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Pediatric Simulation Cases for Primary Care Providers: Asthma, Anaphylaxis, Seizure in the Office

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Abstract

Introduction: Although pediatric emergencies commonly occur in the outpatient setting, studies show that primary care providers often rely on hospitals or the emergency medical system to evaluate the distressed patient. This simulation-based curriculum addresses pediatric emergencies encountered by primary care providers. The cases were facilitated by faculty at an annual conference on urgent pediatric problems.

Methods: Three cases are included in this curriculum: asthma, anaphylaxis, and seizure. Each features a brief narrative description of the case, learning objectives, instructor notes, an example of the ideal flow of the scenario, and anticipated management mistakes. Also provided are tools on optimizing the simulation environment, teamwork and communication, and the debrief. Educational materials are included in the respective medical pathologies. The simulations can be run using a high- or low-fidelity mannequin.

Results: The simulations were carried out annually for 4 years with over 100 providers. Participants overall felt the curriculum was relevant to their practice in the realms of medical management and patient-provider communication. **Discussion:** These simulation cases train primary care providers to recognize a decompensating patient, activate the emergency response system, and initiate appropriate treatment for acutely ill pediatric patients with asthma, anaphylaxis, or seizure. The cases also reinforce teamwork and communication skills with the intention of improving overall readiness in the office. The simulations have been found to be effective learning tools at the University of Washington, which continues to train outpatient providers in emergency response annually using this curriculum.

Keywords

Simulation, Asthma, Emergency Medicine, Anaphylaxis, Seizure, Pediatrics, Primary Care Pediatrics

Educational Objectives

By the end of this activity, learners will be able to:

1. Provide effective initial management of a pediatric patient with asthma, anaphylaxis, or seizure in their primary care setting.
2. Recruit assistance in managing a pediatric patient with asthma, anaphylaxis, or seizure in their primary care setting.
3. Demonstrate effective teamwork and communication skills while managing an emergency.
4. Identify systems opportunities to improve the care of a pediatric patient with asthma, anaphylaxis, or seizure in their primary care setting.

Introduction

The primary care provider plays an important role in the pediatric emergency care system.¹ When a child endures a potentially life-threatening illness, it is natural for caregivers to seek initial help from the provider that they know and trust.² The outpatient office serves as a primary entry point to the emergency care system across various geographic settings; in one report, 62% of pediatricians treated a patient with an urgent condition more than once weekly.³ A survey of suburban pediatric practices with an average of 2.2 practitioners per office reported a median of 24 emergencies per practice occurring annually.⁴ Despite this, many health care professionals feel that outpatient emergencies are uncommon and, when they do occur, often rely on emergency medical services to respond to the distressed child before providing

Appendices

- A. Simulation Case Asthma.docx
- B. Simulation Case Anaphylaxis.docx
- C. Simulation Case Seizure.docx
- D. Simulation Environment Preparation.docx
- E. Teamwork and Communication Glossary.docx
- F. Debriefing Materials.docx
- G. PowerPoint Asthma.pptx
- H. PowerPoint Anaphylaxis.pptx
- I. PowerPoint Seizure.pptx
- J. Handout Asthma.docx
- K. Handout Anaphylaxis.docx
- L. Handout Seizure.docx
- M. Simulation Session Evaluation Form.docx

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

stabilizing measures. Studies show that in general, practices are not prepared to manage pediatric emergencies and have documented deficiencies in equipment and training.^{5,6} Only one-half of surveyed pediatricians felt prepared to manage their most common emergencies in one urban setting.² The American Academy of Pediatrics has issued a policy statement encouraging frontline caregivers to receive training in basic and advanced life support in order to improve survival of children.⁷

Simulation is one tool that can be used for education and systems testing for rare but risky events. Targeted education and practice with teamwork and communication may also lead to improved care in a crisis.⁸ A recent needs assessment for medical providers working in a remote Alaskan setting revealed the desire for medical simulation practice. These providers acknowledged that the lack of both a curriculum and resources was a barrier to incorporating a simulation program and expressed a desire for simulation-based training in the realms of teamwork, communication, respiratory distress scenarios, and supportive ventilation skills.⁹ This result is not surprising, as respiratory emergencies, along with seizures, are among the most common emergencies encountered in the outpatient setting.¹⁰

The purpose of this module is threefold:

- To teach the pediatric primary care provider how to recognize, treat, and stabilize the child with asthma, anaphylaxis, or seizure in the outpatient clinic setting.
- To increase the effective teamwork and communication of the clinic staff during an emergency.
- To help participants identify systems and process opportunities within their own environments to make managing emergencies more efficient and effective.

We have provided materials (including content to assist with preparation, setup, facilitation, and debriefing) to help instructors implement simulations focusing on three common pediatric emergency scenarios: asthma, anaphylaxis, and seizure. These specific scenarios were chosen based on consultation with pediatricians in our community who acknowledged the relative frequency of these high-stakes medical scenarios. The debriefing tools we provide allow for adaptation depending on site and learner needs as well as individual experiences during the simulated scenario. They also facilitate the identification of systems issues and opportunities for improvement. We have also included supplementary educational materials and an evaluation form for learners to use to provide feedback on the sessions.

While a curriculum for resident learners responding to the pediatric emergency in the outpatient setting has previously been published in *MedEdPORTAL*,¹¹ our curriculum was developed for a target audience of pediatric and family medicine primary care physicians, physician assistants (PAs), nurse practitioners (NPs), nurses, medical assistants, and other clinic staff who may be called on during a medical emergency outside of a hospital or emergency department. It would also be appropriate for pediatric, family medicine, and emergency medicine residents and PA, NP, nursing, and medical students. Although *MedEdPORTAL* has published other simulation-based curricula addressing asthma,¹² anaphylaxis,^{13,14} and seizures,¹⁵⁻¹⁸ ours is unique in that it is intended to help primary care physicians, PAs, NPs, nurses, and other support staff activate emergency protocols, stabilize an acutely ill patient, and function as a team in their native settings. Participants should have prerequisite knowledge of how to perform a rapid assessment of the airway, breathing, and circulation in a child. Preparticipation review of these skills can be included as needed.¹⁹

Methods

Intrinsic motivation to be adequately prepared in one's clinical environment is a strong driving factor for many practitioners to participate and learn. We designed this curriculum guided by adult learning principles, with simulation as the educational strategy, to facilitate an active learning environment through participation. The curriculum allowed learners to systematically perform a rapid initial assessment and demonstrate the initial stabilization for pediatric patients presenting with asthma, anaphylaxis, and seizure using only what was available to them in their own clinical setting. Because it required participants to

function as a team, it also offered participants the opportunity to practice and refine team communication, leadership, and followership skills, as well as to assess their own environments for systems and process opportunities to improve the care they provide. During the debrief, the facilitators asked the teams to reflect on their performance, assess their current systems and processes, and identify areas with improvement opportunities. Given the high-risk, low-frequency nature of these emergencies and the short duration of the simulations themselves, the cases may be used for deliberate practice until participants are able to swiftly assess and manage each emergency.

Development

The simulation scenarios (Appendices A-C), simulation environment preparation (Appendix D), teamwork and communication (TeamSTEPPS)²⁰ glossary (Appendix E), and debriefing guide (Appendix F) were developed for preparation and execution of the simulations and corresponding debriefs. PowerPoint presentations (Appendices G-I) and handouts (Appendices J-L) were used to provide additional education to facilitators or participants. An evaluation form (Appendix M) collected feedback from participants. We designed this curriculum to reach a wide breadth of learners without assuming any prerequisite medical or simulation facilitation knowledge, reflecting the diversity of health care professionals who respond to emergencies in the outpatient primary care setting.

Equipment/Environment

The setting was an outpatient primary care or urgent care clinic room. We have run these simulations with both high- and low-fidelity mannequins. Although we ran the simulations in a classroom as part of a workshop, they should be run in the learners' native clinical environments with only the equipment and resources that would normally be available. See the simulation environment preparation document for a complete suggested equipment list. Because these scenarios were designed for the outpatient setting, rapid laboratory results and images are not included. However, if a clinic site does have these capabilities, they may be incorporated into the scenarios in a time line that is realistic. For example, if a site has the ability to measure a blood glucose level before emergency medical services arrive, the facilitators may provide verbal results when appropriate.

Low-fidelity adaptation: Vital signs may be provided using a tablet or phone application. Facilitators may also verbally provide vital signs and physical exam findings while learners are examining the mannequin. If no mannequin is available, groups can use their creativity by substituting anything from a toy doll to a live actor. What is most important for educational purposes is that the simulation facilitator practices the scenario beforehand, is prepared, and clearly sticks to the case's specific learning objectives.

Personnel

The number of participants was adjusted to reflect the real-life clinical setting for participants. The scenario was repeated to involve additional personnel. Pediatric emergency medicine providers served as the facilitators and simulation technicians. Learning was best achieved if all participants were functioning in their normal roles. For example, if a more experienced nurse would ordinarily function in the role of medication administration, then he or she took on that role during the simulations, although this could be adjusted depending on learner needs.

Implementation

The simulation activity included facilitators and personnel as described above. Given that this curriculum was offered as part of a regional education conference, we did not bring simulations to the actual clinic rooms, as the simulations were run in a conference setting. That being said, the ideal setting to run these simulations would be the actual clinic or urgent care patient rooms to heighten realism, if possible. We recommend that the facilitator set aside protected time to run the simulation in order to maximize the attention of the participants. We devoted 20-30 minutes per scenario to participation and debriefing. All simulation equipment was assembled prior to the activity, including the cases and equipment recommended in the simulation environment preparation document. The teamwork and communication

glossary was used as a guide for participants to familiarize themselves with TeamSTEPPS²⁰ principles. Debriefing materials were used by the facilitator to prepare for the debriefing portion of the sessions. The educational PowerPoint presentations and handouts can be reviewed and distributed after the sessions to reinforce key learning points. Alternatively, they may be provided before the simulations to help prepare team members for the scenarios, depending on the overall goals of the session. Given our time constraints, we used them as facilitator preparation. The simulation session evaluation form was distributed to participants in order to evaluate the simulations and debriefing sessions as well as the learning activity as a whole.

Assessment

The debriefing materials included an overview, a framework for debriefing, scripts, and a medical management checklist form, which allowed for formative assessment of individuals and teams that could be discussed during the debriefing portion of the session.

The evaluation form allowed for participant feedback on whether the simulation was relevant, realistic, and performed in a safe learning environment. The participants were encouraged to reflect on whether the simulation was effective in teaching basic skills, medical management, and teamwork (Kirkpatrick Level 2²¹). Participants were asked to describe how the simulations might alter their medical management in the future (Kirkpatrick Level 3²¹). Finally, the participants were encouraged to provide comments/opinions of the simulation as a whole (Kirkpatrick Level 1²¹).

Debriefing

For debriefing with learners and facilitators, we generally allowed approximately twice the amount of time used for simulation. The debriefing materials were used to facilitate the discussion and provide formative feedback (assessment) with regard to medical management, teamwork/communication, and systems opportunities. The PowerPoint slides and handouts can be used to provide supplemental content education regarding the diagnosis and management of these specific problems. Feedback from participants can be gathered using the simulation session evaluation form.

Results

Over the past 4 years, we implemented these simulation modules with approximately 120 outpatient and urgent care pediatric providers from the community at Urgent Pediatric Problems, an annual continuing medical education (CME) conference put on by the Seattle Children's Hospital's Division of Emergency Medicine. The curriculum received overwhelmingly positive feedback from the diverse participant population, a mix of physicians, NPs, PAs, nurses, naturopaths, and medical assistants.

At our offering in March 2017, the curriculum received an average score of 4.9 (1 = *strongly disagree*, 3 = *neutral*, 5 = *strongly agree*) from participants ($n = 50$) when they were asked if the content was relevant to their practice. Specifically, 48% of respondents responded that the curriculum affected the way in which they would medically treat their patients, 34% responded that the curriculum affected the way in which they would relate to and communicate with patients and families, and 52% responded that the curriculum would affect how they educated patients and families. Participants had several positive comments regarding the sessions. For example, one attendee wrote, "Enjoyed the office emergencies workshop—very useful practice and brings up the questions of what we need to keep in our offices." When asked what elements of this course participants would use to change their practice and how they would implement the changes, responses included the following:

- "I'd like to start drills at our clinic for emergency calls."
- "Make sure I and my MA (medical assistant) know where epi-pen is."
- "More aware about involving others in the work place."
- "Try to implement mock emergent situation drills in our clinic."
- "Simulator class made me think through a variety of scenarios."

Constructive feedback included requests for more simulation scenarios and more practice during the sessions.

Discussion

We devised this resource as a comprehensive curriculum to support facilitators in preparing for pediatric emergencies. The curriculum was designed to teach the recognition and management of three common pediatric emergencies that may present in the outpatient or urgent care setting, improve teamwork and communication in an outpatient emergency, and help identify systems opportunities when managing emergencies in the outpatient setting.

The selection of asthma, anaphylaxis, and seizure as our simulated emergencies was the result of careful consideration and feedback. They are relatively high-frequency and high-stakes scenarios that outpatient providers may encounter, necessitating rapid patient assessment and stabilization. The three diagnoses came from an initial list of over 10 potential pediatric emergencies (e.g., sepsis, bronchiolitis, etc.). We subsequently surveyed a subset of registrants for our course to identify the scenarios they most wanted to practice. Since then, we have trialed a variety of scenarios, eliciting verbal feedback on the relevance of each. The three scenarios presented here are most consistently identified as having the greatest relevance to our participants.

A limitation noted during our implementation of these scenarios in the workshop setting was a lack of realism. This curriculum was initially developed as part of a daylong conference on urgent pediatric problems. Historically, this conference has been attended primarily by physicians and advanced practitioners, with at times a few nurses and medical assistants. Simulation teams therefore differed from the care teams in most outpatient settings. This often meant that we had a disproportionate number of providers present, some of whom were playing roles they would not normally fill, likely diminishing realism. Our group did not use surrogates or actors to play other roles when no nurses or medical assistants were present; however, this approach can certainly be considered, if available. In addition, due to practical limitations, all sessions were conducted in a conference room (not in a simulation center or actual clinic room). Feedback forms noted that it was more difficult for learners to suspend disbelief in this setting. Based on our experience, we recommend implementing these scenarios in the clinical setting where they would actually occur to enhance realism, allow for better systems analysis, and thereby maximize learning. In situ simulation is ideal, albeit not feasible at all times due to workflow and staffing constraints.

We have received valuable feedback from participants regarding the content of our curriculum. We found that due to limited interventions in many settings (e.g., schools, primary care sites without the ability to establish IV access, etc.), scenarios that rely on more invasive interventions (e.g., fluid boluses, IV antibiotics) were less relevant to our participants. We therefore modified the scenarios accordingly in response to this feedback. We have also learned that prior to beginning a scenario, querying the participants' specific clinic capabilities allows the instructor to titrate the scenario so that the team is practicing what it would really be able to do, not a textbook recommendation for management. This includes gathering monitoring and airway equipment that would be available as well limiting medical interventions to those that would be realistically accessible. Ideally, the scenarios should be conducted in situ so that participants must find the necessary supplies.

We recognize that these simulations have been facilitated by pediatric emergency medicine faculty in the context of a CME conference at an academic children's hospital. When the scenarios are carried out at disparate outpatient and urgent care sites, a primary care physician will be in the role of the simulation facilitator, which might be a new role for that person. For that reason, this curriculum includes information to consult when preparing the simulation environment, as well as a glossary of simulation language and debriefing materials with scripts.

A limitation to our results is that we have not gathered information about how learners changed their practice environment or clinic equipment following the simulations. We are currently piloting these simulation scenarios in a rural outpatient setting in bush Alaska, following a needs assessment demonstrating that providers there desired to practice responding to the pediatric patient in respiratory distress.⁹ This desire is not surprising given the high rates of pulmonary disease endemic to that particular region. We are currently studying the feasibility of implementing the simulation scenarios at this rural site, and future studies will focus on assessing changes in knowledge skills and practices in our participants.

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Reported as not applicable.

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