

## Promoting Smoking Abstinence in Pregnant and Postpartum Patients: A Comparison of 2 Approaches

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**Objective:** To compare the implementation, delivery, and implications for dissemination of 2 different maternal smoking-cessation/relapse-prevention interventions in managed care environments.

**Study Design:** Healthy Options for Pregnancy and Parenting (HOPP) was a randomized, controlled efficacy trial of an intervention that bypassed the clinical setting. Stop Tobacco for Our Kids (STORK) was a quasi-experimental effectiveness study of a point-of-service intervention. Both incorporated prenatal and postnatal components.

**Patients and Methods:** Subjects in both studies were pregnant women who either smoked currently or had quit recently. The major intervention in HOPP was telephone counseling delivered by trained counselors, whereas the STORK intervention was delivered by providers and staff during prepartum, inpatient postpartum, and well-baby visits.

**Results:** In HOPP, 97% of telephone intervention participants reported receiving 1 or more counselor calls. The intervention delayed but did not prevent postpartum relapse to smoking. Problems with intervention delivery related primarily to identification of the target population and acceptance of repeated calls. STORK delivered 1 or more cessation contacts to 91% of prenatal smokers in year 1, but the rate of intervention delivery declined in years 2 and 3. Modest differences were obtained in sustained abstinence between 6 and 12 months postpartum, but not in point prevalence abstinence at 12 months.

**Conclusions:** The projects were compared using 4 of the 5 dimensions of the RE-AIM model including reach, adoption, implementation, and maintenance. It was difficult to apply the fifth dimension, efficacy, because of the differences in study design and purpose of the interventions. The strengths and limitations of each project were identified, and it was concluded that a combined intervention that incorporates elements of both HOPP and STORK would be optimal if it could be implemented at reasonable cost.

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Smoking during pregnancy increases the risk of numerous adverse health outcomes, including bleeding during pregnancy, placenta previa, abruptio placentae, and infant low birth weight due to retarded fetal growth.<sup>1</sup> Furthermore, exposure of infants and children to cigarette smoke in the home is a risk factor for sudden infant death syndrome, lower respiratory tract illness, otitis media, and worsening of asthma.<sup>2</sup> Cessation of smoking during pregnancy substantially reduces these risks.<sup>2</sup> Although about 30% of pregnant smokers in the United States quit smoking for the duration of pregnancy, 25% to 30% of pregnant smokers continue to do so during pregnancy, and of those who quit, as many as 70% resume smoking within 1 year after delivery.<sup>3-5</sup>

The effects of intervention on smoking cessation during pregnancy have been examined extensively.<sup>6-19</sup> The intensity of these interventions has varied considerably, and results suggest that high- or low-intensity interventions have similar outcomes.<sup>17,18,20</sup> Few studies have examined the effectiveness of postnatal intervention in preventing relapse and fewer have included both prenatal and postnatal interventions.<sup>6,21</sup>

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Healthcare settings, particularly managed care, present opportunities to reach large populations of smokers with personalized assistance. In addition, the managed care environment provides an excellent venue for implementing practice guidelines (eg, making tobacco use a vital sign; providing brief advice at every clinic visit), dedicating staff for smoking-cessation/relapse-prevention activities, and training healthcare professionals, including physicians and nurses.<sup>22-24</sup> Intervention modalities within managed care settings can be decentralized and clinic based, centralized and non-clinic based (eg, by mail or telephone), or a combination of these approaches.

This article compares 2 studies of maternal smoking-cessation interventions in managed care environments. These interventions had several features in common, including focus on relapse prevention, incorporation of prenatal and postnatal interventions, and delivery and evaluation of effective smoking-cessation interventions in real-world settings. However, these projects differed markedly in their intervention approach and methodology. Healthy Options for Pregnancy and Parenting (HOPP) bypassed clinic encounters, in part to ensure that the intervention would occur and that it would be of high quality. Stop Tobacco for Our Kids (STORK) capitalized on the provider-patient relationship by having clinicians deliver the intervention in the practice setting at the point of service. We describe key components of these 2 approaches, difficulties and successes in their implementation, and suggest recommendations for dissemination of smoking-cessation efforts in managed care.

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... METHODS ...

**Subjects and Setting**

Subjects and settings for the 2 studies have been described in detail elsewhere.<sup>25,26</sup> Briefly, HOPP was conducted at 2 sites: Group Health Cooperative of Puget Sound (Seattle) and Park-Nicollet of Minnesota (Twin Cities metropolitan area). In HOPP, patients scheduling a prenatal visit to the obstetrics and gynecology (OB/GYN) clinic were contacted by telephone for an initial survey and were screened for smoking status and study eligibility. Eighty-two percent of eligible patients completed the survey. STORK was conducted in the Portland, Oregon metropolitan-area facilities of Kaiser Permanente, Northwest (KPNW), and subject accrual occurred at the first pregnancy OB/GYN visit, during which

smoking status was routinely assessed. Current and recent (within 30 days prior to conception) ex-smokers were eligible for inclusion in both studies.

**Study Design**

*HOPP.* HOPP was a randomized, controlled trial in which subjects were randomly assigned to 1 of 3 interventions: (1) self-help booklet only (n = 297); (2) prepartum intervention only (n = 294); and (3) both prepartum and postpartum interventions (n = 306).

*STORK.* STORK used a 3-group, longitudinal time-series design with 1 intervention group and 2 comparison groups. Intervention subjects (n = 2055) were smokers who registered for prenatal care after their prenatal clinic staff received training to deliver the intervention, but before December 4, 1996, the end of the intervention period. The 2 comparison groups received care in the same clinics prior to implementation of the intervention and were as follows: (1) a historical comparison group (n = 1028) consisting of women who registered for prenatal care after January 2, 1992, and delivered before clinic staff were trained in the intervention; and (2) an interim comparison group (n = 824) that included women who began prenatal care prior to staff training, but continued in prenatal care after the intervention was initiated at the clinic they attended. The interim group had the potential to receive some intervention.

**Interventions**

Key components of HOPP and STORK interventions are summarized in the **Table**.

*HOPP.* All subjects in HOPP received an attractive self-help booklet titled *Stop Now for Your Baby* that was targeted at pregnant smokers. Subjects in the prepartum intervention and prepartum/postpartum intervention groups received telephone counseling and handwritten notes from telephone counselors in addition to the self-help booklet. These groups also received a relapse-prevention packet containing a booklet and small gifts, including bubble bath, tea, and a refrigerator magnet. The prepartum intervention group received telephone counseling (maximum of 3 calls) only in the prepartum period. The prepartum/postpartum intervention group received telephone calls (with a maximum of 3 additional calls up to 4 months postpartum) as well as 3 newsletters during the postpartum period.<sup>25</sup>

*STORK.* The STORK intervention was personalized according to the woman's readiness to quit

smoking and used a brief motivational approach based on a well-described model.<sup>27,28</sup> The intervention was delivered and reinforced at point of care delivery and integrated into usual care at prepartum, inpatient postpartum, and well-baby visits. Intervention began at the first pregnancy visit. The prepartum phase emphasized smoking cessation. The inpatient component emphasized relapse prevention and targeted smokers who had quit smoking during pregnancy. The pediatric component targeted all smokers and recent quitters who took their babies to KPNW well-baby clinics and emphasized relapse prevention for women who had quit smoking during pregnancy and, for continuing smokers, both cessation and avoiding smoking around the baby.

The STORK intervention had 4 components that pertained to all 3 phases of the intervention: (1) assessing stage of readiness to quit; (2) giving a stage-specific supportive message; (3) making a plan with the patient; and (4) documenting the activity. Stage-specific videos, pamphlets, physician prompt sheets, and a partner letter supported intervention delivery.<sup>26</sup>

**Training of Intervention Staff**

**HOPP.** Telephone counselors underwent several hours of face-to-face instruction before initiating telephone calls. All 3 counselors (2 in Seattle, 1 in Minnesota) were ex-smokers who had been through a pregnancy. Detailed written protocols guided the telephone counseling, and telephone counselors discussed cases with and reported concerns to the investigators on a regular basis. No training was needed for clinic staff, but investigators held meetings with OB/GYN providers to describe the study, answer questions, and provide copies of intervention materials for review.

**STORK.** The STORK intervention was preceded by 60- to 90-minute training sessions,

conducted by intervention facilitators, for nurses, clinic assistants, and providers on their portion of the intervention. In addition, clinic nurses attended a half-day workshop on the principles of behavioral intervention. An intervention facilitator was assigned full-time to each clinic for its first month of start-up and periodically thereafter to monitor progress, motivate staff, solve problems, model the intervention, and provide assistance with intervention. After several months of implementing the intervention at each clinic, these responsibilities were transferred to a team consisting of a lead nurse, provider, and clinic assistant who volunteered to champion the intervention among their peers. Periodic booster training sessions, conducted by study staff, were held during the first 2 years, and a final booster/problem-solving

**Table.** Key Intervention Components of STORK and HOPP

Phase	STORK	HOPP
Prenatal	Prenatal visit 1: 1. Assess smoking status 2. Deliver stage-specific motivational message* 3. Develop plan with patient 4. Document†	8-12 weeks of gestation: Assess smoking status 12-20 weeks of gestation: Mail self-help booklet‡
	All subsequent visits: 1. Assess stage 2. Give supportive message 3. Develop plan with patient 4. Document	1-2 weeks, ~10 weeks, and ~12 weeks later: Follow-up telephone counseling with personal note Send relapse-prevention packet
In hospital	1. Assess stage 2. Give supportive message 3. Develop plan with patient 4. Document	
Postpartum	Postpartum visit and pediatric well-baby visits 1. Assess stage 2. Give supportive message 3. Develop plan with patient 4. Document	~ 1-2 weeks postpartum: Send newsletter 1 Make telephone call/send personal note ~ 4 weeks postpartum: Send newsletter 2 Make telephone call/send personal note ~ 12 weeks postpartum: Send newsletter 3 Make telephone call/send personal note

\*Intervention aids: stage assessment card; staged videos; staged brochures; action plan pad.

†Documentation aids: form inserted in medical record.

‡Booklet titled *Stop Now for Your Baby*.

session was held with obstetric and pediatric lead nurses in the third year. Subsequently, indirect support was provided through motivational e-mail updates and a quarterly newsletter to providers and staff.

**Monitoring Implementation**

*HOPP.* Computer records aided project staff in mailing booklets and newsletters at appropriate times to individual subjects and also cued telephone interventionists to schedule calls. Telephone counselors recorded the number of calls to each woman, length of each call, and topics covered in each call. Follow-up surveys assessed the use and recall of booklets and newsletters by study subjects.

*STORK.* Intervention facilitators periodically reviewed procedures for stocking materials, as well as intervention progress at each clinic site and used these visits to remotivate staff. Process data for each prenatal and pediatric clinic were obtained from quarterly medical record reviews on a random sample of women with recent visits. Whenever possible, these participants were also interviewed by telephone to obtain feedback on receipt of components of the intervention and to elicit their reactions to the smoking counseling they received. A follow-up questionnaire was mailed to all women in the sample 1 year after delivery to document receipt of smoking-cessation counseling, brochures, and the partner letter. Nonrespondents were called, and those willing completed the questionnaire by telephone. Data on specific smoking-cessation counseling behaviors were collected from clinic staff at baseline and at the end of the intervention period, and data on adoption of the intervention by providers were collected on 2 occasions after the start of the intervention.

Comparable demographic information was not available for STORK participants.

**Delivery of the Intervention**

*HOPP.* Participation in the counseling calls was high among women in both the prepartum only and prepartum/postpartum HOPP groups; 92% accepted the first prepartum call in both groups together and 82% of the women in the prepartum/postpartum group accepted at least 1 postpartum call. The majority of women (93%) recalled the postpartum newsletters. Of the 57% who reported reading all or most of them, 60% reported following the recommended suggestions. Women in the HOPP prepartum and prepartum/postpartum groups recalled receiving the booklet more often than did the booklet-only group (96% vs 81%;  $P < .05$ ). The majority (91%) of women recalled the relapse-prevention kit. Almost 50% of the women reported reading most or all of the relapse guide and of these, 58% reported following suggestions in the guide.

*STORK.* In STORK, all 3 sources of data on delivery of the intervention over the 3 years of the study—chart reviews, telephone interviews, and self-report questionnaires—showed similar patterns, with high rates of delivery during the first study year and declining rates over the subsequent 2 years. Rates of delivery varied among clinic sites and were higher for the prenatal than for the inpatient and pediatric components. Short-term improvements followed booster sessions. In the prenatal setting, the lowest intervention delivery rates were those based on chart reviews, the highest from patient self-report. Prenatal intervention delivery rates, as documented in medical records, were 91% in year 1, 61% in year 2, and 46% in year 3. Among women interviewed by telephone, 100%, 91%, and 73% reported receiving smoking counseling in years 1, 2, and 3, respectively. The follow-up questionnaires showed intervention delivery rates of 90% in year 1, 93% in year 2, and 94% in year 3. More than 75% of intervention women who reported receiving smoking counseling indicated that it was helpful.

The patient data thus suggest that clinic staff often did not document their interventions. Although documented rates of delivery declined in years 2 and 3, the number of interventions per woman who received any intervention (based on medical record data) dropped from 3.1 in the start-up year to 2.0 in year 2, and then rebounded slightly to 2.4 in year 3. The questionnaire data showed an increase in use of brochures, but not videos, after the start of intervention. Self-reported rates of deliv-

... RESULTS ...

**Subject Characteristics**

The average age of the study sample was 27.7 years for HOPP and 24.5 years for STORK. Both studies included recent smokers who had not smoked in the past 7 days at baseline—44% of HOPP participants and 26% of STORK participants. Current smokers in HOPP reported smoking substantially fewer cigarettes per day (4.8) than did current smokers in STORK (8.3). Of the HOPP participants, 67% reported household income greater than \$30,000, 88% were Caucasian, 82% were married or living as married, 64% were employed full-time, and 17% were college graduates.

ering the smoking counseling were collected from providers at the end of the second year of the study and showed that 76% of obstetrics providers and 95% of pediatric providers used the interventions with at least some patients, and 37% of obstetrics providers and 20% of pediatric providers used them routinely. At the end of the study, staff were asked to indicate their level of agreement with the statement "I have done my part in delivering the STORK intervention." Seventy-three percent of medical assistants, 83% of nurses, and 50% of providers who responded to the survey indicated that they strongly or moderately agreed with the statement.

### Postpartum Abstinence Outcomes

Detailed abstinence outcome data from these studies are presented elsewhere.<sup>25,26</sup>

**HOPP.** Self-reported smoking status was used to determine smoking abstinence, although saliva cotinine was also measured (there were no between-group differences in the proportion of saliva samples returned or in the proportion confirmed). The prepartum/postpartum intervention delayed but did not prevent postpartum relapse to smoking. At 8 weeks postpartum, prevalent abstinence was significantly greater for the prepartum and prepartum/postpartum intervention groups than for the booklet-only group (booklet only, 30%; prepartum, 35%; prepartum/postpartum, 39%;  $P = .02$ ). At 6 months, prevalent abstinence reported by the prepartum/postpartum group was significantly higher than in the other 2 groups (booklet only, 26%; prepartum, 24%; prepartum/postpartum, 33%;  $P = .04$ ). Differences in prevalent abstinence related in part to a nonsignificant reduction in relapse in the prepartum/postpartum intervention group. However, by 12 months postpartum, no differences were seen between the groups in prevalent abstinence.

**STORK.** This study also used self-reported smoking status outcomes. Significant differences were noted between the historical comparison group and the intervention group in the following outcomes: sustained quit rates during pregnancy (comparison, 29%; intervention, 39%;  $P = .001$ ), not smoking in the hospital after delivery (comparison, 61%; intervention, 67%;  $P = .015$ ), continuous smoking abstinence between 6 and 12 months after delivery (comparison, 15%; intervention, 18%;  $P = .045$ ), and protecting the infant from cigarette smoke at home (comparison, 73%; intervention, 88%;  $P = .001$ ).<sup>26</sup> The 3% absolute difference in smoking abstinence between 6 and 12 months, although statistically significant, was modest, and no differences in 7-day

prevalent abstinence at 12 months were noted in this study.

### Problems in Implementation

**HOPP.** Initial difficulties in identifying pregnant smokers and lack of a previous personal connection between the patient and the counselor contributed prominently to difficulties in delivering the intervention. HOPP used a telephone survey to identify pregnant women who smoked, so for the approximately 18% of women who could not be surveyed (because they refused or screened out counselor calls), smoking status was unknown. In a large percentage of completed calls, counselors were unable to actively engage women in discussion of issues pertaining to smoking. Call completion rates varied between the 2 performance sites for calls after the initial call. The length of calls also varied between the 2 sites, despite detailed protocols, perhaps reflecting differences in the populations served.

**STORK.** In STORK, which relied heavily on medical care staff for implementation, major issues were provider resistance and the logistics of implementing and maintaining the intervention in a busy, rapidly changing healthcare setting. Because STORK was a clinic-based program, it was relatively easy to identify pregnant smokers, because smoking status was established routinely at prenatal intake. However, since STORK was also interested in recent smokers, questions were added to the intake form about smoking at conception. Thus, documentation of smoking status at intake had to be monitored until the new questions became routine. Difficulties in implementation arose from system complexities and individual staff and provider attitudes. In all clinics, staff and providers had to be psychologically readied to deliver the intervention; developing the skills and comfort to perform the intervention also took time. Furthermore, providers often stopped discussing smoking once a woman quit, and consequently, 27% of women who quit smoking restarted during pregnancy. Many pediatric providers preferred to address issues of environmental tobacco smoke rather than discuss maternal smoking, since the baby, not the mother, was the patient. Other hindrances in clinic settings included limited time, use of float personnel, introduction of a computerized medical record system, decrease in nursing full-time equivalents, and a shift from an initial prenatal nurse-patient counseling visit to group visits.

Lack of system linkages also contributed to problems in delivering the inpatient and pediatric relapse-prevention components of the intervention.

Prenatal and inpatient records were not linked, and hence, inpatient nurses had to review prepartum smoking history with the mother. Further, since mothers' and babies' medical records were not linked, the mother's smoking status had to be reassessed at the well-baby clinic, and no obvious way was found to record her smoking status in the baby's electronic record.

... DISCUSSION ...

**The RE-AIM Model**

Glasgow, Vogt, and Boles<sup>29</sup> have proposed the RE-AIM (Reach, Efficacy, Adoption, Implementation, Maintenance) model for evaluating a public health intervention. Although HOPP and STORK were quite different in design and purpose (testing efficacy vs effectiveness), it is possible to compare advantages and disadvantages of the 2 interventions using at least 4 of the 5 dimensions of the RE-AIM model, namely reach, adoption, implementation, and maintenance. The studies could be compared on the fifth dimension—efficacy—as well, but differences in study designs and purpose make such a comparison less meaningful. HOPP was a randomized controlled efficacy trial and STORK was a quasi-experimental effectiveness study. HOPP studied pregnant smokers who completed the baseline telephone survey needed to determine smoking status, whereas STORK included all prenatal registrants. Survey methods differed between the projects, with HOPP using telephone surveys and STORK using mailed questionnaires. Both studies' intervention approaches delayed postpartum relapse but were unable to sustain these effects in the long term. Because of the differences between the studies, it would be premature to favor 1 approach over the other on the basis of efficacy.

*Reach* refers both to penetration of an intervention into the target population (in this case, pregnant current and recent ex-smokers) and to how well those who receive the intervention represent the target population. We expected HOPP to be delivered at a high level, because the intervention was delivered by project staff. In fact, 97% of HOPP participants who had been identified as smokers received at least 1 counselor call. However, because the study relied on a survey of prenatal registrants to identify pregnant smokers, those who did not complete the telephone survey were missed, and it is unknown how they compare with those who did complete the survey. STORK relied on the clinic

intake process to identify prenatal smokers and could monitor whether an initial smoking assessment had been completed on every prenatal registrant and, if not, prompt clinic staff to do so at the next visit. Although 93% of intervention women reported having at least 1 prenatal visit during which smoking was discussed, the absolute number of intervention contacts (average of 3.1 in year 1, 2.0 in year 2, and 2.4 in year 3) was rather low, considering the potential number of contacts that could have occurred during the prepartum period. It could not be determined whether demographic characteristics differed between women who received the intervention and those who did not.

In both studies, delivery rates postpartum were lower than those in the prepartum period. In HOPP, this occurred because of women refusing to discuss smoking when reached or screening out calls. In STORK, pediatric providers were uncomfortable discussing smoking with mothers who were not their patients. A postpartum/pediatric smoking intervention component, if effectively supported, has the potential to extend the reach of a clinic-based intervention and help reduce postpartum relapse. Secker-Walker and colleagues found that face-to-face counseling during early postpartum visits substantially reduced postpartum relapse,<sup>6</sup> and Wall and colleagues successfully trained pediatricians to assist in relapse-prevention initiatives for mothers as part of well-baby care.<sup>21</sup> Use of posters to create patient demand in the pediatric setting might also have been helpful.

*Adoption* refers to the proportion and representativeness of settings that adopt the program. Adoption of the intervention by clinic staff was not an issue in HOPP, because the intervention bypassed the system by using project staff. However, adoption was a major problem in STORK, because resistance of staff and providers presented a substantial barrier. Adoption occurred more readily in small clinics than in large clinics, in part because it was easier for champions of the intervention to influence peers in the smaller clinics. A strategy to improve provider participation and raise comfort level in discussing smoking cessation is to increase patient demand for preventive services. This can be done through use of environmental cues such as posters (used by STORK in prenatal settings) and patient educational materials (used by both projects).<sup>30-33</sup> Providers who remain reluctant or uncomfortable with the topic could delegate discussions about smoking to another health professional (eg, a nurse or health educator) or refer mothers to

a telephone follow-up counseling resource after briefly broaching the subject of smoking cessation or relapse prevention.

*Implementation* refers to the extent to which a program is delivered as intended. Except for the problem of identifying the target population, implementation of the HOPP intervention was much easier than implementation of the STORK intervention. The availability of dedicated resources and individuals for delivering the intervention facilitated planning, scheduling, training, quality monitoring, and delivery. The STORK experience illustrates the complexities and system barriers that interfere with disseminating research-derived interventions within the clinical facilities of a healthcare system. In addition to the barriers posed by competing demands for time and attention, other obstacles to delivering the intervention included changes in staffing ratios and personnel, clinic procedures, and communication and documentation systems. System supports are generally important for delivery of preventive services because preventive services, such as smoking cessation, involve multiple steps over a period of time.<sup>29</sup> STORK would have been easier to implement had it occurred after establishment of KPNW's system-wide tobacco initiative, which set performance targets tied to compensation, incorporated smoking assessment as a vital sign, and implemented a program of quality-assurance monitoring and feedback.

*Maintenance* refers to the extent to which innovations become stable, enduring components of the behavioral repertoire of an individual or of an organization's services. Maintenance of the HOPP intervention in a healthcare system would be considerably simpler than maintenance of STORK, for many of the same reasons that implementation was easier. However, HOPP was a funded research project, and maintenance would require the organization to commit resources to sustain the intervention after the external project funding ended. Had HOPP been implemented by the healthcare system initially, only an ongoing commitment of funds would have been required. A long-term threat to maintenance is that separating the resource from clinical services risks its being a target for cost cutting. Maintenance of STORK, once adopted by staff and providers, also requires system support, including clearly identified system performance targets, monitoring, and system changes that facilitate the intervention. Examples include adequate time for nurses to follow up with patients after an initial message from the provider<sup>34</sup> or the opportunity for providers to refer

patients interested in quitting to follow-up calls from health educators.

### **Optimization**

On an individual level, the lack of a maintained intervention effect in HOPP was disappointing. Although HOPP achieved initial intervention effects, it may have erred in not actively involving the clinic system. STORK represented a more comprehensive approach that actively engaged the clinic and clinic staff. However, the modest differences between intervention and control rates of long-term smoking abstinence were also disappointing.

Each intervention had limitations that could be overcome by adding elements of the other. HOPP was an intervention focused only on telephone counseling and might have benefited from active involvement of the medical care system. For example, inclusion of a cover letter from providers along with intervention materials might have enhanced the credibility and effectiveness of a HOPP telephone intervention; or at visits, providers could have reinforced the message, thereby lending credibility to and increasing acceptance of the telephone calls. Conversely, the HOPP telephone intervention could have been used to extend the reach and impact of the provider messages of the STORK intervention. A brief provider message, promptly followed by a telephone call to counsel the women on strategies for quitting and remaining abstinent, would minimize demands on provider time, yet retain the import of the provider message and overcome the logistical and cost problems of referral to a nurse or other tobacco counselor in the clinic setting. Interventions that incorporate support from women's natural social networks (ie, a partner or other supportive person in her environment) along with provider and telephone intervention might be considered in future implementation as well.<sup>35,36</sup> Neither HOPP nor STORK (outside of a letter to the partner) specifically emphasized engaging the partner or other outside social support.

### **Costs of Implementation**

A concern in disseminating the interventions is the incremental cost of institutionalizing HOPP or STORK in other managed care settings. For STORK, the issue is primarily of the types of system changes that would be required to maximize the implementation of such an approach, which will vary by setting. For example, system supports that were implemented in KPNW in 1999 as part of a system-wide smoking-cessation initiative could have greatly

enhanced the initial implementation of the program. These included medical education classes to train clinicians in motivational interviewing and change strategies; construction of a system-wide electronic documentation system that recorded whether an individual was a nonsmoker, recent smoker, or current smoker, and number of cigarettes per day for the latter; system targets for smoking assessment and counseling (and eventually quit rates); and referrals for health educator follow-up calls to women who were interested in quitting. The availability of smoking counseling in primary care and some specialty care settings can provide further support in reinforcing efforts of women who recently quit during pregnancy or who are contemplating quitting. The incremental costs for institutionalizing STORK include those for initial training and for the provider's time for delivering the intervention. From our experience with STORK, once providers are trained and have some practice, the intervention adds a maximum of 5 minutes to a visit, and if nurses are used to deliver the counseling, the cost is reduced.

The institutionalization of HOPP appears to be more straightforward and would depend on commitment by managed care organizations of the up-front monetary costs for the program. As mentioned earlier, a problem with HOPP is how to identify the total population of pregnant smokers and recent ex-smokers. However, with the necessary institutional commitment, HOPP could be implemented by training health educators within the system to conduct outreach calls. Also, training new health educators is easier than tracking the training needs of new providers and staff in multiple clinic settings. Central tracking of the delivery of a HOPP-like program in which counselors are recruited and trained to do the intervention should be relatively easy.

The costs of such a system would be more straightforward than those incurred in implementing a clinic-based system such as STORK. Data from HOPP indicate that for the maximum possible number of calls of average duration in the combined prepartum/postpartum intervention, the total actual health educator telephone contact time per participant would be 48.6 minutes. However, because only the most motivated patients would receive this number of calls, the average telephone time per contacted smoker would be considerably less. Total counselor time per patient would be double to triple the time spent in direct patient telephone contact and would also include making calls that were not completed, keeping records, and supervision. A

more detailed consideration of cost-effectiveness issues is beyond the scope of this manuscript. If HOPP were institutionalized, its quality could be maintained at a level comparable to that achieved in the current efficacy study.<sup>37,38</sup> An option in future implementation might be to contract with state-wide smoking-cessation programs to provide telephone support. At this point, however, it is unclear that incremental long-term abstinence outcomes are sufficient to justify a major expenditure of resources to institutionalize the postpartum interventions.

In summary, a combined intervention that used clinic-based providers as well as non-clinic-based resources might be optimal if it could be implemented at reasonable cost. STORK could profit from consistent delivery of high-quality materials and telephone support that do not require provider commitment of time or effort. Unequivocal reinforcing messages in clinic and hospital settings would lend additional weight to the telephone counseling. A combined intervention that is consistently delivered and rigorously evaluated and that draws on naturally existing sources of social support has excellent potential for long-term public health impact.

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