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A Smoking Cessation Intervention for Low Income Smokers in the Emergency Department

E. Melinda Mahabee-Gittens, M.D., M.S.[1], **Jane C. Khoury, PhD**[2], **Mona Ho, MS**[1], **Lara Stone, M.A.**[1], and **Judith S. Gordon, PhD**[3]

[1]Division of Emergency Medicine and Asthma Research, Department of Pediatrics; Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, Ohio

[2]Division of Biostatistics and Epidemiology, Department of Pediatrics; Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, Ohio

[3]Department of Family and Community Medicine, University of Arizona, Tucson, Arizona

Abstract

Background—There is a high prevalence of smoking among caregivers who bring their children to the pediatric emergency department (PED), and even higher rates of tobacco smoke exposure (TSE) and related morbidity among their children. The PED visit presents an opportunity to intervene with caregivers, but it is unknown whether they are more likely to quit if their child has a TSE-related illness. We sought to examine a PED-based smoking cessation intervention, and compare outcomes based on children's TSE-related illness.

Methods—A single-arm, prospective trial, with baseline, 3 and 6 month assessments. Caregivers whose child had either a TSE-related (n=100) or non TSE-related illness (n=100) were given a brief intervention consisting of counseling, referral to the Quitline, and free NRT.

Results—Participants were: 91.5% female; 50.5% African American; 100% Medicaid recipients; 30.8 years old; child age mean 5.5; 90% highly nicotine dependent; 60.3% and 75.8% allowed smoking in the home and car, respectively. At follow-up (65% retention): 80% reported quit attempts at 3 months, and 89% between 3 and 6 months. There were significant decreases in number of cigarettes smoked, time to first cigarette, and smoking in the home and car. Quit rates were 12.2% at 3 months, 14.6% at 6 months, and 7.3% at both time points (50% biochemically confirmed). There were no significant differences in outcomes based on children's illness.

Correspondence: E. Melinda Mahabee-Gittens, MD, MS, Divisions of Emergency Medicine and Asthma Research, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue; Cincinnati, Ohio 45229-3039, Tel (513) 636-7966; Fax (513) 636-7967, melinda.mahabee-gittens@cchmc.org.

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Conclusions—A brief PED-based smoking cessation intervention resulted in quit attempts and successful quits. However, the presence of a TSE-related illness did not result in different cessation outcomes.

Keywords

smoking; tobacco; parent; secondhand smoke; tobacco smoke; tobacco control; smoking cessation

Introduction

An estimated 11 million low-income caregivers who smoke accompany their children to the pediatric emergency department (PED) annually.[1–3] Children from low-income households are at higher risk for tobacco smoke exposure (TSE) and TSE-related morbidity compared to children from households above the poverty level.[4–7] Compared to higher income smokers, low-income smokers are at increased risk for tobacco-related disparities such as lower cessation rates, higher smoking-related illnesses, and lower access to cessation resources. The PED is a novel, yet largely underutilized setting in which to address these disparities. Much of the care delivered in the PED is non-emergent, and these visits are characterized by long wait times. This presents a unique opportunity to help caregivers quit smoking, and thus, reduce their children's TSE.

Our previous cessation research indicates that caregivers who visit the PED are aware of the pediatric effects of TSE, are motivated to quit, and eager to receive cessation counseling.[8–11] The Health Belief Model[12] posits that one's beliefs about health problems, and the perceived benefits of action, explain engagement in health-promoting behavior, such as smoking cessation. Additionally, the model posits that a stimulus, or cue to action, such as a child's acute illness, must also be present in order to trigger smoking cessation.[13,14] Prior research evaluated whether caregivers were more likely to quit smoking if a cessation intervention was presented as a way to improve their child's health, with largely disappointing results.[15] Our prior research demonstrated that caregivers who perceive that their child's health is at risk due to TSE are more motivated to quit, and those who believe that quitting will benefit their child's health are more likely to quit.[16,17] However, it is not known if caregivers who smoke are more likely to quit if their child is brought to the PED for a TSE-related illness and receive an intervention that includes information on the effects of TSE on their child's health. We hypothesized that the delivery of a brief cessation intervention to caregivers during the PED visit would be more effective for those whose child had a TSE-related illness versus those who did not. The primary aim of this study was to evaluate the feasibility and overall efficacy of a brief PED-based tobacco cessation intervention among low-income caregivers who brought their child to the PED and to compare efficacy in caregivers whose child presented with and without a TSE-related illness.

Method

Participant, Screening, and Recruitment

Participants were recruited between March 2012 and June 2013 from the PED of Cincinnati Children's Hospital Medical Center (CCHMC). A clinical research coordinator (CRC) accessed the electronic health system to screen for eligible caregivers who: presented to the PED with a child <18 years of age who was triaged in the non-urgent or urgent category and were recipients of Medicaid (used as a proxy for low-income status). These caregivers completed a screening questionnaire which assessed demographics and smoking status. Those answering yes to: "Have you smoked at least one cigarette in the past week?" were considered current smokers. Caregivers were excluded if they: were enrolled in a cessation program or using nicotine replacement therapy (NRT) or other pharmacologic cessation treatment; were non-English or non-Spanish speaking; had no working phone number or mailing address; or had plans to move within eight months. To determine if there were differences in outcomes in caregivers whose child did or did not have a TSE-related illness, we recruited an equal number (N=100) of caregivers with a child with a potentially TSE-related chief complaint as outlined by the U.S. Surgeon General (e.g., colds, ear pain, wheezing),[18] and a non-TSE-related illness (N=100). Eligible caregivers provided informed consent. This study was approved by the Institutional Review Board at CCHMC.

Assessments

Demographics were collected at baseline: caregiver and child age, gender, race/ethnicity, and education level. We also assessed caregivers' smoking behavior, nicotine dependence and prior quit attempts. To determine nicotine dependence, we used the Heavy Smoking Index (HSI) which is a validated, 2-item self-report measure of nicotine dependence (range 0–8) derived from the Fagerstrom Test for Nicotine Dependence.[19,20,21] Caregivers were assessed for level of readiness to quit using the Contemplation Ladder (range 0–10).[22] Caregivers also reported smoking at home and in the car. To assess caregivers' perception of their child's smoking related health risks, we used measures adapted from Wagener et al.[23] which assess perceived child health risk due to caregiver smoking, and perceived child health benefit to caregiver cessation (range 1–7). Caregivers were asked if they believed that their child's PED visit was due to a TSE-related illness (Yes/No). Finally, caregivers were queried regarding their acceptability of the cessation intervention (5-point Likert scale with responses ranging from "Strongly disagree" to "Strongly agree").

The CRC conducted phone follow-up at 3 and 6 months after baseline to assess participants' smoking behavior, nicotine dependence, quit attempts, readiness to quit, smoking in the home or car, and smoking abstinence (caregivers were asked to choose the response that best represented the amount they smoked "During the last 7 days." Options were: "I smoked every day", "I smoked once in a while", and "I haven't smoked at all, not even a puff". Only those who selected the latter category were considered abstinent). The primary outcome measures were repeated point prevalence of smoking at 3 and 6 months, and prolonged abstinence at 6 months. Secondary outcomes included number of quit attempts, level of readiness to quit, participant retention, and use of cessation resources. Self-reported abstinence was verified during home visits with exhaled carbon monoxide testing using a

Bedfont MicroSmokerlyzer™ machine with > 6 ppm as the cutoff indicating a positive smoking result.[24]

Smoking Cessation Intervention

Caregivers received a brief (10–15 minutes) counseling session by the CRC while their child was waiting to be evaluated by the physician. This dedicated CRC was trained by the PI (MMG) prior to the study and observed delivering the counseling for the first 10 participants. The counseling was based on the 5A's of the PHS Clinical Practice Guideline for Treatment of Tobacco Dependence,[25] highlighting the effects of TSE on children's health. Participants responding positively to: "*Do you want to quit in the next six months*?" were given a description of the Ohio Quitline (QL), and then asked about their interest in being referred. For those participants responding negatively, the CRC used the 5R's counseling technique to increase readiness to quit,[25] and then gave an expanded description of the QL services. All participants were offered the opportunity to have a direct phone or fax referral to the QL during the PED visit. Those not wishing to be contacted by the QL were offered written QL cessation brochures. Counselors at the QL attempted to contact referred participants up to 3 times over a 7-day period. Caregivers contacted by the QL were provided stage-appropriate information and/or counseling. In the PED, participants who expressed an interest in receiving NRT were screened for eligibility. Eligible participants were given vouchers to be redeemed at CCHMC's pharmacy for a free, 2-week supply of NRT (choice of gum, patch, or lozenge) with directions on proper use delivered by the CRC. Participants received gift cards of $10, $20, and $30, at baseline, 3 months, and 6 month follow-up, respectively; a bonus $10 gift card was received for completion of both follow-ups.

Analyses

Univariate analyses identified potential outliers and examined distributional properties of the dependent and independent variables. Bivariate analysis examined the relationships between dependent and independent measures. As we had measurements recorded over time, the statistical analysis used a method to account for these multiple measurements and also for any missing timepoints. The technique used is called a mixed model and uses generalized estimating equations, allowing examination of changes over time. The subject identifier is used in the regression model and is included as a random effect, as it is unique to each participant. Based on the literature, six pre-determined covariates (caregiver age, race and education, HSI, child age, and TSE-related illness)[26–28] were included in the multivariable analyses, regardless of statistical significance. Adjusted odds ratios (AOR) and 95% CI's are reported from the final models. All analyses were conducted using SAS® version 9.3 (SAS Institute, Cary, NC), PROC GENMOD was used for the repeated measures analysis. An a priori level of $p<0.05$ was considered statistically significant.

Results

Participant Characteristics

A total of 1809 caregivers were approached; 865 (47.8%) screened positive for current smoking but 355 (41%) refused further study screening. Of the remaining 510, 399 (78.2%)

were current smokers with Medicaid. Of these, 252 (63.1%) were eligible; 212 (84.1%) consented; 12 were duplicates and were removed; thus 200 (79.4%) received the intervention and were included in the analysis (Figure 1). The sociodemographics, smoking behavior, and TSE-related characteristics of the study population at baseline are presented in Table 1.

TSE-Related Characteristics

Of the total sample, 43.5% believed that their child's health would improve if they stopped smoking but only 27.6% believed that their child would develop a serious disease if they continued smoking, and there were no differences in these beliefs if the child presented with TSE-related illness. When caregivers whose children presented with TSE-related complaints were compared to those whose children presented with a non-TSE-related complaint, they were more likely to: be younger, have a younger child, not allow smoking inside the home, and believe that their child's visit was due to TSE. There were no other statistically significant differences in demographic or smoking-related measures related to TSE (Table 1).

Participant Retention

The CRC obtained questionnaires from 131 (65.5%) participants at 3-months, and 130 (65%) at 6-months; 109 (54.5%) were completed at both 3 and 6 months; 48 (24%) were lost to follow-up at both time points. The primary reasons we were unable to reach participants were no answer or the wrong telephone number given. Those who completed both 3- and 6-months were more likely to have older children (mean, SD 6.4, 5.2 years vs. 4.5, 4.6 years, $p=0.008$) and to be older than 30 years old (62.6% vs. 93.4%, $p<0.001$).

Changes in Caregiver Attitudes about TSE

There were no differences at 3- or 6-months in caregivers' belief that their child's health would worsen if they continued smoking, or that their child's health would improve if they quit, comparing those whose child did and did not present with a TSE-related illness.

Changes in Smoking Behaviors

Of the 131 caregivers that we assessed at 3 months, 16 (12.2%) caregivers reported that they had quit at 3 months (9/16 [56%] completed the CO test; 7/16 [44%] biochemically confirmed). Of the 130 caregivers that we assessed at 6 months, 19 (14.6%) reported that they had quit at 6 months (8/19 [42%] completed the CO test; 6/19 [32%] biochemically confirmed). Of the 109 caregivers that we assessed at both 3 and 6 months, 8 (7.3%) reported that they had quit (5/8 [62.5%] completed both CO tests; 4/8 [50%] biochemically confirmed). The eight reporting quitting at both time points are included in the 16 and 19 that reported quitting at 3 months and 6 months, respectively. In addition, 80% of caregivers made a quit attempt between baseline and 3 months, and 89.2% made a quit attempt between 3 and 6 months. Using an intent to treat analysis, sixteen (8%) of caregivers reported that they had quit at 3 months, 19 (9.5%) reported that they had quit at 6 months, and eight (4%) reported that they had quit at both 3- and 6-month follow-ups.

As shown in Table 2, there were statistically significant changes from baseline to both 3- and 6-months in cigarettes smoked, time to first cigarette, and HSI. Whites had higher odds of smoking <10 cigarettes/day than African Americans (Adjusted Odds Ratio (AOR) 0.11, 95% CI 0.06–0.2), but also higher odds of smoking their first cigarette within five minutes of waking compared to African Americans (AOR 1.9, 95% CI 1.1–3.3). Additionally, Whites had higher odds of having HSI > 4 compared to African Americans (AOR 3.4, 95% CI 1.9–6.2), and caregivers older than age 30 had higher odds of an increased HSI compared to younger caregivers (AOR 2.2, 95% CI 1.1–4.2). There were significant increases in the number of participants who did not allow smoking in the home over time from baseline (39.7%) to 3 months (60.3%), ($p<0.01$), but not from baseline (39.7%) to 6 months (53.9%); Whites had higher odds of banning smoking in the home (AOR 1.8, 95% CI 1.1–3.1, $p<0.05$), compared to African Americans, as did non-heavy smokers compared to heavy smokers (AOR 1.8, 95% CI: 1.8, 1.0–3.1, $p<0.05$), and caregivers who had younger children (AOR 1.08, 95% CI: 1.01–1.14, $p<0.05$ for each year decrease in age). Similarly, there were decreases in the number of caregivers who smoked in their cars over time; caregivers with younger children had higher odds of not smoking in the car (AOR 1.19, 95% CI: 1.08–1.30, $p<0.001$ for each year decrease in age).

There were no statistically significant differences in caregiver age, gender, education, prior quit attempts, or readiness to quit in those who reduced smoking at follow-up. However, a higher percentage of White caregivers reported smoking fewer cigarettes compared to all other races both at 3 months (68% vs. 40%, $p<0.01$) and at 6 months (69% vs. 40%, $p<0.01$). There were no differences in quit rates or reduction in smoking when we compared those who did and did not bring their child in for a TSE-related illness.

Use of Cessation Resources

Four participants accepted direct and 103 accepted fax QL referral. Of those who accepted fax referral, 25% reported on follow-up assessments that they had received QL counseling. All who expressed an interest in receiving NRT (N=184, 92%) were screened for NRT eligibility; 169 (92%) were eligible and received NRT vouchers. Of those given the voucher, 79 (47%) redeemed it; 41 (52%) received the patch, 29 (37%) the gum, and 9 (11%) the lozenge.

Consumer Satisfaction

Of the 198 (99%) caregivers who completed the acceptability survey, the majority strongly agreed or agreed that they were “satisfied” with the intervention (n=187, 94%), that the intervention was “useful” (n=187, 94%) and “interesting” (n=189, 95%). Additionally, the majority said they would “*recommend this study to a friend or family member*” (n=190, 96%), and that “*smoking advice should be given in the PED*” (n=182, 92%).

Discussion

To our knowledge, this is the first study to test the effects of a brief cessation intervention including NRT in the PED setting. Although we hypothesized that caregivers who brought their children in for a TSE-related illness would have higher cessation rates, our results did

not support this hypothesis. Nor did we see differences in beliefs about the effects of smoking or the benefits of quitting on their child. Similar to our previous studies, only 28% of caregivers in our study whose child had a TSE-related illness believed that their smoking was putting their child's health at risk, and 44% of caregivers believed that quitting would benefit their child.[17] Our findings support previous primary care or hospital-based research that found no clear evidence of cessation success with caregivers whose children have a TSE-related or even a general "ill child" visit.[29–32] However, a recent meta-analysis indicates that interventions designed to achieve cessation among caregivers for the sake of their children appear to increase quit rates, especially when interventions include the use of medications.[15] Our lack of findings may be due to non-standardized information about how TSE relates to their child's illness included in our intervention. Additionally, our lack of findings may be due to our broad definition of a TSE- related illness which included illnesses that are not as commonly recognized by caregivers as being associated with TSE, such as colds and ear infections. There were encouraging results in cessation, number of cigarettes smoked, nicotine dependency, readiness to quit, and reported TSE in the home and car. Moreover, similar to previous research, we found that caregivers who had younger children were more likely to have imposed smoking bans and may be more likely to perceive harm from smoking[23] and to quit after an intervention.[16]

The current study is important for several reasons. First, it documents the feasibility and acceptability of a PED-based smoking cessation intervention for caregivers who are *not* the patient and are not expecting to be targeted in an intervention for themselves. We achieved high recruitment rates (84%) and the overwhelming majority (94%) found the intervention acceptable. Second, this study highlights the need for interventions that provide education for caregivers about the effects of smoke exposure on children. Caregivers did not understand the effects of TSE on their children or the benefits of quitting on their children's health. Third, our results suggest that this intervention may be effective in reducing smoking, and increasing cessation among caregivers identified in the PED. Finally, this study highlights methodological issues related to evaluating a cessation intervention targeting caregivers recruited from the PED setting. Although the majority of caregivers welcomed the vouchers for NRT, only 47% actually picked up the NRT from the on-site pharmacy (which was just down the hall from the PED). It may have been better to provide caregivers with NRT during the PED visit. Additionally, we had difficulty with participant retention despite multiple contacts, generous incentives, and the option of home visits to caregivers who reported abstinence. Such difficulties with retention are common in low income populations.[33]

A number of limitations should be considered when interpreting these results. First, this was a small sample, limiting the overall power of the study. However, despite the sample size, a number of significant and important findings were detected related to cessation in this population that has not been extensively studied. In addition, the sample was drawn exclusively from a population of low-income smokers who presented to a Midwestern, tertiary care PED at one children's hospital, which limits generalizability. On a related note, our sample was largely female which is due to fact that female caregivers are much more likely to bring their children to the PED than males.[34] Greater efforts are needed to recruit

and enroll male caregivers who smoke into PED-based interventions. Additionally, due to the low socioeconomic status of our PED population, we experienced a high attrition rate at follow up. Finally, no control condition was included to determine whether or not changes were due to the intervention or simply to the changing smoking patterns of caregivers; however based on our previous research in this setting, we know that it is unlikely that these caregivers would have been assisted in quitting without this intervention.[28,35,36] Future PED-based efficacy trials should include a control arm and a larger sample of caregivers. Despite these limitations, results from our research may guide future research on conducting cessation interventions for low-income caregivers in the PED and other acute-care settings.

Conclusion

The results of our pilot study are promising, and suggest the need for further research in this area. The intervention model was viable and acceptable to caregivers, and there was preliminary evidence of efficacy. However, it is necessary to conduct full-scale randomized control effectiveness trials. Additionally, future studies need to improve retention rates in this transient, low-income population. Our findings did not show differences in cessation between caregivers whose children have/did not have TSE-related illnesses. Future research should focus on improving and testing the TSE intervention component. Encouragingly, our brief intervention prompted a substantial number of quit attempts, reduced cigarette consumption, increased smoking bans, and reduced smoking prevalence among this underserved population.

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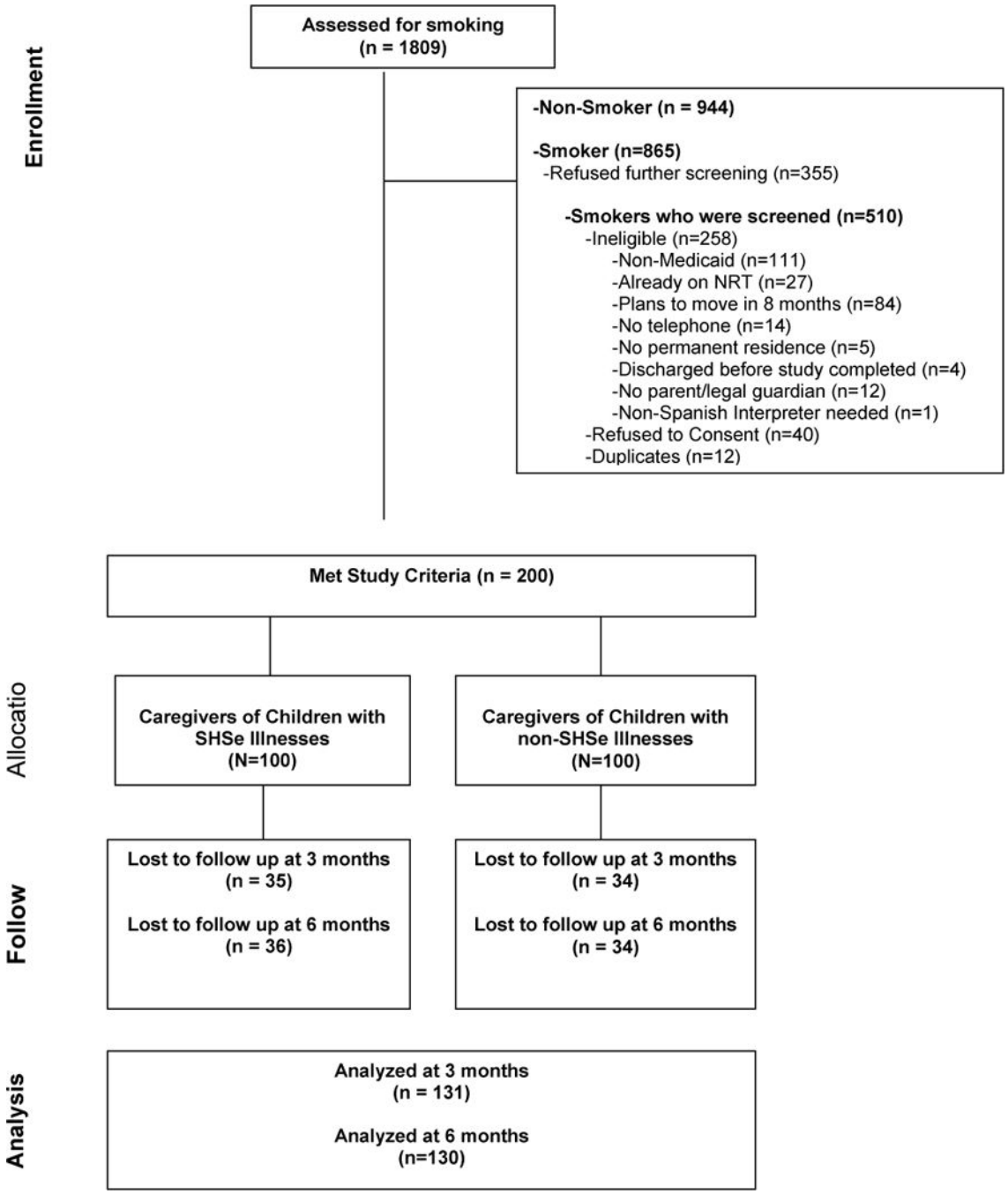

Figure 1.
Flow of participants in the study

Table 1

Population Demographics, Caregiver Smoking Belief, and Caregiver's Beliefs

	Total Sample (N=200) N (%)	TSE-Related Illness (N=100) N (%)	Non-TSE-Related Illness (N=100) N (%)	p Values
Parent age (mean, SD) **<30 years** **≥30 years**	30.8, 8.0 95 (48.2) 102 (51.8)	29.3, 7.2 56 (57.1) 42 (42.9)	32.3, 8.5 39 (39.4) 60 (60.6)	**0.01** **0.01**
Child age (mean, SD)	5.5, 5.0	4.0, 4.4	7.0, 5.3	**<0.0001**
Parent gender-female	183 (91.5)	90 (90.0)	93 (93.0)	NS
Parent Race **White** **African American** **Asian, American Indian, Unspecified**	87 (43.7) 101 (50.8) 11 (5.5)	43 (43.0) 52 (52.0) 5 (5.0)	44 (44.4) 49 (49.5) 6 (6.1)	NS
Parent Education **Less Than College** **Some College and above**	124 (62.3) 75 (37.7)	61 (61.0) 39 (39.0)	63 (63.6) 36 (36.4)	NS
Number of cigarettes/day **1–10** **>10**	100 (50.0) 100 (50.0)	54 (54.0) 46 (46.0)	46 (46.0) 54 (54.0)	NS
Minutes to first cigarette upon awakening **1–5** **≥6**	100 (50.0) 100 (50.0)	44 (44.0) 56 (56.0)	56 (56.0) 44 (44.0)	NS
Heavy smoking Index ≥ 4*	179 (90.0)	89 (89.0)	90 (90.0)	NS
Motivation to quit (Range 0–10; Mean, SD)	7.1, 2.3	7.1, 2.1	7.0, 2.5	NS
Smoking not allowed inside the home	79 (39.7)	47 (47.0)	32 (32.3)	**0.03**
Smoking not allowed inside the car	29 (24.2)	13 (23.6)	16 (24.6)	NS
Caregiver's Belief of child disease ≥ 50% likely if they do not stop smoking	55 (27.6)	28 (28.0)	27 (27.3)	NS
Caregiver's Belief that Child's Health would get "much better" or "completely better" if they quit smoking	87 (43.5)	42 (42.0)	45 (45.0)	NS
Caregiver's Belief that Child's PED visit is due to TSE	14 (7.0)	12 (12.0)	2 (2.0)	**<0.006**

*Heavy Smoking Index is a validated, 2-item self-report measure of nicotine dependence derived from the Fagerstrom Test for Nicotine Dependence (FTND);[20,21,22] please see text.

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Table 2

Changes in Smoking Characteristics

	Baseline (n=200)	3 Month (n=131)	6 Month (n=130)	P-value for Unadjusted/ Adjusted* Gee Analysis over Time	Specific Difference in Adjusted Gee was present in Baseline to 3 months, 3months to 6 months, or Baseline to 6 months
Number of cigarettes/day **0–10** **>10**	100 (50.0) 100 (50.0)	120 (91.6) 11 (8.4)	117(90.0) 13 (10.0)	**<0.0001/<0.0001**	Base to 3mo. (p<0.0001) Base to 6mo. (p<0.0001)
Time to first cigarette (minutes) ≤ **5** ≥ **6**	100 (50.0) 100 (50.0)	22 (16.8) 109 (83.2)	19 (14.6) 111 (85.4)	**<0.0001/<0.0001**	Base to 3mo. (p<0.0001) Base to 6mo. (p<0.0001)
Heavy smoking ≥ 4**	179 (90.0)	54 (41.2)	43 (33.1)	**<0.0001/<0.0001**	Base to 3mo. (p<0.0001) Base to 6mo. (p<0.0001)
Motivation to quit (Range 0–10; Mean, SD)	7.1, 2.3	7.6, 1.8	7.6, 2.0	**0.01**/0.3	
Motivation to quit ≥ 7 (Range 0–10)	110 (55.0)	89 (77.4)	87 (78.4)	**<0.0001/0.001**	Base to 3mo. (p=0.001) Base to 6mo. (p=0.004)
Smoking not allowed inside the home	79 (39.7)	79 (60.3)	70 (53.9)	**<0.0001/0.023**	Base to 3mo. (p=0.008)
Smoking not allowed inside the car (N=120)***	29 (24.2)	28 (40.0)	32 (43.8)	**0.004/0.009**	Base to 3mo. (p=0.01) Base to 6mo. (p=0.002)

* Adjusted for second hand smoking related illness, heavy smoking, race, parent age group, parent education, and child age. However, heavy smoking was not used as a covariate in the model for number of cigarettes/day or time to first cigarette.

** Heavy Smoking Index is a validated, 2-item self-report measure of nicotine dependence derived from the Fagerstrom Test for Nicotine Dependence (FTND);[20,21,22] please see text.

*** 80 caregivers did not own cars