Nicotine & Tobacco Research, 2014, 1–5
doi:10.1093/ntr/ntu201
Brief report

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Full and Home Smoking Ban Adoption After a Randomized Controlled Trial Targeting Secondhand Smoke Exposure Reduction

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Abstract

Introduction: The current study examined home and full (i.e., home plus car) smoking ban adoption as secondary outcomes to a randomized controlled trial targeting reduced secondhand smoke exposure (SHSe) for children under treatment for cancer.

Methods: Families with at least 1 adult smoker who reported SHSe for their children ($n = 119$) were randomized to control or intervention conditions and followed for 1 year with 5 assessments. Both groups were advised of the negative health outcomes associated with SHSe; the intervention group provided more in-depth counseling from baseline to 3 months. Parents reported on household and car smoking behavior, demographic, psychosocial, and medical/treatment-related information.

Results: Regardless of group assignment, there was an increase in home (odds ration [*OR*] = 1.16, $p = .074$) and full (*OR* = 1.37, $p = .001$) smoking ban adoption across time. Families in the intervention group were more likely to adopt a full ban by 3 months, but this difference was nonsignificant by 12 months. Married parents (*OR* = 2.33, $p = .006$) and those with higher self-efficacy for controlling children's SHSe (*OR* = 1.11, $p = .023$) were more likely to have a home smoking ban; parents who reported smoking fewer cigarettes were more likely to adopt a home (*OR* = 1.62, $p < .0001$) or full (*OR* = 7.32, $p = .038$) ban.

Conclusions: Smoking bans are in-line with Healthy People 2020's tobacco objectives and may be more feasible for parents with medically compromised children for immediate SHSe reduction. Furthermore, interventions targeting full smoking bans may be a more effective for comprehensive elimination of SHSe.

Introduction

Healthy People 2020 has a key objective to reduce secondhand smoke exposure (SHSe) by increasing the number of smoke-free homes, decreasing SHSe among children, and achieving complete adoption of car smoking bans (*car ban*) for families with children.[1] Consistent with these goals, home smoking bans (*home ban*), or rules prohibiting smoking in the home, are associated with lower SHSe for children even with the presence of smokers in the household.[2–4] Having a home ban does not ensure a car ban, yet less focus has been given to car bans as prior studies have mainly considered the home or the home and car separately.[5–10]

Despite greater risk to the detrimental consequences of SHSe,[11] home ban rates are slightly lower for households with medically

compromised children on treatment for cancer (50% vs. 43%; Binns et al.[5]; Tyc et al.[12]). These children are exposed to tobacco smoke from multiple sources and settings and may even be exposed at higher rates in the car as compared to the home.[11,13] Thus, the current study focused on the adoption of a full smoking ban (*full ban*) in a medically compromised population. A full ban was defined as a household with smokers that prohibited all smoking in the home and car. As opposed to smoking cessation, full bans may be preferred for families with a child on treatment for cancer because it would result in immediate SHSe reduction, while not overly taxing already stressed parents.[10] The prevalence of home and full bans was assessed as a secondary outcome for a SHSe reduction trial. It was hypothesized that families in the intervention group would adopt a home and/or full ban at higher rates compared to those in the control condition due to more intensive counseling about SHSe. Relevant smoking, demographic, psychosocial, and medical factors were examined as predictors of home and full ban adoption.

Methods

Participants (n = 135) were drawn from a randomized, controlled trial targeting SHSe reduction at a large pediatric oncology hospital. Eligibility required children (≤18 years) to be currently undergoing cancer treatment, live with an adult smoker, and be exposed to SHSe. Sixteen families were excluded because they reported no exposure in both the home and car at baseline or were missing reports on home and car exposure. Parents/guardians were smokers (n = 84) and nonsmokers (n = 35) reporting on another smoking household member.[14] No significant differences in demographic or medical factors were observed between those retained (n = 119) and those excluded; however, families excluded reported fewer cigarettes smoked, lower cigarette exposure, and higher self-efficacy in maintaining a smoke-free environment, which provides support for why families had already obtained a full ban prior to the intervention.

Patients and their families were randomly assigned to an intervention or standard care control with assessments conducted at five time points: during an intervention phase (baseline and three months) and follow-up phase (6, 9, and 12 months). During the intervention phase, SHSe reduction was targeted through a multicomponent behavioral program delivered by trained counselors. Families attended three individual, biweekly, hour-long sessions followed by three 25 min sessions delivered by phone. Behavioral contracts, letters of encouragement from physicians, self-monitoring, problem solving, and social reinforcement for successes were focused on during counseling sessions. Participants were provided literature on SHSe risk and stress management, were encouraged to bring family members to sessions, and gradually prompted to do more by setting and reporting on goals. Neither condition was specifically encouraged to adopt home or car bans, but were advised of the negative outcomes associated with exposure; the intervention group was further encouraged to remove their children from sources of exposure by not smoking when the child was present and asking others not to smoke in the child's presence. Participant demographic information, study intervention strategies, recruitment and retention, and the primary outcomes of the study are provided elsewhere.[12]

Measures

Demographic and medical predictors (i.e., marital status, parent and child age, child's time since diagnosis) and variables directly influential on SHSe (i.e., number of smokers in the home, smoking status of the participating parent) were collected at baseline. Parent-reported SHSe, parent-reported smoking, smoking ban status in the home, SHSe in the car, number of smokers in the home, and parents' self-efficacy to control SHSe was assessed at each time point.

Parent-Reported SHSe and Smoking

Parents reported on the number of cigarettes to which the child was exposed in the home and car from all smokers over the previous week, which was combined into a composite measure, called *total exposure* (see Tyc et al.[14] for reliability and validity information). In addition, parents reported on the total number of cigarettes smoked by all persons in the home and car, regardless of whether the child was present over the past seven days, which has been validated in prior studies.[15–17]

SHS Self-Efficacy

Parents rated their confidence in their ability to maintain a smoke-free environment with a 4-point scale from "not at all confident" to "very confident," with higher scores indicating higher levels of self-efficacy in relation to ability to control children's SHSe. The scale has demonstrated good internal, construct, and predictive validity,[18,19] which was replicated on the current sample (Cronbach's α = .82).

Smoking Ban Classifications

Participants were classified as having a home ban if they reported no child exposure in the home by him/herself or anyone else in the past seven days and they responded that "people can't smoke in the home" when asked about the rules of smoking in their home. Participants were classified as having a full ban when, in addition to a home ban, no exposure in the car was reported during the past seven days.

Generalized estimation equation[20,21] models were fit using the SAS procedure PROC GENMOD (SAS). Two models were specified separately for predicting the adoption of home or full bans. For both models, a full model was first fit including all demographic and exposure predictors of interest: parent marital status and age, patient age, time since child's diagnosis, treatment group, time (baseline, 3, 6, 9, 12 months), treatment by time interaction, number of smokers in the home, target parent smoking status, total cigarettes smoked and exposed, and self-efficacy. Nested models were compared and the best fitting model was retained using quasi-likelihood information criterion,[22] a modification to Akaike's information criterion, with intervention group always forced in the model.

Results

By the end of the intervention phase, 42% of families reported a home ban (intervention: 45.6%; control: 37.5%) and 20.0% employed a full ban (intervention: 27.6%; control: 12.3%). At the end of the follow-up phase, 45.4% of families reported a home ban (intervention: 47.2%; control: 43.6%) and 20.4% employed a full ban (intervention: 24.5%; control: 16.4%). Comparison analyses demonstrate significant differences between the intervention and control group for full bans at three and six months (see Figure 1), although the treatment by time interaction was nonsignificant and was not included in the best fitting model. Regardless of group assignment, participants were more likely to have adopted a home ban by the end of the intervention when comparing baseline and 12 month home ban adoption rates (χ^2 = 13.08; p < .001).

Predictors of Home Ban Adoption

Group assignment (intervention or control) was not a significant predictor of adopting a home ban (see Table 1). Regardless of group assignment, the expected odds of having a home ban increased by 16% every three months for families in the study, although this increase was nonsignificant and should be interpreted with caution (odds ratio [*OR*] = 1.16, $p = .074$). Parents who were married were 2.23 times as likely to have a home ban as non-married parents (*OR* = 2.23, $p = .006$), while the expected odds of having a home ban increased by 102% if the participating parent was a non-smoker (*OR* = 2.02; $p = .043$). Parents who reported lower rates of cigarettes smoked were more likely to report a home ban; with the odds increasing by 62% per 10 fewer cigarettes reported (*OR* = 1.62, $p < .0001$). Additionally, parents with higher self-efficacy for controlling their children's SHSe were more likely to have a home ban (*OR* = 1.11, $p = .023$), with an 11% increase of a smoking ban per one unit increase in self-efficacy.

Predictors of Full Ban Adoption

There was a marginal difference between intervention and control groups for the adoption of full bans (*OR* = 1.81, $p = .060$). The expected odds of a full ban increased by 81% for patients enrolled in the intervention group. Additionally, the longer the study progressed, the more likely a full ban would be obtained (*OR* = 1.37, $p = .001$), with the expected odds of a full ban increasing by 37% per every three months in the study. Parents who reported a smaller number of total cigarettes smoked were 632% more likely to have a full ban per 10 fewer smoked cigarettes (*OR* = 7.32, $p = .038$).

Discussion

The current study partially supported that participation in a SHSe reduction intervention could increase the adoption of smoking

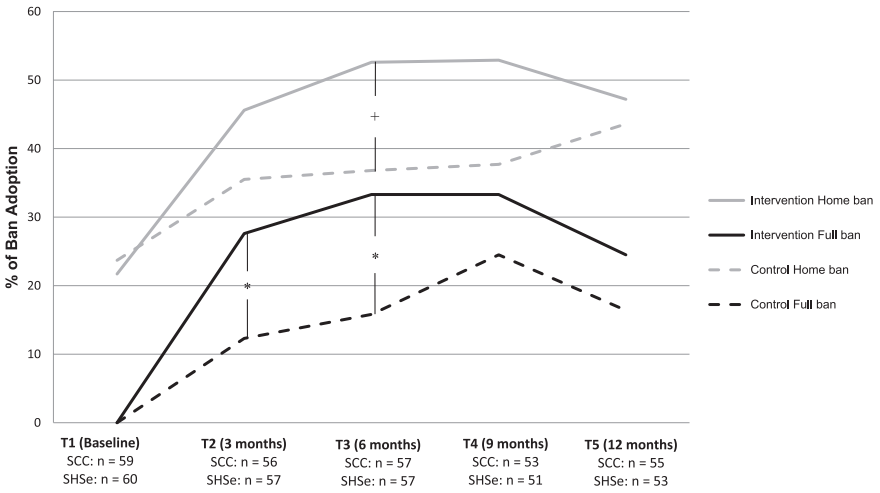

Figure 1. Smoking ban adoption by intervention condition and time point; data were collected at a large pediatric hospital from 2002–2008. *Note.* Because it was an exclusion criteria for this analysis, there were no families reporting full smoking bans at baseline, but about a quarter of the sample (standard care control : 23.7%; secondhand smoke exposure reduction intervention: 21.7%) reported having a home ban. *$p < .05$; +$p < .1$.

Table 1. Final Model Assessing Predictors of the Adoption of a Home Smoking Ban ($n = 119$); Data Were Collected at a Large Pediatric Hospital From 2002 to 2008

Parameter	Estimate	Standard error	95% Confidence limits		*OR*	*p* value
Home smoking ban						
Intercept	−2.11	1.00	−4.08	−0.14		.035
Intervention group (SHSe)[a]	0.23	0.31	−0.38	0.84	1.26	.456
Time (in 3-month unit)	0.15	0.08	−0.01	0.31	1.16	.074
Marital status (married)[b]	0.85	0.31	0.24	1.45	2.33	.006
Target parent smoking status (nonsmoker)[c]	−0.70	0.35	−1.39	−0.02	2.02	.043
Cigarettes smoked (10 cigarettes)	−0.48	0.07	−0.62	−0.34	1.62	<.001
Efficacy (1 unit)	0.11	0.05	0.01	0.20	1.11	.023
Full smoking ban						
Intercept	−4.41	2.17	−8.67	−0.15		.043
Intervention group (SHSe)[a]	0.60	0.32	−0.03	1.22	1.81	.060
Time (in 3-month unit)	0.32	0.09	0.14	0.49	1.37	.001
Cigarettes smoked (10 cigarettes)	−1.99	0.96	−3.87	−0.11	7.32	.038
Efficacy (1 unit)	0.15	0.09	−0.03	0.34	1.17	.101

Note. OR = odds ratio; SHSe = secondhand smoke exposure.

[a] Reference group is control group.

[b] Reference group is non-married.

[c] Reference group is non-smoker.

bans among smoking households drawn from a pediatric cancer hospital. While the intervention did not significantly increase the adoption of smoking bans in the intervention group, smoking ban adoption increased the most during the intervention phase and, while nonsignificant, participants assigned to the intervention group were almost twice as likely to adopt a full ban ($OR = 1.81$; $p = .06$). In line with the behavioral ecological theory, the child's disease, medical treatment, and clinical setting may have been sufficient motivation for parents to lower their child's exposure, reduce their smoking, and adopt smoking restrictions in the home and car.[23]

Results suggest the need to consider contextual factors such as nicotine dependence, psychosocial, and demographic predictors that could impact SHSe reduction through the adoption of smoking bans. Although prior research has consistently linked lower exposure with smoking bans,[3,4] lighter smoking was a more important predictor of smoking ban adoption than the number of cigarettes to which a child was exposed. Cigarette smoking may be a proxy for nicotine dependence, such that those who smoke less may be more able to alter their smoking behavior compared to those more heavily dependent on cigarettes.[24] Additionally, parents with higher self-efficacy for controlling exposure were more likely to adopt a home ban, and while nonsignificant, this variable met inclusion criteria for the model predicting the adoption of full bans. Parental self-efficacy has been linked with reduced SHSe in children[19,25] and is one of the most theoretically grounded construct for health-behavior change (e.g., Health Belief Model and Bandura's Social Learning Theory). Finally, there seems to be a consistent link between having a spouse and reduced SHSe and smoking,[12,25] perhaps due to the presence of a nonsmoking adult in the home, which has been associated with smoking bans.[5,26]

To improve upon limitations of the current study, interventions assessing smoking ban adoption as a primary outcome should directly ask about rules in the car to assess the presence of a full ban, incorporate real-time, instead of retrospective reports of exposure across a longer duration of time, and collect environmental measures to validate parent reports of smoking bans.[27] Furthermore, it is important to consider the influence of the macro-environment on the micro-environment for the adoption of smoke-free homes.[27] In this instance, the smoke-free rules in the hospital setting could partially explain the increased rate of bans across time, regardless of intervention assignment.

Conclusion

This is the first study to consider a full ban, which is important given families with a home ban are not necessarily eliminating exposure risk in the car.[3,8,10] Study results provide important psychosocial, demographic, and exposure considerations for future interventions. In line with Healthy People 2020 tobacco objective, a full smoking ban may be a more appropriate conceptualization for eliminating exposure from children's environment from all sources, especially for medically compromised children, as it encourages immediate exposure reduction.

Funding

This study was supported in part by grants CA 085406 and CA 21765 from the National Cancer Institute and the American Lebanese Associated Charities.

Declaration of Interests

None declared.

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