The Impact of a Brief Intervention on Maternal Smoking Behavior

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Abstract. ***Objective.*** **To determine if mothers receiving a smoking cessation intervention emphasizing health risks of environmental tobacco smoke (ETS) for their children have a higher quit rate than 1) mothers receiving routine smoking cessation advice or 2) a control group.**

Design. **Randomized, controlled trial.**

Setting. **Primary care center in a large urban children's hospital.**

Intervention. **Four hundred seventy-nine mothers were randomly assigned to a smoking cessation intervention either aimed at their child's health or their own health, or to a control group receiving safety information.**

Outcome Measures. **Smoking status, stage of change, cigarettes/day, location smoking occurred, and knowledge of ETS effects.**

Results. **Complete data (baseline and both follow-ups) were available for 166 subjects. There was no impact of group assignment on the quit rate, cigarettes/day, or stage of change. The Child Health Group intervention had a sustained effect on location where smoking reportedly occurred (usually outside) and on improved knowledge of ETS effects.**

Conclusions. **Further research is needed to devise more effective methods of using the pediatric health care setting to influence adult smoking behaviors.** ***Pediatrics*** **2000;105:267–271;** ***maternal smoking, smoking cessation, nicotine addiction, nicotine dependence.***

ABBREVIATIONS. ETS, environmental tobacco smoke; CG, control group; CHG, Child Health Group; MHG, Maternal Health Group; PCC, Primary Care Center, Columbus Children's Hospital; ANOVA, analysis of variance.

Maternal tobacco addiction has recently been demonstrated to be a significant unmet health care need of mothers of children in pediatric primary care.[1] Smoking by women of childbearing age impairs the health of the smoker, the developing fetus, and the exposed child. While cigarette smoking was in the past a traditionally male behavior, tobacco companies have successfully targeted women since the 1960s.[2] As a result, since the early 1990s, rates of smoking among men and women have become similar. Currently, 22.6% of women are self-reported smokers, compared with 27% of men.[3] Smoking prevalence varies inversely with educational level and is highest among persons living below the poverty level.[3]

Passive smoke exposure has been linked with respiratory diseases of exposed children. The 1992 US Environmental Protection Agency report confirmed causal links between environmental tobacco smoke (ETS) and increased incidence of lower respiratory infections among infants and young children, increased incidence and severity of asthma, increased prevalence of middle ear effusion, and reduction in lung function.[4] Approximately 38% of US children aged 2 months to 5 years are exposed to ETS in the home.[5] Because of the demographics of adult smoking prevalence, the majority of exposed children are from low-income families.

The spontaneous smoking cessation rate during pregnancy ranges between 15% and 40%[6] with pregnancy representing a "teachable moment" when personalization of the risks of smoking are particularly graphic for many women. Office-based smoking cessation intervention during pregnancy is often successful. A meta-analysis has shown that brief interventions of health care providers during the prenatal visit resulted in a 50% increase in smoking cessation compared with the spontaneous quit rate.[7]

The presence of a newborn or young child in the home may provide another "teachable moment" when emphasis on motivation for smoking cessation can be directed at child health rather than maternal health. Previous research in using the pediatric office visit as an opportunity for smoking cessation counseling is limited. A pilot study conducted at Columbus Children's Hospital indicated that significantly more women ($P < .001$) strongly agreed or agreed with the statement "I will make behavioral changes if I feel my child will benefit" (62%), rather than "I will make behavioral changes if I feel I will benefit" (24%).[8] These responses suggest that the information about the harmful effects of ETS on their children may represent influential information for many mothers and may represent a significant motivator for promoting smoking cessation among mothers who are smokers.

The literature on use of the pediatric visit to encourage smoking cessation for parents is not extensive. Chilmonczyk and others[9] provided smok-

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ing mothers with urine cotinine values of their infants along with techniques to reduce ETS exposure. There were no differences in newborns' urine cotinine levels at follow-up between this group and a control group not receiving this information. Wall and colleagues[10] randomized pediatric practices in Oregon to minimal (routine office care and advice) and extended conditions. Mothers in the extended condition received oral and written smoking cessation advice at the 2-week, 4-month, and 6-month visits. Mothers in the extended condition had statistically significantly higher quit rates (5.9% vs 2.7%) and lower relapse rates (45% vs 55%) compared with those in the minimal condition at 6 months postintervention.

Minimal or brief contact smoking cessation interventions from physicians during a routine office visit have been shown to result in quit rates of 9% to 12%.[11] Because many young adult smokers contact the health care system infrequently for themselves (except during pregnancy),[12] their child's pediatric visit offers a unique opportunity to address tobacco use among parents. If cessation advice delivered in this setting results in a successful quit attempt by a parent, both child and parental health will be significantly improved.

The purpose of this study was to examine the efficacy of promoting smoking cessation using the health of the child as the catalyst for the mother's cessation and continued abstinence from cigarettes. We hypothesized that mothers receiving a smoking cessation intervention emphasizing health risks of ETS for their children would have greater success in quitting smoking than: 1) mothers who received routine smoking-cessation advice which focused on their own health; or 2) a control group of mothers.

METHODS

A 3-group, repeated measures design with random assignment to group was used. The groups were: 1) Child Health Group (CHG)—smoking cessation intervention focused on child's health and exposure to ETS; 2) Maternal Health Group (MHG)—smoking cessation intervention focused on effects of smoking for the mother; and 3) Control Group (CG)—no smoking cessation advice; participants received age-appropriate child safety information. The 2 groups receiving smoking cessation counseling (CHG and MHG) will be referred to as the intervention groups.

Subjects

The target population consisted of female caregivers (16 years and older) who accompanied a child (<12 years) to the Primary Care Center (PCC) of Columbus Children's Hospital for a health care visit for any chief complaint or well-child examination. The population served in the PCC is low-income, with approximately 85% of patients insured by Medicaid or without insurance of any kind, and over half reporting an annual income of <$15 000. Racial composition of mothers was approximately 55% white and 45% black. Exclusion criteria were: not English literate, lived outside of Franklin County, already enrolled in a smoking cessation program, refused to give informed consent, or not willing to provide phone or address for follow-up. Smokers were identified from a baseline survey administered in the waiting room of the PCC and were defined as smoking >1 cigarette/day during the previous week, a definition that has been used to establish national smoking prevalence information.[13]

Recruitment and Randomization

All female caregivers in the PCC waiting area were approached as potential participants from August 1994 to July 1996. A convenience sample was obtained over a period of 18 months based on the daily availability of research personnel who were available 50% of daily clinic hours (the specific days and hours varied during the course of recruitment but did not include evenings). There were no differences in types of patients seen in the PCC based on day of the week or time of the day. Group assignment was accomplished through use of a random numbers table. To diffuse the focus on smoking and smoking cessation, subjects were told that they were participating in a health and safety intervention. Informed consent was obtained from all participants before randomization.

Instrumentation and Measures

Baseline information, obtained by questionnaire, included demographics, smoking status, Nicotine Dependence Questionnaire (NDQ), stage of change algorithm,[14] and the knowledge of the effects of ETS on children. The Nicotine Dependence Questionnaire[15] consists of 9 items assessing automatic and dependent or addictive smoking behaviors. Sample items include: "I find myself smoking without remembering lighting up" (automatic behavior), and "I would find it difficult to go without smoking for as long as a week" (dependent behavior). Summated scores range from 0 to 27, with higher scores indicating more nicotine dependence. Nineteen is a cutpoint indicating high dependence on nicotine.

Stage of change is a concept that has been used to determine the individual smoker's readiness to quit smoking, and is determined by a simple, 3-question algorithm.[14] The *precontemplation* stage of smoking cessation is defined as not seriously considering a change in smoking behavior in the next 6 months, while *contemplation* is seriously intending to change behavior in that time period. A smoker in *preparation* intends to quit smoking in the next month, and has already made a quit attempt during the past year. At any given time, 60% of smokers are in the precontemplation stage, 30% are in the contemplation stage, and 10% are in the preparation stage.[14]

Knowledge about the effects of secondhand smoke on children's health was assessed by asking participants to correctly identify conditions that resulted from exposure to tobacco smoke from a list of 15 possible choices. The correct responses were derived from the recent literature on ETS exposure and children's health.[16,17] Scoring was based on the percentage of correct responses.

The primary outcome measure was smoking status, with abstinence defined as no cigarettes at all in the previous week. Secondary outcome measures were stage of change, number of cigarettes per day, changes in smoking location, and ETS knowledge. Subjects were asked at each follow-up contact if they had changed the location where they smoked, and if so, where that new location was. The same knowledge questions on the effects of ETS on children as on the baseline questionnaire were asked at both the 1- and 6-month follow-ups.

Intervention

The intervention was a brief (10- to 15-minute) counseling session given by a trained research nurse while the child was waiting for his/her pediatric appointment. The counseling was based on the Health Belief Model, which states that for health-related action to occur, individuals must believe that they are susceptible to a serious health problem or perceived threat.[18] The motivational focus of the intervention was determined by the group assignment of each subject. Subjects in the CHG group were informed of the hazards of ETS on their children, but the impact of cigarettes on their own health was not mentioned. Similarly, subjects in the MHG group were told about the effects of their cigarette smoking on their own health, but were not given any information about the effects of ETS on children.

Intervention subjects were given a standard smoking cessation self-help manual, *Freedom From Smoking for You and Your Family*,[19] and clear instructions on its use. This manual served as the guideline for the quitting process. Strategies for quitting were behaviorally based, and included stimulus avoidance, goal setting, and self-reward. In addition, nicotine fading (gradually

decreasing the nicotine content smoked by switching to lower nicotine brands) was a particular strategy emphasized both in the manual and the counseling session. The first few pages of the manual, which dealt with motivation to quit smoking, could potentially confound group assignment and were thus deleted from all the manuals. All intervention subjects were also given group-specific handouts, emphasizing the respective motivation to quit, and other general smoking cessation advice such as strategies to cope with withdrawal symptoms and minimizing weight gain. Changing location where smoking occurred was not mentioned as a strategy either for quitting or as an alternative goal for CHG subjects. CG subjects were given safety information tailored to the age of the child, along with corresponding handouts. Written materials were at the fourth grade reading level.

Subjects in both intervention groups received reminder postcards at 2 weeks and 4 months postintervention, encouraging them to quit if they had not already done so, and to stay smoke-free if they had quit smoking. Participants were contacted by phone at 1 and 6 months postintervention for follow-up by personnel blinded to their group assignment. If phone contact was not made after 3 attempts, a written follow-up questionnaire with a preaddressed stamped envelope was sent to the participant.

Sample size was originally determined by power analysis, with 160 subjects needed in each group to detect a quit rate difference of 5% (CG) and 15% (after intervention) (power = .8, α = .05).[20] The initial plan was to enroll sufficient subjects so that there would be 160 subjects per group in follow-up after attrition. Preliminary analysis of the first 300 subjects revealed no intervention effect. Enrollment was then capped at 160 per group at baseline.

Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS, Chicago, IL) Version 6.0 for Windows. Student's *t* test and analysis of variance (ANOVA) were used to compare means, χ^2 tests to compare nominal variables, and McNemar's test and ANOVA for comparison of repeated measures.

RESULTS

Of 1421 women screened, 517 (36.6%) were defined as smokers by study criteria, and 479 (33.7%) were eligible or agreed to participate. Subjects reported smoking an average of 14 cigarettes per day for 10 years. At baseline, 50% were precontemplators, 34% were contemplators, and 16% were in the preparation stage of change. The mean percentage of correct responses on knowledge of ETS was 65%. Two-thirds lived with at least 1 other smoker in the household.

There were no statistically significant differences between the 3 groups (CHG [n = 153]; MHG [n = 164]; and CG [n = 162]) on any baseline variable, including demographics, number of cigarettes/day, years of smoking, number of previous quit attempts, interest in quitting, stage of change, knowledge about ETS, or nicotine dependence, and/or number of friends and other household members who smoked. (Table 1).

Sixty-one percent (n = 295) of subjects were successfully contacted for the 1-month follow-up and 48% (n = 232) for the 6-month follow-up. There were 166 subjects for whom data were available at baseline and at both follow-up points. There were no significant differences between subjects who completed the 2 follow-ups and other subjects in terms of age, race, income, education, method of payment, and group assignment or any other baseline variable. Subjects lost to follow-up were considered continuing smokers, using the "intent to treat" model of analysis.

At 1 month, 2% (n = 10) of subjects (CHG = 4, MHG = 2, CG = 4) reported quitting smoking; at 6 months, 3.7% (n = 18) of subjects (CHG = 7, MHG = 4, CG = 7) reported quitting. There was no impact of group assignment on smoking status either at 1 month or at 6 months postintervention. Despite the number of subjects lost to follow-up, there were sufficient subjects remaining to detect a difference in quit rate of 7.5%, based on the actual quit rate of 2.5% in the CG, a clinically meaningful difference (power = .8).

The mean number of cigarettes that subjects in all groups reported smoking per day decreased over time, from 13.8 at baseline to 10.0 at 1 month postintervention, and 8.8 at 6 months postintervention value ($P < .05$). However, there was no effect of group assignment on this significant reduction. Similarly, there was no effect of the intervention on stage of change at either 1 or 6 months postintervention.

CHG subjects showed significant changes in the location they reported smoking compared with control subjects at the 6-month follow-up [χ^2 (2, n = 230) = 5.8; $P < .05$] (Table 2). One third of CHG subjects at the 6-month follow-up reported a loca-

TABLE 1. Comparison of Groups at Baseline—Smoking Characteristics

	CHG (n = 153)	MHG (n = 164)	CG (n = 162)
1. Years of smoking	9.37 ± 6.6	10.28 ± 5.7	9.96 ± 6.9
2. Cigarettes per day	13.32 ± 8.3	15.01 ± 9.7	12.99 ± 8.4
3. Time to first cigarette of the day (minutes)	49.01 ± 81	55.40 ± 87	74.63 ± 125
4. Prior quit attempts	2.44 ± 2.6	2.36 ± 2.9	3.4 ± 1.2
5. Nicotine Dependence Questionnaire score:	10.54 ± 6.2	10.48 ± 6.3	9.44 ± 6.2
6. Baseline knowledge (mean % correct):	65 ± 15	65 ± 14	64 ± 14
7. State of change (%):			
Precontemplator	46	48	56
Contemplator	38	37	28
Preparation	16	15	17
8. Currently pregnant (%)	3.3	3.0	3.7
9. Estimated % of friends who smoke			
a. None	8.6	5.5	6.2
b. 25% to 50%	43	43.9	49
c. 75% to all	48.4	50.7	44.7
10. % of household members (>15 years) who smoke (other than subject)	66	65	66

Values are mean ± SD, or %.
No significant differences between groups.

TABLE 2. Percent of Women and Reported Change in Location Where Smoking Occurred

1-Month follow-up (n = 295)		
	Location Change	No Change
CHG (n = 93)	17 (18%)	76 (82%)
MHG (n = 103)	13 (13%)	90 (87%)
CG (n = 99)	10 (10%)	89 (90%)
6-Month follow-up (n = 232)		
	Location Change	No Change
CHG (n = 72)	24 (33%)*	48 (67%)
MHG (n = 81)	12 (14%)	69 (86%)
CG (n = 79)	13 (16%)	66 (84%)

* $p < .05$ (McNemar's test).

TABLE 3. Knowledge of Effects of ETS on Children

(% of Items Correct ± SD) (n = 166)			
	Baseline	1-Month Follow-up	6-Month Follow-up
CHG (n = 53)	64 ± 14.1	69* ± 13.6	69* ± 14.2
MHG (n = 56)	64 ± 14.5	65 ± 11.7	65 ± 12.6
CG (n = 57)	63 ± 11.8	59 ± 13.7	63 ± 14.2

* $p < .001$ for interaction between time of follow-up and group assignment (2-way ANOVA with repeated measures.)

tion change for smoking, with the majority of those reporting "outside" as the new location, compared with 13.5% and 16% for the MHG and CG groups, respectively.

ETS knowledge scores increased significantly in the CHG group from 64% of items correct at baseline, to 69% correct both at 1 month and 6 months postintervention. MHG subjects showed no significant changes in knowledge at 1 month and 6 months postintervention. CG subjects showed an initial decrease in the knowledge score at 1 month, which returned to baseline level at 6 months (Table 3). ANOVA tests of repeated measures showed an interaction between group assignment and time ($P < .001$) with this effect being attributable to the increase in knowledge among the CHG subjects, which was sustained at 6 months.

DISCUSSION

Our hypothesis, that a brief smoking cessation intervention at the pediatric visit, emphasizing ETS exposure and maternal concern for child health would be effective, was not supported. We found no impact of our brief nurse-delivered intervention on the quit rate, number of cigarettes per day, or stage of change. The intervention stressing child health appeared to have a significant sustained effect on both the location where smoking occurred and improved knowledge of effects of ETS. This finding is congruent with the intervention focus because smoking location is only relevant to child health, and the knowledge tested was ETS effects on children. However, the statistically significant effect on knowledge represents a relatively small increase in knowledge, from a mean of 9.75 correct to 10.3 correct.

Although it is possible that changing location and increasing knowledge of ETS effects are small steps taken by mothers in the direction of changing smoking behavior, and ultimately quitting, it is noteworthy that there was no impact of either intervention on stage of change, which would indicate actual contemplation or preparation to quit smoking. An unambiguous message to quit smoking has been noted as a very significant motivator for adults.[11] Mothers receiving the CHG message may not have interpreted the information as a clear message to quit smoking, despite the fact that location change was not mentioned as an alternative strategy to smoking abstinence during the counseling session. Instead, they may have viewed this intervention as a motivation to not expose their children to tobacco smoke, while continuing their own smoking behavior. The lack of impact of the CHG intervention on stage of change indicates that the latter hypothesis may be likely.

One potential limitation was the use of self-report for the variables "cigarettes per day" and "location smoking occurs." Cigarettes smoked per day decreased significantly in all groups from baseline to the final follow-up. This may suggest possible social desirability of reporting decreased cigarette usage over time, although reported smoking reduction occurred with the same frequency across all groups, including the CG. On the other hand, there was a relationship between group assignment and smoking location. It is possible that mothers in the CHG group answered affirmatively, but not truthfully, to the question regarding changing location for smoking, again because of the perceived social desirability of this response. Mothers who received the child health message may have not wished to reveal that they smoked near their children, especially in the context of a project based at a children's hospital. This response is similar to what is often observed in the clinical pediatric setting, where parents readily admit to being smokers, but always add that smoking never occurs around their children. Further research, using biological confirmation of ETS exposure, such as child hair cotinine analysis, will be necessary to determine the validity of parental report of smoking location.

The research of Wall et al[10] suggested that in the pediatric setting, it is necessary to repeat smoking cessation interventions over time at each well-child check, and to not discontinue this intervention at a predetermined time. Wall and Severson[21] demonstrated that quit rate differences between intervention and CGs were no longer present 6 months after the last intervention. This point underscores the need for a continued, repeated intervention in this setting.

In contrast to the extended intervention by Wall and colleagues, there was only 1 face-to-face intervention contact, reinforced by 2 postcards in the present study. This was not sufficient to impact on maternal smoking behaviors, although brief counseling (3 to 10 minutes) resulted in 12.1% quit rates at 5 months or longer in the Agency for Health Care Policy and Research meta-analysis.[11] The population we studied may represent a group of hard core smokers who are difficult to motivate and treat.[22] As motivated

smokers quit every year, remaining smokers are increasingly more difficult to intervene with effectively.[22] It is possible that the low socioeconomic status of the sample may have impacted negatively on the quit rate. At baseline, the population from which the sample was drawn was low-income, with a high rate of maternal smoking (38%). Poverty itself has been shown to decrease the likelihood of effective smoking cessation intervention.[22] Two-thirds of smokers in our sample lived with another smoker. Outreach methods to involve the other smokers in the household may prove more effective than an intervention directed at only 1 family member.

Implication of Findings

A brief nurse-delivered smoking cessation intervention in the pediatric setting did not impact on the quit rate, stage of change, or number of cigarettes per day. There was a sustained effect, however, on knowledge of ETS hazards for children and on location where smoking reportedly occurred among mothers in the CHG intervention group. Further research is needed to devise more effective methods of using the pediatric health care setting to influence adult smoking behaviors. Areas to explore include involving other household smokers, providing repeated and more comprehensive interventions, and forming linkages with family physicians and general internists who can provide parents with intensive smoking cessation treatment. Pediatricians may be satisfied with motivating their patients' parents to not smoke around their children; but ideally, their role should be to encourage and promote total tobacco cessation for families.

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