Pediatrician Interventions and Thirdhand Smoke Beliefs of Parents

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Background: Thirdhand smoke is residual tobacco smoke contamination that remains after a cigarette is extinguished. A national study indicates that adults' belief that thirdhand smoke (THS) harms children is associated with strict household no-smoking policies. The question of whether pediatricians can influence THS beliefs has not been assessed.

Purpose: To identify prevalence of THS beliefs and associated factors among smoking parents, and the association of pediatrician intervention on parent belief that THS is harmful to their children.

Methods: Exit interview data were collected from 1980 parents following a pediatric office visit. Parents' level of agreement or disagreement that THS can harm the health of babies and children was assessed. A multivariate logistic regression model was constructed to identify whether pediatricians' actions were independently associated with parental belief that THS can harm the health of babies and children. Data were collected from 2009 to 2011, and analyses were conducted in 2012.

Results: Ninety-one percent of parents believed that THS can harm the health of babies and children. Fathers (AOR=0.59, 95% CI=0.42, 0.84) and parents who smoked more than ten cigarettes per day (AOR=0.63, 95% CI=0.45, 0.88) were less likely to agree with this statement. In contrast, parents who received advice (AOR=1.60, 95% CI=1.04, 2.45) to have a smokefree home or car or to quit smoking and parents who were referred (AOR=3.42, 95% CI=1.18, 9.94) to a "quitline" or other cessation program were more likely to agree that THS can be harmful.

Conclusions: Fathers and heavier smokers were less likely to believe that THS is harmful. However, pediatricians' actions to encourage smoking parents to quit or adopt smokefree home or car policies were associated with parental beliefs that THS harms children.

Trial registration: This study is registered at NCT00664261.
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Background

Thirdhand smoke (THS) consists of pollutants that accumulate and remain on indoor surfaces long after secondhand tobacco smoke dissipates. Toxins and toxicants present in THS can persist for weeks to months[1,2] and undergo chemical transformations to produce potent carcinogenic tobacco-specific nitrosamines.[3]

Higher levels of THS contamination in infants' bedrooms have been shown to be independently associated with higher levels of infant urine cotinine, a metabolite of nicotine.[4] This association is especially alarming, as 18% of children aged 3–11 years and 17% of children aged 12–19 years live in a home where someone smokes inside.[5] Routes of exposure to THS include inhalation, ingestion, or dermal uptake,[6] and young children likely are exposed to more THS dust than adults as they have

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mouthing behaviors[7] and spend more time in the home and on the floor where dust collects, is disturbed, and is resuspended into the air.[8]

One national study of a representative sample of U.S. adults showed that beliefs that THS harms the health of children were independently associated with household rules strictly prohibiting smoking in the home. By contrast, no such association was found for beliefs about the harms of secondhand smoke.[9] This finding suggests that concerns about THS may be influential in decisions to adopt strict home-smoking bans. The present study examines THS beliefs among smoking parents and how these beliefs are associated with interactions between smoking parents and their children's healthcare providers.

Methods

A secondary data analysis was performed using baseline data from the Clinical Effort Against Secondhand Smoke Exposure (CEASE), a cluster RCT that tested the effectiveness of an intervention designed for use in pediatric offices to address parental tobacco use. The study was conducted in partnership with Pediatric Research in Office Settings (PROS), the practice-based research network of the American Academy of Pediatrics (AAP). IRB approval was obtained from Massachusetts General Hospital, Boston MA, the AAP, and local practice IRBs, when required. Data were collected from 2009 to 2011; analyses were conducted in 2012.

Twenty pediatric practices participated. Practices had at least three practitioners, were not housed within a medical school or parent university, and had at least 50 patient visits and ten parental smokers per day. Parents were eligible if they accompanied their child to the pediatric office visit, smoked at least a puff of a cigarette in the past 7 days,[10] were the legal guardian of the child seen, spoke English, and were aged ≥18 years.

Study-trained exit-interviewers administered a screening questionnaire to parents immediately following their child's visit. The exit-interviewer then obtained informed consent and administered a postvisit enrollment survey to each eligible and willing parent. On completing the postvisit enrollment survey, parents received $5 in cash. Screening continued until approximately 100 parents were enrolled at each practice.

A self-reported estimate was collected from each parent regarding the number of cigarettes smoked per day. To assess pediatric tobacco control actions, parents were asked if they recalled being asked during their visit if their home or car is smokefree, if they received any advice to quit smoking, and if they received any advice to have a smokefree home or a smokefree car.[11] Parents were also asked: *During your visit today, did anyone enroll you in a telephone "quitline" or other program to help you quit smoking?* to determine if they recalled being referred to a quitline or another cessation program. A pediatrician action scale was created and actions were categorized into one of four levels: none (lowest action); ask; advise; and refer (highest action). Actions were classified according to the highest level of interaction reported by each parent.

To assess health beliefs about THS, parents were asked whether they strongly agreed, agreed, disagreed, or strongly disagreed with the statement: "Breathing air in a room today where people smoked yesterday can harm the health of babies and children."[11] Parents who strongly agreed or agreed were categorized as holding the belief that THS harms the health of children, and parents who disagreed or strongly disagreed were categorized as not holding the belief that THS harms the health of children.[9] Parent demographic characteristics were also assessed: age, gender, race and ethnicity, and level of education.

Bivariate analyses were conducted using Pearson chi-squares. Multivariable logistic regression was used to examine the associa-

Table 1. Parental belief in harm of thirdhand smoke

Characteristic	Believe thirdhand smoke harms babies and children $n=1770$[a] (n [%])	p-value
PARENT DEMOGRAPHICS		
Age (years)		0.58
18–24	477 (91.6)	
25–44	1185 (90.9)	
≥45	108 (88.5)	
Gender		<0.01
Male	365 (86.9)	
Female	1403 (92.0)	
Race and ethnicity		0.64
Hispanic	200 (93.0)	
Non-Hispanic, white	1168 (90.7)	
Non-Hispanic, black or African-American	286 (91.1)	
Others	116 (89.2)	
Education		0.44
<High school	277 (91.1)	
High school graduate	817 (91.0)	
Some college/trade school	491 (89.8)	
College graduate	179 (93.7)	
PARENT SMOKING BEHAVIOR		
No. of cigarettes smoked per day		<0.01
≤10	1190 (92.4)	
>10	566 (88.0)	
PEDIATRICIAN ACTION		0.02
None	817 (90.3)	
Ask	275 (87.6)	
Advise	570 (92.8)	
Refer	92 (95.8)	

[a]Of total N=1947; the denominator varies slightly for individual analyses because of missing data.

tion between the odds of holding the THS harm belief and the collection of the predictors (parent age, parent gender, parent race and ethnicity, parent education level, parental report of the number of cigarettes smoked per day, and pediatrician action) while controlling for study arm assignment. There was no interaction between gender and number of cigarettes smoked per day, and therefore the interaction was not included in the final model. All results were evaluated using a significance level of $p<0.05$. PASW Statistics 18 was used for the statistical analysis.

Results

The exit interviews reveal that 91% (1770) of smoking parents held the belief that THS can harm the health of babies and children, and 9% (177) did not. Bivariate results are presented in Table 1. The logistic regression model was significant; chi-square(11)=32.60, $p<0.01$. The Hosmer Lemeshow test suggests the logistic regression was appropriate, as no misfit was detected; chi-square(8)=6.43, $p=0.60$. Results are presented in Table 2. Fathers, compared to mothers, and parents who smoked more than 10 cigarettes per day, compared to parents who smoked ten or fewer cigarettes per day, were less likely to hold the THS harm belief. Parents who received advice at the pediatric office visit to have a smokefree home or car or to quit smoking and parents who were referred to a quitline or other cessation program were more likely to hold the THS harm belief than those who were not advised or not referred, respectively.

Table 2. Multivariable logistic regression analysis of parental beliefs about thirdhand smoke

Predictor	AOR (95% CI)
No. of cigarettes smoked per day	
>10	0.63 (0.45, .88)*
≤10	1.0 (ref)
Gender	
Male	0.59 (0.42, 0.84)*
Female	1.0
Pediatrician action	
Ask	0.89 (0.56, 1.39)
Advise	1.60 (1.04, 2.45)*
Refer	3.42 (1.18, 9.94)*
None	1.0

Note: AOR values shows adjusted odds of parent's agreeing that thirdhand smoke can harm the health of babies and children (N=1890). Parents with missing data were not included in analysis. Model also included parent age, parent education, race and ethnicity, and study arm assignment (control vs intervention), all not significant.
*$p<0.05$

Discussion

The present study demonstrates that fathers and parents who smoked more than ten cigarettes per day were less likely to agree that THS posed a health risk to their children. However, parents who were advised to adopt a smokefree home or car policy or to quit smoking, and parents who were referred to cessation assistance in a pediatric office were more likely to hold THS harm beliefs. THS harm belief was independently associated with being advised, but not with being asked, about having a smokefree home or car. Similarly, Tong et al.[12] found physician advice delivered to smokers was associated with wanting to quit smoking, whereas simply asking about tobacco use was not. Being referred to a quitline, the highest level of pediatrician intervention, showed the strongest association with THS beliefs, suggesting that higher levels of clinician intervention may have greater results.

Limitations of the current study include not knowing how much pediatricians' actions may have been prompted or influenced by parents' preexisting THS beliefs, and the reliance on parent self-report. Additionally, the use of volunteer parents and PROS pediatricians may not be representative of the general population. Finally, the use of cross-sectional data precludes inference of causality.

Conclusion

The pediatric office setting may present an opportunity to influence parental beliefs about THS by delivering currently recommended strategies that encourage home and car smoking bans and promote cessation. The results reported in this paper may also be relevant for designing novel therapeutic interventions to minimize infant and children's involuntary exposure to THS.

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Bend Medical Group–Springfield Office (Springfield); *Missouri*: Priority Care Pediatrics LLC (Kansas City); *New Mexico*: Las Vegas Clinic for Children and Youth; PA (Las Vegas); *Ohio*: Bryan Medical Group (Bryan), The Cleveland Clinic Wooster (Wooster); *Oklahoma*: Shawnee Medical Center Clinic (Shawnee); *Oregon*: Siskiyou Pediatric Clinic LLP (Grants Pass); *Pennsylvania*: Pennridge Pediatric Associates (Sellersville); *South Carolina*: Inlet Pediatrics (Murrells Inlet); *South Dakota*: Avera McGreevy Clinic (Sioux Falls); *Tennessee*: Raleigh Group PC (Memphis); *Virginia*: Pediatrics of Kempsville PC (Virginia Beach), Riverside Pediatric Center (Newport News), The Clinic (Richlands); *West Virginia*: Shenandoah Community Health Center (Martinsburg).

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