

PEDIATRIC ASTHMA

Medication Use in Australian Children with Asthma: User's Perspective

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Background and objectives. Medication use-related issues remain problematic in childhood asthma despite effective treatment strategies and public investment into improved asthma management strategies in industrialized countries. This study aimed to carry out an in-depth exploration of the views of parents/carers and children with asthma on medication use. **Methods.** Semi-structured qualitative interviews were conducted with a purposive convenience sample of children with asthma and their parents recruited from general practices in Sydney. Interviews were tape-recorded, transcribed verbatim, and thematically analyzed. **Results.** A total of 52 interviews (26 parents/carers and 26 children with asthma) were conducted. Major themes which emerged from the children's interviews included issues such as self-image, resistance to medication use, and lack of responsibility in medication taking. Parental or carer issues included lack of clear understanding of how medications worked, as well as administration difficulties, cost constraints, and beliefs about medications contrary to quality use. **Discussion.** This is one of the few research studies exploring the viewpoint of children with asthma about their medications in Australia. Despite investment in dissemination of professional, targeted evidence-based asthma management strategies in healthcare, there seems to be a lack of depth in terms of what parents understand about their child's asthma. Effective communication about medication usage, especially the inclusion of the child in the consultation to empower them to be involved in their own asthma care, may be the answer.

Keywords asthma, child, issues, medication, medicine, therapy

INTRODUCTION

Asthma is a common and serious health problem with over 300 million people diagnosed worldwide (1). The prevalence of pediatric asthma increased steadily during the last part of the twentieth century among high income countries particularly the United States, Canada, New Zealand, Australia, and the United Kingdom (2–5). Asthma is a major contributor to the burden of illness in children (6); it was estimated that on average children miss around 13 million school days each year due to asthma (7). Childhood asthma is also associated with lower quality of life and higher rates for asthma primary care and emergency department visits as compared to adults (8).

Asthma is one of the most prevalent respiratory health conditions in Australian children (5). It was estimated that 21% of children aged 0–15 years have been diagnosed with asthma in Australia, while 11.3% of children within the same age group have a current diagnosis (5, 9). Asthma is one of the most common problems managed by doctors and is a frequent reason for the hospitalization of children (10–12). The mortality rate due to asthma in Australia remains high on an international scale (11). The latest Australian Bureau of Statistics' data recorded 17 deaths in 2009/2010

for children under 15 years compared to seven deaths in 2005/2006 (13). The Australian data suggest that there are significant social costs as well. The emotional burden on families is substantial: both children with asthma and their parents have significantly lower quality of life, emotional health, and social functioning in comparison with those who do not have asthma (6, 14).

Medications are the mainstay of asthma therapy (15). Despite the availability of effective asthma medications for more than a decade, asthma control in children remains suboptimal even in developed nations where experience in childhood asthma has been longer, and public health investment into asthma higher (15). Many children with asthma are not being managed in accordance with current evidence-based guidelines, and asthma management practices vary widely between countries (16). Most adults and children with asthma are dispensed inhaled corticosteroids intermittently, despite treatment guidelines recommending regular use in people with persistent asthma. Over 80% of inhaled corticosteroids in adults and 40% in children with asthma are supplied in combination with long-acting beta-agonists, despite guidelines recommending that combination medications should only be considered in children whose asthma is not well-controlled with regular inhaled corticosteroids (11, 17). Issues in the use of asthma medications have been investigated more thoroughly in adult patients compared to children (11).

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Asthma medication is encumbered by many issues and is especially problematic in children with asthma, since the parental/carer responsibility for monitoring and medication use by the child adds another layer of complexity (18). Household routine, carer to carer communication, motivation, attitudes, and understanding of medication regimens are key factors predicting adherence or nonadherence to medication regimens. Nonadherence types have been described as erratic, unintentional, or deliberate (19). Erratic nonadherence on the parents' part may be due to low levels of organization, e.g., parents/carers may feel tied down by medication regimens with occasional lapses in regimen adherence. Unintentional nonadherence may occur due to poor inhaler techniques or unawareness. Studies, for example, report that the inability of parents to recognize symptoms and initiate medications at appropriate times often leads to the worsening of a child's condition and overall lack of asthma control (15). Previous research has also identified a strong parental fear of side effects from asthma medicines, especially from corticosteroids; this may lead to underuse of preventer medication and exemplifies deliberate nonadherence. Some studies revealed nonadherence due to increase in use of complementary and alternate medicine (CAM), which was based on distrust of conventional medicines, bad experiences with physicians, and/or belief that CAMs are safe, are natural, and lack side-effects (15).

In the case of children too, nonadherence may stem from many reasons. A child's embarrassment over taking medicines in public has also been reported by a few studies (deliberate and erratic nonadherence), and children may not be motivated to adhere to medication regimens and may therefore need repeated reminding by parents (15). Sometimes, children have problems taking medication due to the esthetics of available medications or fear of spacer facemasks leading to erratic and unintentional nonadherence (15).

Many educational interventions have been successfully implemented for asthma control and adherence, but not many researchers focus on the actual mechanics of medication use (15). The literature demonstrates that not many strategies target medication use in children with asthma. Identifying a child's perspective to formulate asthma medication use strategies is rarely performed (15, 20). The results of studies suggest that the majority of children either may not receive or may not recall receiving asthma education and are not included in their asthma management (19, 21). Despite an increasing prevalence of chronic conditions in childhood, currently, very few children's health education curricula include elements of appropriate medicine use, and what exists has not been based on what children know or on their behavior or expectations relative to medications. The aim of this study was to explore issues that arise when using asthma medications in children, from parents' and children's perspective.

METHODS

The study was carried out in four primary care practices in Sydney. The concerned general practitioners (GPs) or

practice nurses (where the medical practice had one, and where the GP allocated this role to the practice nurse) recruited the participants. The GPs identified the potential participants. The parents/carers and the child were invited to participate in the study on behalf of the Surgery/Practice/Medical Centre if they met the following criteria: (a) the child was between 7 and 12 years of age, (b) the family had sufficient fluency in English to allow the interview to be conducted, (c) the child had a diagnosis of asthma and had used asthma preventer medication for at least 3 months in the last 12 months, and (d) the child did not have comorbid chronic illness along with asthma except any other allergic condition (allergic rhinitis, eczema, and generalized allergic disorder). The GPs or practice nurses facilitated the recruitment process by obtaining consent from the potential participants to take part in research. Although consent to participate was sought from the parent on behalf of their child, prior to conducting interviews, children's assent to participate was determined verbally. Once the consent was obtained, a study investigator contacted the potential participant and fixed the time and venue for the interview. The interviews were conducted in a private place within the practice (but not visible to the patient's physician) or over the telephone as per the convenience of the interviewee. The designated participants (either the parents/guardians of a child with asthma or the child themselves) were interviewed as per the interview guide designed by the investigator/s.

Semi-structured in-depth interviews were conducted separately with children with asthma and at least one of their parent/guardian. Although the interviews were conducted separately, the parents were requested to remain within visual vicinity of their child being interviewed. Two semi-structured interview guides consisting of open-ended questions were constructed, one for parents and the other for children, and they included questions relating to asthma and medication identified as issues during a systematic search of current literature (Table 1). The interview guide commenced with a few queries about general demographics. As this is usually fairly neutral noncognitive challenging task, initiating an interview with such queries was thought to allow participants to feel comfortable and develop rapport with the interviewers. Following the recording of general demographics, participants were asked questions relating to the asthma-related history of the child, as well as the child's current level of asthma control (the latter based on definitions outlined in the Australian Asthma Management Handbook, 2006). These straightforward discussion points were followed by increasingly more thought-provoking questions about medication use. The face validity of this interview guide was ascertained by obtaining the opinions of several healthcare professionals (pediatric respiratory specialists, general practitioners, asthma educators and academic, child psychologist, and practicing pharmacy practitioners). Questions were open-ended with prompts. In each question, probing content was limited to a single idea, and a brief introduction to each section was provided to give the respondent an idea of what was going to be asked. Prompts based on issues identified in the literature search and the

TABLE 1.—A gist of the interview guides used in the interviews.

Interview guide for parents of children with asthma	Interview guide for children with asthma
How long has your child had asthma?	What is it like having asthma?
What sort of tests were undertaken in order to confirm the diagnosis?	What did your doctor tell you about your breathing problem?
What did the diagnosis mean to you and your child?	Can you tell me about the medicines/medications you are taking?
What sort of information about asthma was provided to you at the time of diagnosis?	How often do you take these medicines? (Reliever, preventer as the child identifies his/her medicine)
Who actually explained to you about the inhalers or other medications? Who demonstrated how to use them?	Do you take these medicines/medications at school if you need to? What is that like?
Do you or your child have any issues or concerns in regard to medication use?	What happens when you visit the doctor for your asthma?
Do you think your child has any problems in using asthma medication?	How would you like the doctor to explain more to you about your asthma, the treatment so that you can understand this better?

face validity exercises were included with each question. Practice interviews were conducted with two children with asthma and their parents separately, to identify any problems with the guide and to improve interviewer's technique. As the interviews involved the children, the researchers consulted a child psychologist and followed published protocols for qualitative research (22) that focused on the ways that enable the children to articulate their experiences. The first few actual interviews were conducted with an experienced interviewer (the last author), with the primary researcher (the first author) observing.

Most of the interviews lasted for approximately 20 minutes and were tape-recorded with the permission of interviewees. Each person was interviewed once only. During the interview (with parents/guardians), the interviewing researcher summarized the key points of each section of the interview and requested an "on-the-spot" verification. This process was included in the audiotape recording. Following completion of the interview, parent and child interviews were transcribed verbatim. Field notes were taken for several interviews. Some of the interviews were conducted over the telephone upon interviewee's request ($n = 10$). The transcripts and the field notes from the interviews were deidentified (e.g., references to a physician were removed from the transcripts) and thematically analyzed.

Grounded theory methodology (23) and latent content analysis was employed to analyze the data (24). The transcribed material was read a number of times to get a general sense of the key messages. Coding and categorization were done inductively in several stages. The first stage included identification of "meaning units". This was done by underlining key phrases and words in the text and then restating these in the margin as condensed meaning units labelled with codes. The codes were then compared and grouped into tentative subcategories. In the final steps, the emerging categories were further compared, reorganized, and merged into more analytical categories and one overarching theme. To ensure the validity of coding, two researchers (the first author and the last author) coded transcripts independently of each other and compared thematic findings for the transcripts. The first author had conducted the data collection and was familiar with the

transcripts and aware of nonverbal nuances expressed by participants. The last author had audited the quality of data collection for a small subset of interviews ($n = 3$) and was experienced in qualitative research conduct and analysis. Any inconsistencies in coding were rectified by discussion, explanation of coder perspective, and mutual agreement on major themes, and a coding scheme was subsequently decided on. The results were finally verified in discussion with all the authors. The concept map helped to understand the relational issues between themes and subthemes. A checklist to ensure systematic and high quality data for qualitative research has been presented in Table 2.

Ethics approval for the project was granted by the Human Resource and Ethics Committee at the University of Sydney, Australia (HREC-13976).

RESULTS

A total of 52 interviews (26 parents/carers and 26 children with asthma) were conducted between November 2011 and April 2012. The results have been outlined as reported by the participating parents and children with asthma; the participants perspective was not corroborated by conducting interviews with the consulting GP healthcare professionals. The demographic characteristics of the interviewed children with asthma and their parents are presented in Table 3. Concept and theme maps were created for the parent and child interviews (Figure 1). The key findings for medication use issues are outlined in the themes reported below. Although some of the themes were similar, results for the parent and child interviews are reported separately. Illustrative quotes are highlighted in Table 4.

Parents'/Carers' Experiences with Child's Asthma

Parents'/Carers' stress and concern at initial diagnosis.

As reported in previous studies, having their child diagnosed with asthma was stressful for most of the interviewed parents who feared their child will never be able to lead a normal life. They also referred to worry, concern, and anxiety at the initial diagnosis. Some parents reported feelings of panic and confusion experienced during an acute exacerbation of their child's asthma. However,

TABLE 2.—Checklist for qualitative research to ensure systematic and high quality data (22, 25).

Quality indicators in qualitative research	Adoption and application by researchers
Member checking (analogous to internal validity)	The technique of the researcher restating, paraphrasing, and summarizing the information during the interview (with parents/guardians) and requested an “on the spot” verification.
Disconfirming evidence	This was actively sought by recruiting participants from different suburbs and nonmetropolitan areas—Blacktown, Glendenning, Westmead, and Gosford. E.g., Gosford has lower income families than in other suburbs in Sydney (26). Opposing views where they have been expressed have been included in the presentation of findings. E.g., most of the participants got formal education at the time of diagnosis except for a few. There was very little disconfirming evidence in most themes identified; most themes were unanimously expressive of participants’ views.
Transferability (analogous to external validity)	Researchers believe that our study will provide insight into issues from the perspective of a selected group of individuals; therefore, generalizability was not intended.
Dependability (analogous to reliability)	None context changes in results have been noted. E.g., participants who requested a telephone interview ($n = 10$) were observed to be the same. There were no thematic differences between the telephone and face-to-face modes of interviewing.
Confirmability (analogous to objectivity)	Results were independently analyzed by two researchers. Any inconsistencies in coding were rectified by discussion, explanation of coder perspective, and mutual agreement on major themes, and a coding scheme was subsequently decided on.

most of the parents appear to have coped fairly well with their child’s asthma over time.

Parents’/Carers’ perceptions about their child’s asthma and quality of life. A majority of the parents seemed to

TABLE 3.—Demographic characteristics of the parents and children with asthma.

Characteristic	Frequency (%)	
Parent Interviews (number)	26	
Parent attendance at the interview		
Only mother	22 (84)	
Only father	2 (8)	
Caregiver	2 (8)	
Employment	Mother	Father
Working full time	17 (65)	26 (96)
Pension	1 (4)	1 (4)
Not working	8 (31)	0 (0)
Child Interviews (number)	26	
Gender Male	21 (81)	
Age, Mean (range)	10 (7–12)	
Level of control of Asthma ^a		
Well controlled	23 (88)	
Partially controlled	3 (12)	
Type of asthma ^b		
Mild persistent	16 (62)	
Moderate persistent	10 (38)	
Medication prescribed ^a		
Preventers		
Montelukast tablet	8 (31)	
ICS/LABA	17 (65)	
ICS (alone)	6 (23)	
Relievers		
Salbutamol inhaler	26 (100)	
Rescue		
Liquid prednisolone sodium phosphate	12 (46)	
Miscellaneous		
Antihistamine/decongestant drops	6 (23)	
Amoxicillin	2 (8)	

Notes: ^aAs reported by the participants.

^bAccording to Australian Asthma Management Handbook.

have a general understanding about asthma and most of them had a good understanding of triggers and how to avoid them. Some of the parents voiced their concerns about the quality of life and the constraints placed on them by having a child with asthma. Some of the mothers reported they were usually the parent responsible for childcare and the need to be available for support of their child’s variable asthma exacerbations; this limited their employment opportunities. Some of the parents stated that the child with asthma required extra vigilance that affected day to day life of the family. Some parents also voiced that children had to miss school due to acute exacerbations of asthma which affects their performance in class.

A few parents reported that their child experienced embarrassment when using inhalers in front of their peers or in public initially. However, this embarrassment seemed to fade with the passage of time, as children witness other peers using similar medications. Some parents reported that with the increased awareness about asthma in schools, children appeared to be comfortable using their inhalers in front of others.

Medication Issues

Parents’/Carers’ perceptions about their child’s asthma medications. When the chart illustrating the full range of asthma medications was displayed, the majority of the parents could correctly identify the medication and the dose as well as the regimen their child had been prescribed. All the parent participants could distinguish between “preventers” and “relievers”. However, most of the parents appeared to be confused over the purpose and classification of asthma medications, i.e., how a reliever or a preventer works. A couple of parents revealed their concerns about “steroid dependence” and/or potential side effects of oral and inhaled corticosteroids. A few parents also showed reluctance about the use of long-term medicines in children.

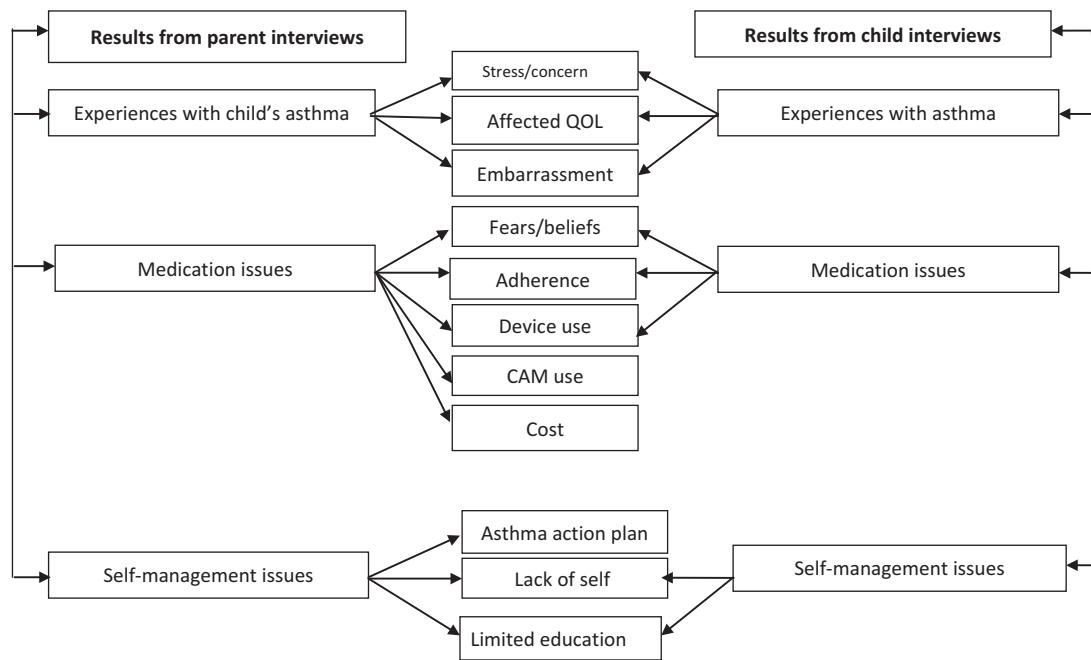


FIGURE 1.—Results from interviews.

Parental issues with adherence. Most of the parents reported that they adhered with the doctor's instructions about medication use. On deeper questioning and probing, a few of them revealed that they stopped preventer medication when their child appeared well and asymptomatic. While most of the parents understood the concept of preventing asthma symptoms, they did not associate prevention with medication use and this led to suboptimal control of their child's asthma. There were few instances of unintentional nonadherence to preventer medications. Most of the parents commented that almost all the children showed reluctance over the use of long-term medications. Most of them had problems taking medication due to the aesthetics, including taste or smell.

Parental issues with devices. Parents also commented on their child's inhaler and spacer technique and care, suggesting that confusion over use may be attributed to issues with information delivery from the healthcare professionals (doctor/practice nurse/pharmacist). Spacers appeared to be the biggest challenge, particularly in terms of what size to use as well as loading and cleaning.

Beliefs about complementary and alternate medicine. Almost a quarter of the parents/carers reported the use of CAM for their child's asthma. Most of them reported using herbal medicines, vitamins, and steam therapy. Although these have been reported to be used in previous Australian studies, none of the parents talked about using or trying yoga, breathing exercises, or homoeopathy. A few of the interviewed parents reported non disclosure of CAM use to the concerned doctor.

Cost of medicine. The affordability of the medicines and devices was a common concern raised by a majority of the interviewed parents. Our data indicated that middle income

families were the most affected. This may be because medicines are government-subsidized for those who belong to a lower income group, who had a concession card, or for pensioners in Australia, while there was no such support for those in the middle income groups. Despite financial stress many parents reported willingness to spend money for medication if there were evident benefits to their child.

Self-Management Issues

Most of the parents acknowledged that they were receiving good care. The majority of the parents expressed that the doctors in primary care had educated them well at the time of diagnosis and discussed the treatment plan. Most of them also reported that the doctors communicated well about the medications including their dosage and also demonstrated the inhaler technique well, during the early stages of receiving a formal diagnosis. However, a few of the parents also commented that they did not receive any formal education at the time of diagnosis.

All the parents reported that they had a written asthma action plan (WAAP). Most of them felt that the WAAP was easy to follow and improved their child's care. Some of the parents expressed that their WAAP helped them to manage their child's asthma well and a few of them also reported that the action plan helped them recognize their child's asthma exacerbations early and initiate prompt treatment.

Almost all the parents stated that the education about asthma was given to them by their healthcare provider but that the child had been rarely involved in the consult. This was found to be concordant with the child interviews, where the children reported that they were not involved in the consult. Most of the parents/carers appeared satisfied

TABLE 4.—Descriptions from interviews that contributed to the theme.

Parent interviews	Illustrative quotes
<i>Experiences with child's asthma</i>	
Parents'/Carers' stress and concern at initial diagnosis	"I know there is no cure for asthma, just wish my son gets well soon. I am really worried for him." (Parent #P4G1) "I was really upset when I came to know my son has asthma, as my elder one also had asthma but now he is better. I am really worried about him, they say one third of the children outgrow asthma when they are 12 or 13 years. Just wish he recovers soon." (Parent #P5G1)
Parents'/Carers' perceptions about their child's asthma and quality of life	"..... I stopped working. Sometimes I try to work part-time as I have to take care of my son." (Parent #P2G3) "At times I feel he is not performing as his classmates, he gets tired easily." (Parent #P3G1) "When she is not well, I don't send her school as she is very careless about her medicines. They expect her to tell when she needs medicines, so I keep her at home." (Parent #P2G3) "..... Initially he used to feel a bit embarrassed of using inhalers at school but now with time he is comfortable." (Parent #P3G2)
<i>Medication issues</i>	
Parents'/Carers' perceptions about their child's asthmedications	"With the preventer I am a bit doubtful, but Ventolin I know it works." (Parent #P1G1) "I feel he is not growing like other kids, it worries me." (Parent #P7G2) "He has really bad teeth and the dentist thinks it's because of medications he is taking for his asthma." (Parent #P2G1)
Parental Issues with adherence	"I am not sure. but when he is better at times we stop the inhalers, especially in summers and he is just fine but when winters start we have to give the preventers and Ventolin." (Parent #P5G2) "We try to follow the prescribed schedule give by the doctor but when my daughter is well she always misses one or two doses." (Parent #P2G4) "She doesn't like the taste of Predmix; always have to run after her to give the medicine." (Parent #P7G1)
Parental issues with devices	"It is difficult to carry the spacer at times; especially when he participates in the sports. He feels uncomfortable to use it at times. Initially he used to cry a lot, now he is better with it." (Parent #P6G2) "Previously we used two devices now both are the same kind of puffers; it was difficult for us to remember the technique of both." (Parent #P3G4)
Beliefs about complementary and alternate medicine	"I tried some herbal medicines, but not sure if they were effective as we never stopped the inhalers." (Parent #P5G1) "I remember using steam therapy that was quite effective for my son. The doctor never suggested any alternative therapies." (Parent #P3G2)
Cost of medicine	"I am not worried about the dollar value to the medications, they are expensive, but till my daughter benefits from them we are ready to pay." (Parent #P6G1)
Self-management issues	"They told us what we wanted to know at the time of diagnosis." (Parent #P1G2) "I don't remember we got any formal education about medications or the treatment plan." (Parent #P1G3) "The doctor gave us the Asthma Action Plan, it is easy to follow. We have stuck it on our fridge, so that I and my husband can follow it when required." (Parent #P2G3) "They told us what we wanted to know at the time of diagnosis." (Parent #P1G2) "We follow what the doctor prescribes. I am not too sure if need to know more about medications." (Parent #P5G4)
<i>Children Interviews</i>	
<i>Experiences with Asthma</i>	
Child's perception about asthma and quality of life	"It isn't a good feeling having asthma, thats what I can say." (Child #C1G4) "I can't play like my friends, can't run as fast as them." (Child #C4G3) "..... I used to feel a bit uncomfortable while using the inhalers at school but I am fine with it now." (Child #C6G2)
<i>Medication issues</i>	
Child's perception about asthma medications	"..... I don't like taking medicines when I am well, why should we use them when we are well?" (Child #C4G2) "I don't like the taste of Predmix." (Child #C3G3) "My mum says, I get hyper when I take Predmix. I am not sure, at times I feel the same." (Child #C7G1)
Child adherence	"I forget. My mum reminds me usually to take the medicines, when she is not at home she calls me up." (Child #C6G2)
Self-management issues	"Usually the doctor talks to my mum and explains her. She explains to me when we come home." (Child #C8G2) "I am not sure if I want to know about the medicines, haven't thought about it. Mum knows everything." (Child #C6G1) "My mum or dad knows about the medicines I use and help me using puffers." (Child #C2G4)

with the care provided, while there were some discrepancies between information-seeking and decision-making preferences.

Children's Experiences with Asthma

Child's perception about asthma and quality of life. Most of the children reported that they felt different from their peers and sometimes felt left out because of their asthma. All the children were aware that they suffer from "asthma." A few of them expressed concern about their health. For a few of the children, having asthma was associated with restricted physical activity. Some of the children voiced that they felt embarrassed while using puffers at school or in public initially. Some of the children also showed their apprehension about missing school and reported that this sometimes affects their performance in class.

Medication Issues

Child's perception about asthma medications. When a chart showcasing the medication for asthma was displayed, most of the children could identify the medications they used for their asthma. A few of them showed reluctance over the use of long-term medication due to the taste, smell, or esthetics of the available medication, which was concordant with parent interviews. Some of the children also expressed their concern about the side effects of the medications they used.

Child adherence. Almost all the children reported that they managed their asthma in cooperation and supervision of their parents/carers. Most of the children admitted that they require repeated parental reminders to take their medication. Some of the children complained that it was hard to remember when to take the medication. Almost all the children reported that they used their medication at school.

Self-Management Issues

Most of the children stated that the doctors communicated information about the medication such as dosage, regimen, and demonstrated how to use devices. Almost all the children reported that they were not involved in the consultation with the doctor. Most of the children appeared to be satisfied with the care provided which was concordant with parent interviews. Most of the children expressed no interest in receiving information about their asthma medications.

DISCUSSION

To our knowledge, this is the only recent study exploring the viewpoint of Australian children with asthma and their parents/carers about issues with medication use. We primarily focused on issues pertinent to the suboptimal use of medications in children with asthma and have explored the independent viewpoints of children with asthma and their parents/carers by interviewing them separately; this is novel feature of our study. Based on our analysis of these interviews, we report important issues in asthma medication use in children. Major themes emerging from parental

or carer interviews included lack of clear understanding of how medications worked administration difficulties, cost, and beliefs about medication contrary to quality use. The issues emerging from child interviews included child's self-image, resistance to medication use, and lack of responsibility in medication-taking. It is clear that some of these issues have been long-standing in asthma research. Given that current medications available are very effective in treating asthma and preventing loss of control, it is perhaps time to reflect on how we educate parents/carers and children with asthma about using them effectively too.

Our data indicates several significant issues in the effective use of asthma medications which have also been reported in previous studies. Our findings about parental concern and anxiety at initial consultations and diagnosis are in accordance with previous studies (13, 27–29). Data gleaned from our interviews reveal that parents still seemed unsure in their knowledge and classification of asthma medications, which has been reported universally (30, 31). It would appear that such knowledge is layered. A superficial level of knowledge exists, in that parents were able to correctly identify the medications and regimen that had been prescribed, however, real understanding of how the medication worked, and therefore the logical basis for the prescribed regimen was somewhat lacking, and these may be reasons for unintentional nonadherence (19). Parents also disclosed possible reasons for deliberate nonadherence, one main factor in this regard were parental fears and beliefs about inhaled corticosteroids. Many parents believed steroids posed risks to their children in terms of adverse effects on growth. This phenomenon of "steroid phobia" has been reported extensively as a major barrier to the use of asthma medicines in children globally (15, 29, 32–39).

Similarly, in the case of children with asthma, data showed issues which have been highlighted in previous findings. Younger children tend to resist receiving their medications, especially when they feel well; this potential for under-medication in early childhood is still a matter of concern (40–42). Our data reveal children with asthma often have limited involvement in consultations with general practitioners despite their significant role in medication-related activities at home (43, 44). The child's initial embarrassment over the use of inhalers in public was also voiced in some of the interviews, which is consistent with previous research (41, 42). Taste and esthetics of the medication is still a major problem area for children (39). In terms of health professionals, our data indicate that most of the interviewed children were not included in the consultation which is in concordance with previous studies (15, 45–48).

A rather mixed finding in our study was related to education provision by the child's healthcare professionals (GPs and practice nurses). While many parents reported that they were provided with satisfactory education, a few parent respondents were not of this view. A collaborative approach between providers, parents, and children helps to develop an appropriate asthma management plan for the child (49). However, there is a gap between the best

practice and clinical care. Recent studies have found that these guidelines are not being met, with less than half of families studied ever receiving any education about their child's asthma (50, 51).

Although findings about the impact of cost on parental decision to use medication for a child with asthma have also been rather mixed, cost was an emerging issue voiced by asthma patients and their carers in our study. Our data revealed that the cost of the medication was a major issue which affected families, despite the fact that the Australian government provides subsidized prescription drugs to the residents through a program known as the Pharmaceutical Benefits Scheme (PBS). The PBS ensures that all Australians have affordable and reliable access to a wide range of necessary medicines. Despite this program, all the interviewed parents voiced that their children require multiple medications and the cost of the medications was a concern for the family, which is concordant with previous research (13, 39). Such findings are globally prevalent. In the United States where health insurance and pharmacy benefits are possibly more complicated than in Australia, a recent study explored the impact of increasing patient prescription copayments for guideline recommended, long-term asthma controller medications on asthma-related medication use, and healthcare services. The findings suggested that even small changes in average copayment for asthma medications can result in significant reductions in medication use and unintended increases in healthcare services (52). Closer home, another Australian exploratory study which was conducted with adults reported that the cost of asthma medication was an issue for the participants (41). The study charted that the participants performed their own "cost-benefit analysis" for medication use, weighing up the expense, perceived side effects, and potential benefits of the medication/s they used. As a consequence of this, several participants chose to alter their medication regimen to minimize costs (41). This study also reported that the decision to visit a doctor was also dictated by the costs, the necessity to take time off work, travel and waiting times, and the anticipated benefit. Several participants also reported that they could not consult a doctor or specialist if they were not "bulk billed," i.e., a system in Australia where the health service provider is paid 85% of the scheduled fee directly by the government by billing the patient via their Medicare card (there is no patient copay) (41). However, another exploratory study reported by Barton et al. which involved parents caring for a child with asthma but found that while cost was an issue, caregivers indicated that it did not impact the purchasing and use of medication with their children (27). The general theme in our study was similar in that though cost was a major burden, most parents/carers would still purchase medications if there were obvious benefits. Although parents did not state this explicitly, it may be the case that costs are one key factor that dictate cessation of preventer medications too soon when symptoms resolve; this needs further exploration, using sophisticated health economic techniques. Nonetheless, given the current economic climate, communicating with the parents/carers about

medication costs should be an integral part of childhood asthma management (40).

Our findings were in stark contrast with previous reports on WAAP utilization by Australian GPs (53, 54). A previous study in Australia, for example, highlighted that in primary care, where most children with asthma are managed, fewer than 25% of people with asthma have a WAAP (55–57). All parents in our sample reported that they had been provided with an action plan by their GPs. Some of the parents elaborated that the comprehensive asthma management plan helps them recognize their child's asthma exacerbations early and initiate prompt treatment. Further, in our study sample, the usage of preventer medication appeared to be guideline adherent in terms of dosage and nonuse of high-dose inhaled corticosteroids and adequate taper down when asthma was controlled. This is also a positive change compared to other reports indicating that Australian GPs are not managing moderate to severe asthma in line with evidence-based clinical practice guidelines and that gaps remain in the provision of evidence-based care for patients with asthma in general practice (54). In our sample, the uptake of written action plan provision facilitated reasonably optimal preventer medication use by children or their carers this resulted in asthma control.

Exploring clinical implications of our findings, there are several strong pointers. Key areas of focus are asthma education and asthma self-management. Self-management skills are being increasingly focused upon by primary care professionals, as was the case in our sample with action plan provision. Encouraging children to master self-management skills and involving them in shared decision-making is essential, which is not occurring to a large extent in asthma (49). Shared decision-making needs to be a two-way exchange of information and treatment preferences (49, 58). However, it would appear in our sample that this was done at the doctor–parent level without involving the child. There is ample evidence in the literature that children know little about medication and that information about medication is not usually given to children by their healthcare providers or as part of school health education programs (45). Practitioners need to consider including a child's input into their treatment plans as it could possibly improve adherence and health outcomes (49, 59). Encouraging child involvement may enhance the child's self-confidence and improve their management skills, and information received from a child may differ from the caregiver's report which may actually improve the child's care (49, 60–62). Previous studies demonstrate that adequate physician-patient communication contributes to improved asthma management. An excellent example of this is Practitioner Asthma Communication and Education (PACE) Australia program, an innovative communication and paediatric asthma management program for general practitioners that improved asthma management and patient outcomes (63). For children, these plans should be made simple and easy for schools and school-based health centers to use. Mastering self-management skills at an early age will improve adherence to medication (64).

Indeed, very recently the notion that asthma education can successfully change parental/carer and child beliefs and behaviors and improve adherence, and that guidelines may need to setting specific was editorialized (65).

Clinicians also need to rethink asthma education. It would appear that knowledge of the mechanism of how asthma therapy works was superficial even at the parental level. There are decade's worth of reports about steroid phobia in parents. These combined issues possibly contribute to a good deal of unintentional and intentional non-adherence. It has been suggested that facilitating adherence involves an understanding the patient notions of therapy and addressing concerns and misbeliefs based on current evidence such that the clinician and patient are colloquially speaking, "on the same page." Addressing fears and concerns about preventer medications should be a focus at the clinical interaction. Strategies to minimize medication costs should be another. Post-education provision health-care professionals should negotiate a child's treatment, taking also into account parental views toward medicines and previous use of self-medication for their child (66, 67). A study revealed that CAM use is not necessarily "competitive" with conventional asthma therapies; families may incorporate different health belief systems simultaneously in their asthma management. As CAM use becomes more prevalent, it is important for physicians to ask about CAM use in a nonjudgmental fashion (67).

Organizational reengineering of primary care practices may assist in boosting asthma education provision, for example, by effectively utilizing allied health skills within the practice (e.g., practice nurses) and outside. There is a comprehensive body of evidence supporting the role of community pharmacists in asthma care (68, 69). It may be worthwhile exploring this venue for collaborative asthma care, since most medication purchase in the community setting is mediated by pharmacy outlets, patients present at pharmacies possibly in between physician visits to obtain repeat prescription authorizations (69, 70). Community pharmacists can also provide practical tips on cost reduction such as offering generic medications or informing families about government incentives such as the "safety-net," where if a family crosses a threshold expenditure level, the medications have reduced copay. Effective use of practice nurses in primary care practices may also be an option for better provision of asthma education to parents/carers and children with asthma (39, 71).

Our study has several limitations. We used a small convenience sample of parents and children with asthma whose opinions may not represent parents and children with asthma in the broader community. However, this research aimed to provide insight, through a qualitative approach, into issues from the perspective of a selected group of individuals; therefore, generalizability was not intended. Future studies will be required to explore the opinions of the broader community of parents and children with asthma. Two researchers were involved in the interviewing process and therefore interviews may have differed in terms of prompting. In some situations, audio recordings were inaudible and we had to depend on the field notes.

CONCLUSION

Our study adds to the mounting evidence for suboptimal asthma medication use by children with asthma. Long known problems such as steroid phobia still exist and deeper understanding of how asthma medications work still eludes parents, carers, and children with asthma. Financial pressures are important considerations in using medications. However, provision of written action plans for all patients seems a possibility, and seems to improve skills and confidence. The results of this study show specific areas in asthma medication use that need to be addressed. Healthcare professionals need to communicate directly with children about their medications at an appropriate cognitive level in order to increase their understanding and skills concerning health issues. These strategies will not only engage children and parents but also help in empowering families by giving them a role in optimizing asthma medication usage. Thus, our research should help inform the development of strategies to minimize poor quality use of asthma medication in children in the future. Our findings may also be used to assist in the development of new needs-based, child-friendly, and cost-effective educational tools focusing on the use of asthma medication in children. It is time that asthma research moves from the "clinical" to the "humanistic" outcomes paradigm.

DECLARATION OF INTEREST

The authors declare that no conflicts of interest exist. The authors alone are responsible for the study design and preparation of this article.

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