Brief Interventions for Tobacco Users: Using the Internet to Train Healthcare Providers

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Abstract

One fifth of Americans smoke; many have no plans to quit. Motivational Interviewing (MI) is an effective approach to intervention with precontemplative smokers, yet a substantial number of healthcare practitioners lack training in this approach. Two interactive online tutorials were developed to teach practitioners to deliver brief tobacco cessation interventions grounded in the MI approach. The tutorials emphasized the unique aspects of working with precontemplative smokers, incorporating audio and video examples of best practices, interactive exercises, targeted feedback, and practice opportunities. One hundred and fifty-two healthcare providers-in-training were randomly assigned to use the online tutorials or to read training material that was matched for content. A virtual standardized patient evaluation was given before and after the training. Both groups improved their scores from pre- to posttest; however, the tutorial group scored significantly better than the reading group at posttest. The results of this study demonstrate the promise of interactive online tutorials as an efficient and effective way to deliver clinical education.

Key words**:** *Internet, Medical Education, Smoking, Tobacco, Motivation Techniques.*

Introduction

Despite the national health objective to reduce the prevalence of adult smoking to twelve percent by 2010, an estimated 20.9 percent of adult Americans currently smoke.[1] Smoking remains the leading preventable cause of illness and death in the United States, responsible for approximately 438,000 smoking related deaths each year.[2] More deaths are caused each year by tobacco use than by all deaths from human immunodeficiency virus (HIV), illegal drug use, alcohol use, motor vehicle injuries, suicides, and murders combined.[2] Furthermore, estimates show that smoking costs over $150 billion in annual health-related economic losses and $75.5 billion in additional medical expenses.[3]

Healthcare providers such as physicians, dentists, pharmacists and nurses are optimally situated for providing tobacco cessation interventions. Recent studies, however, indicate that few patients receive tobacco cessation interventions from their physicians or other healthcare providers.[4, 5] Although approximately 75% of smokers visit a physician each year, up to half of adult smokers visit a dentist, and clinical guidelines recommend that all clinicians provide tobacco cessation advice, more than one-third of smokers have never been questioned about their tobacco use status or been advised to quit.[6, 7] The Agency on Health Care Policy and Research and the Centers for Disease Control guidelines for healthcare providers recommend that interventions assess tobacco use status for every patient, provide assistance for those willing to quit and deliver brief interventions to increase motivation to quit for those who are unwilling.[7] The guidelines recommend that all healthcare providers "strongly, consistently, and repeatedly" intervene with their patients who use tobacco.[7]

Healthcare providers cite barriers to providing smoking cessation interventions such as lack of intervention time, inadequate training, and lack of opportunities and time for additional training.[8-10] Clinicians who have received training in providing tobacco cessation interventions are more likely to feel that they have the necessary intervention skills and are more likely to actually intervene.[11, 12] When they do intervene, healthcare providers are effective. For example, two meta-analyses of an intervention involving brief advice about quitting, plus a follow-up session dispensed by physicians and nurses, showed that both interventions increased rates of quitting in patients, and that brief interventions performed by both physicians and nurses can be effective.[13, 14]

Thus, because interventions are effective, and when properly trained, providers do attempt to intervene, the demand for training in intervention methodology is indisputable. Providers need to be trained in tobacco cessation interventions that are very brief and targeted to meet the needs of the particular tobacco user. Thirty percent of smokers in the United States have no imminent plans to quit using tobacco (i.e., they are in the "precontemplation" stage of change). Tobacco cessation guidelines recommend different interventions for individuals who are unwilling to quit than for those ready to make a quit attempt and advise brief motivational interventions for precontemplative individuals.[7] Most of the training available to healthcare providers is consistent with the treatment guidelines for tobacco users who are ready to quit.[15]

The brief motivational interventions suggested by the Tobacco Cessation Treatment Guidelines are loosely based on the principles of Motivational Interviewing (MI). MI is specifically designed to be used with patients at various stages of readiness to change, is empirically validated and incorporates specific, brief techniques tailored to help tobacco users become more ready to make a quit attempt.[16, 17] Brief Negotiation (BN) is a condensed version of MI relying on the same principles, tailored to brief encounters in healthcare settings.[16, 17]

MI-based interventions have been shown to increase tobacco cessation rates in primary care settings. For example, Manfredi and colleagues found that smoking quit rates for women in public health clinics were doubled when MI was used to intervene.[18] Furthermore, it has been shown that MI can be taught effectively to healthcare providers, who also find the approach acceptable to use with their patients.[19-23]

Healthcare providers cite several barriers to providing tobacco cessation interventions. Two key barriers related to the lack of provision of interventions are lack of training time and competence: Healthcare providers often feel inadequately trained and feel that they have little time to devote to clinical training.[24] In order to make our training more amenable to busy healthcare providers, we chose to use the Internet to deliver a web-based tutorial. ELearning, which includes formats such as Internet-based tutorials, CD-ROMs, and distance learning, has been shown to be at least as effective as traditional teaching methods like textbooks and lectures.[25-27] Several studies also report high student satisfaction with Internet-based learning tools.[26, 28]

Moreover, computer-delivered formats are also more convenient than traditional methods.[27]

Purpose of Study

Thus, the primary goal of the present project was to develop a concise and effective Internet-delivered eLearning program to train primary care providers to provide brief motivational interventions to smokers not immediately ready to quit. This eLearning program consists of two independent tutorials: Brief Negotiation (BN), covering MI skills for brief primary care interventions, and Quick Interventions for Targeting Smoking (QUITS), which delivers training in screening, assessment, and delivery of a targeted tobacco cessation intervention consistent with treatment guidelines. Both tutorials were interactive, requiring the application of knowledge to novel situations, and used best practice case examples (audio and video) as a primary teaching tool. A pilot version of the QUITS training program was shown to increase scores on an open-ended written exam.[29] For the present study, we evaluated the educational effectiveness of the two tutorials in a randomized trial of healthcare and allied healthcare professionals-in-training, using a matched reading materials control condition. Knowledge quizzes and a virtual standardized patient assessment were used as outcome measures.

Methods

Participants
Participants were 152 healthcare and allied healthcare professionals-in-training recruited from a large Northwestern university. Participants were either graduate students in their profession or undergraduate nursing students. Twenty-eight percent of participants were pharmacy students, 21% nursing, 21% medical, 18% social work, and 7.5% dental, and most (59.2%) were in their first year of training. Average age was 26.6 years (range, 19-56 years) and 78% were female. Sixty-four percent of the participants identified as White, 24% as Asian, 4% as Hispanic/Latino, 3% as Black/African-American, 1% as Hawaiian/Pacific Islander, and 6% as multi-racial or other.

All participants reported that they were either "somewhat" or "very" comfortable using a computer. The two groups did not vary on any demographic variable, however the pre-test scores of the control group were significantly higher than those of the intervention group.

Instruments

Initial Screening. Inclusion criteria for the study included enrollment in one of several healthcare training programs (e.g., medical school, nursing school) and having no more than one hour of training in MI. More than three hundred people initially contacted the study coordinator and 169 of those screened met inclusion criteria. Most (70%) of the participants who were excluded during the screening were ineligible due to having completed more than an hour of training in MI.

Standardized Patient Video Assessment. We developed a computerized standardized patient video assessment (SPVA) to assess skills gained from the intervention, modeled after the Video Assessment of Simulated Encounters (VASE) developed by Rosengren and colleagues.[30] The VASE itself could not be used because it was designed specifically for drug and alcohol abuse treatment professionals. In our SPVA, video segments showed actors portraying four patients who varied in their readiness to engage in health behavior changes, three of whom were active smokers. Scripts were written by the first two authors with consultation from one of the authors of the VASE.[30] Participants were asked to take the part of a healthcare provider and respond to the patients by typing their responses into a text box. Four to seven questions were asked about each of the four patients, with 19 questions in total. Care was taken to create items that varied in difficulty and assessed skills emphasized equally in the tutorial condition and in the reading condition. Participants completed the SPVA both before and after they participated in the study intervention or control condition.

With consultation from MI training experts, the first two authors developed a coding system for the SPVA. Each of the items was scored on a zero- to three-point scale. A zero was given for a response that was wholly inconsistent with MI (e.g., likely to exacerbate resistance). A three was given for a response that fully captured the MI approach. Item scores were summed for a total score (highest possible score = 57). Two research assistants were trained and implemented the coding system blind to condition and time (pre- or post-intervention). Twenty percent of participants' responses were scored by both research assistants, and reliability of the two coders for those items ranged from $r = .80$ to .96 (average $r = .88$). The internal consistency reliability for the SPVA was $\alpha = .65$ at pretest and $\alpha = .60$ at posttest, reflecting the breadth of the items used in the assessment.

Knowledge tests. Two 15-item multiple-choice knowledge quizzes were developed by the investigators. One assessed knowledge of the more general domain of brief negotiation (BN), and the other specifically focused on knowledge of brief interventions for tobacco cessation (QUITS). These quizzes were given at post-test only. The material tested was fully covered in both conditions (online tutorials and readings). Item analysis was conducted to ensure that at least 50% of participants were correct for any particular item. One item was dropped from each test due to poor performance. Coefficient alphas for the BN and QUITS tests were .46 and .31, respectively, due at least in part to the small number of items and the diversity of material that was tested.

Satisfaction questionnaire. A 10- to 15-item satisfaction questionnaire consisted of Likert-scaled questions, the content of which differed somewhat between conditions so as to measure satisfaction with aspects particular to a specific modality. Items were rated from "strongly disagree" (1) to "strongly agree" (5). Items are shown in Table 3.

Procedure

All procedures were approved by the Institutional Review Board at the University of Washington. Initially, participants completed informed consent, a demographic form, and the SPVA on a computer. They were then randomized to use the two tutorials or to read materials covering the same content. The two tutorials, BN and QUITS, include interactive exercises with tailored feedback, video and audio examples and exercises, interactive practice and review, and free-response textbox items for personal reflection. Instructional material from the two tutorials was based on Miller and Rollnick's *Motivational Interviewing*[17] and Rollnick et al.'s *Health Behavior Change: A Guide for Practitioners.*[16]

The Tutorials. BN teaches healthcare providers the basic principles and skills of MI in the context of the healthcare setting. BN teaches providers to use techniques such as the OARS skills (open-ended questions, affirmations, reflections, and summaries) and coping with patient ambivalence towards change[17]. BN uses a case-based approach to learning, requiring users to apply their knowledge to patient examples throughout the training.

QUITS teaches brief tobacco cessation interventions. Specifically, QUITS teaches providers to assess each patient's readiness to quit, importance of tobacco cessation, and confidence in being able to quit (via 0-to-10 scaling questions). The providers are taught two motivational interventions (decisional balance or "pros and cons of quitting" and identifying and reducing barriers) and to choose an intervention based on their assessment (e.g., choose the decisional balance intervention if importance rating is low). QUITS uses a teaching method that delivers targeted lessons and feedback to users based on their existing knowledge (facet-based learning).[31]

The reading material control condition included portions of the same books used to develop the tutorials.[16, 17] The content of the readings mirrored the content presented in the computer tutorials.

All participants were given approximately two hours (ranging from 1¾ - 2½ hours) to complete the learning tasks. An exception was made for one individual with a learning disability who required four hours to complete the intervention.

Post-testing. After completing the intervention, participants completed a multiple-choice knowledge quiz for each tutorial or section of reading, and the SPVA (identical to the pretest SPVA). Finally, they completed the satisfaction questionnaire and offered their opinions about the tutorials or readings. After completing all portions of the study, participants were debriefed and compensated $100 for their time and effort.

Results

SPVA

Mean scores on the SPVA at pretest and posttest, by condition, are given in Table 1. An independent groups t-test revealed that pretest scores were significantly lower for those randomly assigned to the tutorial condition, compared to the readings condition. Paired t-tests revealed that those in either the readings condition, $t(74) = -23.72$, $p < .001$, or the tutorial condition, $t(74) = -26.79$, $p < .001$, improved from pretest to posttest. To control for pretest differences between conditions, ANCOVA was conducted to evaluate the between-groups differences on SPVA posttest scores, with pretest scores entered as a covariate. As shown in Table 2, results indicated that, controlling for pretest scores, participants in the tutorials condition scored significantly higher at posttest than did those in the readings condition.

Knowledge Quiz

Results of the knowledge quizzes are given in Table 2. Independent-samples t-tests showed significant differences between the reading and the tutorial groups for both BN and QUITS. Overall, scores on the BN and QUITS tests were significantly correlated with each other ($r = .39$, $p < .001$) and with SPVA scores at posttest ($r = .50$, $p < .001$; $r = .55$, $p < .001$; respectively), providing evidence of convergent validity.

Satisfaction Questionnaire

Results are shown in Table 3. In general, participants in the tutorials group expressed high satisfaction.

Discussion

Knowledge acquisition and practical application are two key components in learning. Pedagogical research has long confirmed the importance of building on students' prior knowledge and having them draw connections between what they know and what they are learning[31]. To ensure this is taking place, students need to be actively engaged in forming and answering questions about the new knowledge with which they are confronted. This is the working idea behind the promotion of "interactive" software programs in learning. Cognitive engagement occurs when the user is encouraged to reflect on what has been presented and articulate the connections that are being formed in her or his thinking. This level of engagement happens, for example, in problem-solving exercises that demand the application of prior or recently acquired knowledge to new situations. Feedback confirming or disproving the users' solution or conclusions further contributes to the active acquisition of knowledge in the learning process. The tutorials, BN and QUITS, were highly interactive, offering practice opportunities, video and audio best-practice examples, and many different types of problem-solving exercises with feedback. These interactive features may have promoted more engagement and thus more learning than reading content-matched written materials.

Healthcare providers are sorely in need of training in strategies to assist their precontemplative patients with behavior change. The results of this study demonstrate the promise of interactive online tutorials as an efficient and effective way to deliver clinical education. There are several benefits of using the Internet to deliver clinical training. First,

providers can use the training at their convenience while at work or at home. Individuals can use the computerized trainings at their own pace and repeat exercises to give themselves ample opportunity to practice the skills if needed. Additionally, computerized tutorials can be tailored for the needs of different learners by adding optional learning material or by "branching" content so that information is offered to each learner based on specific variables (e.g., answers to questions or scores on a pretest). Furthermore, when computerized education is delivered via the Internet it is particularly fast and inexpensive to update or to customize for varied user groups.

Traditional clinical training is often very time intensive. Lectures, group discussions, role playing and practicing with standardized patients may all be involved in learning a new clinical skill. Unfortunately, healthcare providers have difficulty finding the time to devote to this kind of intensive clinical training. Healthcare providers are busy and a short training tutorial that can be completed and then referenced later as the provider encounters particular clinical situations may be more practical and better utilized than more traditional training methods.

While the study showed promising results, it was not without its limitations and future research will benefit from taking these into consideration. First, it would be optimal to measure learners' behavior in the actual setting in which they would be using the skills. Future studies should assess how often and to what degree the learners put their new skills into practice, and what kinds of refreshers or reminders keep new clinical skills in use. Second, our sample was healthcare providers-in-training. It remains to be seen if on-the-job providers would find the training as easy to use or beneficial as students. Internet use and comfort with computers are negatively correlated with age, so it is possible that providers who have been in practice for many years may not be as satisfied with online training and may not find it as easy to use. Future studies ought to include healthcare providers who are currently in practice, in order to assess any possible differences between professionals with varied levels of experience and comfort with computers. Third, because our virtual standardized patient assessment was developed for this study, its reliability and validity had not been previously established. Unfortunately, as yet there are no standardized assessments of BN or MI as used in the healthcare setting, making it necessary for us to develop our own assessment. This enabled us to test exactly what the providers-in-training were taught. Although scores between the tutorial and readings

groups indicated significant differences in MI knowledge and skills, it is difficult to know the clinical significance of these differences. Thus, future development of a standardized assessment, including cut-off points to demarcate competence, will provide much richer information about this technique and its use in healthcare settings. A final limitation is that the virtual standardized patient assessment did not allow for analysis of tone of voice. Warmth and sincerity are key features of MI. Future assessments of this type could include voice recording which would also increase the similarity of the assessment to real clinical encounters.

Conclusion

The present study demonstrates the educational effectiveness of two interactive Internet-delivered tutorials which train healthcare providers to deliver brief tobacco cessation interventions based on the principles of Motivational Interviewing. Healthcare students who used the two tutorials had higher scores on both multiple-choice quizzes and on a computerized standardized patient assessment than did those who read the same material. Furthermore, participants enjoyed using the tutorials and gave them high ratings of clinical utility. One particularly interesting finding was that students learned demonstrable clinical skills in a very short time. Although we do not know if the participants translated their skills into real world practice, they were able to use the skills appropriately with the virtual standardized patients. Scores on the computerized standardized patient pretest and posttest showed that providers-in-training in both conditions learned about brief motivational interventions for tobacco cessation. Qualitatively, responses to the SPVA tended to change dramatically from pretest to posttest. At pretest, many participants used techniques such as lecturing and offering unsolicited advice. Common techniques at posttest included requesting permission to discuss a topic, offering to collaborate in developing a change plan and setting small manageable goals. For example, the following are one tutorial-group participant's responses to the same question at pretest and posttest. Pretest: "I would have her discuss her concerns with her husband and children about her quitting smoking. She should tell them that she may be going through a difficult time, but that she needs them to help her through it. Then have her make a list of what she eats, so she can be aware. Also have her join a support group with other people in her situation." Posttest: "I would ask her what she believes the next step should be. We could then formulate a plan

together that moves her in the direction of quitting with goals that are attainable."

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Table 1. Scores on SPVA

Pretest		Min	Max	M	SD
	Tutorials	4.0	25.5	12.6	5.1
	Readings	2.0	26.0	14.5	5.4
		$t(149) = 2.21, p = .028$			
Posttest					
	Tutorials	2.0	44.0	31.7	6.6
	Readings	9.0	43.5	28.0	6.1

Table 2. **Analysis of Covariance on SPVA Scores by Condition**

	Variable Entered	B	SE	β	t
Step 1					
	Pretest Score	0.58	0.089	0.47	6.479
$R^2 = .221, F(1, 148) = 41.972, p < .001$					
Step 2					
	Condition	4.994	0.883	0.379	5.653
Change in R^2 for Step 2 = .139, $F(1, 147) = 31.959, p < .001$					
Total R^2 for Model = .360, $F(2, 147) = 41.356, p < .001$					

Table 3. **Proportion Correct on Knowledge Quizzes**

BN Quiz	Min	Max	M	SD
Tutorials	.36	1.00	.78	.14
Readings	.21	1.00	.70	.14
		$t(148) = -3.46, p = .001$		
QUITS Quiz				
Tutorials	.64	1.00	.90	.09
Readings	.57	1.00	.86	.10
		$t(148), -2.58, p = .011$		

Table 4. Satisfaction Questionnaire Results

Variable	Tutorials		Readings	
	M	*SD*	*M*	*SD*
The software worked without "crashing."	4.53	0.96		
The practice exercises were helpful.	4.41	0.57		
The audio components of the program worked well.	4.70	0.62		
Pictures loaded quickly in the program.	4.72	0.55		
I found the software easy to use.	4.72	0.55		
I found the software attractive to look at.	4.23	0.75		
The video components of the program worked well.	4.52	0.76		
I enjoyed using the software.	4.27	0.67		
The situations and conversations presented were realistic enough to teach the material.	4.47	0.61	3.84	0.85
[A version of this software]/[This reading material] would be a good teaching tool for students.	4.52	0.57	3.01	1.21
[A version of this software]/[This reading material] would be a good learning tool for professionals.	4.41	0.69	3.26	1.14
I enjoyed [using the software]/[reading this material] more than I would have enjoyed [reading the material from a book]/ [learning from an interactive computer tutorial].	4.84	0.40	1.77	0.78
I enjoyed [using the software]/[reading this material] more than I would have enjoyed listening to a lecture on the same material.	4.23	0.78	1.94	0.87
I'll be able to use some of the techniques presented in [the tutorial]/ [this reading] in my clinical work.	4.60	0.59	4.01	0.65
My overall impression of the [tutorial]/[readings] is[*]	4.43	0.57	3.04	0.88
The examples in the reading were helpful.			3.80	0.83
I found the written exercises enjoyable.			2.64	0.95
There were sufficient example situations and conversations presented to help clarify and demonstrate the material.			3.36	0.98

Note. Item rated on a 5-point Likert scale with 1 = terrible, 3 = neutral, 5 = wonderful.