

# The Effects of Peer Counseling on Smoking Cessation and Reduction

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**OBJECTIVE:** To evaluate a peer counseling intervention for pregnant smokers.

**METHODS:** One hundred forty-two pregnant, predominantly Hispanic women were assigned to a peer-led smoking cessation program or to usual care.

**RESULTS:** Compared with usual care, peer counseling reduced smoking ( $-9.1$  versus  $-4.5$  cigarettes daily,  $P = .03$ ), but did not affect absolute quit rates (24% versus 21%) at 36 weeks' gestation. Infant birth weight negatively correlated with cigarettes smoked per day ( $r = -0.29$ ,  $P < .01$ ) and expired carbon monoxide ( $r = -0.39$ ,  $P < .001$ ) at delivery. Birth weight for infants born to women who quit smoking averaged 7.2 lb versus 6.8 and 6.3 lb for mothers smoking one to six and more than six cigarettes per day at delivery ( $P < .01$ ).

**CONCLUSION:** Peer counseling reduced the number of cigarettes smoked daily but did not increase cigarette abstinence rates. Infant birth weight increases with both smoking cessation and smoking reduction, suggesting that peer counseling intervention programs may improve newborn health despite their failure to affect smoking cessation. (Obstet Gynecol 2003;101:504-10. © 2003 by The American College of Obstetricians and Gynecologists.)

Smoking during pregnancy continues to be a serious public health problem. Maternal smoking is associated with an increased risk of tubal pregnancy, spontaneous abortion, placenta previa, placental abruption, hydramnios, premature rupture of membranes, and preterm labor.<sup>1</sup> Approximately 20% of pregnant women in the United States smoke despite widespread awareness of the harmful effects of smoking during pregnancy.<sup>2</sup> Women who continue to smoke during pregnancy tend to be young, unmarried, poor, emotionally stressed, undereducated, multiparous, and heavy smokers.<sup>3</sup> Data from Hartford Hospital's Women's Ambulatory Health Services, which provides prenatal care to low-income

women, showed 29% self-reported smoking during pregnancy.

A work group was established to design an innovative research-based approach to enhance quit rates in this special population of pregnant smokers at Hartford Hospital. Although a number of randomized trials show that behavioral interventions reduce smoking rates during pregnancy,<sup>4,5</sup> we wanted to implement a program that would potentially be beneficial in our clinic population. Hartford Hospital has had recent experience with a successful peer support counseling program to increase breast-feeding rates in its prenatal clinic. Peer support counseling is a mechanism through which health information is reinforced by lay workers. Peer counseling appears to work because of the nonhierarchical relationship that is created through the sharing of similar life experiences and by increasing social support.<sup>6-8</sup> Studies combining peer counseling with standard prenatal care have demonstrated overall improvement in perinatal outcomes, and have shown promise in increasing breast-feeding rates among low-income women.<sup>7</sup> Peer support has also been used successfully in the treatment of addictive behaviors such as alcohol and drug abuse.<sup>9</sup> With this model in mind, an intervention for smoking cessation was designed to study the potential benefits of peer support counseling for low-income pregnant women.

## MATERIALS AND METHODS

This study used a prospective, randomized control design to compare usual care with usual care plus peer support counseling for smoking cessation in low-income pregnant women. The study was carried out on site at a large urban obstetric clinic.

Between January 1998 and February 2000, all pregnant women at the clinic were screened at their prenatal intake visit, using the American College of Obstetricians and Gynecologists prenatal form, to determine their smoking status. Hartford Hospital is a nonprofit, tertiary-care, community hospital located in Central Connecticut with more than 4000 infant deliveries each year.

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This clinic serves primarily a low-income pregnant population with a smoking rate of 29%. Women who met the following criteria were invited to participate in the study: 1) current smoker (smokes at least one cigarette per day the week before learning of pregnancy), 2) documented pregnancy with intention to carry to term, 3) less than 20 weeks' gestation, 4) speaks either English or Spanish, and 5) is 18 years or older. Women who used smokeless tobacco or nicotine replacement products, or who self-reported current substance abuse or dependence were not recruited.

Written informed consent, as approved by the hospital's Institutional Review Board, was obtained from all subjects. Pregnant smokers were randomly assigned to either the control (usual care) or experimental group using a computer-generated numbers list. The obstetric care providers in the clinic were blinded to group assignment.

Usual care for smoking cessation was provided by clinic staff physicians, residents, nurse practitioners, and nurses. All health care providers received standardized training for smoking cessation using the Agency for Health Care Policy and Research guidelines: "ask, advise, assist, and arrange."<sup>10</sup> Training was provided by a local expert in smoking cessation. A systematic process to address smoking cessation at every prenatal visit was adopted by all clinic personnel.

At the first prenatal visit, the health care provider delivered a strong quit message, discussed the maternal and fetal risks associated with continued smoking, and distributed smoking cessation educational materials. This literature, "Quitting for You 2,"<sup>11</sup> was used with permission from the Massachusetts Department of Public Health and was chosen because of its literacy level, visual appeal, content, cost, and its availability in English and Spanish. The "Quitting for You 2" program included information on self-help behavioral strategies for smoking cessation specifically geared toward pregnant women, as well as a provider counseling guide.

In subsequent prenatal visits, the health care provider was instructed to assess stage of readiness to quit smoking, provide smoking cessation counseling using a provider protocol prompt sheet in the medical record, and document counseling in the medical record. Participant charts were flagged with a study logo label to serve as a further reminder for staff to conduct smoking cessation counseling at each prenatal visit.

The experimental group received the same smoking cessation peer counseling from the clinic health care providers, plus smoking cessation counseling from lay community health outreach workers, used as peer counselors. Peer counselors were selected from an existing pool of nonsmoking, female, community outreach workers who possessed the same social-environmental and cultural qualities of the

study participants. Peer counselors received two standardized training sessions in smoking cessation from a local expert. In the first 3-hour training session, peer counselors were instructed in the Agency for Health Care Policy and Research guidelines for smoking cessation. Role playing was used as a teaching tool to help with provider training in various situations the peer counselors might encounter with their clients. In the second 2-hour session, basic strategies for motivational counseling for smoking cessation as outlined by Rollnick et al<sup>12</sup> were covered in a didactic format.

Peer counselors were instructed to encourage the pregnant woman in the quit attempt, communicate caring and concern, encourage the woman to talk about the quitting process, and to reinforce basic information about smoking and successful quitting. Each counselor was instructed to have eight client contacts with each participant randomized to the experimental group. During this client contact, the peer counselor supported and reinforced the stop smoking messages of the health care providers using a standardized prompt sheet. Peer counselors were instructed to document the date, location, type, and length of each visit, as well as capture the reported stage of change and describe the peer counselor and mother interaction.

In addition to demographics and medical history, smoking history (number of cigarettes smoked per day, number of years smoking, number of quit attempts, longest quit attempt, other smokers in household) was assessed. Self-report measures were provided in both Spanish and English. The Fagerstrom Tolerance Questionnaire was used to provide an index of nicotine addiction.<sup>13</sup> Smoking status at baseline and 36 weeks' gestation was validated with urinary cotinine levels that were reported as either positive or negative. Urine cotinine screening was performed by immunoassay using a 200-ng/mL cutoff for a positive screen (Quest diagnostics, Pittsburgh, PA). Carbon monoxide in exhaled air (Vitalograph, Lenexa, KS) was also measured at each visit to evaluate smoking cessation (less than 8 parts per million is consistent with cigarette abstinence)<sup>14</sup> and reduction.

Data were analyzed using SPSS for Windows 9.01 (SPSS, Upper Saddle River, NJ). Dichotomous baseline variables were compared using contingency tables with  $\chi^2$  analyses, and continuous variables were compared using analysis of variance or *t* tests. Correlation coefficients were Pearson *r*. Analysis of covariance was used to compare groups while controlling for baseline variables.

## RESULTS

One hundred forty-two pregnant smokers were recruited into the study; 67 were randomly assigned to peer counseling, and 75 were assigned to usual care. At

**Table 1.** Demographic Characteristics of Subjects

Variable	Peer counseling group ( <i>n</i> = 67)	Usual care group ( <i>n</i> = 75)
Age (y) (mean ± SD)	25 ± 6	26 ± 6
Gravida (mean ± SD)	3 ± 2	3 ± 2
Education (%)		
≤8 grade	10.5	12.0
9–11	46.3	48.0
12th	21.0	25.0
>12th grade	12.0	8.0
GED	10.5	7.0
Work status (%)		
Employed	37	40
Unemployed	63	60
Language (%)		
English	64	61
English/Spanish	33	35
Spanish	3	4
Marital status (%)		
Married	1.5	10.7
Single	98.5	86.7
Separated	0	2.7
Ethnic group (%)		
Black	12	13
Hispanic	63	63
White	24	23
Other	1	1
Number of cigarettes per day* (mean ± SD)	13.3 ± 8.2	11.2 ± 8.4
Baseline CO	5.12 ± 5.01	7.25 ± 7.18
Number of y smoking (mean ± SD)	7.6 ± 5.5	8.5 ± 5.5
Number of quit attempts (mean ± SD)	1.6 ± 1.9	1.4 ± 1.7
Number of smokers in household (mean ± SD)	1.1 ± 1.2	1.3 ± 1.2
Short-Form Fagerstrom Index	3.8 ± 2.87	4.2 ± 2.44

SD = standard deviation; GED = general equivalency diploma; CO = carbon monoxide.

Results are percentage or mean ± SD.

\* Significant difference between groups,  $P < .05$ .

the end of the study (36 weeks' gestation), 43% of the peer counseling group and 36% of the usual care group were lost to attrition, leaving 38 and 48 subjects in each group, respectively. Smoking was measured by self-report and confirmed with both expired carbon monoxide and urinary cotinine.

Subjects ranged in age from 18 to 41 years (median age 25), were predominantly Hispanic, and smoked an average of more than one-half a pack per day at baseline (Table 1). Most subjects had less than a high school education. The two groups did not differ on any baseline variables with the exception of number of cigarettes smoked daily. The peer counseling group had a greater proportion of heavier smokers at baseline.

Subjects lost to attrition were compared with those retained for the study. The retained intervention and control groups did not differ from the nonretained subjects with respect to baseline age, education, ethnicity, employment, years of smoking, and past quit attempts. The retained and nonretained subjects did differ slightly in terms of baseline stage of readiness to quit smoking

and cigarettes smoked daily, but the differences favored the control group for better outcomes.

All retained subjects were contacted by the peer counselors. The 38 subjects retained in the peer counseling group had a median of six contacts with the peer counselors. Of those, 45% occurred in the subject's home, 38% occurred by telephone, and 17% occurred at the hospital clinic or the Hispanic Health Council clinic. The mean length of each visit was  $45 \pm 15$  minutes.

The peer counseling group smoked significantly more cigarettes daily at baseline (13.3 cigarettes) compared with the usual care group (11.2 cigarettes) (Table 1). Controlling for baseline smoking, a one-way analysis of covariance indicated that the reduction in daily smoking in the peer counseling group ( $\delta = 9.1$  cigarettes per day) was significantly greater than that in the usual care group ( $\delta = 4.5$  cigarettes per day,  $P = .03$ ) (Table 2). Peer counseling had the strongest effect among those who smoked ten or more cigarettes per day ( $P < .05$ ).

No statistically significant differences in smoking abstinence outcomes were found at follow-up between

**Table 2.** Results—Smoking Outcomes ( $N = 142$ )

Results	Peer counseling group	$n$	Usual care group	$n$	$P$
Change in smoking behavior (number of cigarettes per day)	$-9.1 \pm 7.3$	38	$-4.5 \pm 5.9$	48	.03
Quit rates* retained sample (%)	42	16/38	33	16/48	.50
Quit rates* intention to treat (%)	24	16/67	21	16/75	.84
CO at 36 wk of gestation, retained sample, raw scores	$3.11 \pm 4.41$	36	$5.2 \pm 7.23$	45	.13
CO at 36 wk of gestation transformed for severe positive skew, <sup>†</sup> retained sample	$0.54 \pm 0.40$	36	$0.38 \pm 0.34$	45	.05

CO = carbon monoxide.

Differences between groups were compared with  $t$  tests for continuous variables and Fisher exact tests for categorical variables.

\* Quit rates were calculated using self-report, negative urine cotinine, and exhaled CO.

<sup>†</sup> With inverse transformations, a low(er) value indicates greater CO.

groups, although a greater proportion of subjects quit smoking in the peer counseling group compared with the usual care group. At 36 weeks' gestation, 21% (16 of 75) of participants in usual care and 24% (16 of 67) of participants in the intervention group were abstinent (not significant). Abstinence was verified by both cotinine and carbon monoxide measurements. Individuals lost to follow-up were classified as still smoking. At follow-up, five of the usual care group and one of the intervention group reported not smoking but had positive urine testing for cotinine and were coded as smokers.

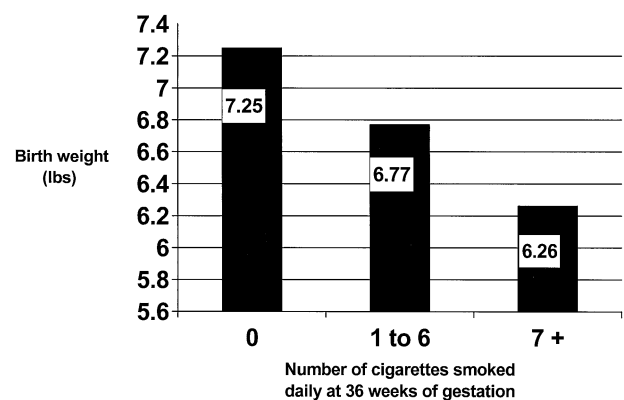
Infant birth weight was correlated inversely with both the number of cigarettes smoked per day at the end of pregnancy ( $r = -0.295$ ,  $P < .01$ ) and expired carbon monoxide ( $r = -0.391$ ,  $P < .001$ ). Both of these correlations were independent of gestational age (90% of the infants were born full term). The average birth weight for nonsmokers was 7.25 lb/3289.5 g ( $n = 29$ , standard deviation 1.30 lb/591.6 g) compared with mothers who smoked one to six cigarettes per day (mean birth weight 6.77 lb/3071.4 g,  $n = 27$ , standard deviation 1.16 lb/525.1 g) and mothers who smoked more than six cigarettes per day (mean birth weight 6.26 lb/2841.5 g,  $n = 23$ , standard deviation 0.99 lb/447.2 g) (Figure 1). Thus, birth weights were almost a full pound greater in nonsmokers than in women smoking more than six cigarettes per day ( $P \leq .01$ ). No baseline variables were significantly related to infant weight (including baseline number of cigarettes smoked per day).

## DISCUSSION

Adding peer support smoking cessation counseling to the duties of prenatal outreach workers significantly reduced the reported number of cigarettes smoked per

day by pregnant women compared with those who received usual care. This reduction was confirmed by a significant reduction in exhaled carbon monoxide levels. The impact of the intervention on smoking reduction was greatest among women who were heavier smokers at baseline. The intervention, compared with usual care, did not significantly increase quit rates, although there was a trend favoring the intervention group. Moreover, infant birth weights were greater among women who quit smoking than in those who were unable to achieve abstinence.

The authors had expected a greater effect than that observed for peer counseling. However, the comparative effect may have appeared smaller in part because of the significant reduction in smoking found for "usual care." Perhaps the study hospital's usual care is more intensive than that found in other large hospitals. If peer counseling had been contrasted with a "nominal care" condition, the results may have been more dramatic. Additional research is needed to test such a hypothesis.



**Figure 1.** Relationship between smoking and birth weight. Malchodi. *Counseling Pregnant Smokers. Obstet Gynecol* 2003.

The hypothesis that peer support counseling improves smoking outcomes during pregnancy is supported by other studies using peer counselors to improve other aspects of prenatal health care<sup>7,15,16</sup> and by smoking cessation studies in nonpregnant populations.<sup>17</sup> Peer counseling appears effective because of the nonhierarchical relationship created through the sharing of similar life experiences, and by increasing social support and decreasing stress.<sup>6</sup> Among the best studied use of peer counseling has been to increase breast-feeding rates among low-income women.<sup>7,15,16</sup> The present results suggest that the use of peer counseling during pregnancy can be extended to also reduce smoking.

We are aware of only one other study that evaluated peer counseling for smoking cessation or reduction during pregnancy.<sup>18</sup> In that study, peer counselors from an East Baltimore community provided one 15-minute period of additional counseling to a low-income population of predominantly black women. They also received additional clinic reinforcement by nurses and doctors at each clinic visit. Counseling was based on the smoking cessation booklet "A Pregnant Woman's Guide to Quit Smoking."<sup>19</sup> There were no differences in quit rates between groups (6.2% in the peer counseling versus 5.6% in the control group) and no effect on smoking reduction. Only 11% of the subjects reduced their smoking in both groups (verified by a 50% decline in salivary cotinine levels). Thus, the present study differs from this prior report in that we found a reduction in smoking with peer counseling.

These differing results may be related to methodologic differences. Peer counselors in the present report had a median of six contact visits throughout the pregnancy, whereas only one 15-minute contact and one follow-up letter of encouragement from the peer counselor at the beginning of the study was provided in this previous report. More frequent contacts have been shown to increase smoking quit rates during pregnancy.<sup>20</sup> In the East Baltimore study, the counseling intervention took place in the clinic, whereas peer counselors in the present study met subjects at a place most convenient for the study subject (which was frequently in the participant's home). Our subjects were predominantly Puerto Rican/Hispanic, whereas the East Baltimore population was predominantly black. Peer counselors in the prior report were hired specifically for smoking cessation, whereas the present study used an existing community resource for this activity, and smoking cessation counseling was added to these counselors' duties. Any or all of these differences may have contributed to the different outcomes.

The observation that peer counseling reduced smoking, verified by decreases in exhaled carbon monoxide, is

an important finding.<sup>21</sup> Furthermore, the reduction in smoking was greatest in those who smoked the most at baseline. Smoking cessation is the ideal health goal, but smoking reduction during pregnancy is also beneficial and has been associated with increased birth weight in at least three studies.<sup>22-24</sup> A decrease in tobacco exposure increases birth weight in a predictable fashion.<sup>22</sup> The present results demonstrating that birth weights were greater in nonsmokers than in women smoking seven or more cigarettes per day confirm this finding. We did not observe birth weight differences between the intervention and control groups despite a reduction in cigarettes in our peer counseling group because the study was not powered to detect this outcome.

Exhaled carbon monoxide was a better predictor of birth weight at 36 weeks' gestation than self-reported number of cigarettes per day. Carbon monoxide appears to play a major role in fetal growth retardation by increasing fetal tissue hypoxia.<sup>25</sup> Carbon monoxide in pregnant animals in the range of human tobacco exposure produces a predictable decrease in offspring birth weight.<sup>26,27</sup> In another study, it was found that a carbon monoxide level less than 5 parts per million minimizes the risk of a low birth weight infant.<sup>28</sup> Thus, exhaled carbon monoxide appears to be a good biomarker for the effects of tobacco exposure during pregnancy on birth weight. The association between low levels of exhaled carbon monoxide and birth weight raises the possibility that a lower value for carbon monoxide should be used to verify smoking status during pregnancy.

There are some limitations to this study. We are unable to discern precisely what components of peer counseling were effective in tobacco reduction during pregnancy. The prenatal counselors delivering the cessation advice for the study population were community outreach workers and not researchers, so we cannot ascertain with certainty what occurred in the counseling sessions. This outpatient, and often home, setting makes it difficult to standardize and replicate this program. On the other hand, smoking during pregnancy disproportionately affects poor women who may have difficulty attending a more formally structured clinic program. Consequently, such a peer-based, outreach smoking treatment program may be especially useful for women who may not avail themselves of more traditional smoking interventions. Such a program may also be cost-effective for clinics with existing prenatal outreach programs.

Only 57% of the peer counseling and 64% of the usual care group completed the study. This almost certainly was a result of our desire to include nearly all women served in the clinic, to make the results more generalizable and applicable to other low-income pregnancy pop-

ulations served by outreach workers. Thus, we included women without a stable residence, women who routinely traveled back and forth to Puerto Rico during their pregnancy, women with ongoing legal issues, and women with substance abuse histories. Many of these patients were lost to follow-up. When lost to follow-up, however, these subjects were considered to be smokers, so the results almost certainly underestimate the potential of such peer counseling programs.

In summary, peer support counseling for smoking cessation during pregnancy in the present study reduced the number of cigarettes smoked at delivery, a finding that was confirmed by a reduction in biomarkers of cigarette use. These results require replication and, if confirmed, studies designed to determine the components of peer counseling responsible for this effect.

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