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Pediatric Boot Camp Series: Infant With Altered Mental Status and Seizure—A Case of Child Abuse

James Metz, MD, Kimberly Stone, MD, Jennifer Reid, MD, Rebekah Burns, MD*

*Corresponding author: rebekah.burns@seattlechildrens.org

Abstract

Introduction: Child abuse, also known as nonaccidental trauma (NAT), is an important cause of pediatric morbidity and mortality. The presentation of NAT is often confounded by unclear histories and victims who are unable to provide information. Medical students and trainees may fail to consider NAT as a diagnosis or be unfamiliar with the evaluation process. **Methods:** This curriculum uses simulation, small-group discussion, and didactics to help medical students gain an understanding of presentation of NAT. Using the case of a 2-month-old boy presenting with altered mental status and seizure, participants practice the assessment and management of an acutely ill patient. Small-group discussions facilitate schema building to enhance each participant's ability to recognize and diagnose different diseases that may present as infant seizure and to identify the signs of NAT. Didactics solidify concepts addressed during the simulation and small-group discussions. **Results:** Medical students participating in this course reported that they felt better prepared for their internships and that working through a case with a large differential diagnosis was helpful for their understanding of causes of infant seizures, including abusive head trauma.

Discussion: This curriculum is unique in that it uses one unifying case to allow participants to demonstrate an understanding of the evaluation and stabilization of a critically ill pediatric patient, develop a broad differential diagnosis for a nonspecific symptom, and prioritize and evaluate possible etiologies through the gathering and interpretation of data. This curriculum may be used independently or in conjunction with other learning activities as part of a pediatric boot camp.

Keywords

Simulation, Abuse, Seizure, Pediatrics, Battered Child Syndrome, Nonaccidental Trauma

Educational Objectives

After participation in this simulation and case conference, participants will be able to:

1. Formulate a differential diagnosis for an infant with altered mental status and seizure.
2. Perform medical stabilization of an infant with altered mental status and seizure.
3. Identify physical exam, laboratory, and radiologic findings concerning nonaccidental trauma.

Introduction

Child abuse, also known as nonaccidental trauma (NAT), affects more than 700,000 children annually, with a rate of approximately 9.4 victims per 1,000 children in the United States. Best estimates show there are approximately 1,500 fatalities yearly from abuse and neglect.¹ As a comparison, lymphoblastic leukemia occurs at a rate of 41 cases per one million children between the ages of 0-14 years.² Despite the high prevalence of child abuse, there remains limited training in this field. As with any diagnosis in medicine, when NAT is not considered in the differential, it is rarely diagnosed. We know that abusive bruises are overlooked as abuse by physicians 44% of the time and that a third of abusive head trauma cases are missed on initial exam.³

This child abuse training module was developed to introduce medical students to the topic of NAT and add it to their pediatric lexicon. Introducing the topic of child abuse can be difficult and sometimes emotionally charged. We have developed a high-fidelity, low-stakes module that uses simulation, small-

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Appendices

- A. NAT Simulation Scenario.docx
- B. NAT Simulation Equipment List.pdf
- C. NAT Debriefing Guide.pdf
- D. TeamSTEPPS Glossary.pdf
- E. NAT Small-Group Discussion Facilitators Guide.docx
- F. NAT Laboratory Slides.pptx
- G. NAT Imaging Slides.pptx
- H. NAT Didactic.pptx
- I. NAT Session Feedback Form.pdf

All appendices are peer reviewed as integral parts of the Original Publication.

group discussion, and team decision making to introduce a child abuse case. This module can be used as an independent learning module or incorporated into a more comprehensive training series, such as a pediatric boot camp designed to better prepare fourth-year medical students for residency.^{4,5}

The presentation of an infant with altered mental status and seizure provides an ideal case for learners to use to construct a broad differential diagnosis and practice hands-on stabilization of a patient with an unknown underlying medical problem. There are many potential causes of seizure in this age group, but the initial management is generally the same.⁶ The case provides a realistic opportunity to manage a critically ill child while simultaneously having to consider downstream steps in the evaluation of an underlying cause. In our respective fields (pediatric emergency medicine and child abuse medicine), we often find that trainees do not consider NAT as a potential etiology for an injury when a clear story is not available. Whether from limited exposure to NAT cases, a lack of training in child abuse pediatrics, or an inability to fathom the different ways that children can be abused, trainees are more likely to miss these high-risk cases.

Curricular design included careful consideration of adult learning principles, including facilitation of schema development, illness scripts construction, and active learning through participation. The course is best completed over the course of 1 day so that the details of the case stay fresh in participants' minds. Although other simulation-based curricula on NAT exist,⁷ this one is unique in that it incorporates in-depth discussion about the possible differential diagnosis for an infant presenting with seizure as well as a didactic component about child abuse. The content, including case details and progression, was selected from our personal experiences in the clinical setting.

This curriculum was originally developed for a target audience of graduating medical students entering fields of practice, such as pediatrics, family medicine, emergency medicine, where they will care for pediatric patients. It would also be appropriate for residents, nurses, and respiratory therapists in these fields as well. Ideally, participants would have prerequisite knowledge of how to assess and stabilize airway, breathing, and circulation in a pediatric patient. Baseline knowledge of first-line antiepileptic medications administered for seizure is also helpful. During small-group discussions, participants should have knowledge of how to read and interpret chest radiographs. Preparticipation review of these skills may be helpful for some learners.⁸⁻¹¹

Methods

The workshop begins with learners participating in a simulation using the scenario of an infant presenting to the emergency department with a chief complaint of altered mental status and difficulty breathing (Appendices A & B). The infant develops seizure activity and must be stabilized, which includes support of airway, breathing, and circulation. The simulation ends when the patient has been stabilized. The simulation is intended to end without a clear diagnosis for the seizures. The main focus during the simulation should be the assessment and medical management of an infant with altered mental status and seizure.

The initial debrief should focus on discussing teamwork and communication; the assessment and stabilization of airway, breathing, and circulation; and the initial management of seizure. Appendix C provides a detailed guide for debriefing that may be used for this particular case. Appendix D is a glossary of terms related to teamwork and communication that may be helpful to discuss when debriefing about team dynamics and performance.

After the simulation debriefing, learners should form small groups with an ideal ratio of four students per facilitator. Appendix E serves as the facilitator guide for the small-group sessions. In their groups, participants should draft an extensive list of possible causes for altered mental status and seizure in an infant. Based on the information received during the simulation and knowledge of the most common causes, each group should select the three etiologies it feels are most likely. Each small group should

share its overall list and top three with the whole group.

Next, the presenter should ask what laboratory or imaging evaluations the participants would like completed to aid in making a diagnosis, in addition to any bedside labs obtained during the simulation such as blood glucose, blood gas, and so on. Using Appendix F, the presenter shows the participants the laboratory values they have requested. Any study that would not return within 1 hour should be reported as pending in order to maintain realism. After all requested labs are presented, small groups should reassess their differential diagnoses. Any causes that have been ruled out should be crossed off. Small groups should redetermine their top three most likely causes and share them with the large group.

The presenter next shows the participants the patient's chest radiograph (Appendix G). Participants can be asked to evaluate specific aspects of the image; for example, one participant might be asked to comment on the airway, another on the contour of the diaphragm, another on the lung fields, and so on. Even if the rib fractures are identified early on, the entire image should be thoroughly reviewed. After the group has finished evaluating the radiograph, small groups should again be asked to reestablish the top three most likely etiologies.

Next, the presenter should show the head CT images (Appendix G) and ask the participants to identify any abnormal findings. Although the ability to read a head CT is not a prerequisite for participation in this workshop, the large subdural bleeds should be identified. Participants should again be asked to rank the etiologies they think are most likely to have caused altered mental status and seizure in the infant from the simulation scenario and what additional information, if any, would help in solidifying their diagnosis. The underlying etiology of child abuse should then be revealed to the participants by the facilitators. Participants should be asked what further evaluation is required at that time. Further steps include obtaining a skeletal survey to look for other injuries as well as a dilated retinal exam to evaluate for retinal hemorrhages.¹² Local practices and policies regarding mandatory reporting to child protection agencies or law enforcement should be discussed at this time.

The presenter may then provide didactic education about NAT (Appendix H). Appendix I may be used to obtain participant feedback after the workshop. See the [Table](#) for details on timing, personnel, equipment, and resource files needed for each component of the workshop.

Table. Overview of Time, Personnel, Equipment, and Resource Files Required for Workshop

Activity	Time Allotment	Personnel	Equipment	Resource Files
Simulation	45 minutes	Simulation technician, two confederates	See Appendix B	Appendix A
Debrief	45 minutes	Two facilitators	None	Appendices C & D
Discussion and presentation of differential diagnosis	30 minutes	Small-group facilitators (1:4)	Pens, paper, easel, markers	Appendix E
Presentation of labs and representation of differential diagnosis	20 minutes	Presenter, small-group facilitators (1:4)	Computer, projector, pens, paper, easel	Appendices E & F
Presentation of chest X-ray and discussion	10 minutes	Presenter, small-group facilitators (1:4)	Computer, projector	Appendices E & G
Presentation of head CT and discussion	10 minutes	Presenter, small-group facilitators (1:4)	Computer, projector	Appendices E & G
Didactic	45 minutes	Presenter	Computer, projector	Appendix H
Wrap-up	5 minutes		Evaluation forms, pens	Appendix I

Optional Additional Activity

If learners have participated in a workshop focused on discussing difficult news with pediatric patients and their families such as our previous MedEdPORTAL publication,⁵ they may role-play discussing the strong concern for child abuse as well as the severity of the injuries with each other.

Low-Fidelity Adaptation

If using a low-fidelity simulator, a facilitator should provide exam findings as the participants are evaluating the mannequin. For example, “The infant is having irregular, slow breathing,” or “There is new tonic-clonic movement of the extremities.”

Results

This curriculum has been used with a total of 14 fourth-year medical students over the past 2 years. While the simulations were conducted in groups of six and eight, all small-group discussions occurred with one facilitator per three or four students. Using a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*), all 14 students strongly agreed that the session was useful. Additionally, 10 of the 11 participants who responded to a postcourse survey strongly agreed with the statement “I feel more prepared for internship after this session.” The remaining participant agreed with the statement. Students reported that the process of using simulation to work through a case with a broad differential and then continuing to build on the case throughout the day was useful. Examples of feedback include “The simulation case, thinking of a wide differential were very useful,” and “It was great to have a sim/case that let us think broadly.”

Constructive feedback included suggestions to allow students to immediately repeat the simulation after the debriefing in order to implement suggestions on teamwork, communication, and medical management at once.

Discussion

We have found that participants are often emotional at some point during this module. It is difficult for many people to consider the possibility that grave injuries and possible death can be the results of violence against a child. Providing a safe environment where learners are able to discuss and reflect allows them to explore and process in a way that is not always possible in the moment in a real clinical setting. Students have often expressed that they feel empowered at the end of the day, feeling as if they may be able to identify and help at least one child suffering from abuse at the hands of a caregiver.

Having students begin the day in a simulated environment allows them to connect the subtle findings and nonspecific ways child abuse may present with underlying cause. Our participants have expressed appreciation for the hands-on practice with clinical stabilization of a child with altered mental status and seizure in the context of a realistic scenario when the diagnosis is not immediately clear. The stepwise process of creating and prioritizing a differential diagnosis that changes as new information becomes available allows learners to construct a mental schema that may be retrieved and manipulated in future clinical practice.

Through our experience, it seems that the simulated portion of this workshop is best suited to a learner group that has had recent education and practice on the management of airway, breathing, and circulation in a critically ill patient. The tactile portion of the simulation is therefore a review instead of a time to learn new skills. Similarly, participants should have a basic understanding of how to read a chest X-ray. A brief primer or handout may be needed depending on the baseline knowledge level of participants. In the second iteration of our workshop, presented as part of a 2-week boot camp for medical students entering into pediatrics, family medicine, and emergency medicine residencies, we included more time for discussion during the simulation debrief and small-group discussions. Students often spend time making connections between the current information and previous discussions on pathology and medical management.

Unfortunately, NAT is a global problem present in virtually all settings and cultures. Although local laws and practices may vary, the need to provide timely medical care and identify the underlying cause in order to protect the patient, as well as other children potentially in the care of the offender, is universal. This curriculum may be used to start the conversation about child abuse and provide health care workers with a basic understanding of the patterns of presentation.

James Metz, MD: Fellow in Child Abuse, University of Washington School of Medicine

Kimberly Stone, MD: Associate Professor, Department of Pediatrics, Division of Emergency Medicine, University of Washington School of Medicine

Jennifer Reid, MD: Associate Professor, Department of Pediatrics, Division of Emergency Medicine, University of Washington School of Medicine

Rebekah Burns, MD: Assistant Professor in Pediatrics, University of Washington School of Medicine

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