



Letters

Determinants of asthma knowledge and practices among caregivers of children with moderate-to-severe persistent asthma

For children with asthma, self-management is critical to minimize exacerbations requiring emergency department visits and hospitalizations.¹ Asthma guidelines recommend self-management education at all points of clinical care, focused on monitoring control, using asthma action plans (AAP), taking medications, and avoiding environmental triggers.¹ Nevertheless, asthma education is limited, contributing to suboptimal knowledge and practices.^{2,3} Improved asthma knowledge/practices are associated with better health outcomes,⁴ yet the determinants of asthma knowledge/practices among caregivers are not well understood. Therefore, this study evaluated differences in asthma knowledge/practices among caregivers of children with moderate-to-severe persistent asthma.

This cross-sectional study analyzed baseline data from Improving Technology-Assisted Recording of Asthma Control in Children, a randomized clinical trial (methodology previously published).⁵

At the baseline visit, 4- to 17-year-old children with moderate-to-severe persistent asthma and their caregivers completed surveys on asthma care (ie, primary or subspecialty care, symptom control) and asthma knowledge/practices. The survey included 8 knowledge and practice items focused on asthma self-management guideline topics (Table 1).¹ The survey was developed and pretested by pediatric health researchers. Demographics (ie, age, sex, race, and ethnicity) were obtained from the electronic medical record.

Analyses were restricted to child/caregiver dyads who completed all knowledge and practices items. Univariable statistics summarized demographics and correct item responses. For each knowledge/practice item, multivariable logistic regressions were fitted to determine the adjusted probability of correct response (yes or no) based on demographic and health care factors. Cluster-robust standard errors were used to adjust for household clustering. Statistical testing was 2-tailed at α less than 0.05. Analyses were performed using Stata SE Version 15.1 (StataCorp LLC, College Station, Texas).

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Among 252 child/caregiver dyads enrolled in the Improving Technology-Assisted Recording of Asthma Control in Children, 210 (83.3%) completed all knowledge and practice items (Table 1). Of these, approximately one-third of children were of female sex (32.9%), Hispanic/Latinx (33.7%), and non-Hispanic Black (30.2%). Children's mean age was 9.4 years (SD=3.5). In addition, 60% of children had public insurance. Approximately half were seen in primary care clinics (52.9%), and 41.3% had uncontrolled asthma.

As indicated in Table 1, 89.5% of the caregivers were aware of their child's asthma triggers. Similarly, most could describe the role of controller and rescue medications (88.1%) and identify how often their controller (93.3%) and rescue (98.1%) medications should be used. Furthermore, 84.3% knew the purpose of AAPs, whereas 94.3% had received an AAP for their child. Nearly all caregivers had received instruction on spacers (98.6%) and owned a spacer (95.7%).

After covariate adjustment (Table 1), younger children were more likely to have a spacer than older children (adjusted odds ratio, 0.74; confidence interval, 0.60–0.91; $P < .01$). Moreover, caregivers of children with controlled asthma were 2.56 times more likely to know the role of controller and rescue medications in comparison to caregivers of children with uncontrolled asthma (adjusted odds ratio, 2.56; confidence interval, 1.03–6.35; $P = .04$). In adjusted analyses, there were no additional differences in asthma knowledge/practices based on race and ethnicity, insurance, or primary vs subspecialty asthma care.

We found that no single factor was consistently associated with asthma knowledge and practices of children and caregivers. These results support the notion that asthma education must be delivered to every child and caregiver at every clinical visit, regardless of individual or health care factors.

Overall, the high levels of knowledge and practices in this study suggest that caregivers generally understand how to manage their child's asthma. This study revealed greater mastery of asthma knowledge/practice than previous studies, potentially owing to the study population's racial and ethnic diversity.⁶ Parent/caregivers' education levels may have influenced asthma knowledge and practices. Furthermore, participants' greater asthma knowledge may reflect higher levels of health literacy,⁷ given recruitment from clinics for a technology-based study suggests regular access to medical care and technology. Finally, eligibility criteria included moderate-to-severe persistent asthma with a potentially higher frequency of health care encounters and thus more opportunities for education.³

We revealed no consistent individual or health care determinants of asthma knowledge and practice, yet we identified several differences of practical importance. Notably, age and asthma control were significant determinants of asthma practices/knowledge, specifically

Table 1
Determinants of Asthma Knowledge and Practices Among Caregivers of Children With Moderate-to-Severe Persistent Asthma

Child / caregiver	Aware of triggers	Knows role of controller and rescue medications	Knows how often to use controller medication	Knows purpose of AAP	Given AAP	Owns spacer
% caregivers with correct response, n = 210	89.5	88.1	93.3	84.3	94.3	95.7
Determinants	Adjusted odds of correct response on survey item ^a —adjusted odds ratio (95% CI), n = 205 ^b					
Age of child (y)	1.01 (0.89–1.16)	0.90 (0.81–1.01)	0.94 (0.82–1.07)	0.90 (0.81–1.00)	1.06 (0.89–1.27)	0.74 ^c (0.60–0.91)
Sex of child						
Female (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Male	0.59 (0.21–1.71)	2.37 (0.97–5.79)	1.12 (0.35–3.55)	2.17 (0.95–4.92)	1.56 (0.49–4.90)	0.83 (0.20–3.47)
Race and ethnicity of child						
Non-Hispanic White (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Non-Hispanic Black or Hispanic or other	0.19 (0.02–1.56)	0.69 (0.19–2.57)	1.12 (0.16–7.69)	1.99 (0.51–7.80)	1.11 (0.12–10.51)	1.97 (0.02–21.47)
Insurance type						
Private (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Public	0.66 (0.21–2.04)	1.09 (0.34–3.47)	1.06 (0.22–5.13)	0.29 (0.08–1.07)	0.53 (0.09–3.24)	0.15 (0.001–15.14)
Asthma care type						
Specialty (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Primary	0.91 (0.33–2.51)	0.69 (0.27–1.77)	0.42 (0.13–1.38)	0.65 (0.28–1.49)	0.62 (0.22–1.74)	1.04 (0.30–3.59)
Asthma control ^d						
Not controlled (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Controlled	0.57 (0.21–1.53)	2.56 ^e (1.03–6.35)	0.93 (0.31–2.79)	1.27 (0.58–2.79)	0.90 (0.30–2.67)	2.25 (0.71–7.08)

Abbreviation: AAP, asthma action plan.

^aOutcomes “knows how often to use rescue inhaler” (98.1% caregivers responded correct) and “received spacer instruction” (98.6% caregivers responded correct) were excluded from analyses owing to lack of statistical power.^bFive child/caregiver dyads were excluded from multivariable analysis owing to missing race/ethnicity (1.0%), clinic type (1.0%), age (1.0%), sex (1.4%), and asthma control (1.9%).^cStatistical significance at $P < .01$.^dAsthma control was defined based on the validated Asthma Control Test and Childhood Asthma Control Test with a score less than 19 defined as uncontrolled and score greater than or equal to 19 defined as controlled.^eStatistical significance at $P < .05$.

knowledge of medications' role and ownership of spacer. All other differences were not sustained after adjustment, suggesting additional mediating or confounding factors may be present.

Based on caregivers' reports, older children were less likely to have a spacer than younger children. This finding was not surprising because studies suggest that spacer use is limited among children.⁸ Spacer use may decrease as children become older, children and their caregivers gain confidence with inhaler use, and/or caregiver supervision of children's inhaler use declines. Spacers are fundamental to proper metered dose inhaler (MDI) use owing to challenges of coordinating steps necessary for the medicine to reach the lungs.⁹ Clinicians must prescribe spacers with every MDI and discuss use of spacers with MDIs when reviewing technique. Pharmacists, pharmaceutical companies, and health insurers can also support guideline-based care by asking patients on spacers when filling MDI prescriptions, packaging spacers with MDIs, and ensuring reimbursement for spacers.

In addition, caregivers of children with controlled asthma were considerably more likely to know the role of controller and rescue medications versus those with uncontrolled asthma. This finding suggests that understanding of different medications, a key component of self-management education, is linked with asthma symptom control. Although we cannot establish directionality, it is prudent to emphasize differences between controller and rescue medications, as studies reveal confusion on asthma medication regimens among children and their caregivers.¹⁰ Appropriate medication use is fundamental to medication adherence, and efforts should focus on education on medications and practical measures, such as packaging or color changes to inhalers, to ensure children/caregivers understand differences between inhaled medications.

This study adds to the scarce literature on asthma knowledge and practices among racially and ethnically diverse populations, although findings may have limited generalizability, specifically to urban communities. Furthermore, the study's cross-sectional nature limits the ability to make temporal and/or causal inferences. Incomplete information on parent/caregivers' education precludes its inclusion in the analysis. Results may be affected by recall bias, given timing of child's last asthma visit was not identified. Finally, the main study was not powered to detect differences in asthma knowledge/practices.

In summary, this study reveals that no individual or health care factors are consistently associated with asthma knowledge/practices among caregivers of children with moderate-to-severe persistent asthma. As such, personalized guideline-based asthma education should occur with every child/caregiver at each clinical visit to help improve outcomes.

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