Behavior change models and theories have been useful in our efforts to help people stop smoking. However, models that were developed for the general population do not always fit special populations such as pregnant women. Many women stop smoking while pregnant, but most resume smoking after giving birth. To help women who stop smoking while pregnant to stay smoke-free, a model for tailoring a smoking resumption-prevention intervention to the special needs of pregnant and postpartum women is proposed. The intervention begins during pregnancy, continues postpartum, and addresses pregnancy and parenting contextual factors in women’s lives. The model is based on motivational theory and includes conducting patient assessments, developing risk profiles, triaging women to different levels of intervention intensity, and matching intervention strategies to women’s risk profiles. JOGNN, 35, 215-222; 2006. DOI: 10.1111/J.1552-6909.2006.00036.x

Keywords: Smoking and Pregnancy—Smoking Relapse Prevention—Sources of motivation—Stepped-Care and Matching Model

Accepted: July 2005

Cognitive behavioral theories and models are good frameworks for tobacco control interventions, and public health campaigns and pharmacologic therapies have been useful intervention strategies (Fiore et al., 2000; Windsor, Boyd, & Orleans, 1998). Ecologic models have also been useful for understanding the multiple factors that influence people’s smoking behavior (Green, Richard, & Potvin, 1996; Stokols, 1996). However, many theories and models that were developed for the general population are less useful for tobacco control with pregnant and postpartum women (Curry, McBride, Grothaus, Lando, & Pirie, 2001). A particularly thorny problem is the substantial number of women who stop smoking for several months while they are pregnant but resume after giving birth (Kahn, Certain, & Whitaker, 2002). The author is in the process of testing a model for tailoring a smoking resumption-prevention intervention to the special needs of pregnant and postpartum women.

A substantial number of pregnant women stop smoking while they are pregnant, but the majority resume by 12 months postpartum.

Pregnancy and Postpartum Smoking Patterns

A substantial number of pregnant women stop smoking while they are pregnant, but up to 70% resume by 12 months postpartum (DiClemente, Dolan-Mullen, & Windsor, 2000; Hajek et al., 2001; Kahn et al., 2002; Lelong, Kaminski, Saurel-Cubizolles, & Bouvier-Colle, 2001; McBride et al., 1999; Mullen, Richardson, Quinn, & Ershoff, 1997; Quinn, Mullen, & Ershoff, 1991). Although pregnancy is an opportune time for smoking cessation (McBride, Emmons, & Lipkus, 2003), the factors that contribute to the high rates of postpartum resumption are complex.
and there is no one apparent path that women follow in their return to smoking (Bottorff, Johnson, Irwin, & Ratner, 2000; Scheibmeir & O’Connell 1997). On the surface, it seems that women who have abstained from smoking for many months and moved beyond the physical, psychological, and social withdrawal associated with not smoking have accomplished a long-lasting behavior change. However, the majority of women resume smoking during the 1st postpartum year.

Hajek, Stead, West, and Jarvis (2005) in a recent Cochrane Database review concluded that brief, skills-based interventions were not effective relapse-prevention strategies for women who stopped smoking during pregnancy. The proposed model addresses these issues in several ways. The intervention is individualized based on the context of women’s lives. Postpartum, women are usually in the same environments that supported smoking before they were pregnant and have the additional joys and stresses of caring for and mothering an infant. It is reasonable that women might return to a familiar behavior that was pleasurable and helped them manage their lives before they were pregnant. It is likely that parenting and nonparenting issues account for women’s return to smoking. Thus, the sources of motivation for abstaining or smoking might differ during pregnancy and postpartum. The proposed intervention spans pregnancy and postpartum to allow for changes in motivation during this transition. Motivational interviewing (MI) is the primary approach used in the intervention. With MI counseling, women create strategies that fit their lives and are feasible for them to accomplish rather than having the counselor teach them skills. Because pregnancy and the postpartum experience include many changes, our intervention includes more than “brief” counseling. It includes one in-depth in-person counseling session and several telephone counseling sessions over several months. It is proposed that the resumption-prevention model and intervention will be more effective than previous interventions.

Effective resumption-prevention interventions may decrease women’s return to smoking and prevent many tobacco-related chronic illnesses.

Sources of Motivation for Becoming a Nonsmoker

From previous research, the characteristics of women and their environments associated with smoking resumption are noted in Table 1. These characteristics provide insight about the multiple sources of motivation associated with smoking or abstinence in pregnant and postpartum women. Many behavior change models include the following concepts: degree of addiction, readiness to change, self-efficacy, and support. These are useful concepts, and we have included them in our model. However, we have added contextual concepts that are appropriate for pregnant and postpartum women, specifically, concerns for the fetus and baby, body weight concerns, and mental health. Grouping these characteristics according to their motivational sources was useful in developing the intervention model.

Deci and Ryan (1985, 2002) in their discussion of self-determination theory did some of the seminal work on intrinsic and extrinsic sources of motivation as a way to understand people’s behavior. Deci and Ryan (2002) describe development as a process in which people are motivated and shaped by social norms and values. Intrinsic motivation comes from within the self and is expressed as the need to be competent and self-determining. Extrinsic motivation comes from the social environment and values. People adopt behaviors, values, and attitudes that are useful for acceptable functioning in the social world. In their study of pregnant smokers, Curry et al. (2001) reported that pregnancy and parenthood-related motivational factors were useful in understanding women’s smoking behavior. They studied pregnant women’s reasons for quitting smoking using a modified Reasons for Quitting questionnaire (RFQ). The original RFQ was developed for the general smoking population and included two dimensions of intrinsic motivation (health concerns and self-control) and two dimensions of extrinsic motivation (immediate reinforcement and social influence.) They modified the RFQ by adding pregnancy- and parenting-related reasons for quitting. Their findings indicated that both recent quitters and continued smokers have high pregnancy motivational scores early in pregnancy and that at 8 weeks postpartum, women who had continued abstinence compared to those who had resumed smoking had a significantly higher intrinsic to extrinsic motivational ratio. These findings suggest that both general and pregnancy-specific (PS) motivational factors are important in understanding postpartum smoking (Curry et al.).

Model Structure

The model was adapted from one proposed by Abrams et al. (1996) as a guide for matching smoking cessation counseling to patient characteristics. The purpose of Abrams et al.’s model was to develop a stronger link between clinical and public health approaches. The 1st phase included screening, diagnosis, and triage plus biobehavioral (BB) and comorbidity assessments. Based on people’s dependence and comorbidity ratings, they were assigned to one of three levels of intervention intensity: minimal care (self-help), moderate care (essentially Agency for Healthcare Quality
and Research’s Clinical Practice Guideline steps of Ask, Advise, Assess, Assist, Arrange) (Fiore et al., 2000), and maximal specialized care (outpatient or inpatient treatment) (Ab Abrams et al., 1996, p. 294). Abrams et al.’s stepped-care and matching model was developed for smoking cessation in the general population, and we have adapted it for resumption prevention with pregnant women. The proposed model is more tailored than Abrams et al.’s and includes assessment, development of a risk profile, triaging women to different levels of intervention intensity, and matching the timing and content of the intervention to women’s risk profiles (see Figure 1). All the steps of the model are initiated during the last trimester of pregnancy, but intervention contacts continue for 3 months postpartum.

**Assessment**

The 1st step in the model is assessment, which occurs when women are between 28 and 32 weeks of pregnancy. The assessment has three dimensions, all of which have been demonstrated to be associated with smoking behavior: BB, PS, and coconditions (CC). The assessment instruments are listed in Table 2. The BB dimension consists of intrinsic sources of motivation. The PS dimension includes extrinsic source of motivation. The CC dimension consists of both intrinsic and extrinsic sources of motivation (see Figure 2).

**Biobehavioral Dimension.** The BB assessment characteristics are those that have been most predictive of resumption in previous studies. The characteristics are degree of dependence, readiness or stage of change, and self-efficacy. Degree of dependence is an indicator of how embedded smoking is in a person’s life (Hajek et al., 2001; Ratner, Johnson, Bottorff, Dahinten, & Hall, 2000). The more dependent people are on tobacco, the more challenging it is for them to become nonsmokers. In addition, people with high dependence often benefit from the use of pharmacotherapies and require more intensive intervention and cessation attempts to be successful.

Readiness to change a behavior has been conceptualized in several ways. The transtheoretical model (TTM) stages of change have been extensively used to assess people’s readiness to change smoking behavior (DiClemente et al., 1991; Prochaska & Velicer, 1997). According to this model, women in earlier stages of change are less likely to be ready to become nonsmokers than women in later stages. There is some evidence that the standard TTM model does not fit the special circumstances of pregnancy and postpartum. Stotts, DiClemente, Carbonari, and Mullen (1996) reported that processes of change were expressed differently among pregnant and nonpregnant groups, suggesting that motivation and coping during pregnancy are different from that at other times. The same

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**TABLE 1**

**Characteristics Associated With Postpartum Smoking Resumption**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Reference(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of Dependence</td>
<td>Hajek et al. (2001); Ratner et al. (2000)</td>
</tr>
<tr>
<td>Readiness or stage of change</td>
<td>Curry et al. (2001); Klesges, Johnson, Ward, &amp; Barnard (2001); Stotts et al. (2002)</td>
</tr>
<tr>
<td>Concerns for the baby’s health</td>
<td>McBride et al. (1999); Van’t Hof et al. (2000)</td>
</tr>
<tr>
<td>Partner or household member smoking</td>
<td>Severson et al. (1997); Van’t Hof et al. (2000)</td>
</tr>
<tr>
<td>Social influences or support</td>
<td>Klesges et al. (2001); Van’t Hof et al. (2000)</td>
</tr>
<tr>
<td>Mental health</td>
<td>Kahn et al. (2002)</td>
</tr>
</tbody>
</table>

---

**FIGURE 1**

Risk assessment.
team (Stotts, DiClemente, & Dolan-Mullen, 2002) found that women’s reports of the likelihood of resuming smoking by 6 months postpartum were the best predictors of future smoking behavior. Although the usefulness of the standard staging algorithms and processes of change is questionable with pregnant women, the concepts of readiness and self-efficacy remain good predictors of postpartum smoking behavior (Stotts, DiClemente, & Dolan-Mullen; Van’t Hof, Wall, Dowler, & Stark, 2000).

Self-efficacy is the confidence a person has that she can engage in a new behavior. Strong self-efficacy is a demonstrated predictor of success in adopting a new behavior such as quitting smoking (Condiotte & Lichtenstein, 1981). The concept of self-efficacy has been incorporated into many behavior change models (Condiotte & Lichtenstein; Gwalney et al., 2002; Velicer, DiClemente, Rossi, & Prochaska, 1990). The relationship between the BB characteristics and smoking behavior have been well substantiated in the literature with both pregnant and nonpregnant populations.

**Pregnancy-Specific Assessment.** The presence of unique motivators and experiences related to pregnancy led us to include a PS dimension to the risk assessment. The

<table>
<thead>
<tr>
<th><strong>TABLE 2</strong> Risk Assessment Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biobehavioral</strong></td>
</tr>
<tr>
<td>Dependence</td>
</tr>
<tr>
<td>Readiness</td>
</tr>
<tr>
<td>Self-efficacy</td>
</tr>
<tr>
<td>Pregnancy specific</td>
</tr>
<tr>
<td>Reasons for not smoking</td>
</tr>
<tr>
<td>Coconditions</td>
</tr>
<tr>
<td>Depression</td>
</tr>
<tr>
<td>Body weight concerns</td>
</tr>
<tr>
<td>Partner/family support</td>
</tr>
<tr>
<td><strong>Instrument</strong></td>
</tr>
<tr>
<td>Fagerstrom test for nicotine dependence</td>
</tr>
<tr>
<td>Likelihood of resumption</td>
</tr>
<tr>
<td>Self-efficacy for smoking abstinence</td>
</tr>
<tr>
<td>Researcher developed, baby focused</td>
</tr>
<tr>
<td>Researcher developed, sensory aversion</td>
</tr>
<tr>
<td>Edinburgh postpartum depression scale</td>
</tr>
<tr>
<td>Williamson’s body image assessment</td>
</tr>
<tr>
<td>Partner interaction questionnaire</td>
</tr>
<tr>
<td><strong>Source</strong></td>
</tr>
<tr>
<td>Heatherton et al. (1991)</td>
</tr>
<tr>
<td>Stotts et al. (2000)</td>
</tr>
<tr>
<td>Becona et al. (1988)</td>
</tr>
<tr>
<td>Concerns for baby, concerns for secondhand smoke and children</td>
</tr>
<tr>
<td>Cigarettes smell bad, lost the taste for cigarettes</td>
</tr>
<tr>
<td>Cox et al. (1996)</td>
</tr>
<tr>
<td>Williamson et al. (2000)</td>
</tr>
<tr>
<td>Cohen &amp; Lichtenstein (1990)</td>
</tr>
</tbody>
</table>

**FIGURE 2**
Model (BB = biobehavioral; PS = pregnancy specific).
characteristics assessed in this dimension are concerns for the fetus and sensory changes in the taste and smell of cigarettes. Both sources of motivation are time limited to pregnancy, disappear after women give birth, and likely contribute to some women’s return to smoking (Pletsch, 2001, 2002).

A woman’s concern for the health of her fetus is a strong motivator for stopping smoking and many women stop smoking just for the pregnancy (McBride et al., 1999; Van’t Hof et al., 2000). A finding from an earlier study indicated that most women were trying to be good mothers and protect their babies from harm by not exposing them to tobacco smoke (Pletsch, 2001). During pregnancy, when the baby was inside their bodies, the women either stopped smoking or reduced the amount smoked in an effort to protect the baby. However, after giving birth, when the baby was outside their bodies, women could protect their babies by restricting smoking in the home and keeping their babies away from secondhand smoke. Postpartum women believed they could be good mothers by restricting their baby’s exposure to tobacco smoke, but still smoke themselves. In addition, many of the circumstances, such as life stressors, that led women to smoke before they became pregnant were present postpartum and women returned to the familiar behavior of smoking.

In the same studies, we found that many women developed an aversion to the taste or smell of tobacco smoke while they were pregnant; this aversion was a primary motivator for their stopping smoking, and women attributed the aversion to being pregnant (Pletsch & Kratz, 2004). In this study, 73% of women who stopped smoking were smoking again by 3 months postpartum (Pletsch & Kratz). Several other studies on gustatory and olfactory changes in pregnancy (Tepper & Seldner, 1999) included anecdotal descriptors of women’s aversion to the smell and taste of tobacco smoke ( Kolble, Hummel, von Mering, Huch, & Huch, 2001). Thus, women who stop smoking because they lose the taste for cigarettes or because the smell has become aversive are likely to resume smoking when they return to a nonpregnant physiological state.

Risk Profiles and Triage

The 2nd step in the model is to develop a risk profile for each woman. Women are assessed on the three risk dimensions and would be categorized into one of four profiles based on the BB and PS dimensions: low BB and low PS, low BB and high PS, high BB and low PS, high BB and high PS (see Table 1). Because motivation for behavior is complex, each dimension includes several concepts. The BB and PS dimensions are most relevant for determining the number and timing of intervention contacts. The CC dimension is related to specific intervention strategies.

Women would have a high BB score if they had one of the following: (a) a score of 6 or greater on the Fagerstrom test for nicotine dependence ( Heatherton, Kozloski, Frecker, & Fagerstrom, 1991), (b) a score of 2 or less on Stott’s readiness to become a nonsmoker screener (Stotts, DiClemente, Carbonari, & Mullen, 2000), or (c) a score of 5 or less on Conditette and Lichtenstein’s self-efficacy for abstinence scale (Becona, Frojan, & Lista, 1988; Colletti, Supnick, & Payne, 1985). Women would have a high PS score if they reported one of the following reasons for not smoking: (a) lost the taste for cigarettes, (b) the smell of cigarettes was aversive, (c) concerns for the baby, or (d) pressure from family and friends to not smoke during pregnancy.

Referrals would be used for specialized services for depression and weight management from the CC dimension. Depression is assessed by the Edinburgh Postnatal Depression Scale with a score of 12 or greater indicating risk for...
Matching

The next step in the model is to match intervention strategies to women’s risk assessments with women choosing intervention priorities. First, women’s risk profiles are reviewed with them. Then, using an MI change plan worksheet (Deci & Ryan, 2002, p. 137), women identify at least one tobacco-related goal, create an action plan for that goal, and think of ways for other people to assist them. In addition, women identify possible roadblocks to achieving their goal and the ultimate results they hope to see. Over the course of multiple intervention contacts, women can identify new goals and action plans as they transition from pregnancy to parenthood. If women ask for advice from the interventionist, a variety of well-documented behavior change strategies are offered. Some typical strategies are anticipating and planning for changes in the context of smoking, expectancies, and behavioral capabilities (Bandura, 1986), increasing self-efficacy (DiClemente et al., 1991), and anticipating and planning for risky postpartum situations such as parenting stress, and social and work environments that support smoking, and methods for obtaining social support (Marlatt & Gordon, 1985). For example, a woman’s BB assessment indicates that she has little confidence that she could refrain from smoking with the stress of having a newborn to care for. The MI change plan worksheet would be used to help her devise a plan for stress management. If she asks the interventionist for additional suggestions, the interventionist demonstrates deep breathing and relaxation techniques, helps the woman identify stress management techniques that have worked for her in the past, provides her with written material about stress management and parenting, and gives her a list of parenting support groups in her community. The intervention is tailored for each woman based on a combination of her own problem solving, expertise of the interventionist, and referral to community resources.

Adoption into Practice

The proposed model of assessment, risk profiling, triaging, and matching addresses the common problems of people being asked to participate in too few or too many intervention contacts, tailors intervention strategies to focus on personal risk factors, and uses referrals to existing programs for services that women might need beyond tobacco control. Telephone counseling is cost-effective and makes the integration into practice more feasible than in-person counseling visits.

In the prenatal setting, a nurse case manager or a nurse with additional tobacco control training could deliver the intervention. Another option is a team approach. Women could be risk assessed and profiles created by one team member, such as a registered nurse; counseling and monitoring could be provided by a certified nurse-midwife, registered nurse, tobacco specialist, nurse case manager, or outreach worker with specialized training; and referrals managed by a discharge nurse or social worker. The process of using the model in practice would be similar to the nationally developed smoking cessation guidelines (Fiore, Bailey, & Cohen, 2000).

| Individualized interventions are likely to be more successful than a one-dimensional approach. |

Summary

Pregnancy has been described as a “teachable moment” (McBride et al., 2003) and identified as an opportune time for families to change smoking behavior (DiClemente et al., 2000). However, previous resumption-prevention programs have not had a sustained impact on changing women’s smoking.

The innovative model that has been described integrates concepts from motivational and behavior change theories and a practice model. The model is currently being evaluated to refine and modify it. Models such as this can contribute to our understanding of behavior change during other significant life transitions for women.
REFERENCES


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