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Prehospital education in triage for pediatric and pregnant patients in a regional trauma system without collocated pediatric and adult trauma centers

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ABSTRACT

Purpose: Patient triage to the appropriate destination is critical to prehospital trauma care. Triage decisions are challenging in a region without collocated pediatric and adult trauma centers.
Methods: A regional survey was administered to emergency medical response units identifying variability and confusion regarding factors influencing patient disposition. A course was developed to guide the triage of pediatric and pregnant trauma patients. Pre- and posttests were administered to address course principles, including decision making and triage.
Results: A total of 445 participants completed the course at 22 sites representing 88 different prehospital provider agencies. Pre- and posttests were administered to 62% of participants with an average score improvement of 53.4% (pretest range 30% to 56.6%; posttest range 85% to 100%). Improvements were seen in all categories including major and minor trauma in pregnancy, major trauma in adolescence, and knowledge of age limits and triage protocols.
Conclusion: Education on triage guidelines and principles of pediatric resuscitation is essential for appropriate prehospital trauma management. Pre- and posttests may be used to demonstrate short term efficacy, while ongoing evaluations of practice patterns and follow-up surveys are needed to demonstrate longevity of acquired knowledge and identify areas of persistent confusion.
Level of Evidence: Level IV, Case Series without Standardized.

1. Background

Trauma is a significant cause of morbidity and mortality, especially amongst adolescent patients, with up to 89.3 per 100,000 pedestrian traffic injuries in the United States alone [1]. With increased awareness of the burden of pediatric and adolescent trauma, injury prevention programs and regional pediatric trauma centers have been established [2,3]. Trauma systems in the United States have evolved to include triage and management principles lowering the mortality of injured patients treated at trauma centers compared to nontrauma centers [4]. Through state and nationwide initiatives to improve the care of all trauma patients, the American College of Surgeons recognized regional pediatric trauma centers (PTCs) to provide optimal care to injured pediatric patients, defined as less than 15 years of age [5,6].

While early reports showed inconsistent results for pediatric and adolescent patients treated at PTCs compared to adult trauma centers (ATCs), data from the National Trauma Data Bank demonstrate improved outcomes and decreased imaging and invasive procedures without additional mortality risk for severely injured adolescent patients treated at PTCs [7]. When both adult and pediatric trauma centers are available in a given region, prehospital providers report significant confusion as to the optimal location for injured adolescent and pregnant patients [7–9]. In the U.S. there are more than 1150 trauma centers with rising numbers of centers with level I designation (the highest acuity designated by the American College of Surgeons) [10]. In a 2000 review of the Kids' Inpatient Database, for example, 89% of injured children received care outside of children's hospitals [11,12].

Abbreviations: PTC, Pediatric Trauma Center; ATC, Adult Trauma Center; MTC, Mixed Trauma Center; NTDB, National Trauma Database; EMT, Emergency Medical Technician; CDC, Center for Disease Control; ACS-COT, American College of Surgeons Committee on Trauma; WREMAC, Western Region Emergency Medical Advisory Committee.

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Similar confusion exists for pregnant trauma patients with physical trauma affecting 1 in 12 pregnant women [13]. In a system with collocated pediatric and adult trauma centers, there has been a movement towards over triage and over admission because of a pregnant state [14]. While some centers have reported use of gestational age as criteria for trauma team activation, there are limited data on appropriate triage if the women's hospital is not collocated within the level I trauma center [15]. Furthermore, research and trauma guidelines support maternal resuscitation and care in order to keep the fetus alive but only rarely mention trauma center designation in triage decision making [16–19].

In this study we sought to describe regional efforts to evaluate existing knowledge of trauma triage among prehospital providers. A program was then designed to educate providers on appropriate care and implement regional protocols to introduce standardized practices and improve patient outcomes.

2. Methods

An educational intervention was performed to clarify appropriate triage of pediatric, adolescent and pregnant trauma patients. Surveys and tests were used to design and measure the effectiveness of an education intervention.

2.1. Study setting

There is one PTC serving all eight counties of Western New York and treating an average of 9100 injured patients annually. The PTC has 24/7 house obstetrical care and is the region's only level 1 NICU. The region's only designated level 1 ATC, located less than 5 miles from the PTC, has extensive resources and specialty trauma care but no pediatric specific services. There is no labor and delivery unit at the ATC but obstetrical consultants are available 24/7 on an on-call basis. There are no other trauma centers serving the eight counties of Western New York. In this region there are approximately 270 responding emergency medical agencies (transporting and non-transporting) including a variety of first responders, Emergency Medical Technician (EMT) Basic, EMT Advanced, and EMT paramedics. In 2015 an active Emergency Medical Service provider was hired as the PTC Coordinator of Trauma Injury Prevention and Educational Outreach within the department of pediatric surgery and trauma.

2.2. Preliminary (formative) survey

As part of an initiative to enhance delivery of care to pediatric trauma patients, a regional survey was administered to emergency medical response units regarding opportunities for EMS outreach and process improvement. The WCHOB Trauma Injury Prevention Coordinator visited multiple EMS provider facilities, hospitals, and ambulance bays to administer survey at the end of 2015. Several different levels and organizations of EMS providers were included in the survey which was collected in a voluntary, anonymous fashion as part of ongoing quality improvement initiatives. Providers were asked open-ended questions regarding how to better facilitate communication and coordination of services with WCHOB.

2.3. Outreach program

Based on the results of the initial survey, a course was developed by the Trauma Injury Prevention and Educational Outreach team as a guide to the triage and management of pediatric and pregnant trauma patients. The lecture, as part of the pediatric trauma and injury prevention educational outreach program, covered several topics including (1) keys to successful pediatric trauma resuscitation; (2) Center for Disease Control Trauma Triage Guidelines; (3) review of preliminary survey of EMS providers; (4) review of region specific age guidelines; (5) discussion and guidelines for triage of pregnant trauma patients; (6) specific trauma care and considerations; and (7) standardized trauma reports. The course included several open-ended questions geared at engaging the participants and assessing knowledge prior to institution of pre- and posttest quizzes (Appendix 1, Pre- and posttest). The pre- and posttest quizzes included five questions each to address five topics covered in the course through multiple choice questions. Topics included case-based scenarios to review (1) major trauma in pregnancy; (2) minor trauma in pregnancy; and (3) penetrating trauma in adolescent patients. The remaining two questions were recall based to address the (4) lower age limit for adult trauma center and (5) major triage factors and decision making for adult vs. pediatric trauma centers. Course and instructor evaluations were also administered to assess ability of the course to adequately accomplish teaching goals and identify areas for improvement. The instructor was evaluated on (1) knowledge of subject matter; (2) preparation for class; (3) effective communication of material; (4) adequate response to students' questions and (5) establishment of positive rapport with students, respectively. The course was assessed for (1) its ability to meet learner's needs; (2) whether or not the course offering matching the descripting in course guide; (3) the pace of the class; (4) the use of materials and handouts and (5) class location and equipment (Appendix 1, course and instructor evaluation).

2.4. Follow-up survey

A follow-up survey was administered using SurveyMonkey®. The survey was distributed through existing list serve by the Trauma Injury Prevention and Educational Outreach Coordinator. All emergency medical response providers that participated in the initial course were included and questions were designed to assess whether or not the individuals had attended the course and whether they had acquired knowledge from their peers if they did not attend the course. The survey also contained a brief knowledge assessment of triage protocols covered in the course such as age of patient and other factors influencing trauma triage (Appendix 2, Follow-up Survey).

2.5. Statistical analysis

Descriptive statistics were performed using Microsoft Excel 2010 to describe the course participants and region served. Pre- and postoperative test scores were compared along with pre- and postintervention rates of adolescent trauma presentations to the regional pediatric and adult trauma centers using Microsoft Excel 2010. Confidence intervals and means were calculated and a p value <0.05 was used for statistical significance using chi-squared to compare pre- and posttest scores.

2.6. IRB review

The study protocol was reviewed by the Institutional Review Board of the University of Buffalo and determined to be exempt from formal review based on incorporation of existing quality improvement initiatives and nonhuman research.

3. Results

3.1. Preliminary (formative) survey

59 surveys were completed by all levels of EMS providers with the exception of Certified First Responders at the end of 2015. With regard to areas for improvement in pediatric trauma services participants requested improvement in communication during triage, increased Continuing Medical Education (CME) opportunities for pediatric care, clearer age guidelines, feedback on critical patients, and decreased clutter in the ED (Table 1). The survey identified areas of confusion with regard to factors influencing patient disposition.