# Emergency Medical Services Triage Using the Emergency Severity Index: Is it Reliable and Valid?

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**Introduction:** Efficient communication between emergency medical services (EMS) and ED providers using a common triage system may enable more effective transfers when EMS arrives in the emergency department. We sought (1) to evaluate inter-rater reliability between Emergency Severity Index (ESI) assignments designated by EMS personnel and emergency triage nurses (registered nurses [RNs]) and (2) to evaluate the validity of EMS triage assignments using the ESI instrument.

**Methods:** This prospective, observational study evaluated inter-rater reliability in ESI scores assigned by prehospital personnel and RNs. EMS providers were trained to use the ESI by the same methods used for nurse training. EMS personnel assigned triage scores to patients independent of assignments by the RN. Inter-rater reliability, differences based on provider experience, and validity of EMS triage assignments (sensitivity and specificity) were evaluated.

**Results:** Seventy-five paired, blinded triages were completed. Overall concordance between EMS providers and RNs was 0.409 (95% confidence interval [CI], 0.256-0.562). Agreement for EMS providers with less experience was 0.519 (95% CI, 0.258-0.780), whereas concordance for those with more experience was 0.348 (95% CI, 0.160-0.536; $\chi^2 = 1.413$, $df = 1$, $P = .235$). Sensitivity ranged from 0% to 67.86%. Specificity ranged from 68.09% to 97.26%.

**Conclusions:** We observed moderate concordance between EMS and RN ESI triage assignments. EMS sensitivity for correct acuity assignment was generally poor, whereas specificity for correctly not assigning a particular level was better. Additional research investigating the potential causes of the poor agreement that we observed is warranted.

**Key words:** Emergency medical services; ESI; Prehospital triage; Triage; Emergency services

Care transitions, often termed "sign out," "handoff," or "handover," occur when 2 or more clinicians exchange information, responsibility, and authority for the care of a patient.[1,2] These 2-way communications between providers, in theory, should facilitate consistency and continuity of care.[3] However, it is well documented that care transitions are vulnerable to communication failures[4-7] and that communication failures are nearly always at the heart of sentinel events.[4,8-11] As a result, The Joint Commission introduced the 2006 National Patient Safety Goal 2E, requiring hospitals to "implement a standardized approach to 'handoff' communications, including an opportunity to ask and respond to questions."[12]

The Institute of Medicine has identified ED settings as being susceptible to "high error rates with serious consequences."[13] Very frequent care transitions occur between emergency medical services (EMS) providers and emergency nurses as prehospital providers bring patients from the community into the hospital setting. These care transitions frequently occur under crowded, high-acuity conditions, creating an environment that is ripe for communication failure.[14,15] Despite the risk, little research examining care transitions occurring between prehospital staff and emer-

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gency nurses has been reported. A recent literature review identified only 8 studies focused on prehospital-to-ED transitions.[15] One qualitative study identified a lack of shared understanding—with "shared understanding" referring to the presence of a common language with which to communicate about a complex clinical situation—as a key barrier to effective transitional communication.[16]

In addition to the potential risks related to communication failures, care transitions from prehospital to emergency nursing personnel in crowded settings can also impact EMS' ability to respond to community calls for assistance. Hospitals have become increasingly affected by inpatient capacity issues with concomitant downstream effects on ED crowding.[17-20] Asplin et al[17] report that the most frequently cited reason for crowding in the emergency department is emergency providers' inability to transfer admitted patients to inpatient beds. When admitted patients are boarded in the emergency department and require continuing care, the ability of emergency clinicians to care for new ED patients is challenged.

The crowded state of emergency departments, in turn, has adverse effects on the prehospital providers and patients who they bring in need of care.[21-23] As crowding has worsened, EMS crews have experienced increases in the time that they spend waiting to transfer the care of their patients to emergency personnel and in the time that they are "out of service" and unable to respond to other emergencies.[22] Many emergency departments respond to extreme crowding with periods of ambulance diversion, asking EMS personnel to divert incoming patients away from their facility during times of crowding.[22] Shen and Hsia[21] investigated the relationship between ambulance diversion and mortality rate in a cohort of 13,860 acute myocardial infarction patients in California. They found that exposure to at least 12 hours of diversion by the closest emergency department to the patient was associated with increased 30-day, 90-day, 9-month, and 1-year mortality rates. Similarly, Yankovic et al[23] found that both high levels of ambulance diversion and simultaneous diversion among several hospitals were related to increased numbers of acute myocardial infarction deaths in New York City.

Diversion from one overcrowded hospital to a more distant hospital results in longer EMS transport times and decreased ability to respond to community needs.[24-27] Pham et al[26] completed a comprehensive review of the literature on ambulance diversion, reporting on 5 studies that showed increased EMS transport times during periods of diversion. Increased transport times and in-hospital time spent waiting to transfer care to ED personnel are significant public health issues because they inhibit EMS providers' ability to quickly respond to additional calls for service in the community.[22]

With these issues in mind, we wondered whether the utilization of a single triage system in both the prehospital and emergency settings might improve communication during these care transitions. Whereas prehospital triage systems tend to rely heavily on clinician gestalt and the patient's presenting complaint, most US emergency departments use the 5-level Emergency Severity Index (ESI) instrument.[28] The ESI was designed for and validated in the ED setting with a variety of types of patients,[29-31] with most studies evaluating registered nurse (RN) use of the tool.[29-32] Because the use of the ESI instrument to triage patients in a prehospital setting has not been reported in the published literature, the objectives of this study were (1) to evaluate inter-rater reliability between ESI triage assignments designated by EMS personnel and emergency triage nurses and (2) to evaluate the validity of EMS triage assignments using the ESI instrument.

## Methods

### STUDY DESIGN

This prospective, observational study was approved by the Institutional Review Board (IRB). Although the requirement for written informed consent was waived by the IRB, an informational letter describing the background for the study and the rights and responsibilities of the study participants was provided to participating EMS personnel. The requirement for written informed consent from transported patients was also waived by the IRB. We evaluated the reliability and validity of triage scores assigned to actual patients transported by the fire department to the emergency department between September and November 2008.

### STUDY SETTING

The emergency department at our institution is an academic referral center with an emergency medicine residency program. The annual ED census was approximately 60,000 patients at the time of the study, with about 27% of patients arriving to the emergency department via EMS. The hospital is a 606-bed tertiary care hospital with an extensive suburban and rural referral area. The fire department covers an urban/suburban environment and transports at least 10 patients per day to our institution. The fire department's Medical Crisis Unit is a full-time professional fire-based EMS service with 160 basic life support providers and approximately 80 advanced life support providers and staffs 4 ambulances with paramedics and emergency medical technician (EMT)–Intermediate level providers. The department