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The ABCs of OTCs: A Video-Based Curriculum Regarding Over-the-Counter Pediatric Products

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Abstract

Introduction: Over-the-counter (OTC) products are widely used by families with young children. To educate future pediatricians on OTC product counseling and support the health and safety of children under their care, modern, accessible, and engaging curricula are needed. **Methods:** We developed an OTC product curriculum consisting of seven videos and one facilitated group discussion using a flipped classroom pedagogy to educate students on counseling parents about OTC product use. Fourth-year medical students pursuing pediatric training from four institutions participated in the curriculum during their end-of-year transition-to-residency course. We measured effectiveness via a pre/post comparison using a student self-assessment with multiple-choice questions. A simulated parent call OSCE provided participants with an opportunity to apply their knowledge and receive directed formative feedback. Data were analyzed using descriptive and inferential statistics. **Results:** A total of 41 students participated in the curriculum and completed all assessments. The majority (93%) watched all the videos. All participants (100%) agreed the videos were useful. Knowledge improved significantly (pretest mean score = 70%, posttest mean score = 87%, $p < .001$). No significant differences were found when comparing institution, gender, prior experience, or electives. **Discussion:** We developed a feasible and effective video-based curriculum to teach OTC product guidance. Given the importance of discussing OTC medications with families and the need for convenient educational tools, this curriculum may have widespread application to medical students during clinical rotations as well as pediatric and family medicine trainees.

Keywords:
Clinical Skills Assessment/OSCEs, Over-the-Counter Products, Pediatrics, Pharmacy, Primary Care

Educational Objectives

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

1. List five to seven of the most commonly used over-the-counter products (OTC) in the pediatric population.
2. Discuss common uses of five to seven of the most commonly used OTC products in the pediatric population.
3. Provide anticipatory guidance to a patient and/or family regarding OTC products.
4. Triage common pediatric questions surrounding OTC products in a simulated parent phone call.

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Introduction

Americans spend more than 30 billion dollars on over-the-counter (OTC) medications per year, and 50% of children receive one or more OTC products each week.[1-3] Caregiver misunderstanding of children's OTC medications is common, and labels may contain misleading language and graphics resulting in inadvertent harm including overdose and death.[4,5] Children's products are often sold in liquid formulations in varying concentrations. Dosing instruments such as syringes or cups come in many styles, have units that may not match product labels, and are not always included in product packaging.[3,6-8] Vulnerable populations with low health literacy are especially at risk for errors,[3,9] and significant numbers of children have experienced an adverse drug event from medication use.[10] As a result, the Accreditation Council for Pharmacy Education recently established the importance of proficiency in pediatric pharmaceuticals.[11]

Despite the critical need for education on OTC counseling, there are substantial gaps in medical education, clearly highlighted by

a case control study in which 89% of medical students failed to identify a significant overdose of acetaminophen in a simulated pediatric outpatient visit.[12,13] An older study detailed a shopping trip for pediatric residents, but its focus was primarily on cost and availability of products rather than application in the patient care setting.[14] A more recent publication focused on pharmacy students teaching medical students prescription-writing skills and hosting a case-based discussion of nonprescription medication; however, no content was devoted to other products such as suction devices, formulas, supplements, or topical products.[15] During our literature search, we did not identify any teaching tools directed at counseling about the myriad of OTC products families with children commonly encounter. Modern and accessible teaching tools to educate future pediatricians on OTC products are needed to support the health and safety of children under their care.

We developed and implemented an OTC curriculum across four institutions for fourth-year medical students entering the field of pediatrics using adult learning principles. Kolb's experiential learning theory served as a conceptual framework for the educational strategies,[16] and Kirkpatrick's evaluation model of reaction, learning, and behavior guided our evaluation.[17] We aligned our design with prior successful educational interventions in telephone triage[18,19] and OSCEs for medical students.[20]

Methods

Curriculum Development

We developed a video-based curriculum that used a flipped classroom technique to deliver and apply content to graduating fourth-year medical students across four diverse institutions in the context of preexisting transition-to-residency courses. Two authors, a general pediatrician with expertise in outpatient pediatrics (Shelly Vaziri Flais) and a clerkship director with expertise in educational delivery (Alanna Higgins Joyce), developed videos that covered seven core topic areas related to OTC products. Topics were chosen based on prior didactic sessions given by Shelly Vaziri Flais, an American Academy of Pediatrics parenting book author and spokesperson. The strategy for curriculum delivery was designed to avoid cognitive overload[21] via three spaced learning opportunities (Figure). Students first completed a self-guided review of online videos (Appendices A-G) with pre/post testing (Appendix H), subsequently attended a facilitated small-group discussion (Appendix I), and finally participated in a simulated phone call with a parent (Appendix J).

Setting and Participants

We developed the curriculum for graduating fourth-year medical students entering pediatric training. The curriculum was integrated into required transition-to-residency courses for all fourth-year medical students who matched in pediatrics at four institutions—the University of Virginia, Virginia Commonwealth University, University of Nebraska Medical Center, and Northwestern University—in the spring of 2021. Written informed consent was obtained from those willing to allow their evaluation data to be used for analysis. Participants created unique identifiers for response tracking while preserving anonymity. Institutional review board approval was received from each of the four participating institutions.

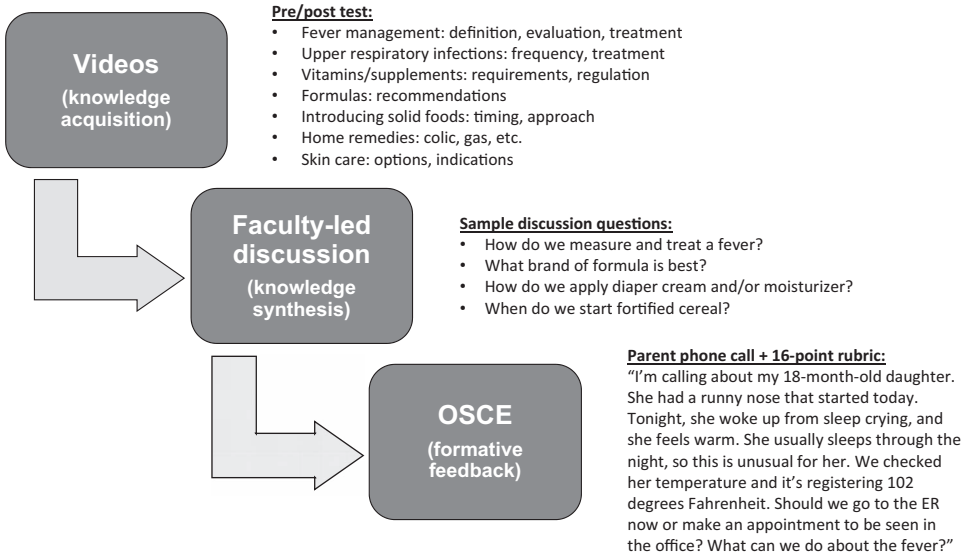

Figure. Over-the-counter products spaced learning opportunities.

Resident and Faculty Participation

Contributing authors at each institution identified a facilitator at each site to host the small-group discussions with students after they had watched the videos. Resident physicians were recruited to participate in the parent phone-call OSCE and score the rubrics. For each of these roles, participants received 30-60 minutes of orientation to review the existing curricular materials, including the case vignette, scoring rubric, and discussion guide. We did not provide any additional training materials. Subsequently, residents and faculty were easily able to lead the group or host the phone call and score the rubric.

Pretest

Participants received a link to the video presentations (Appendices A-G) and a pretest (Appendix H), which they were instructed to complete before viewing the videos. The pretest was hosted by Qualtrics (Qualtrics International Inc.) and included basic demographic variables and an objective knowledge-based assessment related to the definition of fever, the use of antipyretics, cough and cold medications, applications of topical products, formula content, and colic remedies. The questions were multiple choice and true/false.

Online Videos

After completing the pretest, students were instructed to independently watch the videos (Appendices A-G), which outlined typical uses, indications, and precautions for various OTC products using unbranded examples. The videos were 5-9 minutes each and collectively totaled 45 minutes. Segments included antipyretics, cough/cold medications, infant formulas, vitamins/supplements, topical skin care, colic remedies, and solid food products. The Northwestern University Feinberg School of Medicine Instructional Design and Development Center produced all the videos, which were hosted on Vimeo with graphics licensed from iStock (Getty Images). After viewing the videos, students completed a posttest, the same knowledge-based objective assessment as the pretest, on Qualtrics. Skip logic embedded in the survey added additional questions related to the value and effectiveness of the videos.

Small-Group Discussion

Within 1 week of watching the videos, students attended a facilitated group discussion hosted by a pediatric educator (a faculty member or local general pediatrician) at their institution. This took place in a classroom sized for eight to 25 people or was delivered virtually using a videoconferencing platform. We provided the facilitator with a copy of the discussion guide (Appendix I) with specific learning points to cover in 30-50 minutes. We also provided faculty development to the facilitators to ensure standardization of the content.

Exercise

After the small-group session, students applied knowledge through an OSCE caregiver phone-call exercise. The purpose of the OSCE was to provide students with the opportunity to practice and receive feedback on skills developed during the workshop. Residents at each institution were recruited and trained to play the role of a parent requesting advice about their 18-month-old child with an upper respiratory tract infection. Over hospital phones, residents relayed a clinical vignette (Appendix J) with scripted questions covering medication use, fever triage, and supportive care for their child. During the course of the call, the resident scored the student's responses to questions on a structured rubric (Appendix J) in real time and provided brief directed feedback.

Evaluation Tools

We utilized a pre/post survey (Appendix H) to assess knowledge acquisition. To ensure relevance of content, the pre/post video survey was distributed to five expert community pediatricians for feedback prior to implementation. The survey was then pilot tested with a cohort of early pediatric interns from Northwestern University to establish benchmark performance of similar peers. In addition, we used the previously described OSCE to provide formative feedback to the learners regarding their performance applying the knowledge and skills developed in the session. At two of the project sites, two residents independently evaluated several of the OSCE encounters in real time to establish interrater reliability for the structured scoring rubric.

Analysis

All data were aggregated centrally at Northwestern University using Qualtrics. Demographic data, reactions, and performance were summarized using percent and frequencies for categorical variables and mean and standard deviation for continuous variables. Inferential statistics (unpaired *t* test and analysis of variance) were used to compare pre- and posttest performance and to examine the association between covariates and dependent variables. Statistical significance for all analysis was set at $p < .05$. All analyses were performed using IBM SPSS Statistics version 28.0.

Results

A total of 41 students (a range of eight to 16 per site) participated in the curriculum and completed all assessments. The majority were female (68%), reported prior experience caring for children (61%), and had no prior elective or specific training in nutrition

(90%). Most students reported watching all the videos (93%). All students (100%) agreed (10%) or strongly agreed (90%) that the videos were useful. Participants viewed the content favorably in terms of relevance (98% stated agreement), learning level (88%), quality (88%), and duration (93%).

Mean performance on the knowledge-based assessment improved significantly on the posttest (pretest $M = 70\%$, posttest $M = 87\%$, $p < .001$; Table 1), with positive gains on many individual questions (Table 2). OSCE performance revealed participants' strengths in management and return to clinic precautions, with weaknesses in triage and supportive care. Interrater reliability for resident OSCE graders was shown to be consistent across sites. There were no significant differences in performance when stratified by institution, gender, prior caregiver experience with children, or elective experience.

Discussion

We developed an effective, convenient, and practical video-based curriculum to teach learners about OTC guidance. Nearly all participants used the videos, perceived them to be effective, and completed them in their entirety. The content was delivered across four diverse institutions, was integrated into an existing transition-to-residency course commonly used across US medical schools,[22,23] and required relatively minimal faculty development or resources.

Learners demonstrated significant knowledge acquisition related to OTC guidance based on improvement in multiple-choice question scores. Our project expanded upon existing pharmacy literature reporting pharmacy knowledge gains in a small group of medical students after in-person faculty teaching.[11] Our video-based curriculum offers flexible delivery, reduces resource requirements, and can be used in situations where in-person learning is not feasible.[24]

Unique to our curriculum was a brief OSCE requiring students to navigate fever, cough and cold medication, and triage for dehydration or severe illness. The OSCE format allowed us to capture the nuanced nature of an after-hours phone call integrating triage for an ill child with the use of OTC products. While it would have been helpful to assess students on their baseline clinical abilities concerning OTC product counseling prior to participation in the curriculum, our OSCE's labor- and time-intensive nature was a barrier to our sites conducting a pretest OSCE. Nevertheless, the OSCE allowed students to obtain brief formative feedback. We ascertained that, like other learners in OSCE assessments,[25] students in our project struggled most with appropriate patient triage, highlighting an important area for future learning.[15] Students likely showed gaps in triage skills because, although triage was addressed in the facilitated discussion and videos, the focus of the material remained on OTC products and guidance and instruction on their use.

A next step may be to expand participation to other medical trainees and health professions. OTC product knowledge is applicable to many groups, including pediatric interns, clerkship medical students, physician assistant students, and nurse practitioner students. Interdisciplinary workshops with

Table 1. Student Performance on Pre/Post Test and OSCE

		Pretest		Posttest		OSCE	
Category	**No. (%)**	**% (*SD*)**	***p***	**% (*SD*)**	***p***	**% (*SD*)**	***p***
Institution							
Northwestern University	8 (20)	67 (12)	.22	86 (8)	.61	64 (10)	.35
University of Nebraska	7 (17)	71 (5)		86 (8)		56 (14)	
University of Virginia	16 (39)	68 (7)		88 (4)		67 (20)	
Virginia Commonwealth University	10 (24)	75 (10)		89 (5)		56 (20)	
Gender							
Female	28 (68)	71 (8)	.77	88 (4)	.43	61 (18)	.75
Male	11 (27)	68 (11)		86 (9)		63 (18)	
Nonbinary	1 (2)	76					
No response	1 (2)						
Prior experience							
Yes	25 (61)	69 (7)	.64	88 (4)	.34	64 (19)	.74
No	15 (37)	72 (12)		86 (8)		60 (15)	
No response	1 (2)						
Elective experience							
Yes	3 (7)	70 (3)	.99	81 (8)	.06	48 (14)	.35
No	37 (90)	70 (9)		88 (5)		63 (18)	
No response	1 (2)						
Total	41 (100)	70 (9)	<.001	87 (6)	<.001	62 (18)	

Table 2. Pre/Post Test Descriptive Statistics

Question	No.	Pretest		Posttest		% Change
		M %	*SD*	*M* %	*SD*	
Q1. What is considered a fever?	41	88	.331	73	.449	−15
Q2. What is the best type of thermometer for a family to check a 6-month-old's temperature at home?	41	98	.156	100	0	2
Q3. Of the following, which is the best reason to treat a child's fever with an antipyretic?	40	60	.496	54	.505	−6
Q4. Infant and children's acetaminophen suspension is the same concentration:	41	44	.502	95	.218	51
Q5. Infant and children's ibuprofen suspension is the same concentration:	41	76	.435	93	.264	17
Q6. How many upper respiratory infections do kids get on average, in a year?	41	12	.331	0	0	−12
Q7. Which is/are good choices for a 4-year-old to treat the symptoms of a viral upper respiratory infection?	41	32	.471	93	.264	61
Q8. Most vitamins and supplements are regulated by the FDA.	41	98	.156	100	0	2
Q9. Breastfed babies do not require vitamin supplementation in the first months of life.	41	95	.218	98	.156	3
Q10. What is a common reason toddlers have iron deficiency anemia? Choose the best answer:	41	98	.156	98	.156	0
Q11. Most formulas manufactured and sold in the US meet similar caloric/vitamin/mineral nutritional requirements:	41	88	.331	100	0	12
Q12. If an infant has a cow milk protein allergy, they should use:	41	24	.435	78	.419	54
Q13. Pediatricians recommend toddler formulas:	41	88	.331	98	.156	10
Q14. Infant colic is defined as:	41	100	0	100	0	0
Q15. If a family wants to try an over-the-counter colic remedy, what is the safest, most effective choice?	41	29	.461	95	.218	66
Q16. Colic puts an infant at risk for:	41	95	.218	98	.156	3
Q17. Which skin care application will be the thickest and last the longest?	41	85	.358	98	.156	13
Q18. What is a primary ingredient most recommended in a diaper cream?	41	76	.435	95	.218	19
Q19. When should families introduce purees and infant fortified cereals to babies?	41	34	.480	80	.401	46
Q20. Which style of infant solid food introduction helps prevent food allergies?	41	100	0	100	0	0
Q21. Used daily, food puree pouches help babies' oral motor development:	41	54	.505	90	.300	36

Abbreviation: FDA, Food and Drug Administration.

pharmacy students have been shown to improve knowledge and confidence in pediatric prescribing.[26] Our curriculum could expand on this by covering counseling for office visits, after-hours phone calls, or discharge guidance. Collaborative interprofessional application of our session may improve identified areas of weakness across all levels.

Our curriculum has several limitations. It is targeted to transition-to-residency courses for fourth-year medical students. Thus, while any institution with a similar program can implement our work, it may not be appropriate for other learner groups. Our learners were all fourth-year medical students matched in pediatrics who likely were more invested in this topic area than the average medical student. This may have affected our high metrics for video completion and favorable reviews of the content. Due to the COVID-19 pandemic, our learners had less exposure to common colds/coughs than during a typical pediatric respiratory season. As a result, their baseline familiarity with the material may have been limited, leading our data to show a more robust pre/post performance than if learners had had more clinical opportunities to engage with the material. There were multiple-choice questions for which we saw a decrease in performance. Question 6, relating to the number of upper respiratory infections children experience annually, was graded incorrectly (as 10-12 per year) compared with the accurate information presented in the videos (six to eight per year). This error has been corrected in the pre/post survey (Appendix H). We felt student answers to Question 1, related to the definition of fever, were affected by local practice variation during the pandemic. These concepts may warrant reinforcing in the facilitated group discussion. The OSCE was difficult to interpret due to the lack of a pretest and the lesser focus of videos on triage skills; however, we felt the opportunity to practice skills application and obtain feedback was valuable for the students. Finally, it may have been difficult for raters to score a student's answer while also playing the role of the parent. In the future, enlisting a separate grader may improve the accuracy of the OSCE assessment.

OTC products are ubiquitous in the lives of families with young children, yet medical education devotes little time to teaching in this area. Given the feasibility and successful knowledge acquisition demonstrated by our curriculum, we aspire to share it widely with learners of varying levels and from diverse health professions to support the health and safety of children and families under their care.

Appendices

A. Fever.mp4

B. Fussy Infants and Probiotics.mp4

C. Infant Formulas.mp4

D. Solid Foods.mp4

E. Skin Care.mp4

F. Viral Upper Respiratory Infections.mp4

G. Vitamins and Supplements.mp4

H. Pre-Post Test.docx

I. Facilitator Discussion Guide.docx

J. Parent Call Rubric.docx

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

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Ethical Approval
The Northwestern University, University of Nebraska Medical Center, University of Virginia, and Virginia Commonwealth University Institutional Review Boards approved this project.

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