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RESEARCH

Pediatric medication use experiences and patient counseling in community pharmacies: Perspectives of children and parents

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ABSTRACT

Objectives: This study aimed to explore the perspectives of children and parents regarding: 1) pediatric patients' knowledge and medication use experiences for chronic conditions; 2) how they want to learn about medicines; and 3) perceptions of community pharmacist–provided counseling.

Design: Qualitative study using semistructured interviews and thematic analyses.

Setting: Three community pharmacies in 2 eastern states: one in rural western North Carolina, and 2 in an urban region of western Pennsylvania.

Participants: A total of 39 study participants: 20 children using medications for chronic conditions and 19 parents interviewed July–December 2015.

Main outcome measures: Child and parent perspectives regarding pediatric medication use, knowledge, experiences, and pharmacist–provided patient counseling.

Results: Children and parents had similar perspectives on pediatric medication use and pharmacist counseling experiences. Six themes emerged: 1) child's knowledge, self-management, and medication use experiences; 2) essential medication information and sources; 3) child's frequent absence from the pharmacy; 4) patient counseling needs and recommendations; 5) use of interactive technologies to facilitate learning about medicines; and 6) perceptions of pharmacists. Participants reported that children were independently managing their medications, although they had minimal knowledge about medicines. Children and parents stated that the child's absence during medication pick-up at pharmacies was a barrier to receiving counseling by pharmacists. Children were comfortable and receptive to pharmacists educating them about their medicines, particularly how medications affect the human body, how they were manufactured, and research studies on their medications. Parents and children recommended the use of interactive and educational technologies for pediatric counseling.

Conclusion: Children are frequently not present at pharmacies during prescription pick-up; however, children and parents are comfortable with and receptive to pediatric medication counseling by pharmacists. Interactive and educational technologies need to be developed and used by pharmacists to facilitate counseling and educate children about the effective and safe use of medicines.

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In the past 2 decades, the number of children diagnosed with chronic conditions has steadily risen.¹ As a result, children are taking significantly more medications than ever before.^{2,3} Recent trends in drug use indicate that more than 263 million prescriptions are dispensed annually for pediatric patients and more than 6 million children use medications for chronic conditions.^{2,4} Children with chronic diseases have a higher risk of encountering drug therapy problems which may include improper administration, dosing errors,

Key Points**Background:**

- The number of children diagnosed with chronic conditions has rapidly increased in the past 20 years. Many children are independently managing their medications with limited knowledge, which may predispose them to improper administration, dosing errors, and nonadherence.
- Pharmacists in the community are accessible to children with chronic conditions and their caregivers; however, very little is known about children's perceptions of their counseling needs.
- This study advances our knowledge of children's and parents' perspectives of community pharmacists to implement medication counseling services for this vulnerable population.

Findings:

- Participants reported that children were independently managing their medications, although they had minimal knowledge about medicines.
- Both participant groups stated that the child's absence during medication pick-up at the pharmacy prevented them from receiving counseling by community pharmacists.
- Children were comfortable and receptive to pharmacists educating them about their medicines, particularly how medications affect the human body, how they are manufactured, and research studies on their medications. Parents and children recommended the use of interactive and demonstrative technologies.

and medication nonadherence.⁵⁻⁷ Despite having very limited knowledge about prescriptions, many children are independently managing their medications.⁸ Medication dosing errors in children are 3 times more likely than in adults to cause harm or lead to treatment failures, adverse events, or even death.^{9,10} Parents and other family caregivers often overestimate how much medication management responsibility their children can assume.¹¹ Therefore, children's safe and effective use of medications is a growing patient safety concern.

The National Council on Patient Information and Education has recognized that the improper use of medicines in children is a national health problem affecting children of all ages, in all parts of the country, and of every ethnic and socioeconomic group.⁶ Because many children are regularly taking medications, pharmacists can help to improve pediatric patients' knowledge regarding safe use of medicines through provision of direct patient counseling. Pharmacists as medication experts are potentially well positioned to educate children about their medicines, because more than 93% of Americans live within 5 miles of a pharmacy, and there are more than 60,000 pharmacies, often in areas that are more geographically accessible to families than other types of health care facilities.^{12,13}

Furthermore, the U.S. Pharmacopoeia emphasizes that health care professionals should directly speak with children about their medicines using developmentally appropriate methods; this has been shown to improve medication adherence, disease self-management, and clinical outcomes.¹⁴⁻¹⁷ Children with chronic conditions have expressed a desire to be more involved in their treatment, health care decisions, and medication-taking processes.^{16,18} A study found that adolescents typically have difficulty communicating with health care professionals and accessing appropriate medical services.¹⁹ Most studies examining medication counseling in pharmacies have focused on adult patients' and pharmacists' perspectives.²⁰ There has been limited research exploring children's and parents' perspectives on pediatric medication use experiences and their need for pharmacist-provided counseling; this study begins to address this research gap.

Objectives

We explored the perspectives of children and parents regarding: 1) pediatric patients' knowledge and medication use experiences for chronic conditions; 2) how they want to learn about medicines; and 3) perceptions of community pharmacist-provided counseling.

Methods*Study setting, recruitment, and participants*

Participants were recruited from 3 community pharmacies: 1 located in rural western North Carolina and 2 in an urban region of western Pennsylvania. Based on the study objectives and earlier observational findings,²¹ children participants were eligible if they could speak English, were 7 to 17 years of age, and took medication for a chronic condition, such as asthma, diabetes, depression, or attention deficit-hyperactivity disorder. We purposefully included children with various chronic conditions and ages who might have different capabilities and cognitive development to better understand pediatric day-to-day medication use experiences and communication with pharmacists. Parent interviews were conducted to understand their perspectives of their children's medication use and pharmacist-provided counseling; eligible participants could speak English and picked up medication for a child at the pharmacy. Flyers describing the study were distributed to families picking up medications for children with chronic conditions. Pharmacy staff contacted the research team when eligible families showed interest in study participation. Parents and children provided written informed consents and assents, respectively. The University of Pittsburgh and University of North Carolina Institutional Review Boards approved this study.

Data collection

Semistructured interviews were used for data collection. Interview guides ([Appendix](#)) using open-ended questions were developed by 4 members of the research team to elicit perspectives of children and parents regarding pediatric knowledge and medication use experiences, facilitators of

patient counseling, and perceptions of community pharmacists. Two additional pharmacy researchers examined the instrument and provided feedback to enhance content validity and clarity before it was piloted with 4 children. A research assistant (pharmacy student intern) and a pharmacy researcher conducted approximately 20-minute interviews (median 11 minutes) from July to December 2015. Interviews were face to face for Pennsylvania participants and via telephone for North Carolina participants; the same interview guides were used at both study sites. Participant demographic characteristics, including age, education and grade level, gender, race and ethnicity, parent marital status, and annual household income, were collected. Interviews were audio-taped and professionally transcribed verbatim.

Data analysis

To establish confirmability, researchers reviewed transcripts for accuracy.^{22,23} Data analysis was conducted simultaneously with data collection, and interviews were conducted until data saturation was achieved, defined as the point at which no new information was discovered from participants' responses.²⁴ Transcripts were thematically analyzed to develop a list of codes representing major conceptual categories within the data.^{25,26} This master codebook was developed and refined by the entire research team through biweekly meetings. Two members of the research team independently coded all interview transcripts and identified prevalent codes. Nvivo 10 (QSR) qualitative software was used for coding and codebook development. To increase interrater reliability, 4 researchers met to review all codes, their definitions, and refine the codebook. Interrater reliability was acceptable ($\kappa = 0.79$). Coding discrepancies were discussed and resolved during biweekly research team meetings including the interviewers to assist with interpretation of the data. Prevalent codes were categorized and merged into 6 major themes to comprehensively describe children's and parents' perceptions. To ensure study rigor and trustworthiness, interviewers used consistent pilot-tested interview guides and reflective journaling to document their reactions after the interviews, and the research team used peer debriefing, data from multiple sources (children and parents), and multiple coders.

Results

Thirty-nine interviews were conducted with 20 children and 19 parents. Tables 1 and 2 present participant characteristics. Participants were non-Hispanic white and mostly female (children 60%, parents 95%); children aged 12 to 14 years (45%) and in 9th grade or above (50%); and parents aged 40 to 49 years (47%), married (84%), with a bachelor's degree or higher (58%) and yearly income of $\geq \$100,000$ (56%). Following are the 6 themes that emerged from participant interviews as well as verbatim quotes (Table 3).

Theme 1: Pediatric patients' knowledge, self-management, and medication use experiences

Child perceptions

Most children perceived they had adequate knowledge about their medications and why they were taking them. A

Table 1
Description of children (n = 20)

| Characteristic | n (%) |
|----------------------|----------|
| Gender | |
| Female | 12 (60) |
| Age | |
| 7-11 y | 4 (20) |
| 12-14 y | 9 (45) |
| 15-17 y | 7 (35) |
| Race | |
| White, non-Hispanic | 20 (100) |
| School grade level | |
| 5th grade and lower | 4 (20) |
| 6th-8th grade | 6 (30) |
| 9th grade and higher | 10 (50) |

Two children with the same parent were interviewed.

majority were only able to say their medication name and the reason it was prescribed.

"I know what it's made and used for. I wouldn't mind if I knew more about it." – Child (C) 1, male, 16 years

Children were confident in their ability to self-manage their medication regimens with a consistent routine, and thought that they could do so without parental supervision.

"I usually am used to it now. I just get up in the morning, eat breakfast, take the medicine, and then go to school." – C2, male, 14 years

Children stated that they had occasional difficulty remembering to take their medicines.

"I usually don't forget anymore. I used to: 2 or 3 years ago I think I would forget every now and again. And she [the parent] would make sure that I took it. But now I pretty much have it down." – C3, female, 16 years

Table 2
Description of parents (n = 19)

| Characteristic | n (%) |
|----------------------------------|----------|
| Gender | |
| Female | 18 (95) |
| Age | |
| 18-39 y | 3 (16) |
| 40-49 y | 9 (47) |
| 50-59 y | 7 (37) |
| ≥ 60 y | 0 (0) |
| Race | |
| White, non-Hispanic | 19 (100) |
| Education | |
| HS or GED or less | 5 (26) |
| Some college or associate degree | 3 (16) |
| Bachelor's degree | 6 (32) |
| Postgraduate degree | 5 (26) |
| Marital status | |
| Married | 16 (84) |
| Single, never married | 2 (11) |
| Separated | 1 (5) |
| Yearly income ^a | |
| \$0-\$49,999 | 1 (6) |
| \$50,000-\$99,999 | 6 (38) |
| $\geq \$100,000$ | 9 (56) |

^a Yearly income was refused, missing, or unknown for 3 parents.

Table 3
Summary of themes and participant quotes

| Theme | Quotes |
|---|---|
| Theme 1: Pediatric patients' knowledge, self-management, and medication use experiences | "At first I wasn't used to the pill, so it was kind of hard to swallow, but it was fine after a while." – Child (C) 2, male, 14 years "He's getting to the age now to where he's going to—eventually, in a few years—to be taking and doing this stuff himself." – Parent (P) 1, female, 34 years |
| Theme 2: Essential medication information and sources | "He's been my doctor since I was a baby. So I knew him since I was little, so I'm used to how he talks, what he talks about. If he says something people wouldn't understand, I understand it." – C2, male, 14 years "When I first start taking something, like when I first started taking the Mononessa, I think that I had a question, a side effect question, so I went online and looked it up." – C3, female, 16 years |
| Theme 3: Child is frequently absent from the pharmacy | "No. I don't come to the pharmacy all that often." – C4, male, 16 years "I just, I stand there, and I don't really do anything." – C5, 17 years |
| Theme 4: Patient counseling needs and recommendations | "I don't think there's a need to [receive counseling] every time you go and pick up—it's the same medication. You use it and get it filled every month so it's the same thing, so really, nothing's going to change." – P2, female, 57 years |
| Theme 5: Use of interactive technologies to facilitate learning about medicines | "Little games that you can do and it lets you know about them [the medicines]. Like after you do a little game you read a portion, or something like that." – C1, male, 16 years "The wait time at a pharmacy can vary from basically no wait time to 10 or 15 minutes, so I think a benefit would be—would occupy the child during a visit to the pharmacy, and it can be educational, as well." – P9, male, 42 years |
| Theme 6: Perceptions of community pharmacists | "If I'm not sure of something I don't hesitate to call, at all. That's why I like this pharmacy, because I can just call up or [the pharmacist] will say, 'Are you sure you understand this? Do you understand this is going to work like this?' If he sees me not picking something up, he'll say." – P7, female, 54 years "I think explaining to a child how something works in his body might be too much, but I think they could simplify it. [The pharmacist] could simplify it and say, 'Look, this is going to help your tummy in this way,' or—you know? I think he could simplify it in a way that's—like the doctor draws pictures, and sometimes that's too much. And I think that here it could be, you know, a few sentences and make them comfortable, and send him on his way and be done with it." – P7, female, 54 years "I think it's the doctor's responsibility first. The pharmacist's second. But it's also the parents' responsibility to make sure they're informed about what they're giving their children." – P4, female, 35 years |

Other challenges children had overcome included bad taste of and swallowing medications.

Parent perceptions

Parents had differing perspectives on their children's knowledge of their medications and autonomy in self-management. Some parents thought that their children were limited in their medication knowledge, whereas a few thought that their children had considerable medication knowledge.

"He knows what it's for but I don't think he knows anything more than that. He knows the general idea it's supposed to help him calm his nerves." – Parent (P) 1, female, 34 years

Most parents stated that their children understood why they take their medications, the dosage, and medication routine. Concerning their children's autonomy in medication management, a number of parents stated their children take their medicine independently; however, some were still supervising to ensure that they were taking it appropriately. Some parents noted that their children experienced difficulty in remembering to take their medications and therefore needed reminders.

"He takes it in the morning but I always remind him just in case, because, many times, he does forget to take it." – P2, female, 57 years

Parents reported that their children's age influenced their level of independence in medication management, and with increasing age they prepared and expected them to have more autonomy.

"At this age what I like to do is get them familiar with how the whole procedure works. Because I'm trying to get them out of the nest. She has two older sisters, and I wanted them to start taking care of their own scripts, and hoping that she'll, in the next year or two, get comfortable doing that as well." – P3, female, 54 years

Theme 2: Essential medication information and sources

Child perceptions

Children most often stated a desire to learn the basic pharmacodynamics, how they are manufactured, related research studies, and the history of their medications.

"Where it comes from, how it's made, where it's made, who invented it." – C2, male, 14 years

"It would be cool and interesting to see how other people react to it. Like test studies for how other people react to it. And sort of more about how it affects the body." – C3, female, 16 years

A small number of children reported an interest in learning about medication side effects and safe uses. Children stated

that their physician was their primary source of medication information, followed by their parents.

“She [the physician] usually tells me about the medicine when she prescribes it. She doesn't really give me something to read but she sketches stuff out so I can see what's happening.” – C4, male, 16 years

Children had established relationships with their physicians and were accustomed to discussing health and medication concerns with them. A few children reported using the internet to address their medication questions and learn about side effects.

Parent perceptions

For patient counseling purposes, most parents wanted to discuss drug interactions and side effects of their children's medication with pharmacists.

“Side effects are the number one. And then drug interactions. Food interactions with certain pills. But the number one is the side effects.” – P4, female, 35 years

Parents indicated that they primarily received information on their child's medication from physicians, written materials such as pamphlets or package inserts at physician's offices or pharmacies, and the Internet.

“If I have a question ... typically we go through the doctor with what we need for, what's supposed to happen with the medication.” – P5, female, 46 years

“The doctor. The pharmacist. The insert that comes with the medication. Occasionally, you know, websites, look up medication if it's something really exotic.” – P6, female, 47 years

Parents stated that pharmacies can be a source of information; however, pharmacists were perceived to be more of a reinforcement of the information they received from the physician. One parent noted that she always contacted the pharmacist first for medication questions, because they frequently respond faster than the physician.

“I always start with the pharmacist because usually the doctor takes too long to get back to you, but the pharmacist calls quicker. And usually I can get the answer from the pharmacist more easily, and just as complete, so I usually call the pharmacist first.” – P7, female, 54 years

Theme 3: Child is frequently absent from the pharmacy

Child perceptions

Most of the children reported that they rarely visited the pharmacy, often stating that their parents pick up their prescriptions while they are at school.

“I don't pick up my medicine, so I've never really seen my pharmacist.” – C5, male, 17 years

“In the past I've gone probably 10 times. Obviously, they've [the parents] gone, because they usually do it when I'm at school.” – C6, female, 13 years

When children were present, their parents are usually the ones picking the prescription up at the counter and interacting with pharmacy staff. Children often said that they were present but not involved, or they were elsewhere in the store.

“I just sit around and look around at the shelves and the different medicines.” – C7, female, 9 years

Parent perceptions

Parents reported the common absence of the child at the pharmacy for medication pick-up.

“Rarely. Every once in a while he's with me but, even then, he really isn't paying attention to the pharmacist or anything.” – P8, female, 40 years

Often out of convenience, as illustrated in the quote below, parents stated that they typically visit the pharmacy while running errands, after work, or while the child is at school, which results in the child often not being present.

“They're [the children are] not usually with me. I usually come when they're at school.” – P7, female, 54 years

“Just the trip to the pharmacy is typically an in-and-out type trip, and so we will stop on the way home from work or throughout the day, and our kids are usually not with us when we go to the pharmacy.” – P9, male, 42 years

Theme 4: Patient counseling needs and recommendations

Child perceptions

Children expressed an interest in receiving counseling from a pharmacist primarily when they had medication questions.

“You could just talk to them [the pharmacists] and ask them all the questions you wanted, and they could give you all the information. They would ask you questions, like if you want to learn this or learn that.” – C8, female, 10 years

When children discussed different methods of learning about their medicines, almost all of the children were not interested in reading materials such as a comic book or pamphlet. A few noted that if the pamphlet looked interesting and caught their attention they may be drawn to read it, and the ability to take the written material home was an advantage.

“I don't think I would read that, because there's always those pamphlets around and they never really look interesting, so I guess if it looked cool I might take a look at it.” – C4, male, 16 years

One child wanted a meeting with the pharmacist to learn about their medicines and was not interested in any other suggested methods. Nearly all of the children indicated an interest in receiving medication education with the use of engaging technology.

Parent perceptions

Most parents expressed a need for counseling the first time that they picked up their children's prescription, because they would likely have more questions when their children are beginning a new medication.

"When your child goes on a new medication, the pharmacist should know that it is a new medication. I believe the pharmacist themselves should approach the parent at pick-up and say, 'Here are the new pills. I don't know what the doctor told you, but this is what I know. Here are your side effects.' A face-to-face consultation should take place whenever there's a new medication involved, regardless if the doctor talked to you or not. The pharmacist, they have a list of all the pills you're on ... I think there should be interpersonal interaction. Not, 'here's a bag, there's paperwork inside; I hope you read it.' – P4, female, 35 years

Parents reported other circumstances for which they would want counseling, including any changes in the prescription, periodically every 6 to 12 months, and when they had medication-related questions. Some parents noted that because their child has typically been on their medication for a substantial period of time, they were less likely to need pharmacist consultation.

Parents recommended that pharmacists initiate medication counseling to facilitate patient and parent communication.

"I think being proactive helps with patients, whether they request it or not, to give them some really important tips and then, maybe, find out what else they need to know based on their existing knowledge." – P10, female, 46 years

Parents perceived age appropriateness of patient counseling to influence their child's interest and engagement.

"The problem with that is I would think that that may—I don't know how you would end up having a 9-year-old have the same type of film that, say, a 16-year-old would have and still be age-appropriate for both of them. Because if it goes over their heads, then my son's not going to watch it. If it's too young for him, he's not going to watch it." – P8, female, 40 years

For example, one parent noted that younger children would be more inclined to play games on a tablet, but an older adolescent would likely consider that to be juvenile and would be more attracted to using the Internet. Reading materials, specifically comic books, were not perceived by parents to be a suitable source of medication information for their children.

"If you gave him paper and a pencil I think he would be like—he'd roll his eyes. It doesn't seem like work if it's on an iPad." – P11, female, 49 years

Some parents did note that an advantage of comic books was that they were accessible and able to be taken home.

"I think a comic book you can take home. If the iPad's here, you're not going to give him the iPad to take home. But a

comic book is easy and inexpensive and he could do it at his leisure, or on the car ride home. I think that's reasonable." – P12, female, 50 years

Similar to the children's responses, parents perceived their children as being most drawn to interactive technology as an engaging way of providing medication education.

*Theme 5: Use of interactive technologies to facilitate learning about medicines**Child perceptions*

Technology was a significant method that children were interested in to learn about their medicines, particularly through interactive games on a tablet or watching educational videos at a kiosk.

"Anything with technology, for some reason, is more interactive with people." – C3, male, 14 years

Many of the children perceived the kiosk to be an easy and informative way of providing medication education.

"It's just easy to sit down and watch something, so if it was already playing, and you didn't have to ask anybody, I'd watch it." – C4, male, 16 years

"Because whenever I'm just standing around waiting for my mom to get something I would watch the TV in the mall, so I feel like that would work, too." – C6, female, 13 years

However, other children preferred a tablet, such as an iPad, because of the ability to play games.

"I would use the iPad because I think it's kind of interesting. It would be—instead of the sheet of paper, capture my mind more." – C7, female, 9 years

Parent perceptions

Parents thought that their children would be receptive to technology. Many parents stated that their children would be most interested in using a tablet with games owing to their preference for interactive technology.

"He's very into technology and gaming and has an iPhone. And he would rather see something than read it. Something interactive, especially with him being a boy—something that he can—active learning, I guess?" – P10, female, 46 years

Parents were more hesitant of the effectiveness of a kiosk because of age preferences, lack of interactivity, and time constraints.

"He's familiar with the technology. But something interactive might be better than a video." – P12, female, 50 years

If there were a wait time at the pharmacy and the child were present at pick-up, parents thought that their children may be more inclined to watch a video to occupy their time.

Theme 6: Perceptions of community pharmacists

Child perceptions

Many children were more comfortable speaking with their physician rather than their pharmacist owing to a lack of familiarity. Most children reported rarely or never interacting with their pharmacist, and often they did not know their name.

“I don't even know what one of their [the pharmacists'] names is.” – C9, male, 10 years

However, children indicated that they would be comfortable speaking to their pharmacist even though they rarely interact with them, and that they would be receptive to asking pharmacists medication questions. This lack of a relationship with pharmacists was a potential barrier to pharmacist-child communication. However, children stated that an introduction to the pharmacist could help them to feel more comfortable communicating with them about their medications.

“If I was introduced to him [the pharmacist] I'd be pretty comfortable with it.” – C7, female, 9 years

Parent perceptions

Most parents reported that they are comfortable speaking with the pharmacist and have had positive experiences with medication counseling. Parents considered that their relationship and familiarity with the pharmacist facilitated their speaking with them.

“It does make me feel comfortable that we have a relationship, so he knows the family, a little bit about each of us and what's going on with us medically and personally. And that's probably the biggest thing ... his [the pharmacist's] opinion has weight. He's knowledgeable. And they trust him, his authority, and might be slightly more likely to comply with doing everything they're supposed to be doing if it comes from him.” – P6, female, 47 years

Parents were mostly satisfied with the ability to ask their pharmacist questions when they picked up their children's medicines, as well as to call if they have questions when they are not at the pharmacy. Many parents were receptive to pharmacists counseling their children, whereas a few perceived this to be primarily the physicians' responsibility. Some parents noted that their perception of the busyness of the pharmacy may influence their asking or receiving medication counseling.

“Because when we're looking here we can see that everybody looks so busy and you don't want to harass them.” – P12, female, 50 years

Discussion

Although children are significant users of medication for chronic conditions and have high rates of improper use,^{2,3,6} research is limited in this population, and even less is known about their medication use experiences. The present

study describes the integral perspectives of children and parents to understand how pharmacists can support safe and effective pediatric medication use. Children's medication self-management is potentially influenced by their sources of information and knowledge of medicines. Consequently, child-pharmacist engagement is important to address medication knowledge gaps and unique information needs of pediatric patients. Participants reported that children rarely receive medication counseling by pharmacists, partly because of their frequent absence during medication pick-up by their parents, which may affect their perceptions about pharmacists as engaged partners in managing their health conditions. Study findings highlight children's perceived patient counseling needs and appropriate strategies for receiving medication education from pharmacists to facilitate safe independent use of medications, particularly during transition to adolescence. The use of interactive technologies was recommended by children and parents as the preferred approach to provide medication information to pediatric patients to improve their knowledge and self-management practices.

Children were independently managing their medications even though they had minimal knowledge about their medicines. Parents may continue to supervise children's medication use, but they acknowledged that as their child grew older they were encouraging more medication management independence. Adolescents with chronic conditions have expressed fears and concerns about self-managing their illnesses, “feeling unprepared” as they grow into adulthood.^{27,28} To address adolescents' health concerns, it is recommended that health care providers discuss benefits of self-management to improve their continuum of care.^{28,29} Adolescent medication self-management and potential inappropriate use is a patient safety concern as children take on more disease management responsibility and adherence is known to significantly decrease.^{28,30,31} Pediatric medication nonadherence with chronic conditions is increasing and needs to be addressed in clinical care.³² Effective communication with health professionals such as pharmacists is considered to be a way of improving children's knowledge and self-management of medicines^{33,34}; however, our findings indicate that children and parents report that children rarely visit pharmacies, which limits pharmacist-child communication. Adolescents assume increased health care autonomy with medication use and require pharmacy services that may go unmet because pharmacists are unaware of their unique patient counseling needs.³⁴

The absence of children during medication pick-up reported by participants as a barrier to pediatric patient counseling supports findings from earlier studies including observations of pharmacies and self-reports by pharmacists.^{21,33} A study found that a majority (68%) of children did not accompany parents to pick up their medications at pharmacies.²¹ Direct observations in pharmacies showed that only 2% of children received direct counseling from a pharmacist.²¹ Pharmacists have reported that they communicate with children approximately 30% of the time and that often only parents are present when pediatric prescriptions are picked up.^{33,35–37} Consequently, mainly parents receive medication information regarding their child's prescription from pharmacists.^{33,35}

Children's absence during medication pick-up may reduce opportunities for direct pharmacist-child communication. Studies have shown that children want to communicate with

health care professionals about their chronic conditions and medication use as well as to be involved in decision making.¹⁸ Children participants indicated that they are more familiar with physicians and often speak with them about their health conditions rather than pharmacists. However, most of these children were comfortable and receptive to pharmacist provision of medication counseling. Child familiarity or being introduced to their pharmacist was noted as a facilitator that could increase children's involvement in their health care. Parents perceived that an additional facilitator of communication was the proactive actions of pharmacists to initiate discussions about medication concerns. Pharmacists can play a critical role in improving patient outcomes and medication compliance for children by receiving training and education on their prevalent health care issues, medication concerns, and age-appropriate communication.³⁴ Children expressed interest in learning about how their medications affect the human body, how they are manufactured, and related research studies about medicines from pharmacists.

A prominent finding related to children's interest in learning about their medicines was the use of interactive technology. Child and parent participants identified that technologies such as interactive games and educational medication videos on mobile applications were the most effective ways of teaching children about medicines. Currently, educational materials in pharmacies are designed for adults and may not be developmentally appropriate for pediatric counseling.^{16,38} Earlier research has found that children prefer technology-based education over one-to-one educational sessions with their providers,^{39,40} and video-based education has been shown to improve children's medication-taking techniques.⁴¹ Age may influence children's inclination to using different types of technology and levels of interactivity, and as children get older their preferences may change. Adolescents have significantly high levels of medication nonadherence and dosage errors,^{15,42-44} and adolescents use smartphones more than any other population^{45,46}; therefore, further research is needed to explore their perceptions of using mobile applications to improve their medication knowledge and self-management.

Studies have found that educational interventions implemented by health care providers for children with chronic conditions were highly effective and well received.^{47,48} As children age and take on more responsibility for their medications, ensuring that they have adequate knowledge and skill for taking their medications is of critical importance. Pharmacists are accessible health care professionals with extensive medication knowledge who are able to counsel children on their use of medications to improve their knowledge and self-management practices, particularly as they grow into adulthood.²⁸ Pharmacists can educate children with chronic conditions on strategies to support long-term adherence, including reinforcement of proper medication use and demonstration of correct use of medical devices, such as metered-dose inhalers.^{41,47} Pharmacies should develop and support the implementation of age-appropriate interventions that facilitate child-pharmacist relationships and medication counseling.

Limitations

Study participants were all non-Hispanic white, and a small number of children and parents participated in the study. Our

findings reflect a wide age range of children that were in different developmental stages and encompassed a variety of chronic conditions. Preferences for pharmacist interactions may vary by chronic condition; future research should explore differences across conditions.

Conclusion

Children and parents are receptive to medication counseling by pharmacists. However, children rarely interact with pharmacists, largely owing to the children's absence at pick-up. Children and parents recommend the use of interactive and educational technology to facilitate medication counseling. Further research is warranted to examine the effects of interactive technology use by pharmacists to increase pediatric medication counseling and improve children's knowledge and safe use of their medicines.

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Appendix

Child interview guide

Hi! My name is _____ and I'm a researcher. I am going to ask you some questions about how you would like to learn about your medicines. Before we get started, I'd like to get to know you a little better.

What is your favorite TV show?

What kind of music do you listen to?

Now I am going to ask you some questions about ways you can learn about your medicines. I am going to switch on the tape recorder so I don't miss any of the important things you have to say. Do you have any questions for me before we get started? [Turn on tape recorder.]

I'm going to ask you about how you get information about your medicines.

1. What do you know about the medicine you picked up from the pharmacy?
2. What kinds of things do you want to know about your medicine?
3. Who taught you about your medicine?
4. Have you ever gone on the Internet to learn more about your medicine?
5. How can your pharmacist help you learn about your medicines?

When you go to the pharmacy, would you use any of the following things to learn about your medicines?

1. An iPad that has quizzes, games, and videos about your medicine
2. A comic book about your medicine
3. A 10-minute meeting with your pharmacist to learn about your medicine
4. A TV with a station where you can watch videos about your medicine

Now I'd like to talk with you about what happens at the pharmacy when you go to pick up your medicine.

1. How often do you go with your parent or caregiver to pick up your medicine at the pharmacy?
2. What do you do at the pharmacy while you are waiting for your medicine?

Now I'd like to ask you about the pharmacist who works at this pharmacy.

1. Do you know your pharmacist's name?
2. Do you ever talk to the pharmacist about your medicine?
3. How comfortable are you speaking with the pharmacist? What about your doctor?
4. What kinds of things would make you feel more comfortable talking with your pharmacist?

Now I'm going to ask you a few questions about your medicines.

1. Is there anything about taking your medicines that you find confusing or difficult?

2. Do you ever have problems with taking your medication when your parents are not around?

I'm going to turn off the recorder now. I just have a few final questions to ask you.

Child demographic form

1. How old are you (in years)? _____
2. What grade are you in? _____
3. What gender is the child?
 Male Female
4. Are you of Hispanic, Latino, or Spanish origin?
 No Yes
5. What is your race? [For purposes of this question, persons of Spanish/Hispanic/Latino origin may be of any race.]
 White
 Black or African American
 American Indian or Alaskan Native
 Asian
 Native Hawaiian or other Pacific Islander
 Other race (please specify): _____

Parent interview guide

Hello, my name is _____ and I'm a researcher. I am going to ask you some questions to understand how pharmacists can help you and your child learn about their medicines. I am going to turn on the tape recorder so I can accurately capture what you say. We will not share anything you say with your pharmacist or any other person who is not a part of our research team. Do you have any questions before we begin?

[Turn on tape recorder.]

I would first like to ask about your experiences with bringing your child to the pharmacy and your preferences for learning about your child's medicines.

1. How often do you bring your child with you to the pharmacy when you pick up his or her prescription?
2. What kinds of things would you like to know about your child's medicine?
3. What information sources do you use to learn about your child's medicine?
4. How much does your child know about his/her medications?
5. How do you think the pharmacist can help you and your child learn about your child's medicine?

Now I would like to ask you about some different methods for providing medication education to your child.

1. When you go to the pharmacy, do you think your child would use any of the following to learn about his/her medicines?
 - a. An iPad that has quizzes, games, and videos about the medicine
 - b. A comic book about the medicine
 - c. A kiosk that has a TV where your child can watch videos about the medicine
 - d. A 10-minute in-person meeting with your pharmacist to learn about their medicine

2. What other ways could pharmacists make learning about medicines interesting for your child?
3. Does the pharmacist ever give you and your child written materials about your child's medicine?

Now I would like to ask you about your child's medication use experience and communication with the pharmacist.

1. How often would you like the pharmacist to discuss your child's medicines with you and with your child?
2. Do you think the pharmacist should talk to your child about his/her medicines? Why or why not?
3. What kinds of things would make you feel more comfortable talking to your pharmacist about your child's medicines?
4. Who is responsible for managing your child's medication?
5. What makes it hard for your child to take his/her medicine as prescribed?

I'm going to turn off the recorder. I just have a few final questions to ask you.

Parent demographic form

1. How old are you (in years)? _____
2. What is your gender?
 Male Female
3. Are you of Hispanic, Latino, or Spanish origin?
 No Yes
4. What is your race? [For purposes of this question, persons of Spanish/Hispanic/Latino origin may be of any race.]
 White

- Black or African American
- American Indian or Alaskan Native
- Asian
- Native Hawaiian or other Pacific Islander
- Other race (please specify): _____

5. What is the highest level of education you have completed?
 - Eighth grade or less
 - Some high school
 - High school graduate or GED
 - Some college, no degree
 - Associate degree, occupational
 - Associate degree, academic
 - Bachelor's degree
 - Master's degree
 - Professional degree
 - Doctoral degree
6. What is your current marital status?
 - Married or living as married
 - Separated
 - Widowed
 - Single, never married
7. Which of the following best describes your household's total yearly income?
 - Under \$25,000
 - \$25,000 to just under \$50,000
 - 50,000 to just under \$75,000
 - \$75,000 to just under \$100,000
 - \$100,000 to just under \$150,000
 - \$150,000 or more