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Does inhaler technique align with confidence among African-American children and their parents?

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Asthma prevalence and its related morbidity is two to three times higher among African-American children compared to white youth.¹ A key method for reducing asthma-related morbidity is quick-relief and controller medications delivered through respiratory inhaler devices. However, few children use inhalers correctly, which results in negative effects on asthma control, quality of life, and morbidity,² thus, inhaler education is critical.

Inhaler technique education should occur at every opportunity, according to national asthma guidelines; however this education rarely occurs.³ Many barriers exist in clinical settings, including time-pressured schedules, limited staff training, inadequate knowledge, and lack of demonstration supplies.⁴ As a result, healthcare professionals may ask children or parents about technique, utilizing confidence as a proxy to determine if education is needed. Self-assessment has potential for inaccuracies because children and parents overestimate inhaler skills, as evidenced by studies of non-Hispanic white children⁵ and parents of African-American children.⁶ However, correlation between child and parent confidence has not been examined. Further, because this overestimation of skills can result in poor self-management, it is important to examine inhaler technique relative to both child and parent confidence.

This observational study was conducted over one year (2016-2017) in four Chicago public charter schools with a predominately African-American (97%) and low-income (82%) student population. Students with physician-diagnosed asthma identified during school-based screening were recruited.⁷ Written consent and assent was obtained. University of Chicago's Institutional Review Board approved the study.

Conflicts of interest: none

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An asthma educator (community health worker) met for one-hour with each child and parent at the school or community location. Children rated their comfort with independently using the metered dose inhaler (MDI) on a 4-point Likert scale (1=very uncomfortable to 4=very comfortable). Parents completed a questionnaire about confidence in their child's ability to use the inhaler properly, assessed on a 10-point Likert scale (1=not at all confident to 10=extremely confident, can teach others). Then, the educator assessed inhaler technique by asking the child to show how they use an inhaler using a placebo MDI and spacer with mouthpiece, as previously described.⁸ Technique was assessed with a validated 12-step checklist (reliability: kappa=0.94), with one point given per step performed correctly.⁹

Child and parent confidence were dichotomized as "confident" or "not confident" (child: 1-2 versus 3-4; parent: 1-5 versus 6-10). Inhaler technique scores were analyzed as continuous variables. Misuse and mastery were analyzed as binary variables (misuse: <10 versus 10/12 steps correct; mastery: 12 versus <12 steps correct).⁹ The relationship between inhaler technique and confidence was assessed using Cohen's kappa; misuse was utilized for primary analysis and mastery for the sensitivity analysis. Significance was defined by two-tailed p-value<.05. Analysis was conducted using STATA version 14 (StataCorp).

Of 189 eligible children, 118 parents were reached and 65 (55%) enrolled in the study; two children did not complete both components. Participants had a mean age of 10.7 years (SD=1.7, range=8-14), were 46% female, and were 90% African-American. Most parents were female (86%).

More than two-thirds of children were confident that they can properly use inhalers independently (71%, n=37/52). Most parents (92%, n=57/62) reported confidence in their child's properly inhaler use. For inhaler technique, participants completed a mean of 3.65 steps (SD=2.5) correctly. Nearly all children (97%, n=61/63) misused their inhaler. One child (2%) demonstrated mastery.

Neither child confidence nor parent confidence were good proxies for proper technique. In the primary analysis using inhaler misuse, there was slight agreement between child confidence and proper technique (kappa=0.03), as well as parent confidence and technique (kappa=0.006) (Table 1). The majority of children and parents overestimated the child's ability (children 67%, n=35/52; parents 89%, n=55/62), based on high confidence despite inhaler misuse. No children or parents underestimated the child's skills.

In contrast, a small proportion of children and parents accurately matched their confidence to the child's technique. Five percent (n=2/37) of children who were confident in their technique used their inhaler without misuse, while 3.5% (n=2/57) of children whose parents were confident used the inhaler properly. Among children with misuse, 8.1% (n=5/62) of parents accurately reported low confidence in their child's inhaler technique, while 29% (n=15/52) of children described low confidence. Results were unchanged in the sensitivity analysis using mastery of inhaler technique.

In this study of African-American children, child and parent confidence proved to be poor proxies for proper inhaler technique. Our results mirror the high confidence of children and parents described in prior studies and, importantly, extend them by concurrently examining

child and parent confidence among African-American school-age youth.^{5,6} In fact, the data signals parents may be less accurate in predicting children's inhaler ability than the child, potentially due to children's lived experience with inhaler use, parents' lack of knowledge about proper use, or parents' limited supervision of care. Although children were more accurate versus parents, it remains insufficient to identify children at-risk of poor technique. A healthcare professional cannot simply ask children or parents if the child knows how to use an inhaler, as this is not a reliable screening tool to distinguish who needs education. Rather, these findings reinforce that education about effective inhaler technique must be provided at every opportunity and demonstration should be a fundamental part of an asthma evaluation, consistent with national guidelines.

The majority of children in our study were African-American from four schools, which may limit generalizability. Although findings may differ with other racial/ethnic groups, our results provide important insights about management in a vulnerable population with significant asthma disparities.¹⁰ Further, this study looked at technique with MDIs and results may not generalize to other inhaler devices. The small proportion of children with proper inhaler technique precluded more detailed investigation into the relationship between confidence and technique. In addition, children and parents may have displayed social desirability bias when reporting confidence in inhaler technique. Selection bias may be present given low enrollment and no randomization.

Overall, this study shows child and parent confidence are poor proxies for identifying proper inhaler technique. Objective measures should be utilized in healthcare encounters to evaluate inhaler technique, as correcting inhaler misuse is critical to improve outcomes among African-American youth disproportionately affected by asthma.

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Table 1:

Correlation between inhaler technique and child and parent confidence in skills.

Confidence	Correlation between technique and confidence, based on inhaler misuse*	p-value
Child	0.0319	0.18
Parent	0.0058	0.34

* Results were unchanged in the sensitivity analysis using mastery

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