

# Dissemination of an Efficacious Antenatal Smoking Cessation Program in Public Hospitals in Australia: A Randomized Controlled Trial

John B. Lowe, DrPH  
Kevin P. Balanda, PhD  
Warren R. Stanton, PhD  
Chris Del Mar, FRACGP, FAFPHM  
Vivienne O'Connor, FRACOG, FRCOG

This study investigated the impact of a behaviorally based intervention designed to increase the number of hospitals that routinely provide effective smoking cessation programs for pregnant women. In Queensland, Australia, 70 publicly funded hospitals were matched on numbers of births and maternal socioeconomic status and randomly allocated to an *awareness-only* intervention group or a *behaviorally based* intervention group. Success was defined as the routine offer of an evidence-based smoking cessation program to at least 80% of the pregnant clients who smoke. At 1 month, 65% of the behaviorally based intervention hospitals agreed to provide materials about smoking cessation programs for their antenatal patients, compared with 3% of the awareness-only hospitals. After 1 year, 43% of the intervention hospitals still provided the material, compared with 9% of the awareness-only hospitals. These findings show that a brief intervention to hospitals can encourage antenatal staff to provide smoking cessation materials to pregnant women.

To be effective, health protection programs must be delivered to their intended populations. The transfer of such programs into everyday practice should follow their dissemination, based on Rogers's "Diffusion of Innovation" theory.<sup>1</sup> This theory has been widely used in trials to change practices at both the community school and individual level.<sup>2-4</sup> In his theory, Rogers identified the need to provide innovations (programs) that demonstrate the following criteria for adoption and implementation: offers an advantage over what is currently being conducted, is compatible with the environment, is less complex to provide, and can be trailed and observed before a commitment to continue is made. Ferrence<sup>3</sup>

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John B. Lowe, Kevin P. Balanda, Warren Stanton, and Chris Del Mar, Centre for Health Promotion and Cancer Prevention Research, University of Queensland, Faculty of Health Science, Herston, Queensland, Australia. Vivienne O'Connor, Department of Obstetrics & Gynaecology, University of Queensland, Mater Mothers Hospital, South Brisbane, Queensland, Australia.

*Address reprint requests to* John B. Lowe, Department of Community and Behavioral Health, College of Public Health, the University of Iowa, 2936 Steindler Bldg., Iowa City, IA 52242-1008; phone: (319) 335-9831; fax: (319) 335-9200; e-mail: john-low@uiowa.edu.

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and others have characterized the overall adoption as an S-shaped curve, which emphasizes that an innovation emerges slowly at first and then more rapidly, concluding with a leveling off or decline. Within this S-shaped adoption curve, Rogers's theory describes five phases in the diffusion process: knowledge/awareness, persuasion, decision, implementation, and confirmation. The development of prenatal smoking cessation programs in hospitals might follow this same sequence. Successfully getting pregnant women to quit smoking requires programs that are not only *effective* in helping them but also *available* to them.

## BACKGROUND

Smoking during pregnancy poses risks for both fetus and mother: It increases the risk of low birth weight, preterm labor, spontaneous abortion, perinatal death, small for dates, fetal respiratory complications, increased risk of prematurity, antepartum haemorrhage, and premature rupture of the membranes.<sup>5-7</sup> Maternal smoking also harms the health of the infant, contributing, for example, to sudden infant death syndrome<sup>8</sup> and acute respiratory infection.<sup>9</sup>

However, smoking among pregnant women remains common, especially among those of lower socioeconomic status (SES) groups.<sup>10</sup> Twenty percent of women smoke cigarettes during pregnancy in the United States,<sup>11</sup> 28% do so in the United Kingdom,<sup>12</sup> and 24% in Australia.<sup>13</sup> Smoking prevalence among pregnant women has been reported as high as 43% and 49%.<sup>14,15</sup>

Antenatal smoking cessation programs have been shown to be effective and acceptable.<sup>16-19</sup> A meta-analysis of smoking cessation programs has confirmed that effective programs are available and—depending on a number of factors, such as who delivers the program, level of education of the women, and the resources—can produce a smoking cessation rate of between 7% and 27%.<sup>16,17</sup> In a recent meta-evaluation of 23 trials of smoking cessation during pregnancy, Windson and colleagues found that program strategies for pregnant women were important to achieve a behavioral impact.<sup>19</sup> This meta-evaluation concluded that self-help, minimal-contact interventions could produce behavioral impacts in public health maternity clinics both in the United States and overseas.

Despite this growing body of evidence, however, few hospitals offer smoking cessation programs as a matter of routine to their antenatal patients who smoke. A survey in Queensland hospitals found that fewer than 10% offered such programs. In a review of smoking cessation in pregnancy programs, Walsh and Redman<sup>20</sup> concluded that health care providers did not routinely provide smoking cessation interventions to pregnant women. Staff perceived the lack of time to perform smoking cessation counseling during the antenatal visit as a major barrier to delivering the service. Furthermore, staff perceived that they did not have adequate training to consult smokers regarding quitting.

However, researchers have found that because of the often long waiting times in public hospitals, patients can find intervention programs entertaining, relevant, and diverting.<sup>21</sup> In addition, if smoking is reduced, many hospitals might greatly benefit from the reduced demand for their expensive facilities and services. For all of these reasons, the dearth of in-hospital antenatal smoking cessation programs is a serious problem that needs to be addressed.

## INTERVENTION

### Development of the Intervention

The intervention was based on Rogers's Diffusion of Innovation theory.<sup>1</sup> Diffusion theory has been referred to as the conceptual foundation in a number of studies involving tobacco prevention and cessation.<sup>22-24</sup> This theory was used to guide and facilitate the concept and development of the intervention, which used three phases as previously identified: awareness, persuasion, and implementation. The goal of the intervention was to provide the opportunity for all pregnant women who smoked to be offered an effective smoking cessation program designed specifically for pregnant women.

Initially, investigators conducted four focus groups with ward nursing staff and individual interviews with three superintendents and midwives in their respective hospitals. The focus group used a semistructured question format to investigate influences to the staff in providing a program such as one in smoking cessation, as well as factors that they would consider when adopting a program. Barriers to the adoption of the program and their possible solutions were explored in these consultations, and the most acceptable means of presenting this information to clinical staff were investigated. This work provided the basis for developing the organizational framework for the workshops and for presenting the awareness/knowledge phase. This framework provided general guidance on how to approach and work with the hospital, as well as the possible influence of key gatekeepers in the hospital. The organizational framework is shown in Figure 1.

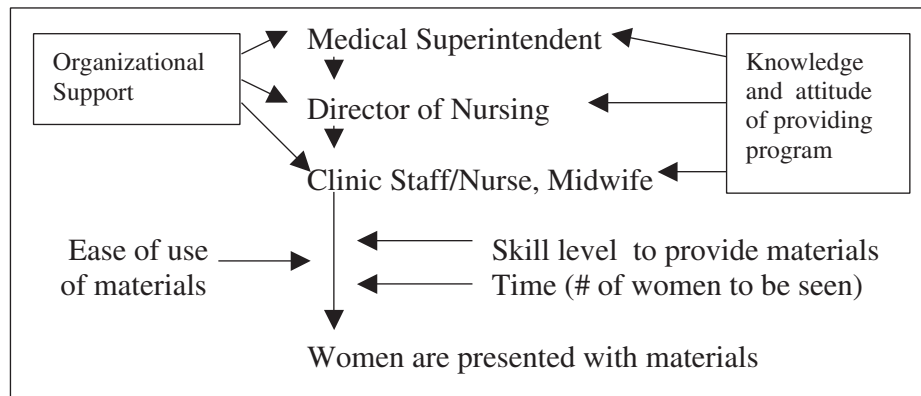
Thus, a multiphase strategy training program was developed in this study, which included (a) a knowledge/awareness phase of antismoking programs for pregnant women, (b) a persuasion phase to the hospital to incorporate the program into the system of delivery and care, and (c) its decision/implementation phase to provide the program to women.

#### *Awareness Phase*

The goal of this phase was to make all hospitals aware of the availability of effective antenatal hospital-based smoking cessation programs for pregnant women. The awareness phase consisted of flyers distributed to all hospitals through the medical superintendent and directly to the antenatal staff. The use of this strategy to inform medical superintendents and antenatal staff was to increase the likelihood of the information reaching decision makers as well as practitioners. It explained the statistics on why pregnant women should quit smoking and how and why health professionals in hospitals should and could be involved. The flyer also described two effective antenatal smoking cessation programs available and explained how they could be obtained. A follow-up phone call by the research assistant verified the receipt of the information by the medical superintendent and the midwife.

#### *Persuasion Phase*

This phase was designed to persuade hospitals to agree to use an antenatal smoking cessation program as a matter of routine. An educational package consisting of a presentation and workshop for antenatal hospital staff was developed. The workshop format, with refreshments, was the medium that staff overwhelmingly agreed would be optimal



**Figure 1.** The organizational framework of the antenatal smoking cessation intervention.

for a high level of participation. The workshop was conducted by an academic from the medical school and required a senior administrative medical and nursing staff member to be present with the other doctors and nurses. All intervention hospitals had a minimum of 60% of antenatal staff attending the workshop. Workshops were conducted between shifts in the afternoon. This workshop stressed the need for an antenatal smoking cessation program and, more important, provided guidelines on how to implement a smoking cessation program for pregnant women in the hospital. The workshop was interactive and included a training video portraying five scenarios involving interaction between midwives and pregnant women at antenatal book-in. The videotape addressed concerns expressed by midwives/nurses about approaching some types of pregnant women such as aggressive smokers and those whom they were sure did not want to quit.

The workshop included role-play and group discussion on how that individual hospital could adopt the proposed program for the hospital. Barriers identified by the focus group (e.g., time and need for skills in smoking cessation counseling) were examined in order to consider how the hospital could overcome the barriers. Staff time schedules were reviewed to focus on when the materials could be presented to the women. Skills that would be needed to present the information were addressed during the workshop and role-playing of delivery of the materials was conducted. Issues of effectiveness were addressed through a cost-benefit model and emphasized that staff effort was valuable to helping both mother and baby. The entire workshop lasted approximately 1 hour. The hospital provided coffee, tea, and cakes for the workshops. At the end of the workshop, a commitment to ordering and providing smoking cessation booklets for smoking pregnant women was sought.

#### *Implementation Phase*

During the implementation phase, each hospital was to conduct a recommended program of smoking cessation in their hospital. This involved asking antenatal patients their smoking status and then offering all pregnant women who were currently describing themselves as a smoker a self-help smoking cessation program. The intervention for this phase consisted of follow-up letters and 6 monthly newsletters to the antenatal staff

emphasizing hospitals that had participated in the workshop and had implemented a smoking cessation program. The newsletter also contained information about any problems that had been reported and how the hospital responded, as well as contact numbers and offers of assistance by other hospitals that had implemented the program and solved them. Information that was provided in the workshop was briefly summarized for the hospitals in the newsletter.

### **Smoking Cessation Program**

Initially, a review of hospital-delivered self-help antenatal smoking cessation programs was undertaken. The recommendation of smoking cessation materials for pregnant women was based on two criteria: (1) of proven effectiveness in Australian populations and (2) available for purchase in large quantities. Two programs could be recommended on this basis: one titled "The Smoking and Pregnancy Pamphlets" by the Victorian Smoking and Health Program (QUIT) and a smoking cessation self-help manual titled "Healthy Two," which was developed by smoking pregnant women and edited by the senior author. Both had been developed and evaluated in Australia and reported quit rates of approximately 10%.<sup>24</sup> Although other programs had been reported in the literature, they did not fulfill the criteria.

### **METHOD**

An eligibility survey of all public hospitals in Queensland was conducted to determine the level of delivery of antenatal smoking cessation programs for pregnant women. Hospitals were included in the eligibility survey if they provided antenatal care and/or book-in procedures for delivery to 10 or more patients a year and if they did not serve an Aboriginal or Torres Strait Island population of more than 50%. The decision to exclude hospitals that service more than 50% Aboriginal or Torres Strait Island population was based on the lack of culturally appropriate programs to offer these women. The survey was sent to medical superintendents who completed the first section, which requested information about the hospital and its antenatal care. The survey was then passed on to a key antenatal staff member to complete, which in most cases was a midwife. The survey from antenatal staff provided information with regard to the routine formal activities conducted to assist antenatal patients to quit smoking or the existence of formal procedures to ensure staff members offer these activities to all smoking antenatal patients. Hospitals were eligible for the trial if they were currently not providing any antenatal smoking cessation care. This included the provision of either program materials or pamphlets about stopping smoking.

Eligible hospitals that did not provide any materials or information were matched on the number of births, location of population of the center (rural/metropolitan), and whether they had a specific antenatal department and/or clinic. Within pairs, hospitals were randomized into intervention and control groups.

All hospitals, both intervention and control, were provided the awareness phase of the intervention. This information was sent to the individuals that participated in the pretest survey at the hospital. In addition, hospitals in the intervention group were also provided additional materials including a workshop on both the persuasion phase and the implementation phase.

Follow-up of all hospitals in both the intervention and control groups was conducted at 12 months to assess the level of use of antenatal smoking cessation programs. A research assistant who was not familiar to the hospital personnel and not identified with the program group conducted a follow-up telephone call. Information was obtained from both the medical superintendent and director of nursing or head nurse midwife. Both the medical superintendent and director of nursing were asked a series of three open-ended questions to determine use, coverage, and procedure for providing a smoking cessation program routinely to pregnant women. Adequate care was defined as the existence of a smoking cessation program that was provided routinely to at least 80% of the smoking pregnant women. Only if both sources agreed that adequate care had occurred, the hospital was counted as having implemented the smoking cessation program. If the program was not being offered, the staff was questioned as to what happened in the time period following the workshop. The open-ended question was only added for those hospitals that had conducted a workshop. This qualitative information provided data on possible self-reported reasons for not implementing the program.

In addition to assessment of the use of antenatal smoking cessation programs in the group of hospitals, a cohort study was conducted in two program hospitals that had stated they had integrated the program into their antenatal program. We selected a small and medium-sized hospital that was similar to the majority of the hospitals in the study. The aim of the cohort study was to compare the quit rate with that achieved during earlier efficacy trials. These two hospitals (one small, one medium) provided ethical clearance to contact patients, and a consecutive grouping of patients was identified and telephoned prior to delivery (approximately 36 weeks) to determine (a) whether they had received the materials and (b) whether they were smoking. Questions about their smoking and whether they received the program were part of a larger questionnaire to the women that was described as an evaluation of the overall antenatal care program at the hospital.

## RESULTS

Eighty hospitals were eligible to participate in the study, representing 92% of the total number of public hospitals in Queensland that provided antenatal care and ranged from a low of 10 births to a high of 2,148 births per year. Another 10 hospitals (five pairs) were omitted after the study began as one of the hospitals in the pairs no longer provided antenatal care. Seventy hospitals were included in the final analysis: 35 in each group. Matching of the hospitals was successful as there were no differences in number of births, rurality, and whether they had a specialized antenatal service at baseline. Furthermore, during the course of the study, the number of births in the hospital and whether they had a specialist antenatal service did not shift.

Complete follow-up at 12 months of both pairs occurred in 22 pairs for a follow-up of 63%. Complete follow-up was only considered if both information from the medical superintendent and the director of nursing was collected. Complete follow-up could not be obtained primarily due to the inability to contact either the medical superintendent or the director of nursing after a minimum of three attempts.

The program was self-reported by hospital staff to be implemented by 23 (65%) of the 35 intervention hospitals and 1 (3%) of 35 control hospitals at the 1-month follow-up. At 12 months, 15 (68%) of the intervention hospitals were providing antenatal smoking cessation to smoking pregnant women compared with only 3 (14%) in the control hospitals.

On an intention-to-treat analysis at 1 year, 43% of the hospitals in the intervention group compared with 9% in the control group were still implementing the program.

As the original design was a matched-pair design, analysis was conducted in the pairs. Only 22 pairs (44 hospitals) had complete information on both pairs. Table 1 represents the end points at 12 months in a two-by-two contingency table. McNemar's chi-square indicates a statistically meaningful difference between the proportion of intervention hospitals implementing the program and the proportion of control hospitals implementing the program ( $\chi^2_1 = 12, p = .0005$ ). The relative difference between intervention and controlled conditions was 0.632 ( $\pm 0.11$ ).

A logistic regression was conducted to study the influence of several characteristics of the hospitals including size of the hospital, number of births, seniority of staff, and supporting programs. Neither the size of hospital nor the number of births was associated with the implementation of the program. The Spearman rank correlation between the size of the hospital and number of births was .78 ( $p < .0001$ ). In the final logistics model, only births were entered. Table 2 represents an analysis of the numbers of births as categorized by small (0-227), medium (300-642), and large (1,000-2,200) per year and group identification on whether they implemented the program. The delivery of the intervention was the only factor influencing implementation ( $p < .0001$ , odds ratio = 15.76). Furthermore, the seniority of the staff did not have an influence on implementation ( $p = .86$ ).

### **Reasons for Nondelivery of the Program**

Each of the hospitals that were not providing the program reported in the follow-up telephone assessment that they stated the reason was they were not "convinced" that they could overcome the barriers, such as staffing or time that was addressed in the workshop. These hospitals reported that they could not overcome the provision of staff time to provide the services and the lack of infrastructure support by the administration to overcome any perceived barriers. This was the perception of the medical superintendent and/or the director of nursing. However, all did not rule out the possibility of adoption "sometime in the future."

Five hospitals reported they had discontinued the program between the 1-month follow-up and 12-month follow-up. This decision to discontinue the program appeared to be based principally on the inability to continue to obtain supplies of the self-help booklet. These hospitals did not appear to have an individual responsible for maintaining the booklets or follow-up orders of the booklet.

### **Maternity Cohort**

From two hospitals, a total of 200 consecutively presenting women who were smokers participated in the cohort study. Of these 200 women, 75% indicated they were offered a smoking cessation program in pregnancy, and 20 self-reported they had quit smoking. This provided a smoking quit rate of 10%. There was no significant difference between the two hospitals with respect to the proportions of pregnant women who were offered the self-help manual and the proportions that reported quitting smoking.

Table 1. Matched Pair Analysis<sup>a</sup> of Hospitals That Implemented a Smoking Cessation Program at 12 Months

	Pairs of Hospitals		Total
	Control	Control	
	(Yes)	(No)	
Intervention (yes)	3	12	15
Intervention (no)	0	7	7
Total	3	19	22

a. McNemar's  $\chi^2_1 = 12.0$ —an associated exact probability of .0005.

Table 2. Factors Influencing the Implementation of a Smoking Cessation Program for Pregnant Women

	Regression Coefficient	SE	$\chi^2$	p Value	Odds Ratio
Group (intervention or control)	2.76	0.67	4.20	< .0001	15.76
Birth—small	-0.21	1.01	-0.21	.83	
Birth—medium	0.94	1.29	-0.73	.46	
Birth—large	0.94	0.99	0.95	.34	

## LIMITATIONS

The dependent variable in this study was a self-report by two individuals (superintendent and senior antenatal staff member) to the criteria of presenting a program of smoking cessation to 80% of the smoking antenatal patients. It is likely that both the superintendent and the antenatal staff member assumed that the program was being provided to all pregnant women and did not measure this quantitatively. Furthermore, by requiring that both superintendent and nurse midwife had to agree that the program was being delivered, the true percentage may have been underestimated. This only affects the estimate of the percentage coverage and not the validity of the dependent variable.

We were not able to conduct a verification of cessation rates in all intervention and control hospitals. This was not possible due to the cost of such a trial and, more important, the delay in getting permission from each institutional review board within each hospital in the state. This provided a substantial barrier that could not be overcome within the time and cost limitations of this trial. We do believe, however, given the low uptake of any type of program within the control hospitals, it is doubtful that quit rates changed dramatically from the previous efficacy trials. The verification of the two hospitals' smoking rates provided data of the integrity of the program.

This study was conducted predominantly in rural areas of the state of Queensland. The primary request from hospitals to the health department each year concerns the desire to have continuing education programs brought to them. The antenatal smoking cessation workshops were welcomed and supported due to, in part, a "professor" from the capital city medical center coming out to the rural areas. This type of presentation was always going to attract the required administrators and also a large number of antenatal staff. This desire by the hospitals to have programs, we believe, influenced the attendance at these programs.

## DISCUSSION

This study demonstrates that a relatively simple workshop, which facilitates the hospitals providing smoking cessation programs for pregnant women, can be achieved in the majority of hospitals. The strength of the intervention is that of 100 hospitals that would fail to implement using the control condition, 63 of the 100 who receive the intervention would implement the program. The hospitals in this study that have not implemented the program need continued monitoring to investigate whether over time they too implement a smoking cessation program for pregnant women as Rogers's model speculates.<sup>1</sup>

The diffusion intervention provided hospitals and their staff with the resources to perform what might be considered "duty of care." However, not all hospitals in the intervention group started the programs, and a number of them tried and did not continue to provide the service. This group of hospitals that started the program and did not continue are of concern. The maintenance of this service and the provision of smoking cessation materials to pregnant women will require additional effort.

The smoking cessation programs employed consisted of brief advice to quit smoking and the provision of quit materials. Although this information has been available for a number of years, relatively few hospitals or general practitioners provide materials on a regular basis to a pregnant woman who smokes. We have shown that the barriers that hospitals have invoked in defense of their inertia (such as lack of time, lack of staff training, too few staff, and pessimistic views regarding intervention effectiveness) can be addressed by administration support and rethinking of the structure of time spent with antenatal patients who smoke. Hospitals have a duty of care to provide access to smoking cessation material that has been demonstrated to be effective.

Administration support may have been perceived by staff from the attendance of a senior administrator at the workshop. This perceived support enabled staff to begin to work on overcoming the barriers to providing smoking cessation for pregnant women. The availability of a senior staff member (director of nursing) for the ward enabled staff to look at relevant structural changes that were possible within the hospital and receive immediate feedback. The use of examples of other hospitals similar to the hospital being provided the workshop was motivating and may have provided a belief that the hospital could use similar strategies to overcome its barriers to implementing smoking cessation for pregnant women. Minimally, it provided them with a starting point for consideration of possible strategies for incorporating smoking cessation for pregnant women. This bringing together of service staff and ward staff appears to have provided the basis for organizational change to occur in the hospital.

Interestingly, the smoking cessation rate was very similar to the rate found in the efficacy trial.<sup>24</sup> This rate, although not as high as other self-help books reported in the literature, is reasonable for a no-counseling handout materials approach to smoking cessation during pregnancy. This type of requirement appears to be one that hospitals will take on board and deliver. More in-depth counseling of the women while raising the smoking cessation rate by a few percentage points must be weighed against the lack of delivery of these types of programs on a wide scale. Whether these programs could in the long run be incorporated into hospitals is something that needs further investigation. Once a hospital is providing smoking cessation material on a regular basis, hospital staff may be more willing and able to increase the amount of counseling that is provided in conjunction with these programs.

The fact that 12 hospitals did not provide the program is not unexpected as these hospitals may need more evidence of the usefulness of providing smoking cessation programs and the evidence that the barriers could be overcome by hospitals similar to themselves.

The need for an identified individual to maintain the materials needs to be incorporated into the process at all hospitals. The additional barrier of not having materials readily available was a substantial issue for continuing the program.

Hospitals may continue to consider the adoption of smoking cessation programs for pregnant women. As neighboring hospitals adopt the service of providing smoking cessation materials and staff members change positions between hospitals, hospitals that are currently not providing the service may adopt the service. This speculation is based on principles set forth by Rogers in *Diffusion of Innovations*.<sup>1</sup>

Outsiders provided the educational program, and there were no direct overall changes in policy development within the hospitals. This is of concern as staff move out of the hospital and/or support from the medical superintendent changes. The next step would be to work with the hospitals that have implemented the program to promote policy and other structural changes for the maintenance of this program.

We were not able to identify significant factors that influenced adoption. This may provide an indication that additional barriers such as the professional and social interaction of the staff with administration, perceived autonomy by nursing staff in the hospital, and the relationship of the hospital with the community may need to be measured.

In conclusion, this intervention program appears to be successful in getting hospitals to implement a smoking cessation program for pregnant women. This, of course, must be put into a larger context of placing the responsibility of smoking during pregnancy not on the pregnant woman alone but also focusing on the social, cultural, environmental, and political aspects of smoking during pregnancy at a community level.<sup>25</sup> Hospitals providing materials to help pregnant women quit smoking, although critical, is only one factor in overall comprehensive programs to reduce smoking during pregnancy.

## IMPLICATIONS FOR PRACTICE

The study used Rogers's *Diffusion of Innovations*<sup>1</sup> as a basis to frame the work. In this case study, following the different phases of Rogers's model provides the structure for moving the hospital from not providing to providing the smoking cessation program, addressing not only awareness but also issues of implementation. Although hospital staff need additional training to offer smoking cessation interventions, there is overwhelming evidence that providing smoking cessation materials to pregnant women is not only warranted but is a duty of care by the hospital. Evidence of effectiveness is not sufficient. This has also been demonstrated by cessation of prevention.<sup>2-4</sup> This process of awareness, persuasion, and implementation phases, when applied to hospitals, appears to follow similar results as when they have been applied to schools and communities.

Current practice in most hospitals is not to provide smoking cessation materials for pregnant women who smoke cigarettes during pregnancy. More effort is needed to move hospitals into implementing a smoking cessation program for pregnant women. Conversely, there is evidence that implementing only the awareness phase by sending out information is not effective. Also, simply providing information to hospitals regarding the need to provide a smoking cessation intervention to pregnant women and how to incorporate it into their prenatal programs is not sufficient for change. This study demonstrates that by providing additional phases per Rogers's model in a form of a relatively

brief intervention can assist hospitals in providing materials to help pregnant women quit smoking. Results from this study document the acceptance of a program of smoking cessation for pregnant women that fits into hospitals and how it can be provided within routine obstetrical care.

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