



## Piloting a pediatric trauma course in Western Jamaica: Lessons learned and future directions



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### ARTICLE INFO

#### Article history:

Received 29 April 2016

Received in revised form 5 December 2016

Accepted 5 January 2017

#### Key words:

Pediatric trauma

Trauma education

Patient simulation

Low- and middle-income countries (LMICs)

Jamaica

### ABSTRACT

**Introduction:** Pediatric injuries are a leading cause of death in low- and middle-income countries (LMICs). Despite this, there are few formal pediatric-specific trauma educational initiatives available in LMICs. While new educational tools are being developed to address this, they have not been piloted in LMICs. In Jamaica, pediatric injuries are a leading cause of hospital admission but care is limited by a lack of training in triage and stabilization. Our objective was to implement and evaluate a pediatric trauma course in Jamaica to determine the impact this may have on further course development.

**Materials and methods:** A pediatric trauma course was conducted at the Cornwall Regional Hospital in Montego Bay, Jamaica sponsored by the Children's Medical Services International, a nonprofit organization. Participants took part in six didactic modules, an infant airway intubation skills session, and three clinical simulation scenarios. Participants completed a postcourse survey at the conclusion of the course.

**Results:** Twenty-five participants including surgical, pediatric, and emergency medicine residents from regional- and district-level hospitals in Jamaica participated in the course. Participants viewed the course favorably. Strengths included good review of pediatric trauma physiology, short modules, hands-on practice, and applicable clinical scenarios. Using a Likert-type rating scale of 1 to 10, with 1 being minimal and 10 being very knowledgeable, precourse knowledge was ranked as 5.9, which increased to 9.2 after the course. Using a similar scale, the precourse comfort level to run a pediatric trauma was 4.9 and increased to 8.5 following the course.

**Discussion:** Implementation of this pilot pediatric trauma course was feasible and successful through collaboration with the hosting regional hospital. The lack of formal pediatric training can be overcome by a course such as this which includes both didactics and hands-on clinical patient simulations.

**Level of Evidence:** 4.

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An overwhelming proportion of pediatric injuries occur in low- and middle-income countries (LMICs). The most recent data estimates from 2013 show that of the more than 798,000 children less than fifteen years of age who died from injuries, 95% occurred in LMICs [1]. In terms of disability, more than 90% of disability-adjusted life years (DALYs) from pediatric injuries occur in LMICs [1]. In Jamaica, pediatric injuries are a leading cause of hospital admission, but care is limited by a lack of training in triage and stabilization [2,3].

In 2004, the World Health Organization (WHO) published *Guidelines for Essential Trauma Care* outlining global standards of care from traumatic injury [4]. The report specifies the importance of pediatric trauma and describes how an approach to pediatric trauma differs from adult

trauma, requiring a particular skill set, pediatric-sized equipment, and medication dose adjustments [4]. As such, a training program tailored for the adult trauma patient is not adequate for the pediatric population. Despite this call for action, more than ten years later, there are few formal pediatric-specific trauma educational initiatives available in LMICs.

New educational tools, including simulation, are being developed to address pediatric trauma in high-income countries (HICs). In American resident training programs, the Accreditation Council for Graduate Medical Education uses simulation to teach and assess resident physician competencies [5]. With the purpose of medical simulation to create and act on critical clinical situations, participants can learn from mistakes in the simulated environment without harm to patients [6]. Simulation also has the potential to be an effective assessment tool [6,7]. Many studies have shown how simulation can improve performance in pediatric trauma and medical resuscitations [8,9]. To our knowledge, however, these tools have not been used in LMICs. The

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objective of this study was to implement and evaluate a pediatric trauma simulation-based course in Jamaica to determine the impact this may have on further course development in other international settings.

## 1. Materials and methods

We conducted a prospective interventional study in November 2015 at the Cornwall Regional Hospital, a 400-bed facility in Montego Bay, which serves as the main tertiary care hospital in the Western Regional Health Authority for Jamaica. Working through a nonprofit organization with longstanding ties to the region (Children's Medical Services International), a team of pediatric and general surgeons, neonatologists, and pediatric oncologists led a one-day pediatric trauma simulation-based course.

The course was built on a pediatric trauma curriculum developed at the Children's Trauma Center, Children's Hospital of Richmond (CHoR) at Virginia Commonwealth University (VCU). The course consists of six didactic modules including an introduction to pediatric trauma management, airway, shock, head injury, thoracic/abdominal injury, and burns, focusing on the principles of pediatric trauma resuscitation. The second portion of the course includes an infant airway intubation station and three simulation-based clinical skills stations that present different pediatric trauma scenarios. The scenarios were developed by pediatric surgeons and general surgery residents in consultation with simulation experts at CHoR and revised to be representative of pediatric injury patterns in Jamaica, reflecting injury trends from the 2013 Global Burden of Disease data [1]. The scenarios are summarized as:

- Scenario 1: A 10-year-old boy with an acute abdomen and a right femur fracture following a motor vehicle crash.
- Scenario 2: A 14-year-old boy with a tension pneumothorax and cardiac tamponade following a stab wound to the left chest.
- Scenario 3: A 5-year-old girl with a blown pupil following a 10-ft fall from a tree.

The course offered at Cornwall Regional Hospital was a full-day event held in a classroom setting in the hospital. The morning session consisted of the didactic modules using PowerPoint presentations on a projector provided by the hospital. The afternoon session involved hands-on infant intubation practice and simulated scenarios in small groups. Three instructors taught the course, with each instructor teaching two modules and facilitating one scenario. All instructors were sponsored by Children's Medical Services International. Course supplies included neonatal and infant airway/intubation mannequins, two laryngoscopes, endotracheal tubes, syringes, oral and nasopharyngeal airways, bag valve masks, oxygen masks, and Broselow tape. There were no direct costs for the supplies, which were borrowed from VCU's Center for Trauma and Critical Care Education. Upon successful completion of the course, participants received a certificate of completion.

At the conclusion of the course, participants completed a postcourse survey commenting on their knowledge of pediatric trauma using a 10-point Likert-scoring system (1 = the least knowledge or comfortable; 10 = the most knowledgeable or comfortable). Results were analyzed using Stata 11 [10]. We report the mean knowledge and comfort levels of pediatric trauma before and after the trauma course ( $\pm$  standard deviation) using a paired *t* test. A 2-tailed *p* value less than 0.05 was considered statistically significant.

Participants answered three open-ended questions pertaining to (1) the strengths of the course; (2) areas of improvement of the course; and (3) topics important to pediatric trauma that were not discussed in the course. We analyzed data from these questions in NVivo 9 [11] using the principles of thematic analysis process [12]. To do this, we first became familiar with the data, reading the verbatim responses and noting reoccurring statements. We then identified emerging themes and developed coding categories with respect to the responses. Third, we coded each set of responses according to the categories. Finally, we used the data to confirm that this was meaningful and appropriate

[13]. We ensured that this was a credible process by revisiting the data multiple times during this process as we developed and verified the coding categories [14].

## 2. Results

Twenty-five attendees took part in the pediatric trauma course. The focus was multidisciplinary and included nurses, residents, and physicians from pediatric, internal medicine, surgery, emergency medicine, anesthesia, and neurosurgery subspecialties. Eighteen participants practiced medicine at Cornwall Regional Hospital, while others traveled from the University Hospital of the West Indies in Kingston approximately 130 km southeast from CRH, Falmouth Hospital 20 km east of Montego Bay, Mandeville Regional Hospital in Southern Jamaica, and Savanna La Mar Public General Hospital in Western Jamaica.

Fig. 1 shows that participants' self-assessment of knowledge increased from an average of  $5.9 \pm 1.9$  to  $9.2 \pm 0.7$  following the course ( $p < 0.001$ ). Participants' self-assessment of the extent to which they were comfortable performing skills associated with pediatric trauma, such as airway intubation, increased from an average of  $6.1 \pm 2.5$  to  $9 \pm 1$  ( $p < 0.001$ ). Similarly, participants' self-assessment regarding the extent to which they were comfortable running a pediatric trauma increased from  $4.9 \pm 0.5$  to  $8.5 \pm 0.2$  ( $p < 0.005$ ). On average, participants strongly agreed that the course improved their confidence to lead a pediatric trauma resuscitation ( $9.2 \pm 0.1$  using a Likert scale of 1 to 10). Participants also strongly agreed that pediatric trauma is an important topic in their medical and surgical education ( $9.5 \pm 0.2$ ).

Table 1 lists the strengths and areas of improvement for the course as reported by the participants, respectively. The most often cited strength of the course was that the scenarios were hands-on and interactive, followed by the material being informative, relevant, and current. Areas of improvement included more scenarios and making the course material more relevant to Jamaica, where diagnostic modalities such as computed tomography (CT), magnetic resonance imaging (MRI), and even laboratory studies are rarely available. Table 1 also outlines participants' perceptions of important concepts in pediatric trauma in Jamaica that were not covered in the course. Three topics, drowning, spinal cord injury, and pediatric drug doses, were cited as important when considering injury patterns in Jamaica.

## 3. Discussion

Implementation of this pilot pediatric trauma course was both feasible and successful through collaboration with the hosting regional hospital. The limited formal pediatric trauma training can be improved upon through sessions which include both didactics and hands-on

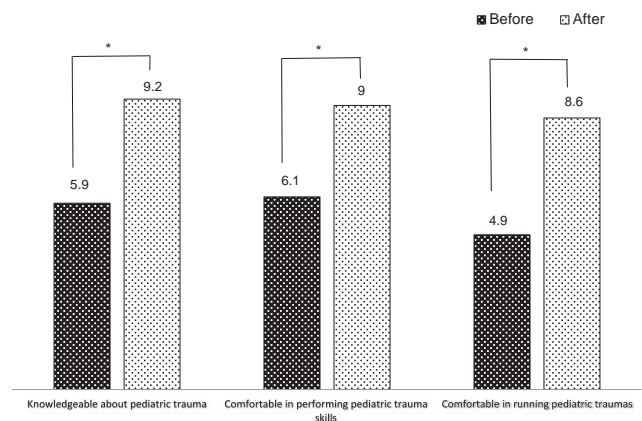


Fig. 1. Average self-assessment of pediatric trauma knowledge and skills before and after participating in a Jamaican pediatric trauma course (rated on a scale of 1 to 10, where 1 = not knowledgeable or comfortable; 10 = the most knowledgeable or comfortable).  $p < 0.05$ .

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