
Development of a Cervical Cancer Educational Program for Chinese Women Using Intervention Mapping

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This article describes the development of a program to increase Pap screening behavior among women in Taiwan. Intervention mapping, an innovative process of intervention design, guided the development of this program. The development process included a needs assessment identifying factors influencing Pap screening behavior relevant to Chinese women. The program used methods such as information transmission, modeling, persuasion, and facilitation. Strategies included direct mail communication, role-model stories and testimonials, and a telephone-counseling component. The delineation of specific plans for implementation and evaluation are also described.

Keywords: *Pap screening behavior; intervention mapping; program development; Chinese women*

In Taiwan, the National Health Insurance Plan (implemented in 1996) provides free health care coverage for Pap screening for women aged 30 and older. Despite universal coverage, most women do not obtain regular Pap smears. A 1990 study that surveyed women in Taiwan found that about 70% (689 of 990) of women age 30 to 64 did not have regular Pap test screenings (Lee, Kuo, Chen, Chen, & Chou, 1997). A recent study in Taiwan showed that about 30% (37 of 125) of women had never received a Pap test and that 58% (72 of 125) were nonadherent to the recommended screening guidelines (Hou, Fernandez, Parcel, & Chen, 2003).

There are a few studies that have applied constructs from various social and behavioral science theories to guide the needs assessment and development of an intervention for cervical cancer screening (Dignan, 1994; Earp, Altpeter, & Mayne, 1995). However, details

were lacking pertaining to how the programs were designed and developed. There was also a lack of information regarding program linkage to specific intermediate outcomes that influence health behavior. Programs labeled *culturally sensitive*, for example, usually do not specify whether any formative research preceded program development or how the program addressed cultural needs. There is often no description of how the intervention methods were selected and why. A review of 65 cancer education programs for adult women across the United States showed that the target audience, the message being delivered, and the action being urged were often not clear in many materials they reviewed (Marcus & Crane, 1998).

This article describes the development of a program called "Love yourself before you take care of your family." It was designed to increase Pap screening behavior specifically for Chinese women living in Taiwan. It was developed using intervention mapping, an innovative process of program intervention design (Bartholomew, Parcel, Kok, & Gottlieb, 2000). Intervention mapping is a detailed process that provides explicit step-by-step guidance for planning and designing theory- and evidence-based health education programs. It intends to integrate theory, empirical findings from literature, and new data collected from study participants in the design of an intervention.

► INTERVENTION MAPPING

Intervention mapping provides the following five fundamental steps in the development of the interven-

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tion: (a) creating matrices of proximal program objectives, (b) selecting theory-based intervention methods and practical strategies, (c) designing and organizing a program, (d) specifying adoption and implementation plans, and (e) generating program evaluation plans (Bartholomew et al., 2000).

Needs Assessment

Intervention mapping depends on a thoroughly conducted needs assessment that specifies the problem of interest. To better design the program, we conducted a pilot study to assess factors that influence Pap screening behavior among Taiwanese women. The pilot study population was made up of a convenient sample of female family members of inpatients who were admitted to one of the major teaching hospitals in Taichung, Taiwan, during the spring of 1999 ($N = 125$). A self-administered questionnaire consisting of 73 items was distributed to 160 women. They were asked to return the questionnaire to the nurse station after they completed the survey. The response rate was 78% (125 of 160).

The pilot study provided information about salient factors influencing Pap screening behavior, such as knowledge, perceived pros and cons, and perceived norms. The information guided the development of the intervention. The needs assessment phase of program development also included focus group interviews to provide direction for the design of the program intervention approaches, concepts, and messages. Three focus groups were conducted during the pilot study ($N = 24$). Women were recruited from churches and community centers in Taichung, Taiwan, through local community contact persons. A semistructured protocol with open-ended and probing questions was used to explore potential behavioral and environmental factors that might influence women's screening behavior in this particular population. Possible intervention ideas and strategies were also collected. The program theme "Love yourself before you take care of your family" was identified through the focus group discussions.

Creating Matrices of Proximal Program Objectives

This step provides the foundation for the program intervention by specifying who and what would change as a result of the intervention. The proximal program objectives are specific statements of what individuals need to learn or what must be changed in the environment related to the determinants in order for the performance objectives to be met. A series of the most proximal program objective matrices, which combine performance objectives for Pap screening behavior with selected personal and external determinants, are created as the final product of this step.

Writing Performance Objectives

After specifying the proximal program objectives, we created performance objectives that specified the health-promoting behaviors and environmental outcomes. The performance objectives break the behavior and environment condition down to their subcomponents and describe what an individual needs to do in order to perform the Pap screening behavior, what would change in the environment as a result of the program, and who would effect the change. Pap test screening has been proven to contribute greatly to the 70% decrease in the death rate during the past 50 years in the United States (Centers for Disease Control and Prevention, 1998). In this program, our goal was to increase the Pap screening adherence among women in Taiwan. Two performance objectives were delineated as follows:

Performance Objective 1: Nonadherent women (women who have not had a Pap test in the previous 12 months) will schedule a Pap test within 3 months.

Performance Objective 2: Nonadherent women will obtain a Pap test within 3 months.

The environment could have an impact on individuals' behavior as well. The needs assessment phase indicated that common environmental factors influencing Pap screening included cost, access (i.e., lack of physician referral), transportation, lack of child care, and gender of the physician (Centers for Disease Control and Prevention, 1998; Seow, Wong, Smith, & Lee, 1995; Yi, 1994). Issues regarding cost and access to Pap screening were not brought up by the focus group, probably because for women aged 30 and older in Taiwan, an annual Pap test is covered by universal insurance. A few women in the focus group of the pilot study mentioned transportation and lack of child care might be problems. Several women from the focus group expressed their preference to have a female provider perform the exam, although in Taiwan, most gynecologists are men. To address these environmental issues of problems with transportation and availability of female providers, the program included the following two performance objectives:

Performance Objective 3: Hospital administrators will approve the provision of Pap tests by female physicians in the community.

Performance Objective 4: Female physicians will commit to providing Pap tests in the community.

Specifying Determinants of Behavioral and Environmental Factors

The analysis from our pilot study revealed several significant factors associated with Pap screening behavior. These included knowledge, perceived pros and cons to screening, and perceived norms about Pap test

screening (Hou, Fernandez, Parcel, & Chen, 2003). These results were consistent with previous research findings (Gotay & Wilson, 1998; Neilson & Jones, 1998; Rakowski, Dube, Marcus, & Abrams, 1992). Compared with nonadherent women, women adhering to Pap screening guidelines tended to perceive higher benefits for Pap tests and lower barriers to obtaining regular Pap tests. They were also more knowledgeable about cervical cancer and Pap tests and tended to perceive that other women obtain annual Pap tests. Some of the reasons women gave for nonattendances at cervical screening included the beliefs that the test was unnecessary and that they were not at risk (low perceived susceptibility). In our focus group discussion, some women said that Pap test reminders could help them take action (cues to action).

During the focus group discussion, many women expressed that they did not have the intention to obtain Pap tests. They expressed they did not think that Pap screening was necessary or relevant to their health. This data implied that intention as well as perceptions that Pap screening is necessary and relevant for their health could be important factors influencing women's decision to be tested.

The final list of determinants of the behavior and environmental conditions was compiled from previous studies, existing social and behavioral theories, and additional factors identified through the pilot study. To prioritize the hypothesized determinants, an expert panel also considered the degree to which hypothesized determinants were important and changeable. These determinants included knowledge, perceived pros and cons from the transtheoretical model (Prochaska, Norcross, & DiClemente, 1994), perceived norms and intention from the theory of planned behavior (Ajzen & Fishbein, 1980), and perceived susceptibility and cues to action from the health belief model (Rosenstock & Krischt, 1974).

We then identified factors influencing the environmental Performance Objectives 3 and 4. These factors included knowledge, outcome expectations, and rewards and/or compensation (see Table 1).

Differentiating the Target Population

When designing an intervention, it is important to consider any difference that may exist among population subgroups that would affect either the performance objectives or the determinants of the performance objectives among subgroups. If these subgroups are funda-

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mentally different, the development process can result in the creation of different methods or strategies and program materials. Differentiating the population by demographic characteristics is the most common way of segmentation. However, the pilot study data suggested that the study participants were relatively homogeneous on all the

demographic characteristics, with marital status being the only factor influencing screening status. This program decided not to differentiate women on demographic characteristics because the intervention program targets mostly married women.

A person's stage of change as described by the transtheoretical model can provide information regarding possible subgroups. The transtheoretical model suggests that behavior change is a process through which people progress along a series of stages. The stages of Pap screening adoption behavior include precontemplation, contemplation, action, and maintenance (Rakowski et al., 1992). All the women targeted in this intervention were nonadherent (women who had not had a Pap test in the previous 12 months). These nonadherent women could be further differentiated by their intention (Prochaska et al., 1994). That is, women who had not had a Pap test in the past 12 months and were not planning to have one in the coming year were classified as precontemplators. Women who did not have a Pap test in the previous months but expressed the intention to have one in the next 12 months were classified as contemplators. Data from our pilot study showed that 42% (22 of 52) of the nonadherent women were in the precontemplation stage, and 58% (30 of 52) of these women were in the contemplation stage.

We considered these differences during the selection of specific strategies for intervention. For example, for women in the precontemplation stage, our goal was to increase their awareness and intention, and move them into the contemplation stage and then the action stage. For women who have already considered having a Pap test, our intervention aimed at helping and enabling them to really take the action to schedule and obtain a Pap test. Although these considerations were important for the selection of specific strategies for the intervention, we did not differentiate the population into subgroups during the matrix development phase (described as follows). This decision was made because the subgroups did not differ substantially with regard to the behavior of interest (Pap test screening), the environmental conditions, or their determinants.

TABLE 1
Matrix of Proximal Program Objectives

<i>Performance Objectives</i>	<i>Intention</i>	<i>Knowledge</i>	<i>Personal Determinants</i>			<i>External Determinants</i>	
			<i>Perceived Benefits (pros)</i>	<i>Perceived Barriers (cons)</i>	<i>Perceived Norms</i>	<i>Perceived Susceptibility</i>	<i>Cue to Action</i>
Behavior: Nonadherent women will obtain a Pap test after 3 months of intervention.							
Performance Objective 1: Schedule a Pap test		1a. Identify locations and schedules that a Pap test screening is offered.	1b. State benefits of having an annual Pap. 1c. Point out that scheduling an appointment is important to ensure that she will obtain a Pap.	1d. Set time aside to schedule a Pap. 1e. Obtain clinic's phone number.	1f. Express that other women like her call to schedule a Pap.	1g. Identify themselves at risk of getting cervical cancer.	1h. Increased reminders for women to have a Pap.
Performance Objective 2: Obtain a Pap test	2a. Express intention to obtain a Pap.	2b. Describe the Pap test procedure. 2c. List the "don'ts" before obtaining a Pap exam.	2d. Identify a Pap test can detect cell changes before they become cancerous. 2e. Define that regular Pap screening can help women find cancer early.	2f. Predict less embarrassment about having a Pap screening. 2g. Recognize her right to ask for a female nurse to be present during the procedure.	2h. Indicate that other women like her obtain their annual Pap. 2i. Review Pap screening as a routine medical procedure.		
<i>Environment: Increased availability of alternative service by female doctors</i>							
<i>Performance Objectives</i>							
Performance Objective 3: Hospital administrators will approve to provide the service	Hospital administrators will approve to provide the service	Hospital administrators recognize the importance of providing the alternative service.	Hospital administrators recognize the importance of providing the alternative service.	Hospital will receive good reputation in providing the outreach service. More community people will visit the hospital.	Outcome expectations	Reward and /or Compensation	Hospital will receive positive feedback from the community.
Performance Objective 4: Female physicians will sign up the duty to perform Pap exams in the community	Female physicians will sign up the duty to perform Pap exams in the community	Relate that women prefer female doctor to perform the Pap exam.	Relate that women prefer female doctor to perform the Pap exam.	Women will show up in the outreach screening service. Community will appraise her, and more women and/or patients would choose her at the hospital.	Outcome expectations	Reward and /or Compensation	Doctors will get compensation by signing up for the duty.

TABLE 2
Methods and Strategies

<i>Learning and/or Change Objectives</i>	<i>Methods</i>	<i>Strategies</i>	<i>Program Component</i>	<i>Descriptions and/or Messages</i>
Knowledge determinate (LO)	Information transmission (attention and comprehension)	Direct mail communication	Theory- and evidence-based cervical cancer brochure “Do you know” fact sheet	See brochure Fact sheet about cervical cancer and Pap screening
Intention, perceived pros and cons, susceptibility, and perceived norms determinate (LO)	Modeling Persuasion	Modeling and persuasion through role-model stories Persuasive communication	Role-model stories Testimonials “Do you know” fact sheet Women’s quotes from focus groups	See role model stories and testimonials See fact sheet Women’s sharing regarding their Pap experience
Cue to action and availability of alternative screening service	Facilitation	Enabling services Increase service accessibility Increase availability of the screening	Screening invitation letter Doctor’s schedule Phone intervention Community screening service provided by female doctor	See screening invitation letter Telephone intervention to remind women to schedule a Pap test

NOTE: LO = learning objective.

Developing a Matrix of Proximal Program Objectives

To ensure that the supporting theoretical and empirical findings were appropriately applied in the intervention, we constructed an intervention matrix (see Table 1). This matrix was created by crossing the performance objectives with the selected determinants. The first row of the matrix lists critical behavioral determinants such as intention, knowledge, perceived susceptibility, perceived benefits and/or barriers (pros and cons), perceived norms, and cues to action. The performance objectives are presented in the left-hand column. Each cell in the matrix describes the learning objectives or change objectives for the cancer-screening program. For example, for the performance objective of “schedule a Pap test,” one of the learning objectives regarding knowledge is that women can identify locations and schedules where a Pap test screening is offered. A change objective regarding “cues to action” is that women will receive screening reminders about a Pap test. The matrix of the learning objectives and change objectives served as a guide for the program intervention development.

► SELECTING THEORY-BASED INTERVENTION METHODS AND PRACTICAL STRATEGIES

In this step, we created an inventory of theory-based intervention methods to address the proximal program objectives (developed in the previous step). The prod-

uct of this step was a table of intervention methods and strategies that matched the proximal program objectives (learning objective and change objectives).

Methods and strategies for the cervical cancer screening project were selected based on findings of the pilot study, the objectives for the program, theory or findings from other studies, and the resources available. Methods selected for the program included information transmission, modeling, persuasion, and facilitation. Intervention strategies planned included direct mail communication, role-model stories and testimonies, and phone counseling. The following section describes how these methods were chosen and how they were translated into practical strategies according to the following three major categories of learning objectives: (a) knowledge-related learning objectives, (b) belief-related learning objectives (i.e., intention, perceived pros and cons, norms, and susceptibility), and (c) environment-related change objectives (i.e., cues to action and availability). See Table 2 for more details.

Methods and Strategies Addressing Knowledge-Related Learning Objectives

To influence knowledge-related learning objectives, the primary method used was information transmission, which aimed at gaining attention as well as comprehension of factual messages (McGuire, 1984).

The direct-mail educational communication was chosen as the primary intervention strategy because it could reach all of the target women and allowed them to

read the information at their leisure. Compared with other kinds of intervention strategies, the direct-mail newsletter campaign is relatively inexpensive both in production and in delivery. The direct-mail newsletter campaign is also typically more effective in recruiting high-risk women than are mass media campaigns and is less expensive than personal contact (Dignan, Michielutte, Jones-Lighty, & Bahnson, 1994).

Components included in the direct-mail campaign were newsletters, cancer fact sheets, educational brochures, and pamphlets. These components contained information on the benefits of Pap test screening, a description of the Pap test procedure, and recommendations about the frequency of Pap test screening. The prevalence, risk factors, and signs and/or symptoms of cervical cancer were also provided. All of the educational materials used plain language and were printed in colors with an attractive layout.

Methods and Strategies Addressing Belief-Related Learning Objectives

Modeling and persuasion were used to influence women's intention, perceived susceptibility, perceived pros and cons, and perceived norms about Pap tests. According to Bandura (1986), modeling is one of the most powerful ways to transmit values and beliefs. Because modeling is most effective if the target women can identify with the model (Bandura, 1986; McAlister, 1995), models were selected from the same demographic group as the target women in order to increase familiarity and similarity. Models that are similar to the target population may communicate their message more effectively than those who are not. Using the matrix of the learning objectives and change objectives as a guide (see Table 1), we searched focus group data for appropriate stories and themes.

Persuasion was another method used to influence women's beliefs about Pap test screening. Persuasive communication is a very powerful way of influencing people and bringing about behavior change and can be defined as a noncoercive influence on the perceived value of particular behaviors (McGuire, 1984). According to Bandura (1986), a very important part of persuasive communication is changing perceptions about how behaviors are viewed.

The program used role-model stories to convey positive values and persuasive messages related to annual Pap test screenings. For example, in one story, Ms. Liu expressed that she now realized how important and beneficial a Pap test was for her health. She said that she felt confident that she could set time aside for a Pap exam every year. Ms. Liu was a young working woman with two children. Although she was very busy with work, family, and kids, she made getting an annual Pap test her priority. Ms. Liu understood the perceived benefits and of setting time aside for a Pap test and overcame her perceived lack of time to have a regular Pap test.

Another woman, Ms. Chuang, shared her experience of changing the way she thought about a Pap test:

I was shocked when one of my close friends told me that she got cervical cancer. Her experience made me feel that I could get cervical cancer too [perceived susceptibility]. I used to use laziness, no time for a Pap, or I won't be the one getting cancer as excuses from obtaining a Pap screening, but now I get a Pap test every year. I need to take care of myself so that I can take care of my family. Everyone has time to stay healthy. Cervical cancer is not a disease that is far away. You could get it as well.

Testimonials were also used as a strategy for both modeling and persuasion. One example was Ms. Chao, a cervical cancer survivor whose story included the following statements:

Pap test could detect cervical cancer in the early stage. I had cervical cancer and had a surgery about 1 year ago. Now I am cured. I think all women should obtain regular Pap tests. Anyone can get cancer, and cervical cancer can be cured if you find it early.

By focusing on specific determinants, the theoretically derived role-model stories and testimonials served as a powerful communication channel to influence women's cancer screening decisions.

Methods and Strategies Regards Environment-Related Change Objectives

The results of the needs assessment indicated that environmental factors also influenced screening. Facilitation was used as a method to change the environment condition. The program increased access to screening services by providing a screening day with a female doctor at one of the community churches. To inform women about this service, a personalized screening invitation letter was mailed out along with directions to the church. Consistent with the health belief model, the program provided "cues to action" (Rosenstock & Krischt, 1974). Women in the program would also receive a phone call to remind them to schedule Pap tests. Evening time slots were arranged for the screening to increase the accessibility for women.

► DESIGNING AND ORGANIZING PROGRAMS

Designing Program Materials

The theme of the program was "Love yourself before you take care of your family." This theme addresses the importance of women's health. In Chinese culture, women are usually the caregivers for the whole family. Chinese women tend to sacrifice and neglect their health and take care of other family members. The theme emphasizes and stresses the need for women to

take care of themselves so that they can take care of their families. Detailed intervention components are listed in Table 2.

Pretest With the Target Group

One very important part of providing new information is to make sure that participants can understand the information given. The information provided in the brochure and the fact sheets was designed to simplify complex issues. The material was pretested with a group of women to make sure they understood the messages. Pretesting print materials with the target audience is essential to receive feedback on attraction, comprehension, acceptability, self-involvement, and persuasion (Rice, 1991). The pretest result showed that most women were satisfied with the intervention content as well as with the layouts. Some women expressed their lack of knowledge regarding the screening procedure so that information was added to the material.

Scope and Sequence of the Program

The program lasted 3 months. Female family members of inpatients admitted into one of the major teaching hospitals in Taichung, Taiwan, during fall of 1999 were interviewed about their screening status. Women who had not had a Pap test in the past 12 months were identified as nonadherent and were thus eligible to be recruited into the program. In the first month of the intervention program, women received a personalized welcome letter to the study, a theory- and evidence-based educational brochure, 14 quotes regarding other women's Pap screening experiences, and a screening schedule with information about the doctors. In the second month, they received a personalized screening invitation letter with screening services provided by a female doctor in one of the community churches. Other materials included four role-model stories from adherent women and cervical cancer survivors, fact sheets regarding cervical cancer and Pap tests, and an updated screening schedule. In the third month, the program provided a phone consultation to remind women about the Pap tests and to help them schedule screening appointments.

► PROGRAM DELIVERY

This step aims to ensure an acceptable level of completeness and fidelity with program delivery. Planning can help identify dissemination strategies. In order to reach the aims, the intervention mapping suggests the need to develop an implementation plan, which includes adoption and implementation objectives, methods, strategies, and a training program to help create the workflow and documentation plans. This part was not fully carried out because dissemination of the intervention was beyond the scope of the study. After the effectiveness of the program intervention has been

evaluated, we will develop the adoption and dissemination plan. Intervention mapping steps will again serve as a guide to the development of the dissemination program.

Program delivery tasks would include obtaining a group of non-adherent women, scheduling and mailing the program intervention materials, coordinating community screening services with female doctors, and conducting screening reminding calls to women in the program. The program would provide training sessions on how to recruit and identify non-adherent women. Program staffs would also be trained on how to schedule and send program materials, as well as how to conduct a telephone consultation.

► PROGRAM EVALUATION

Intervention mapping helps not only the design of an intervention program but also the specification of the evaluation measures. The purpose of this step is to determine whether decisions made about learning and changing objectives, methods, strategies, and implementation are correct at each mapping step through program monitoring and evaluation. This intervention program will be evaluated through a randomized trail study.

Through referring to the matrices of proximal program objectives, we developed items measuring the "effect" evaluation questions. For example, (a) did you schedule a Pap test during the past 3 months? If yes, where did you go? and (b) What were your reasons to obtain a Pap test? To assess the immediate effect of the intervention on the behavior, we also developed scales to measure determinants such as knowledge, perceived susceptibility, perceived pros and cons, and perceived norms (Hou, Fernandez, Baumler, & Parcel, 2002).

"Process" evaluation questions were also developed in the evaluation study. Previous steps of intervention mapping and needs assessment helped us in identifying aspects and variables of the measurement items. To evaluate the intervention, including participant exposure, women's evaluation, and methods and strategies assumptions, we asked women the following questions: Did you receive our mailing information about cervical cancer and Pap screening in the past 3 months? Did you read the information? What did you think of the role-model stories in the newsletters? How often can you relate those role-model stories to yourself? Has a program staff member contacted you for a Pap test arrangement in the past month? Which program components were most effective in influencing your decision to have a Pap test? Other open-ended questions included (a) How do you feel about using direct mail to provide health information? (b) How can direct mail communication influence your health behavior? (c) How do you think other women's experience can influence your Pap decision? And (d) How do you think a screening invitation letter or a reminding call can influence your Pap decision?

To assess the program delivery, we asked staff members several questions: (a) How many nonadherent women were you able to identify? (b) Did you schedule and mail program intervention material to women? (c) Did you organize a community screening service with a female doctor for women? (d) Did you offer a screening consultation call to women? (e) How were women's responses to the program service? and (f) How many women were you not able to contact?

Information about any cervical cancer screening-related community activities or media events were gathered to better explain possible threats to the internal validity of the study.

The preliminary evaluation results showed that the baseline information between intervention and control groups are equivalent, indicating the successes of the randomization process. Women in the intervention group reported a higher rate of completing Pap test screening than did women in the comparison group after a 3-month intervention ($p = 0.002$). Intervention groups of women also had higher perceived pros of having Pap tests ($p = 0.031$) (Hou, Fernandez, Baumler, & Parcel, 2002).

► CONCLUSION

By using the process of intervention mapping, the program developer was able to ensure systematical incorporation of empirical and new data and theories to guide the intervention design. The needs assessment provided an important foundation for this program by specifically identifying factors that influence Pap screening behavior and environment conditions relevant for the Chinese population. Incorporating input from the target population throughout the process was essential. The process also helped the development of an evaluation plan, including the identification of specific research questions and the development of measures. The effectiveness of the intervention demonstrates that developing a program using a systematic process leads to the development of an effective program. Programs targeting other health-related behavior and using other methods or strategies can also be developed with this intervention mapping process.

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