

# Using the Postpartum Hospital Stay to Address Mothers' and Fathers' Smoking: The NEWS Study



**WHAT'S KNOWN ON THIS SUBJECT:** Parental smoking is associated with poor health outcomes for children, spouses, and the smoking parent. Proven therapeutic strategies exist for smokers in this age group, but effective strategies for parental tobacco control are not implemented in the immediate postpartum period.



**WHAT THIS STUDY ADDS:** The period of parental abstinence from smoking while in hospital after child birth may represent a critical moment for parents to enroll in cessation programs. No previous studies used the immediate postpartum period to enroll both parents into tobacco control programs.

## abstract

**OBJECTIVE:** The objective of this study was to test the feasibility and acceptability of introducing an intervention to address mothers' and fathers' smoking during the postpartum hospitalization.

**METHODS:** During a 14-month period (February 2005 to April 2006), we assessed the smoking status of both parents of all newborns who were delivered at a hospital child birth center. Parents who were current smokers (1 cigarette, even a puff, in past 30 days) or recent quitters (smoked since 1 month before conception) were eligible for the study. Parents were assigned to intervention or usual care control condition on the basis of day of study enrollment. Smoking outcomes were assessed at 3 months by telephone survey and cotinine confirmation; quitline use was assessed at 3 months by using quitline database.

**RESULTS:** A total of 101 (64%) of 159 eligible parents enrolled in the study ( $n = 53$  control subject,  $n = 48$  intervention), including 72 (71%) current smokers and 29 (29%) recent quitters. All parents in the intervention group received the in-hospital counseling session, 94% had a fax sent to a provider, and 36 (75%) accepted quitline enrollment. In an intention-to-treat analysis that included both current smokers and recent quitters, self-reported 7-day abstinence decreased from 31% to 25% among intervention parents versus 38% to 23% among control subjects (effect size 9.4%; nonsignificant). Among current smokers at baseline who were reached at follow-up ( $n = 36$ ), self-reported 24-hour quit attempts were higher in the intervention group versus control group (64% vs 18%;  $P = .005$ ), whereas the cotinine-confirmed 7-day abstinence rates at follow-up were 9% in the intervention group and 3% in the control group (nonsignificant).

**CONCLUSIONS:** Enrolling mothers and fathers into tobacco treatment services during the immediate postpartum hospital stay is feasible and seems to stimulate quit attempts. The birth of an infant presents a teachable moment to reach both parents and to provide cessation assistance. *Pediatrics* 2010;125:518–525

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### KEY WORDS

smoking, tobacco, pediatrics, postpartum, parent, smoking cessation, tobacco control, quitline, telephone counseling

### ABBREVIATIONS

SHS—secondhand smoke

NEWS—Newborns Excel Without Secondhand Smoke

NRT—nicotine replacement therapy

This trial has been registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (identifier NCT00844818).

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Although many smokers quit smoking spontaneously during pregnancy and others quit with assistance,<sup>1</sup> most do not, and more than half of those who do quit resume smoking within 6 months' postpartum,<sup>2</sup> with the majority relapsing within the first 3 months' postpartum.<sup>3</sup> Major problems with continuity of cessation support once the infant is born may be partially responsible for these high rates of smoking recidivism.<sup>2,4,5</sup> Obstetrically based tobacco control focuses on harms to infant during pregnancy. Few tobacco control messages delivered in the obstetric setting address the range of pediatric concerns that arise from secondhand smoke (SHS) exposure of the newborn. After the infant is born, postpartum stress, infant irritability, and breastfeeding failure all may contribute to continued smoking.<sup>3,6</sup> At the same time, the rounding pediatrician may not have the time or preparation to deliver the needed support at the critical moment when the mother perceives that she is now free to resume her smoking.

The birth of an infant and the associated period of enforced parental abstinence while in the hospital may represent a critical moment for mothers and fathers to enroll in evidence-based cessation programs. Parental smoking is associated with poor health outcomes for children, spouses, and the smoking parent. Proven therapeutic strategies exist for adult smokers,<sup>7</sup> but effective strategies for parental tobacco control currently are not implemented in the immediate postpartum period. Opportunities exist in the immediate postpartum period to link mothers and fathers to evidenced-based tobacco control interventions that could be delivered in the hospital setting, by telephone quitline, and in the pediatric office. The widespread use of hospitals as centralized birthing centers means that implementing to-

bacco control strategies in these settings across the United States would reach a major portion of smokers who become parents each year.

For women who do not quit during pregnancy, the arrival of the infant may provide a second compelling moment for cessation, associated with a period of enforced abstinence while they are in the hospital with their newborn infant. Fathers who smoke may be in a similarly compelling, although different, situation. For fathers, this transforming life event does not develop for 9 months inside them—it happens all at once, at the birth. Fathers may not be present during follow-up pediatric care, but almost all fathers are present during the hospitalization of mother and infant. To our knowledge, no previous studies used the immediate postpartum period to enroll both parents into tobacco control programs that provide evidence-based tobacco treatment. In this study, the primary objective was to test the feasibility of enrolling into tobacco control programs all parents who smoke.

The intervention included a 15-minute motivational interview to help parents move toward accepting cessation assistance by enrolling in evidence-based tobacco treatment, such as the state quitline, with follow-up feedback to the child's pediatrician. Using the framework of motivational interviewing,<sup>8–10</sup> the in-person counseling session drew on social learning theory, the transtheoretical stages of change, and the health belief model.<sup>11–13</sup> The intervention incorporated stage-appropriate intervention techniques that are hypothesized to move people along toward change and are especially useful for earlier staged smokers.<sup>11,12</sup> Cognitive behavioral techniques, based on social learning theory, become the focus for later stage smokers with an emphasis on

building self-efficacy and social support. Our intervention also encompassed change within a hospital system, and we drew on the framework for effective practice systems change in chronic care model of Wagner and colleagues.<sup>14</sup> Taken together, the behavior and systems frameworks provide the fundamental basis for our intervention.

This pilot trial, known as Newborns Excel Without Secondhand Smoke (NEWS), sought to fill the gap between evidence-based tobacco treatment during pregnancy and effective treatment after the infant arrives. Specifically, by using a randomized design and theoretically based systems-change strategy, we tested the feasibility of delivering state-of-the-art tobacco treatment to mothers and fathers in the hospital, enrolling them in tailored proactive telephone counseling (eg, quitlines), and providing supportive links to pediatric and primary care offices. The ultimate goal was to increase the number of mothers and fathers who quit smoking and remain smoke-free, thereby improving their own health, the health of their children, and the health of other family members.

## METHODS

### Design

This study tested the feasibility and efficacy of a system-level intervention in a postpartum obstetric unit. Parents who smoked or had recently quit were identified systematically, enrolled in the study, and linked to quitline support. The Massachusetts General Hospital Human Subjects Committee approved this study.

### Participants

Participants were recruited from among the parents of newborns who were delivered at Massachusetts General Hospital during a 14-month re-

cruitment period from February 2005 through April 2006. After a routine delivery mothers are admitted to the postpartum floor for the remainder of their hospital stay (typically 48–72 hours). As part of the admissions process, an obstetric nurse practitioner meets with each mother to perform a routine postpartum checklist. For the study, we added to this checklist a question asking, “Has either parent/guardian smoked a cigarette, even a puff, within the last 12 months?” The nurse practitioner recorded the smoking status of both parents in the mother’s medical record. With a positive answer, the nurse gave each parent an educational pamphlet about SHS exposure and the “importance of not smoking around your infant” and contact information for the state quitline.

Nurse practitioners were trained for 2 weeks to make this assessment. The accuracy of their assessments was validated for two 1-week periods. Each week, study staff themselves assessed the smoking status of both parents and then compared their results with the results obtained by the nurse practitioners. Agreement was high ( $\kappa = 0.90$ ).

A master’s-level research assistant screened the charts of new admissions to identify potentially eligible parents on the basis of the nursing question that had been added to the checklist described. A parent was eligible when he or she reported being a current smoker (defined as having smoked, even a puff, within the last 30 days) or a recent quitter (operationalized as having smoked, even a puff, 1 month before this pregnancy). We operationalized recent quitter in this way to capture all quits during pregnancy given uncertainty around the actual date of conception. Other eligibility criteria included having access to a telephone, speaking English, and expectation of being a Massachusetts resident

throughout their study participation (~3 months from consent date). Eligible parents were invited to enroll, gave informed consent, and completed a baseline survey administered by the research assistant. We conducted with the parents who enrolled in the research study follow-up telephone surveys at 3 months after discharge from the hospital.

### Randomization

Participants were assigned to either the control or the intervention condition on the basis of the date the mother was admitted to the postpartum floor. This strategy was chosen to permit greater predictability of workflow for the research assistant. Before the start of participant recruitment, each date during the recruitment period was randomly designated as control or intervention condition. A study staff member flipped a coin while another staff member recorded the result of the flip (heads or tails) on a piece of paper. Each piece of paper was sealed in an envelope with a recruitment date written on the front of it. A third staff member, who was not part of the coin-flipping process, decided whether heads or tails would be intervention days. On the morning of each recruitment day, a member of the study staff took the envelope for that date and opened it to reveal that date’s group assignment. Participant recruitment occurred Monday through Saturday.

### Survey Measures

The primary measure of cessation was 7-day point prevalence of cotinine-verified tobacco abstinence at 3 months’ postpartum. The baseline saliva sample was collected from all participants after the administration of the baseline survey to compare self-reported abstinence with laboratory evidence. At the 3-month follow-up, the study participants who reported a 7-day abstinence were mailed a pack-

age with a tube (cotton insert), a biohazard plastic bag, an instruction sheet, and return-addressed, stamped envelope. We used a monetary incentive (\$50) and multiple contacts to obtain mailed cotinine samples at 3 months. Self-reported nonsmoking was considered validated when saliva cotinine value was  $<20$  ng/mL by using the enzyme-linked immunosorbent assay method.<sup>15</sup> As an additional intermediate survey outcome measure, we compared percentage of parents who reported quit attempts that lasted 24 hours in intervention and control time periods at the 3-month follow-up.<sup>16</sup>

Measures and covariates included demographics, smoking history, smokers in household, social supports, and satisfaction with intervention components. These variables were assessed at baseline and follow-up by using items drawn from the Smoke-Free Families Core Assessment Forms,<sup>16</sup> HEDIS Measures Interview Survey,<sup>17</sup> and our previous work.<sup>18</sup> In the analysis, baseline smokers and quitters were analyzed separately and then combined to yield an overall effect size. All parents who were lost to follow-up were assumed to be smoking, a conservative intention-to-treat analysis. A stratified analysis of the fathers was also performed. Small sample sizes in individual cells did not support multivariable analyses.

### Intervention

Parents who were assigned to the control condition had no contact between the baseline and follow-up surveys. Parents who were assigned to the intervention condition received the following: (1) one 15-minute in-person counseling session delivered by trained study staff working from adapted materials and messages specifically tailored for parental smokers ([www.ceasetobacco.org](http://www.ceasetobacco.org))<sup>18,19</sup>; (2) offer of enrollment in a proactive state-of-

the-art telephone counseling intervention (QuitWorks, the Massachusetts statewide quitline, which did not offer nicotine replacement therapy [NRT] at the time of the study); and (3) letters faxed to the newborn's pediatrician, parents' primary care provider, and mother's obstetrician indicating the parent's tobacco use status and readiness to quit and recommending useful strategies to facilitate parental cessation, the need for ongoing support, and medication prescription when appropriate. The overall strategy is based on the evidence-based 5A model and tailored to the circumstances of the parental smoker in the hospital setting when their child is hospitalized.<sup>7,19,20</sup>

Parents who accepted quitline referral completed a QuitWorks enrollment form, which was faxed to the state quitline. Quitline staff then made up to a total of 5 attempts to reach the parent by telephone. If they were unable to make contact with the parent, then they sent written cessation materials by mail to the parent. When they did reach a parent, they conducted a brief telephone interview to assess readiness to quit or willingness to remain abstinent and helped the parent to decide on a course of action, including intensive telephone counseling and/or referral to a local tobacco treatment service in the community. A telephone line of quitting tips and a Web-based cessation program were also offered. The outcome of this session was reported to the parent's designated provider, in this case the pediatrician, by a faxed feedback report from the quitline. The rationale is that parents see the child's physician more often than their own physicians during the child's first year of life. Parents who decline proactive quitline enrollment were encouraged to discuss quitting options with their health care provider, given the Massachusetts quit-

line contact information, and encouraged to call.

## RESULTS

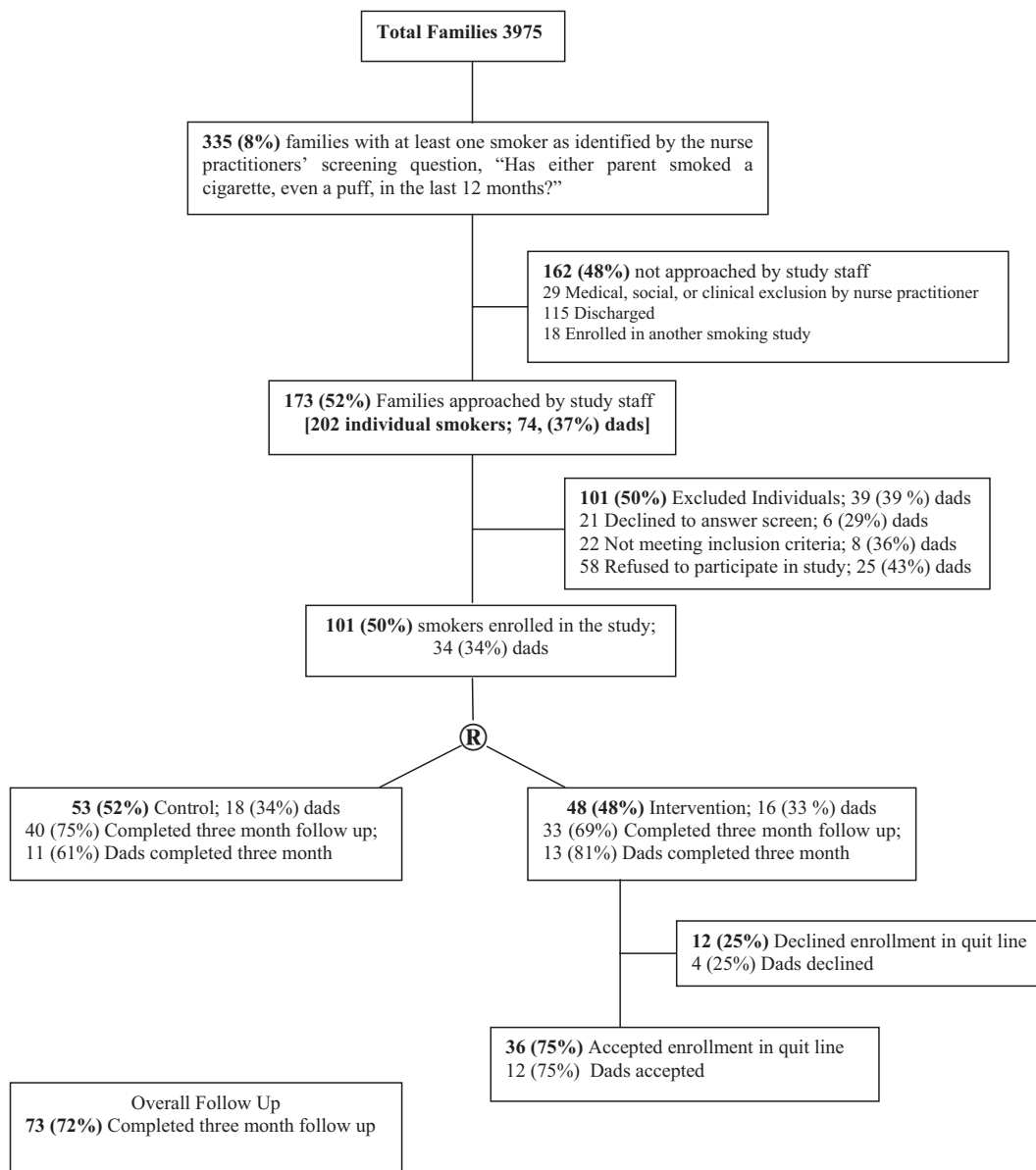
Figure 1 displays the study flow. Study staff approached 173 postpartum families during the 14 months of study enrollment, representing 202 individual mothers or fathers who smoked in the past 12 months. Of those, half ( $N = 101$ ) enrolled in the study. At baseline, the control and intervention groups were similar (Table 1). Self-reported 7-day abstinence had 96% agreement with baseline laboratory saliva cotinine level. Overall, 73 (72%) participants were followed at 3 months (75% of control subjects and 69% of intervention group; nonsignificant).

Table 2 shows acceptability of tobacco control services. Overall, in the intervention group, we found high rates of accepting enrollment into the state quitline resource (36 [75%] of 48). Among current smokers, 29 (84%) of 35 enrolled, and among recent quitters, 7 (54%) of 13 enrolled. In addition to our surveys, we gathered data from the state quitline. Among those who enrolled, 33 (92%) of 36 had either direct telephone contact (44%) or written materials sent to their home (47%). The majority of the intervention group agreed to have a fax sent to at least 1 of their primary care clinicians (45 [94%] of 48), primary care provider (28 [58%] of 48), mother's obstetrician (22 [69%] of 32), or newborn's primary care doctor (40 [83%] of 46). All faxes were confirmed received by the receiving clinician's fax machine. A majority of both the intervention and control groups would have accepted NRT if it had been offered during the postpartum hospitalization, and 96 (95%) of 101 reported that all parents who smoke should be offered cessation support during the postpartum hospitalization. We confirmed that no one in the control group had direct

telephone contact with the quitline, despite receiving the quitline contact information pamphlet from the nurses.

Table 3 shows the overall intention-to-treat analysis that included all participants (both current smokers and recent quitters). The prevalence of self-reported 7-day abstinence was 31% at baseline and 25% at follow-up in the intervention group versus 38% at baseline and 23% at follow-up in the control group (effect size = 9.4%; nonsignificant). For current smokers at baseline, 64% in the intervention group and 18% in the control group reported making a 24-hour quit attempt by follow-up ( $P = .005$ ), 15% in the intervention group and 9% in the control group self-reported 7-day abstinence at the 3-month follow-up (nonsignificant), and cotinine-confirmed 7-day abstinence at the 3-month follow-up was 9% in the intervention group and 3% in the control (nonsignificant).

At baseline, the 34 fathers in our sample were only half as likely to have quit smoking in the past 12 months compared with mothers (21% vs 42%;  $P = .034$ ). Fathers had low rates (0%) of previous participation in individual or telephone counseling, whereas (6%) reported previous group smoking cessation counseling. This finding contrasts sharply with the high rates (75%) of fathers in the intervention group who accepted enrollment in the quitline during the postpartum hospitalization in this study. A majority (67%) of fathers who accepted enrollment in the quitline reported receiving telephone counseling at follow-up compared with 41% of mothers who accepted quitline enrollment. Only half of fathers had ever used any medication to help them quit smoking, but the majority would have accepted a medication during the postpartum hospitalization. Provision of pharmacotherapy



**FIGURE 1** Revised template of the CONSORT diagram showing the flow of participants through each stage of a randomized trial.

was not part of this study. Only 15% of fathers in the study received advice to quit smoking from the mother’s obstetrician, whereas >90% of mothers received this advice. For fathers who were smokers at baseline, 23% in the intervention group and 14% in the control group self-reported 7-day abstinence at the 3-month follow-up (nonsignificant). Among mothers who were smokers at baseline, 10% in the intervention group and 5% in the control group self-reported 7-day

abstinence at the 3-month follow-up (nonsignificant).

### DISCUSSION

This study demonstrated that it is feasible to implement a strategy aimed at reducing smoking among parents during the postpartum hospitalization. The postpartum hospitalization presents an opportunity to identify both mothers and fathers and both current smokers and recent quitters and connect them with tobacco

treatment services in both the health care setting and the community. The majority of parents accepted tobacco treatment services during the hospital stay.

Others have shown that the hospitalization of adults provides a teachable moment for adult cessation.<sup>21–24</sup> The newborn engenders in both parents an overwhelming need to protect it from harm, making the immediate postpartum period a potential teachable mo-

**TABLE 1** Baseline Characteristics

Characteristic	Intervention ( <i>n</i> = 48)	Control ( <i>n</i> = 53)	<i>P</i>
<b>Demographic</b>			
Female, % <sup>a</sup>	67	66	.9470
Age, median, y	28	30	.6730
Attended college, %	38	47	.3260
White, %	85	85	.9430
<b>Smoking history</b>			
Current smoker, %	69	62	.6000
Female	63	54	.4960
Male	81	78	.8030
Age started, median, y	15	17	.0754
Cigarettes per day, median	4.4	5.0	.4103
First cigarette within 30 min of waking, %	48	70	.0800
Quit attempt in past year, %	77	68	.3650
<b>Medication use, %</b>			
NRT	46	42	.6620
Bupropion	10	11	.8840
Any	46	42	.6620
<b>Previous cessation counseling, %</b>			
Group	6	6	.9000
Individual	4	4	.9190
Telephone	2	2	.9440
Any	8	9	.8460
<b>Receipt of advice from current provider, %</b>			
Obstetrician	97	83	.0670
Parent's doctor	74	90	.0580
Pediatrician	41	27	.1830

<sup>a</sup> All females were mothers, and all males were fathers.

**TABLE 2** Acceptability and Use of Program Components

Parameter	Intervention ( <i>N</i> = 48), <i>n</i> (%)	Control ( <i>N</i> = 53), <i>n</i> (%)
Fax sent from postpartum floor to clinicians	45 (94)	NA
Parent's primary care provider	28 (58)	NA
Mother's obstetric care provider	22 (46)	NA
Child's primary care provider	40 (83)	NA
Permission given for proactive quitline referral	36 (75)	NA
<b>Quitline confirmed outreach</b>		
Any confirmed outreach	33 (69)	0 (0)
Materials sent by mail	17 (35)	0 (0)
Telephone contact	16 (33)	0 (0)
Would use NRT if it were offered postpartum <sup>a</sup>	28 (58)	34 (64)
<b>Reported use of NRT since enrollment</b>		
Patch	2 (4)	1 (2)
Gum	2 (4)	1 (2)
Bupropion	0 (0)	0 (0)

<sup>a</sup> NRT not offered as part of the intervention.

ment for motivating smoking cessation. We previously showed that hospitalization of a child is a teachable moment to address parental smoking.<sup>18</sup> Linking parents to proactive telephone counseling may be a good way to deliver ongoing counseling support to young parents, given their reluctance to travel for repeated face-to-

face counseling sessions.<sup>25</sup> Quitlines are increasingly available in the United States and have demonstrated effectiveness for smoking cessation.<sup>26</sup> The majority of parents who smoke would accept quitline enrollment in the context of their child's visit to the doctor.<sup>27,28</sup> Previous qualitative work suggested that fathers were not likely to

rely on smoking cessation resources to help them quit.<sup>29</sup> High rates of quitline enrollment and counseling in our study suggest that low rates of fathers' previous use of smoking cessation resources may reflect poor access rather than unwillingness to use available resources.

The intake form of the newborn unit was changed to incorporate routine screening, with nurses then providing basic SHS counseling beyond usual care. The increased provision of tobacco control service to both study conditions may have biased our study to the null hypothesis. The strategy of randomization to intervention or control condition by day potentially introduced bias because the research assistant may have tried harder to enroll smokers on the intervention or control days. Total number of enrollees was relatively similar in both conditions, however. This study was not powered to detect parental smoking cessation or relapse prevention, and it did not show a statistically significant difference in self-reported cessation, cotinine-confirmed cessation, or relapse prevention between conditions. Although the majority of parents reported that they would use NRT if it were offered postpartum, they were not actually offered NRT or instructed to use NRT or other pharmacotherapies that might have increased the quit rate. It is unclear whether actually offering NRT in the postpartum period would lead to use of the medication by mothers and fathers; any previous use of NRT was 44% in this study. In previous studies in the outpatient and inpatient settings, offering NRT to parents led to high rates of reported use at follow-up.<sup>18,28</sup> Quitline protocols at the time of the study were designed for smoking cessation rather than relapse prevention, yet, in this study, all current smokers and recent quitters were offered enrollment. Quitline protocols

**TABLE 3** Smoking Outcomes by Study Arm

Parameter	Baseline, <i>n</i> (%)		Follow-up, <i>n</i> (%)	
	Intervention	Control	Intervention	Control
Quit rate (7-d point prevalence)	15/48 (31)	20/53 (38)	12/48 (25)	12/53 (23)
Cotinine-confirmed quit rate	NA	NA	9/48 (19)	6/53 (11)
Had 24-h quit attempt since enrollment (among those who were followed up and were current smokers)	NA	NA	9/14 (64) <sup>a</sup>	4/22 (18) <sup>a</sup>

<sup>a</sup> *P* = .005.

for relapse prevention now exist, and a quitline that chose to offer smoking cessation counseling and tailored relapse prevention for mothers and fathers in this context might have increased the overall rate of abstinence at follow-up. The rate of loss to follow-up was remarkably low given the educational status of our sample, although the intervention was done in a state and a hospital location with low smoking prevalence.<sup>30</sup>

We chose to highlight the enrollment of parental smokers in tobacco control programs as the primary outcome for the following reasons. First, evidence suggests that clinicians do a much better job of screening and advising against parental tobacco use than they do of assisting the parental smoker or referring him or her for follow-up services.<sup>31,32</sup> Potentially 1 of the most important outcomes to demonstrate in this study was the change in enrollment rates into evidence-based tobacco control programs. Second, Massachusetts is 1 of a growing number of states that support a quitline and other services in which clinicians can actively enroll patients who smoke. Many of these services face the problem of low use on a population basis, especially in the absence of expensive advertising campaigns.<sup>33–36</sup> One way to increase the reach of these services is to harness the health care system to refer smokers to them proactively.<sup>35</sup> Because younger adults do not seek

primary care as frequently as older adults,<sup>37</sup> referral in this setting may represent the best way to use the health care system to offer a quit smoking program for this population group.

The primary outcome of this study was not cotinine-confirmed quit rate at the 3-month follow-up. Although tobacco abstinence is an extremely important outcome in our study, it is not a good measure of change within the hospital setting. The propensity of a parent to make a quit attempt will also depend on the quality of the services that are delivered outside the hospital; this quality will vary from program to program and from state to state. Quit attempts that last at least 24 hours are often used as a proxy measure to show that an intervention has had some effect on smoking behavior and were indeed significantly higher in the intervention group; however, what we sought to demonstrate primarily in this study was the feasibility and acceptability of linking these parents to this type of evidence-based program and of forging tobacco control continuity with the pediatric office.

The implementation of this intervention has had a lasting impact on the postpartum unit. Before the start of the project, the unit lacked a systematic method for addressing smoking with the parents of newborns. Part of implementing this tobacco control

strategy required adding a question that assesses the smoking status of both parents to an intake form that is routinely used by the nurse practitioners with all admissions. This form is maintained in the mother's medical record, is easily accessible to all of the health care providers on the unit, and enabled the postpartum staff to continue to assess and address parental smoking beyond the study period. On the basis of our experience, in ~1 day, a licensed social worker in the hospital could be trained to do the 15-minute motivational interview that was done by the research assistant during the study period.

The clustering of births at hospitals in the United States allows access to tobacco treatment for families at the critical moment of postpartum hospitalization. The NEWS intervention strategy would be transportable to any state with a fax to quit program and would encourage delivery of evidence-based tobacco control in the postpartum setting.

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