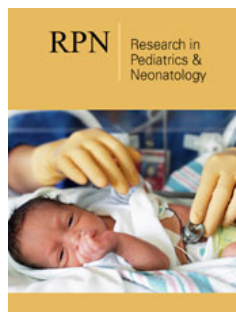


A Novel Scalable Simulation Event to Teach Pediatric History and Examination to a Large Cohort of Medical Students

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***Corresponding author:** Joshua J Davis, Associate Professor of Clinical Skills and Course Director, Kansas College of Osteopathic Medicine at Kansas Health Sciences University, USA

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Megan Bayer^{1,2}, Iram Sirajuddin², Amelia Hopper³, Joshua Davis^{4*} and Angela Carrick⁵

¹Embedded Nurse, University of Kansas, School of Medicine and former Simulation, Director Kansas College of Osteopathic Medicine at Kansas Health Sciences University, USA

²Associate Professor of Allergy/Immunology, Kansas College of Osteopathic Medicine at Kansas Health Sciences University, USA

³Simulation Research Director, University of Kansas, School of Medicine and former Adjunct, Professor of Clinical Skills, Kansas College of Osteopathic Medicine at Kansas Health Sciences University, USA

⁴Associate Professor of Clinical Skills and Course Director, Kansas College of Osteopathic Medicine at Kansas Health Sciences University, USA

⁵Associate Dean of Student Success and Associate Professor of Emergency Medicine, Kansas College of Osteopathic Medicine at Kansas Health Sciences University, USA

Abstract

Introduction: Teaching pediatric history-taking, physical examination, and diagnostic reasoning is fundamental to medical education but is often hindered by limited clinical opportunities, especially with live pediatric patients. Simulation offers a scalable alternative to traditional bedside teaching.

Methods: We designed a novel observational simulation event for second-year medical students, consisting of three pediatric cases: a newborn visit, a toddler with constipation, and an adolescent with poor school performance. Nine volunteer students acted as patients, parents, or physicians, with the remainder participating in group observation and debriefings. A pre-event lecture reviewed pediatric history and examination techniques. Post-event surveys assessed perceived skills, confidence with different age groups, and event satisfaction, using Likert-type scales and qualitative feedback. Paired t-tests analyzed pre- and post-event scores, and qualitative data underwent inductive thematic analysis.

Results: Of 112 students, 110 participated; 81 (73.6%) completed surveys. Perceived ability to perform pediatric histories improved by 76% (mean difference 3.09, $p < 0.01$) and examinations by 71% (mean difference 2.78, $p < 0.01$). Confidence was highest for evaluating adolescents (3.82/5) and lowest for newborns (3.12/5). Students rated the event highly for content (7.86/10), organization (8.34/10), and enjoyment (4.25/5). Positive feedback highlighted group discussion, actor quality, and realism; suggested improvements included smaller groups and increased hands-on practice.

Discussion: This large-scale, resource-efficient simulation significantly improved medical students perceived pediatric history and examination skills. While increased realism and hands-on opportunities may enhance learning, this approach is easily adaptable to other institutions and content areas.

Introduction

Teaching the skills of obtaining history, physical examination, and diagnostic reasoning is a central tenant of undergraduate medical education [1]. It is a key aspect of medical practice, as a well-done history and examination can lead to the correct diagnosis 60-80% of the time [2]. Despite this, the training of students on these skills remains highly variable and the ability of physicians to do these well continues to decline, which is associated with poorer patient outcomes [3-5]. Much of this is attributed to global issues in medical education like lack of time, finances, and resources in the curriculum; increased reliance on technology; and a decrease in teaching time spent at the bedside [6-9].

When surveyed, pediatric clerkship directors report that pediatric history and examination should be taught in the preclinical curriculum [10]. Teaching the nuances of a pediatric history and physical examination, including communication skills, to medical students is especially fraught with obstacles [10,11]. This has led to a highly variable exposure to these skills among medical students [10]. While hands-on exposure is considered the ideal teaching methodology for teaching history and examination [12,13]. Data has shown that observation of simulation cases can provide a reliable alternative to educating larger groups of students [14]. Our institution ran into similar barriers as others have described regarding lack of live pediatric participants of varying ages to demonstrate history and examination skills [15,16]. Thus, we sought to develop a feasible alternative for pre-clinical medical students to be exposed to the skills of taking a history and examination for a pediatric patient.

Methods

We developed a novel observational simulation to help teach pediatric history and examination skills to our second-year medical student class with objective listed in Appendix 1 & 2. We developed 3 cases (attached) of pediatric patients: a routine newborn visit, a toddler with constipation, and an adolescent with poor school performance Appendix 3-5. Prior to the event, the students were surveyed to identify 9 volunteers to participate as parents, patients, and doctors for each of the cases. Each of these students were given access to their case and role and a 1-hour practice session. For the newborn and toddler, a manikin model was used to simulate the patient.

On the morning of the event, the students were given a 50-minute interactive lecture on the components of the pediatric history and examination, including the key concepts of how to communicate with parents and provide anticipatory guidance. In the afternoon, the students convened in a large conference room with video capabilities. They were divided into groups of 8-12 students and sat with their group. Each simulated case was broadcast live to the group classroom. During this live broadcast, the simulated doctor/student obtained a history and brief examination, and the other students played the role of parent and/or patient depending on the case. The volunteer students then returned to the large group, and each case was debriefed using facilitator sheets.

Students were surveyed in class the week following the event during class time regarding their experience in the pediatric event. Students were asked about their perceived ability to perform a history and physical examination on a pediatric patient using a 10-point Likert-type item as well as their confidence to evaluate a patient in each age group represented (newborn, toddler, adolescent) using a 5-point Likert-type item. They also were surveyed on the content and organization of the event and their overall enjoyment. They were asked to give a 1-word description of "things that went well" and "opportunities for improvement" with a free text feedback section. This survey was developed a priori by the authors and pilot tested with 5 third year students who had never previously participated in the event.

Normally distributed variables were tested using a paired two tailed student's t test. More recent data suggests Likert type scales can be treated as parametric continuous data [17]. Qualitative analysis of the one-word descriptor was done using a prevalence weighted word cloud (<http://www.wordclouds.com>). Qualitative analysis of the other responses performed by 2 authors using inductive qualitative analysis until thematic saturation was achieved.

Appendix 1

Educational objectives for a novel pediatric simulation event

- Demonstrate obtaining a comprehensive pediatric history, with particular attention to the needs and concerns of patients, parents, and caregivers.
- Demonstrate an age-appropriate physical exam, with focus on proficiency in both basic and age-specific techniques.
- Demonstrate effective communication skills when interacting with pediatric patients and their caregivers, tailoring the approach to the age and developmental stage of the patient, including promoting adolescent autonomy.
- Accurately explain findings to patients, parents, and caregivers.
- Analyze physical exam findings to formulate appropriate differential diagnoses and treatment plans.

Appendix 2

Pediatric history taking simulation lab

Course description: This interactive two-hour session focuses on developing history-taking skills within pediatric patient encounters. With simulations conducted in the simulation center, students will observe three distinct pediatric cases: a newborn well-child check, a toddler with constipation, and an adolescent consultation. Only a select group of student volunteers will participate directly in each simulation, taking on the roles of patient parents and student doctors, while the rest of the class will observe remotely in room 488, divided into small groups. Each case will include a live-streamed interaction, followed a faculty-led debrief in small groups to reinforce key learning points. This formative session blends board-relevant material with practical clinical skills in a dynamic, engaging format.

Course agenda

| Time | Activity | Description |
|-----------------|--|--|
| 1:00 PM-1:10 PM | Introduction | Overview of session goals, expectations, and case format |
| 1:10 PM-1:50 PM | Case 1: Newborn Well-Child Check | Simulated encounter and debrief |
| 1:50 PM-2:30 PM | Case 2: Toddler with Constipation | Simulated encounter and debrief |
| 2:30 PM-3:10 PM | Case 3: Adolescent Encounter | Simulated encounter and debrief |
| 3:10 PM | Conclusion | Wrap-up, key takeaways, and Q&A |

Lesson plan for each case

Updated Lesson Plan for Each Case.

Introduction (10 Minutes)

- Overview of session goals, objectives, and format.
- Clarify roles: a select group of student volunteers will engage in the simulations as caregivers and student doctors, while the rest of the class will observe in small groups in Room 488 with faculty facilitators.

Case 1: Newborn well-child check (40 Minutes)

Simulated encounter (15 minutes)

- Selected student volunteers interact as the caregiver and student doctor in the simulation room, focusing on gathering history related to a newborn's health and development. 2 caregivers, 2 student doctors.
- Faculty facilitators in Room 488 guide observing groups, prompting them to note effective history-taking techniques and key developmental milestones.

Small group debrief (20-25 minutes): Faculty in each small group lead discussions on the encounter, focusing on the unique aspects of conducting a well-child visit and addressing any identified gaps in the history-taking process.

Case 2: Toddler with constipation (40 Minutes)

Simulated encounter (15 minutes):

- A new group of student volunteers role-play the encounter, focusing on exploring potential causes and management of constipation in a toddler. 2 caregivers, 2 student doctors.
- Observing groups continue to engage in guided note-taking, identifying effective questioning techniques and the importance of dietary and developmental history.

Small group debrief (20-25 minutes): Faculty facilitators discuss how to approach a common pediatric complaint, such as constipation, emphasizing patient and caregiver communication and clinical reasoning.

Case 3: Adolescent encounter (30 Minutes)

Simulated encounter (15 minutes): Final group of student volunteers conduct history-taking with an adolescent patient and their caregiver, focusing on addressing developmental, social, and mental health aspects. 2 student doctors, adolescent and caregiver.

Small group debrief (20-25 minutes): Discussions led by faculty facilitators focus on strategies for building rapport with adolescents, handling sensitive topics, and tailoring communication to the patient's developmental stage.

Conclusion (5 Minutes)

Faculty summarize the session's key takeaways, highlight common themes across the cases, and address questions from students about pediatric history-taking.

Created by: Dr. Iram Sirajuddin and Megan Bayer

Appendix 3

Case 1: Newborn well-child check

Scenario overview: A new parent and supportive family member bring their 2-week-old newborn for a routine well-child check. The goal of the encounter is to assess the baby's health, identify any caregiver concerns, and provide anticipatory guidance. The scenario includes a mix of common newborn issues such as breastfeeding struggles, jaundice, and sleep irregularities, allowing the student doctors to practice taking a detailed history and addressing parental concerns.

Participants

- 2 Student Doctors:** Conduct the history-taking, using open-ended and targeted questions.
- 2 Caregivers:**
 - Parent 1: The primary caregiver, who is an anxious first-time parent, focused on breastfeeding and jaundice concerns.
 - Parent 2: A supportive family member who offers additional context and expresses worry about the baby crying excessively.

Key Objectives

- Obtain a thorough feeding history, including frequency, duration, and perceived challenges.
- Explore stooling and urination patterns to assess hydration and feeding adequacy.
- Identify developmental milestones and explore caregiver knowledge of safe sleep practices.
- Discuss anticipatory guidance (e.g., tummy time, vaccination schedule, signs of illness).
- Practice building rapport with both caregivers and managing an anxious caregiver dynamic.

Script for caregivers

Parent 1

- Anxiously provides information about inconsistent breastfeeding (baby latches sometimes but pulls away).
- Shares worry about jaundice: "The baby still looks yellow around the eyes-should we be worried?"
- Mentions feeling overwhelmed and concerned about being "a bad parent."

Parent 2

- Adds that the baby cries "all the time," particularly in the evening.
- Expresses frustration, asking, "Isn't there something we can do to make the baby sleep better?"
- Occasionally interrupts Parent 1, but ultimately defers to their lead.

Case details (provided to caregivers)

1. Baby born full term (38 weeks) via C-section due to prolonged labor and fetal distress, APGAR 8/9.
2. Exclusively breastfed; feeds inconsistently, averaging 10-12 times a day, with frequent pulling away.
3. Recent weight check at 1-week visit: slightly below birth weight, but within normal range for breastfeeding.
4. Stool: Yellow, pasty, once per day. Wet diapers: 6-8 per day.
5. Sleep: Sleeps 2-3 hours at a time, wakes crying; longest stretch at night is 3 hours.
6. Jaundice noted in the hospital and has resolved.

Faculty debriefing guide

Strengths: What did the student doctors do well?

- a. Communication: Did the students establish rapport with both caregivers? Highlight instances where students used open-ended questions to explore concerns or validated caregiver experiences.
- b. Organization: How was the student doctor's organization of the history taking? Did the students systematically gather information about feeding, stooling, and sleeping patterns.
- c. Empathy: What went well when they addressed the anxiety of Parent 1 and balanced their interaction with Parent 2.

Weaknesses: Missed Opportunities

- a. What could they improve on?
- b. Did the students fail to explore maternal mental health or ask about post-C-section recovery (e.g., pain or breastfeeding positioning challenges)?
- c. Did they probe for understanding of safe sleep practices (e.g., avoiding co-sleeping, tummy time guidance)?
- d. Did they ask about family or community support (e.g., lactation consultant, family members helping at home)?
- e. What would you have done differently if you were in that situation?

Closing questions

- a. How effectively did students involve both caregivers in the conversation?
- b. Were students able to navigate caregiver dynamics (e.g., Parent 2's interruptions)?
- c. Did they summarize and close the session effectively, addressing key concerns and leaving the caregivers with clear next steps?

Teaching points for anticipatory guidance

1. Feeding

- a) Normal newborn feeding frequency (8-12 feeds per 24 hours).

- b) Signs of effective breastfeeding (e.g., audible swallowing, satiety cues, weight gain).

2. Stooling and hydration: Wet diapers as a hydration indicator; normal stool patterns for breastfed infants.

3. Sleep: Reinforce safe sleep practices: "Back to Sleep" guidelines, avoiding soft bedding, and understanding normal sleep-wake cycles.

4. Jaundice: Reassure caregivers about physiologic jaundice while educating on warning signs (e.g., lethargy, poor feeding, dark urine, pale stool).

5. Caregiver mental health: Subtle probing for postpartum depression or caregiver burnout, offering resources if concerns arise.

Takeaways

1. Building rapport is crucial when managing anxious or overwhelmed caregivers.
2. Effective history-taking requires balancing the focus between the infant's health and the caregiver's concerns.
3. Anticipatory guidance is an opportunity to educate caregivers about normal infant development and empower them with strategies for common challenges.
4. Managing caregiver dynamics can enhance the patient-family-provider relationship and optimize outcomes.

Appendix 4

Case 2: Toddler with constipation (with OMM component)

Scenario overview: A parent and a family member bring their 2-year-old toddler for concerns about chronic constipation. In addition to gathering a detailed history and providing a management plan, students should explore how Osteopathic Manipulative Treatment (OMT) might be used as a complementary approach to relieve symptoms and support normal bowel function.

Participants

a. 2 Student doctors: Conduct history-taking and discuss potential OMT techniques that could benefit the patient.

b. 2 Caregivers

- I. Parent 1: Primary caregiver, concerned about the child's discomfort and focused on immediate relief.
- II. Parent 2: Skeptical family member who questions the use of OMM and prefers "just fixing the diet."

Key objectives

- a. Obtain a comprehensive history, including dietary habits, toileting behaviors, and developmental milestones.
- b. Explore the role of somatic dysfunction in the gastrointestinal system and discuss how OMT may support normal bowel function.

- c. Provide a holistic management plan incorporating dietary changes, behavioral strategies, and OMT where appropriate.

OMM considerations

Relevant anatomy

- a. Focus on the sacrum, lumbar spine, and abdomen as they relate to parasympathetic and sympathetic innervation of the gastrointestinal tract.
- b. Understand how restrictions in these areas may contribute to constipation.

Techniques to consider

- a. Sacral Rocking: To stimulate parasympathetic activity via the pelvic splanchnic nerves.
- b. Abdominal Techniques: Gentle abdominal kneading to promote bowel motility.
- c. Thoracolumbar Soft Tissue: To address sympathetic overactivity affecting the gastrointestinal system.
- d. Myofascial Release: To relieve restrictions in the abdominal and pelvic regions.

Script for caregivers

Parent 1

- a. Expresses concern about the toddler's discomfort and is open to any treatment options, asking, "Is there something else we can do to help them go?"
- b. Relays that the toddler resists sitting on the potty and hides when needing to go.

Parent 2

- a. Minimizes the issue, saying, "It's just diet-why are we talking about these extra treatments?"
- b. Expresses skepticism about OMT: "Does that really help with things like constipation?"

Case details (provided to caregivers)

1. **Diet:** Drinks 20-24 ounces of whole milk daily; prefers cheese, pasta, and crackers with minimal fruits and vegetables.
2. **Behavior:** Avoids sitting on the potty; hides when needing to go. Recently started toilet training.
3. **History:** No fever, vomiting, or blood in stool. No known food allergies or significant medical history.
4. **Hydration:** Minimal water intake but drinks sweetened fruit juice.

Faculty debriefing guide (Including OMM)

Strengths

- A. What went well for them?
- B. How did they integrate OMM into the encounter?

- I. Did the students integrate OMT as part of a broader treatment plan, emphasizing that it complements dietary and behavioral changes rather than replacing them?
- II. Did students explain OMT in simple, understandable terms for the caregivers?
- III. Praise students for suggesting techniques appropriate for the toddler's age and comfort level.

Weaknesses

- a. What could have been improved on?
- b. What would you have done differently in this situation?

Closing questions

- a. What are the challenges with obtaining a history and creating a plan for a child at this developmental stage.
- b. Did the students integrate OMM into the history-taking and management plan appropriately?
- c. Were they able to explain the purpose and benefits of OMT in a way that addressed both caregivers' perspectives?
- d. Did they provide a balanced, holistic plan that combined OMT with evidence-based dietary and behavioral interventions?

OMM integration teaching points

Explaining OMT to Caregivers

- a. Highlight OMT as a gentle, noninvasive method supporting the body's natural function.
- b. Example: "OMT can relieve tension in areas like the lower back and abdomen, improving bowel motility and reducing discomfort."

Techniques

- a. Sacral Rocking: Encourages nerve activity aiding intestinal movement.
- b. Abdominal Massage: Stimulates digestion through soothing pressure.
- c. Soft Tissue Techniques: Relieves lower back tension to support gut motility.

Holistic approach: Combine OMT with dietary changes (e.g., more fiber, less milk) and behavioral strategies (e.g., consistent potty routine).

Management plan

OMM recommendation

- a. Demonstrate techniques (e.g., sacral rocking, abdominal massage), addressing caregiver safety concerns.
- b. Suggest follow-up OMT if symptoms persist after dietary adjustments.

Dietary and behavioral strategies: Promote high-fiber foods, limit milk to 16 oz/day, and encourage water intake.

Follow-up: Schedule a visit to monitor progress and reassess OMT effectiveness alongside other interventions.

Takeaways

1. OMM offers a unique, hands-on approach to addressing functional gastrointestinal issues, complementing standard treatments.
2. Effective communication is essential when explaining OMM to caregivers, especially those who may be skeptical.
3. A holistic management plan incorporating OMT, diet, and behavior strategies aligns with osteopathic principles of treating the whole patient.

Appendix 5

Case 3: Adolescent encounter

Scenario overview: A parent brings their 15-year-old adolescent for concerns about behavioral changes, withdrawal from activities, and poor appetite. The caregiver is highly concerned and interprets the issues as laziness or excessive screen time, while the adolescent is struggling with stress and self-esteem issues related to school and social dynamics. The encounter's primary goal is to build rapport with the adolescent, elicit relevant social and mental health history, and provide a balanced approach to addressing the concerns of both the adolescent and the caregiver.

Participants

- a. 2 Student Doctors: Conduct history-taking, focusing on the adolescent's perspective while managing caregiver input effectively.
- b. 1 Adolescent: Answers questions with hesitation initially but opens up when rapport is established.
- c. 1 Caregiver: Overly involved parent, focused on blaming screen time and behavioral changes while unaware of deeper underlying stressors.

Key objectives

- a. Establish rapport with the adolescent to encourage honest communication about stress, mental health, and social factors.
- b. Balance the conversation by addressing both the adolescent's and caregiver's concerns.
- c. Explore lifestyle factors, including sleep patterns, diet, extracurricular activities, and social relationships.
- d. Introduce age-appropriate interventions for stress and mental health concerns, emphasizing collaboration with the family.

Script for adolescent

- A. Initially provides short answers, saying, "I don't know" or "It's fine." Opens up later with:
 - I. "I'm just stressed about everything."
 - II. "I feel like I'm not good enough, especially when I mess up at school."

III. "I don't even want to hang out with my friends anymore because they're doing so much better than me."

B. Mentions poor sleep (4-5 hours a night) and feeling tired all the time.

C. Confesses to skipping meals sometimes because of "not feeling hungry."

Script for caregiver

A. Frequently interrupts, saying things like:

- a. "They're on their phone all night. That's why they're tired."
- b. "This is just laziness—we didn't have these problems when I was their age."
- c. "I don't know why they're acting like this. Everything was fine last year."

B. Expresses frustration but does not acknowledge the adolescent's emotional struggles:

- a. "They're just making excuses not to do their homework or chores."
- b. "I just want them to stop being so dramatic and act normal again."

Case details (provided to adolescent and caregiver)

Adolescent

- a. Feels overwhelmed by school pressures and social comparisons.
- b. Grades have declined slightly, which they attribute to feeling tired and unmotivated.
- c. Lost 2 pounds over the last month but denies specific health complaints beyond fatigue and appetite changes.

Caregiver

- a. Attributes change to excessive screen time and a lack of discipline.
- b. Reports "things were fine last year" and focuses on behavioral solutions without acknowledging stress.

Expanded faculty debriefing guide

Strengths

1. What went well for them?

A. Communication

- I. Did the students demonstrate patience and empathy when engaging the adolescent?
- II. Highlight effective use of open-ended questions (e.g., "What has been stressing you out lately?" or "How do you usually feel about school?").

2. Balancing Roles

- I. Did the students involve the caregiver appropriately without allowing interruptions to derail the conversation?

- II. Praise attempts to redirect focus to the adolescent's perspective (e.g., "Let's hear from [name] about how they're feeling first, and then we can explore your concerns").

Weaknesses

- A. What could have been improved on?
- B. What would you have done differently in this situation?
- I. Did students probe enough into specific stressors (e.g., academic workload, peer relationships, or potential bullying)?
- II. Did they adequately explore sensitive topics, such as depressive symptoms, anxiety, or self-esteem issues?
- III. Did students recognize potential signs of clinical concern, such as weight loss, sleep disruption, or emotional withdrawal?
- IV. Did they ask about safety concerns, such as self-harm or suicidal ideation, in an appropriate and sensitive manner?

Closing questions

- a. Did the students balance their attention between the adolescent and caregiver effectively?
- b. Were they able to summarize the encounter with clear next steps for both the adolescent and caregiver?
- c. Did they approach sensitive topics with appropriate language and empathy?

Teaching points for adolescent communication

- A. Building rapport**
- a. Discuss strategies for engaging reluctant adolescents (e.g., normalizing their experiences, using reflective listening)
- b. Reinforce the importance of using nonjudgmental language to make the adolescent feel heard.
- B. Balancing Input**
- a. Highlight techniques for managing an overbearing caregiver, such as redirecting interruptions or requesting one-on-one time with the adolescent if appropriate.
- b. Emphasize the importance of validating caregiver concerns without dismissing the adolescent's perspective.
- C. Exploring stressors**
- a. Use specific, age-appropriate questions to explore mental health:
- I. "What's the hardest part about school right now?"
- II. "What do you do when you feel stressed or upset?"
- III. "Have you felt really down or hopeless recently?"
- D. Red flags**
- a. Encourage a structured approach to identifying warning signs (e.g., PHQ-9 for adolescents).

- b. Teach how to ask sensitive questions about safety in a non-threatening way (e.g., "Some teens feel so overwhelmed they might think about hurting themselves-has that ever crossed your mind?").

Management plan

- A. For the Adolescent**
- I. Suggest stress management techniques (e.g., mindfulness, journaling, regular sleep routines).
- II. Encourage re-engagement with peers and extracurricular activities as a gradual process.
- B. For the caregiver**
- I. Provide education on adolescent development and the importance of emotional support during stressful periods.
- II. Offer resources for family counseling or parenting strategies for teens.
- C. Referral considerations:** If red flags are present, recommend a follow-up with a mental health professional or pediatrician.

Takeaways

- A. Adolescents require a tailored approach to communication, emphasizing rapport and trust.
- B. Caregiver dynamics can significantly impact the adolescent's willingness to open up; managing these dynamics is a key skill.
- C. Addressing both immediate concerns (e.g., stress, fatigue) and long-term solutions (e.g., counseling, lifestyle changes) is essential for holistic care.
- D. Effective screening for mental health issues in adolescents involves normalizing these concerns while ensuring safety and support.

Results

Of the 112 students in the class, 110 participated in the event. Nine of these students (8%) served as volunteers to perform the cases. The remaining students participated in the debrief. Of these, 81 (73.6%) responded to both portions of the survey. Overall, students reported that the session improved their perceived ability to perform a pediatric history by 76% (mean pre-event 4.06, mean post-event 7.15, mean difference 3.09, $p < 0.01$) and examination by 71% (mean pre-event 3.90, mean post-event 6.68, mean difference 2.78, $p < 0.01$). The mean confidence to evaluate a newborn after the event was lowest at 3.12/5, followed by more confidence in evaluating a toddler (3.45/5) and adolescent (3.82/5).

Overall, students agreed the content and organization were appropriate (mean 7.86/10 and 8.34/10, respectively) and they enjoyed the event (mean 4.25/5). Sixty-one students (75.3%) answered the single word descriptor (Figure 1) and most commonly described the session as insightful ($n=6$), helpful ($n=6$),

informative (n=5), engaging (n=4), or fun (n=4). Themes from positive comments regarding what went well were most commonly the value of group discussions, the quality of the student actors, and the realism of the approach (Table 1). Themes on opportunities for

improvements were most commonly recommendations for making the practice more hands-on, smaller groups, and more realistic cases (including better actors or to use faculty).



Figure 1: Copy of feedback questions on a novel pediatric simulation event at a single osteopathic medical school.

Table 1: Qualitative feedback on a novel pediatric simulation event at a single osteopathic medical school.

| Category | No. of Responses | Example Phrase |
|---------------------------------------|------------------|---|
| Positive | | |
| Value of group discussions | 24 | The small group conversations were great |
| Quality of student actors | 19 | The student actors did a good job of making the scenarios believable |
| Realism of encounters | 10 | Cases were realistic |
| Engaging with faculty | 7 | Good discussions with professors |
| Execution of the event | 6 | I thought viewing the sim live went really well |
| Content | 6 | Seeing multiple pt's/cases at varying ages |
| Self-improvement | 3 | It was a fun way to learn how pediatric visits can go |
| Constructive | | |
| More hands on | 10 | Make it more hands on |
| Realism and quality of student actors | 8 | Perhaps make real doctors do the exam so we can see what it would be like coming from someone with experience, rather than our classmates just making up things as they go. |
| Smaller groups | 7 | I think that making smaller groups watching multiple encounters would give diversity of experience. |
| More preparation | 7 | Prepare volunteers more so that the cases are better suited for oral case presentation |
| Technological issues | 6 | Video quality |
| More time | 6 | Just more time with this. I think having more low-stakes opportunities to grow really are helpful, and help bring general stress levels down during an already stressful time. Thank you. |

| | | |
|------------------------------|---|---|
| Room size | 4 | Separate rooms to view |
| Consistency across groups | 3 | Maybe have someone give feedback to everyone because in a large loud room sometimes I didn't get a chance to talk with a physician |
| Allow students to keep notes | 2 | Allow students to have the information from the encounter for their SOAP note assignments in the future. |
| Too long | 1 | I think that the discussion length could be a little shorter, as a lot of us in my group were just waiting around for the next sim to be viewed |

Discussion

Our novel approach to teaching the basics of history and examination of pediatric patients was an effective way to teach a large group of preclinical students with minimal resources and no live pediatric patients. We showed that the session improved perceived abilities of students to perform history and examination with patients of 3 different ages. Students overall had a positive review of the session, particularly content and organization.

A minority of students did request more hands-on practice or realistic patients; however, this was greatly outnumbered by the number of students who appreciated the realism and student actors. We acknowledge that hands-on practice with real patients for each student would be ideal, but as noted above it has shown to have many issues historically, including ethical concerns. Feasible improvements we will likely implement in future sessions include dividing groups into separate rooms and watching pre-recorded videos. We also will likely reduce individual group size to 5 students in the future.

Using children as standardized patients is ethically complex despite being educationally valuable. Children are a vulnerable population with limited capacity for fully informed consent, requiring robust parental permission and, when developmentally appropriate, child assent to ensure that participation is voluntary and ethically sound [18]. Ethical frameworks emphasize minimizing risk and discomfort, avoiding exploitation, and ensuring that educational benefit justifies any potential burden placed on the child. Identifying children to serve in this role can be difficult, as parents may be unwilling to allow their children to be used for medical education. Further, children should not be used when suitable alternatives (e.g., adult standardized patients, high-fidelity simulation, or task trainers) can achieve similar educational outcomes, and that their involvement should occur in safe, supervised environments with clear safeguards. This study points to one way to achieve that goal.

The data is limited by its single site nature in one class cohort, potentially limiting generalizability. Further, our study lacks a true control group and is pre/post in nature, which limits causality and may be at risk for confounding. The study also used student self-report and a priori knowledge questions with limited validity evidence and no other objective outcomes. Nine students receive actual simulation exposure, but it was also with students and not trained standardized patients/parents.

While our data only represents a single class at a single institution, this concept can easily be modified and utilized by

other institutions. The approach here was so successful, it is also foreseeable that alternative content could be modified to fit this structure.

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Conflicts of Interest

The authors have no conflicts of interest relevant to this article to disclose. Dr. Davis reports one-time unrelated honoraria funding from Sketchy and Scholar Rx.

Ethics

This was an educational project and granted exemption from IRB review.

Data availability

Data is available from the authors upon reasonable request.

Contributions

All authors participated in project design and data collection; JD completed data analysis and drafted the manuscript; and all authors revised the manuscript for critically important content and reviewed the manuscript and agreed to be listed as authors and accept responsibility for the content.

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