timely manner, as the circumstances of injury might warrant.

Since 1986, the American College of Surgeons Committee on Trauma (ACS-COT) has published a resource manual that provided guidance for the field triage process through a field triage decision scheme¹. This guidance was updated and published with each version of the resources manual during 1986, 2199n (2009, CDC published guidelines on the field triage process (the Guidelines)².

FIGURE 1. Field triage decision scheme, United States, 2006



Source: Adapted from American College of Surgeons. Resources for the optimal care of the injured patient. Chicago, IL: American College of Surgeons; 2006. Footnotes have been added to enhance understanding of field triage by persons outside the acute injury care field.

* The upper limit of respiratory rate in infants is >29 breaths per minute to maintain a higher level of overtriage for infants

• Trauma centers are designated Level I...IV, with Level I representing the highest level of trauma care available.

† Age <15 years.

** Intrusion refers to interior compartment intrusion, as opposed to deformation which refers to exterior damage.

•• Includes pedestrians or bicyclists thrown or run over by a motor vehicle or those with estimated impact >20 mph with a motor vehicle.

§§ Local or regional protocols should be used to determine the most appropriate level of trauma center; appropriate center need not be Level I.

†† Age >55 years.

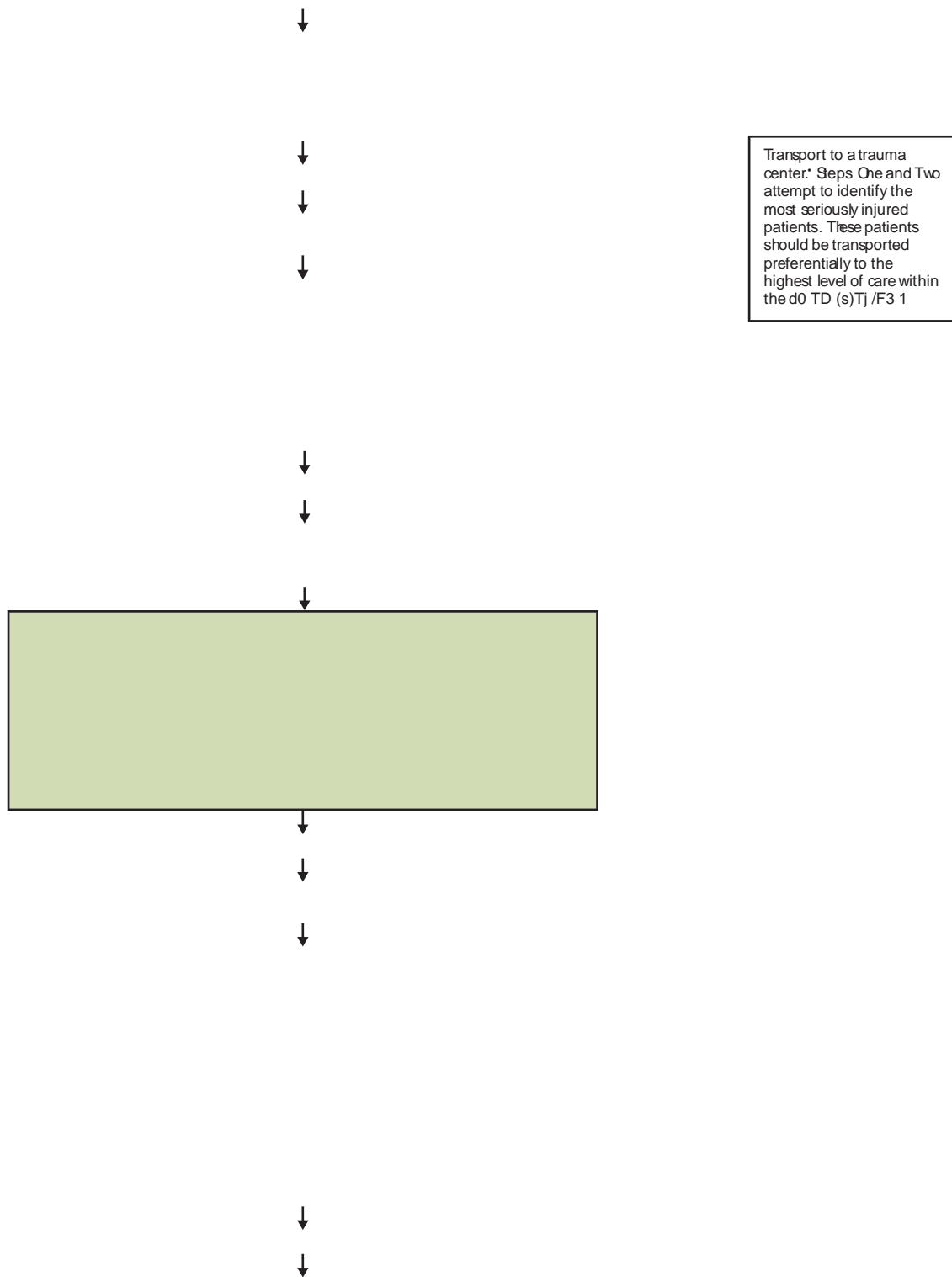
*** Patients with

by EMS providers and represents the Panel's opinions after a review of the published medical literature and reports from communities that are implementing the Guidelines regarding their experience. The Panel recognizes that these Guidelines cannot address the specific circumstances of each EMS system in the United States or all circumstances that might arise at the scene of injury or while the patient is being transported to hospital or trauma center. The Guidelines discuss core elements of any well-managed field triage process; these guidelines should be adapted to fit the specific needs of local environments within the context of defined state, regional, or local trauma systems and in accord with an analysis of local data. In areas of uncertainty, or in those not addressed by the Guidelines, local EMS systems should rely on direction from local EMS medical directors, regulations, policies, and protocols.

Methods

Published peer-reviewed research was the primary basis for making any revisions to the Guidelines. To identify articles related to the overall field triage process, a structured literature search was conducted in Medline. English language peer-reviewed articles published between January 1, 2006 (the year of the 2006 revision) and May 1, 2011, were searched. Because no single medical subject heading (MESH) is specific to field triage, multiple search terms were used. The following terms were searched as MESH vocabulary, keyword, natural language, and truncated terms in order to maximize retrieval of relevant articles: •trauma,Ž •wound,Ž •injury,Ž •pre-hospital,Ž •emergency medical services,Ž •ambulance,Ž •transport,Ž and •triage.Ž In addition, to identify articles related to specific steps within the Guidelines that might have been missed by the general field triage search strategy described above, researchers used terminology from each criterion of the 1999 and 2006 guidelines as MESH vocabulary, keyword, natural language, and truncated terms to maximize retrieval of relevant articles. Examples of terms used include •physiology,Ž •flail chest,Ž •accidental falls,Ž and

FIGURE 2. Guidelines for field triage of injured patients — United States, 2011



Abbreviation: EMS =emergency medical services.

* The upper limit of respiratory rate in infants is >29 breaths per minute to maintain a higher level of overtriage for infants.

* Trauma centers are designated Level I-IV. A level I center has the greatest amount of resources and personnel for care of the injured patient and provides regional

BOX 1. Selected examples of CDC's efforts to ensure dissemination, implementation, and evaluation of the 2006 guidelines for field triage*

Dissemination

Materials (available at http://www.cdc.gov/FieldTriage/pdf/EMS_Guide-a.pdf) to local, state, and regional emergency medical services, academia, professional organizations, fire departments, ambulance services and trauma centers nationwide

Implementation

http://www.cdc.gov/fieldtriage) that has had 73,636 page views, 8,060 downloads of the 2009 guidelines, and 2,641 downloads of the training materials providers, physicians, and nurses

Evaluation

trauma care providers regarding the guidelines

*CDC. Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage. MMWR 2009;58(No. RR-1).

In April 2011, the Panel met to discuss the articles, recommendations of the working group, and the experiential base from states and communities implementing the Guidelines and to reaffirm or revise the Guidelines. In the sources reviewed Injury Severity Score (ISS) >15, where available, was used as the threshold for identifying severe injury; however, other factors (e.g. need for prompt operative care and intensive care unit [ICU] admission) also were considered. A threshold of 20% positive predictive value (PPV) to predict severe injury was used to place criteria into discussion for inclusion as mechanism-of-injury criteria. A review of NHTSA's National Automotive Sampling System-Crashworthiness Data System (NASS-CDS) and Crash Injury and Research Engineering Network (CIREN) (information also was undertaken to inform the Panel on the high-risk automobile-crash criterion. The final recommendations of the Panel were based on the best available evidence. Where definitive research evidence was lacking, the Panel based its revisions and recommendations on the expert opinion of its members. Consensus among the Panel members on specific recommendations and modifications was not required.

2011 Field Triage Guideline Recommendations

Modifications to the previously published Guidelines have been summarized (Box 2). The sections that follow discuss the changes made and provide the rationale of the Panel for making these changes. The 2011 Guidelines have been endorsed by multiple professional organizations and federal government agencies. The national Highway Traffic Safety Administration concurs with these Guidelines. An updated list of endorsing organizations is available at http://www.cdc.gov/fieldtriage.

Name of the Guidelines

Need for Ventilatory Support: Criterion Added

The need for ventilatory support (including both bag-mask ventilation and intubation) was added to respiratory rate of <10 or >29 breaths per minute (<20 in an infant aged <1 year). Although it has been assumed that patients requiring ventilatory support would meet the respiratory rate criterion, three studies suggest that this is not necessarily the case and demonstrate the importance of considering ventilatory support, in addition to respiratory rate, in identifying seriously injured patients. Among 6,259 adults meeting Step One criteria across 11 sites in North America, an advanced airway attempt (i.e., intubation or supraglottic airway placement) was the strongest predictor of death or prolonged hospital stay among all physiologic measures (29). Among 955 injured children meeting Step One criteria from the same sites, little difference was reported in the proportion of children with abnormal respiratory rates who were seriously injured compared with those whose injuries were not serious (44% and 47%, respectively); however, the need for ventilatory assistance was highly discriminating between the two groups (46% and 3%, respectively) and again was determined to be the strongest physiologic predictor of serious injury (30). Another study involving 3,877 injured children had similar findings, with field intubation attempt being second only to GCS in identifying children in need of trauma center care (31). Therefore, after reviewing the literature and considering the evidence, the Panel added need for ventilatory support to the respiratory rate criterion recognizing that adults and children requiring advanced airway interventions represent a very high-risk group, whether or not other physiologic abnormalities (including specific respiratory rate values) are present and to ensure that patients requiring airway support receive the highest level of trauma care within the defined trauma system.

Additional Physiologic Concerns Discussed by the Expert Panel

The following sections describe additional physiologic criteria topics that were discussed by the Panel and for which no changes were recommended.

Glasgow Coma Scale Motor

Although the Panel considered adding the motor portion of the Glasgow Coma Score (GCS) as an alternative to the GCS total (GCS), which includes verbal, eye opening, and motor components, no change was made. The motor score has been demonstrated to be associated with the need for lifesaving interventions (32,33). Debate occurred as to whether using only the motor score would be easier for EMS personnel than the GCS, however, because of the lack of confirmatory evidence, the long standing use of the GCS

its familiarity among current EMS practitioners, the inclusion of the motor score within the GCS, and complications because of the difficulty of comparative scoring systems, the Panel recommended no change at this time.

Systolic Blood Pressure in Older Adults and Children

The Panel discussed including a systolic blood pressure (SBP) threshold of <110 for patients aged >65 years. After deliberation, the Panel decided to account for physiologic differences in older adults in Step Four under Older Adults; the rationale and clinical evidence are discussed in that section. The Panel maintained the decision to retain the SBP <90mmHg threshold in children. Because of the substantial proportion of young children with no field measurement of blood pressure (31), the Panel believed this decision would have minimal impact on overtriage.

Shock Index

A retrospective chart review of 2,445 patients admitted over a 5-year period at an urban Level I trauma center determined that shock index (heart rate divided by systolic blood pressure) is an accurate prehospital predictor of mortality. However, the Panel identified no evidence to suggest that shock index improves field identification of seriously injured patients beyond the existing physiologic measures, and noted that utilization of the shock index requires a calculation in the field, and its value during field triage remains unclear. The Panel noted that the use of shock index for triage decisions might be more applicable in the future as vital signs and triage criteria become routinely recorded and collected on mobile devices.

Step Two: Anatomic Criteria

hemorrhage control methods and thus potentially result in overtriage; and the •crushed, degloved, mangled, or pulseless extremity,Ž •all penetrating injuries to head, neck, torso, and extremities proximal to elbow or knee,Ž and •amputation proximal to wrist or ankleŽ criteria were as likely to identify severely injured patients regardless of tourniquet use. The Panel recommended further study of the use of this intervention.

Pelvic Fractures

Patients with pelvic fractures should receive rapid and specialized care because of the possibility of internal hemorrhage and other associated injuries. The Panel discussed whether the term •pelvic fractureŽ was the most appropriate term for the Guidelines to use to aid EMS professionals in identifying patients in need of trauma center care, recognizing that certain states and communities have changed this terminology to read •unstable pelvic fracture,Ž •suspected pelvic fracture,Ž or •pelvic instability.Ž After extensive discussion, the Panel decided to retain the term •pelvic fracturesŽ as written because no compelling evidence exists that a different name would identify the patients in need of trauma center care more accurately, for the sake of simplicity, and because adding •suspectedŽ or •tendernessŽ to this criterion might increase overtriage unnecessarily.

Step Three: Mechanism of Injury

In Step Three, the intrusion criterion was modified to include roof intrusion. An injured patient who does not meet Step One or Step Two criteria should be evaluated in terms of mechanism of injury (MOI) to determine if the injury might be severe but occult. Evaluation of MOI will help to determine if the patient should be transported to a trauma center. Although different outcomes have been used, recent studies have demonstrated the usefulness of MOI for field triage decisions. A retrospective study of approximately 1 million trauma patients indicated that using physiologic and anatomic criteria alone for triage of patients resulted in undertriage, implying that using MOI for determining trauma center need helped reduce the problem of undertriage⁴⁶). Another study of approximately one half million patients determined that MOI was an independent predictor of mortality and functional impairment of blunt trauma patients⁴⁷). Among 89,441 injured patients evaluated by EMS providers at six sites, physiologic and anatomic criteria

Re

to access specialized trauma care within this time window by helicopter⁷⁹, field triage in nonurban environments needs to be understood better.

Current peer-reviewed triage literature has described multiple outcome measures, including injury severity, clinical outcomes, need for trauma center resources (with or without a measure of timeliness), or a combination of these metrics. The most common clinical outcome measure is ISS >15, although the AIS 3 has also been used. Trauma center need has been

Areas for Specific Research Using the 2011 Field Triage Guidelines

Several new technologies, which emerge from research in the remote noninvasive monitoring of casualties in austere environments, will likely be commercially available in the near future. Of these innovations, the noninvasive monitoring of heart rate complexity and variability (83), respiratory rate (84), tissue oxygenation, and point-of-care lactate testing (85) appear promising for future field triage, but require more research.

The GCS_n of the GCSs used in state triage guidelines (e.g., Colorado) and has some support in peer-reviewed literature, as noted in the preceding sections. However, additional research is needed to evaluate the use of GCS_n in the context of field triage and the practical implications of changing this Step One criterion.

Advanced automatic collision notification shows promise

8. CDC. WISQARS: web-based injury statistics query and reporting system: injury mortality reports, 2008, United States. Available at <http://www.cdc.gov/injury/wisqars/fatal.html>. Accessed December 13, 2011.
9. CDC. National Ambulatory Medical Care Survey (NHAMCS): 2007 emergency department file. Available at http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm#public_use. Accessed December 13, 2011.
10. MacKenzie EJ, Rivara FP, Jurkovich GJ, et al. A national evaluation of the effect of trauma center care on mortality. *N Engl J Med* 2006; 354:366...78.
11. Haas B, Gomez D, Zagorski B, Stukel TA, Rubenfeld GD, Nathens AB. Survival of the fittest: the hidden cost of undertriage of major trauma. *J Am Coll Surg* 2010;211:804...11.
12. Sasser SM, Hunt RC, Sullivent EE, Wald MM. Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage. *JEMS* 2009. Available at http://www.jems.com/sites/default/files/cdc_field_triage_web_tcm16-205307.pdf. Accessed December 13, 2011.
13. Mistovich JJ, Limmer D. Transition series: topics for the EMT. Upper Saddle River, NJ: Pearson; 2011.
14. Mistovich JJ, Karren KK. Prehospital emergency care. 9th ed. Upper Saddle River, NJ: Pearson; 2010.
15. Gross E, Martel M. Multiple trauma. In: Marx JA, Hockberger RS, Walls RM, et al., eds. Rosen's emergency medicine. 7th ed. Philadelphia, PA: Mosby; 2010.
16. Prehospital Trauma Life Support Committee of the National Association of Emergency Medical Technicians in cooperation with the Committee on Trauma of the American College of Surgeons. PHTLS: Prehospital trauma life support. 6th ed. St. Louis, MO: Mosby; 2007.
17. National Association of EMS Physicians. Field triage of the injured patient. Available at <http://www.naemsp.org/documents/FieldTriageoftheInjuredPatient.pdf>. Accessed December 13, 2011.
18. US Department of Transportation, Federal Highway Administration. Safe, Accountable, Flexible, Efficient Transportation Equity Act: a legacy for users. 42 USC § 300d-4 (2006).
19. Sasser SM, Ossmann E, Wald MM, Lerner EB, Hunt RC. Implementation status of the 2006 Field Triage Decision Scheme, October 2009...April 2010. *West J Emerg Med* 2011;12:275...83.
20. Lerner EB, Shah MN, Swor RA, et al. Comparison of the 1999 and 2006 trauma triage guidelines: where do patients go? *Prehosp Emerg Care* 2011;15:12...7.
21. Faul M, Wald MM, Sullivent EE, et al. Large cost savings realized from the 2006 Field Triage Guidelines: reduction in overtriage to US trauma centers. *Prehosp Emerg Care* 2012. In press.
22. Chen B, Zaebst D, Seel L. A macro to calculate Kappa statistics for

The Morbidity and Mortality Weekly Report (MMWR) is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit MMWR's free subscription page at [http://www.cdc.gov/mmwr](#)