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A Child With Limb Pain: A Case-Based Learning Module and Teaching Resource for Pediatric Infectious Diseases

Jennifer Tam, MD*, Anu Wadhwa, MD

*Corresponding author: jennifer.marie.tam@gmail.com

Abstract

Introduction: While case-based learning is an effective method, teaching resources in pediatric infectious diseases are limited. Thus, we developed a case-based learning module for a common pediatric infectious diseases topic, osteomyelitis. **Methods:** This module contains two resource files, both meant to be printed. The case file contains questions with blank spaces for the trainee (medical student, junior resident) to complete. The case answers file is used as a guide by the teacher (attending physician, fellow, senior resident) and/or the trainee after working through the case. This resource may be used in one-to-one sessions, in a small-group setting, or as self-directed learning. The session is estimated to take 60-90 minutes. A suggested reading list is included. **Results:** This resource was used in a small-group format with the pediatric residents of the Hospital for Sick Children in Toronto for an academic half-day session in November 2015. Twenty-eight learner evaluations were received. The session was rated a 4.8 out of 5 (with 5 = outstanding) and ultimately voted by the residents to be the best academic half-day session of the year. Compared to delivering a didactic lecture on the same topic, the facilitators found preparation time was reduced and interactions with the trainees were more engaging. All were willing to facilitate a similar session again. **Discussion:** This resource was effective and popular from the perspective of both learners and teachers. Additional modules are currently under preparation in order to create a case-based teaching resource for pediatric infectious diseases.

Keywords

Case-Based Learning, Osteomyelitis, Pediatric Infectious Diseases

Educational Objectives

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

1. State an approach to acute limb pain in children.
2. Discuss a diagnostic approach to osteomyelitis in children.
3. Describe the epidemiology, pathogenesis, and clinical features of osteomyelitis in children.
4. List the common microorganisms causing osteomyelitis in children.
5. Discuss the treatment of osteomyelitis, including antibiotic choice and duration.
6. Explain the prognosis and long-term complications of osteomyelitis.

Introduction

Balancing service provision and educational needs in training programs is a challenge inherent to medical education. Arguably, increasingly complex patient care demands and rapidly growing medical knowledge requirements have made finding time for deliberate teaching even more difficult. Thus, resources providing efficient and effective teaching that can be adapted to a variety of contexts while still encouraging self-directed learning are essential.

Currently, there are limited case-based teaching resources available in the field of pediatric infectious diseases. In 2007, the American Academy of Pediatrics published *Challenging Cases in Pediatric Infectious Diseases*, which is a compilation of 50 case studies of pediatric infectious disease

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Appendices

- A. ID Casebook - Osteomyelitis.pdf
- B. ID Casebook - Osteomyelitis Answers.pdf

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

presentations organized by age group.¹ The book provides a description of each case followed by three questions asking for the differential diagnosis, how to evaluate the patient, and how to treat the patient's condition. Next comes a discussion about the diagnosis and treatment. Our resource differs from that book, however, in that our module involves more guiding questions that require the learner to look for the answers in the suggested readings rather than providing answers in a textbook paragraph format. We designed the module this way in order to provide more opportunity for inquiry and critical thinking. On MedEdPORTAL, there are a number of case-based learning resources, but only limited resources focusing on pediatric infectious diseases, particularly at the postgraduate level. The most similar resource to ours is "Pediatric Respiratory Infections: Case Based Learning," by Dr. Marta King,² although Dr. King's resource is meant to be role-played by participants and ours is not. Case-based learning is evidently a popular learning tool on MedEdPORTAL, making it a fitting platform for us to share our work.

This module was developed as the first of a case-based learning collection of pediatric infectious diseases topics titled the Pediatric Infectious Diseases Casebook. The Pediatric Infectious Disease Casebook will cover common clinical case encounters in an interactive format in which the trainee is guided through a case via a series of questions, ranging from developing a differential diagnosis to questions related to the topic being reviewed. This process can be facilitated by any medical teacher, including senior residents, fellows, or attending physicians. In this format, the resource not only teaches content knowledge but also encourages the clinical reasoning process. The resource has the added benefit of requiring minimal supplies (just printed paper) and minimal preparation from teachers, as an answer key and suggested reading list are included.

Case-based learning has been shown to be a more effective method of learning than some other conventional instructional methods, such as didactic lectures. It provides an opportunity for the trainee to think critically in a more clinically realistic context.³ Additionally, case-based learning, known as a guided inquiry approach, provides more focused learning and more efficient use of time compared to problem-based learning, known as an open inquiry approach.⁴ Case-based learning has been found to be an enjoyable experience for both learners and teachers.⁵

This particular module is meant to provide an effective and convenient case-based learning tool for teachers to review a common pediatric infectious diseases topic, osteomyelitis.

Methods

We developed a case-based learning module for acute hematogenous osteomyelitis in childhood. The module is composed of two resource files that are meant to be printed.

The ID Casebook - Osteomyelitis document (Appendix A) should be given to the trainee. The file consists of a case with questions with blank spaces for the trainee to complete, as well as a suggested reading list. A posttest quiz with a reflective question about the resource is appended.

The ID Casebook - Osteomyelitis Answers document (Appendix B) contains the answers to the questions. It may be used as a guide by the teacher and/or by the trainee after working through the case.

The teacher may be an attending physician, fellow, or senior resident. As the resource includes answers, the teacher does not need to be an expert in the topic; however, clinical experience with acute osteomyelitis enriches the discussion. The trainee may be a junior resident or medical student. While this resource was designed for trainees in pediatrics, it may also be applicable to family medicine physicians, physician assistant students, and advanced practice nurses.

This resource was designed to be used in a one-to-one teacher-trainee scenario for informal teaching sessions during an appropriate trainee rotation (e.g., pediatric infectious diseases). The teacher should guide the trainee through the questions and engage the trainee in discussions inspired by the case and/or questions as appropriate. The resource may also be used in a small-group discussion, which we have trialed in groups of four to five learners. To prepare, all facilitators read the provided answer key, while some also read the additional suggested readings. Personal notes may also be reviewed. Facilitator preparation time has ranged from 30 minutes to 3 hours. Many pediatric residents reviewed the

precirculated case questions and suggested readings prior to the session, which they felt made the session more valuable. This resource may also be used as self-directed learning if a teacher is not available.

The teaching session is estimated to take 60-90 minutes but may be shorter or longer depending on how in depth the teacher and trainee wish to discuss the topic. If there is limited time available, the teacher may choose to focus on specific questions and skip others depending on the areas of learning suitable to the trainee. To focus on the approach to limb pain, complete questions 1-7. To focus on the basics of osteomyelitis, complete questions 8-14, 18, and then 20-27. To focus on sacral osteomyelitis (a more advanced topic), complete questions 15-17 and 19.

The case can be given to the trainee prior to the session to allow the trainee to prepare. The suggested reading list for the case is intentionally composed of commonly available references that are easy to access.

Results

This case-based learning module was used in a small-group format with the pediatric residents of the Hospital for Sick Children in Toronto for one of their academic half-day sessions in November 2015. The session was scheduled for 90 minutes, although most groups finished earlier than this. Approximately 28 trainees were divided into six small groups, each led by a facilitator.

Twenty-eight evaluations from the pediatric residents were received. It is possible that there were more learners who attended but did not fill in evaluations, although because the evaluations were also used as attendance markers this sample should be mostly representative. The residents included first-year, second-year, and third-year learners.

Overall, the session was rated a 4.8 out of 5 (with 1 = *unsatisfactory*, 3 = *average*, and 5 = *outstanding*). Comments from the residents included the following:

- “Excellent session! Would like more of the same.”
- “Awesome discussion, very pertinent to day-to-day practice.”
- “Excellent relevant topic rooted in evidence and interactive. Enjoyed small groups.”

Feedback for the individual facilitators was also very positive, with all components (including facilitator preparation, engagement, and encouraging participation) being rated from 4.5 to 5 out of 5. Comments included the following:

- “This was one of the best sessions of the year. Emphasized important, practical points.”
- “Easier to be engaged in smaller group setting. Easier to ask questions.”
- “[Facilitator] was very well prepared, approachable and made an open learning environment. Learned a lot about [osteomyelitis] management and diagnosis. Great suggested readings!”

Residents also rated the promotion of active learning and achievement of learning objectives from this session as 4.5 to 5 out of 5. Ultimately, this session was voted by the pediatric residents as the best academic half-day session of the year, a recognition announced at the annual awards ceremony.

There were six facilitators in our implementation, three attending physicians and three pediatric infectious disease fellows. To prepare, all facilitators read the provided answer key. Some facilitators chose to read some of the additional suggested readings. One fellow reviewed personal notes prior to the session, and two attending physicians reviewed previous talks on this topic. The amount of time spent preparing to be a facilitator for the session ranged from 30 minutes to 2 hours for attending physicians and was 3 hours for fellows. Attending physicians stated they would normally require at least 4 hours to prepare a didactic talk for an academic curriculum session if they had to prepare their own slides, and fellows stated they would normally require at least 5 hours; therefore, the preparation time was significantly reduced for all facilitators. Even with slides provided, the time to prepare a didactic talk was estimated to take longer than the preparation time for this session, with a minimum estimated time of 2-3 hours.

All facilitators found the resources, which were precirculated, helpful. All facilitators also felt that the format of the session promoted clinical reasoning and/or critical thinking in the trainees. Additionally, one facilitator emphasized that “I do think it promotes some clinical reasoning and more so, I think it promotes critical thinking and active learning.” Two facilitators also pointed out that the trainees appreciated the material distributed beforehand, which allowed many trainees to be “well prepared which made the session much more valuable.”

All facilitators enjoyed this experience more than teaching didactic lectures. It was felt that this format allowed more time for questions, as well as an opportunity for the teacher to get a better idea of what the trainees were learning and to learn more about the topic at the same time. All facilitators were willing to participate in a similar session again.

Discussion

This case-based learning module utilizing principles of adult learning theory was both effective and popular with the learners. We utilized this case successfully with pediatric residents during one of their academic half-days in the fall of 2015. The trainees were divided into small groups of approximately four to five, with each group facilitated by either a pediatric infectious diseases fellow or attending physician.

Our trial with the small-group format was also well liked by the teachers/facilitators. This resource allowed them to reduce required preparation time compared to teaching the same material in a didactic format. Moreover, all facilitators preferred a small-group format to formal didactic lectures.

This session was ultimately voted by the pediatric residents to be the best pediatric residency learning series lecture of the year. Given this positive response, we plan to create more such cases and replace sessions in the academic half-day with more teaching in this format. This resource has also received positive feedback when used in a one-to-one teaching setting and as a self-directed learning tool, so we expect that it will be useful in a variety of other learning contexts, too.

This case-based learning module will be available as part of a Pediatric Infectious Diseases Casebook series consisting of a compilation of case-based learning modules on several pediatric infectious diseases. This can serve as an efficient and effective teaching resource in an often time-constrained and ever-expanding medical field.

Potential limitations of this resource include it being best used as a printed document and thereby requiring a printer and paper. Once printed, however, there are no extra materials required. Also, if there is no printer available, the resource may still be useful as an on-screen guide for discussion. While we considered that the low-tech format might be less interesting to the learners, this was not the case as evidenced by the evaluations and learner comments.

Future revisions are expected to occur periodically in order to ensure the information in the teaching session remains up to date.

In summary, this module is simple to implement and is an effective learning tool in the field of pediatric infectious diseases, covering the common topic of osteomyelitis. Learners and facilitators found the format engaging, while facilitators also found the materials time-saving. All stated they would be willing to participate in such sessions in the future. We are sharing this resource in the hope that others may find it a valuable tool as well.

Jennifer Tam, MD: Subspecialty Resident in Pediatric Infectious Diseases, University of Toronto

Anu Wadhwa, MD: Assistant Professor, Division of Infectious Diseases, Department of Pediatrics, University of Toronto; Clinician Educator, Division of Infectious Diseases, Department of Pediatrics, University of Toronto

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Ethical Approval

Reported as not applicable.

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