

Interactive Technology Applications for Behavioral Counseling

Issues and Opportunities for Health Care Settings

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Content: This article discusses the rationale for, and the potential benefits and limitations of, computer-based interactive health communication (IHC) programs for health behavior counseling. We describe common barriers to health behavior counseling in medical settings and show how IHCs can address these issues. Following an overview of current and likely near-future IHCs, the potential impact of IHCs on the patient-provider relationship is considered. Results from evaluations of IHCs are summarized and important and unique issues in evaluating IHCs are discussed. We conclude with recommendations for clinical applications, including recommendations for consumers considering purchase or adoption of IHCs and recommendations for future research.

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Introduction

There is a long history of health care providers counseling patients to change their health-related behaviors. Most patients could improve their long-term health expectations by eating a healthier diet, getting more exercise, stopping smoking, or changing some other behavior, and health care providers often urge them to do so. Indeed, behavioral counseling has long been seen as an important tool in both preventive medicine and in management of chronic disease.^{1,2} The potential impact of behavioral changes on personal health is very large, particularly when considering the concomitant changes in the health care system and the move toward cost containment.³ Thus, the recent development of technology-based interactive health communication (IHC) for behavioral counseling presents significant opportunities for health care settings. However, the advent of IHCs also brings with it some critical considerations.

Two recent trends have created a unique situation. First, time constraints and competing demands on providers make it difficult for them to spend as much time as needed to do effective counseling. Second, the rapid development of electronic technology has re-

sulted in interactive computerized systems capable of providing "expert" behavioral advice.⁴⁻⁶ Together, these trends are resulting in the rapid development and use of IHCs to provide behavioral counseling in health care settings and elsewhere.

It is important to note that the explicit goals of behavioral counseling are changes in health-related behaviors. Although much of what is called patient education implicitly includes behavior change, this is based on an underlying assumption that knowledge will lead to behavior change. When motivation, self-efficacy, and sufficient skills are present and only knowledge is lacking, this assumption may be valid. This rarely is the case. Although information alone can lead to changes in behaviors, simply increasing knowledge has not been effective in changing behaviors in most instances.^{7,8} For example, the vast majority of cigarette smokers are aware that smoking is deleterious to their health,⁹ yet they continue to smoke. However, even brief counseling by a physician does result in a significant increase in the number of patients who stop smoking.^{10,11}

The distinction between counseling and educating is critical for two reasons. First, if we are to change behaviors, it is clear that we must do more than simply provide information. Second, the spectacular ability of computers to quickly search, collect, manipulate, and present information has led to an emphasis on such uses. Indeed, due to the advent of computers, it often is said that we live in the "information age," and computers often are referred to as "information technology."

The advent of the Internet, with its World Wide Web, has provided millions of people with access to vast

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amounts of health information (and sometimes to behavioral counseling). Indeed, one of the major uses of the Internet is to locate health-related information,¹²⁻¹⁴ and there is a rapidly growing deployment of informational Web sites by health care organizations. It should be noted that there also are IHC applications, such as those for informed decision making or decision support, that bridge the gap between simply providing information and counseling for behavior change. The emphasis, however, clearly is on providing information for educating oneself, rather than decision support or counseling for behavior change.

Counseling, in contrast, implies the provision of several things in addition to information. While there are widely differing techniques for counseling, common elements are collaboratively defining goals in ways that make sense to the patient,^{15,16} identifying resources and barriers to behavioral change,¹⁷ developing coping and problem-solving strategies,¹⁸ and providing follow-up support.¹⁶ These steps can then lead to personal insight, motivation, improved skills, and increased perception of self-efficacy and social support. Unfortunately, it is the rare situation in which a provider can effectively personalize and deliver such counseling within the limited time provided for the typical patient-provider interaction. Therefore, there is a growing demand for interventions, including IHCs, that can deliver behavioral counseling without requiring more time per patient from the provider.

Advantages and Limitations of Computer-Delivered Counseling

There are several reasons that IHCs are attractive ways to deliver counseling. From the perspective of managed care, the most important may be the potential cost savings associated with reduced personnel time. Automating the delivery of counseling can reduce the number of staff needed to deliver counseling and the associated costs for personnel training. Interactive health communications also have the potential to improve the effectiveness of behavioral counseling through improved consistency of counseling, better tailoring (i.e., closer matching) of intervention to patient characteristics and recommended guidelines, and improved acquisition of salient personal information, because computers seem to increase willingness to disclose sensitive information.¹⁹ Thus, the potential combination of lower costs with increased effectiveness makes IHCs attractive for use in medical settings.

There also are potential drawbacks to the use of IHCs in behavioral counseling. Machines lack flexibility beyond what has been programmed into them. Patients who present the machine with requests not anticipated by the developers of the IHC are unlikely to receive appropriate responses. The development, maintenance, and updating of IHCs require a unique team of

both behavioral and technical specialists. Given the rapid change in electronic devices and software, there is great (and reasonable) concern that anything developed (or purchased) today may soon be obsolete.

Another consideration is the potential impact on patient-provider interactions. Interactive health communications can be used simply to provide counseling that currently is done by the provider or allied personnel (i.e., nurses and dietitians). Instead of counseling the patient about his or her smoking, the physician instead provides a very brief motivational message and asks the patient to "use the (automated) smoking-cessation program in the next room." Just as a physician might refer a patient to a dietitian for counseling on reducing the fat in his/her diet, the physician instead suggests use of the "nutrition counseling" program. However, IHCs potentially can do much more. For example, IHCs can provide pre-exam counseling (i.e., by an interactive health-risk appraisal program that identifies risk factors and provides motivation to change related behaviors) or at least determine critical risk factors and assess the patient's readiness to change related behaviors. Such applications of technology have the potential for changing the relationship between patient and provider, both by providing increased structure for the clinical encounter and by removing the provider from the actual role of counselor. It should also be noted that IHCs need not stand alone but can be employed as adjuncts. For example, IHCs can be used much as current patient education materials (i.e., videos and brochures) that serve to prompt, focus, and reinforce discussions with a counselor. However, in this article we are addressing primarily stand-alone IHCs that, at most, require the provider to give the patient a brief recommendation or prompt suggesting use of the IHC program.

In the sections that follow, we briefly describe current modalities for IHC counseling applications, issues affecting the adoption and institutionalization of IHCs, and evaluation issues, and then make recommendations on future use of IHCs and research directions. (A listing of other types of IHC applications and issues can be found in reference 12.) Key questions for IHC counseling applications are: (1) Can IHCs counsel patients effectively?; (2) Are the benefits greater than the associated costs (i.e., for development, deployment, and maintenance)?; and (3) What does it take to implement IHCs into clinical settings where the end result will be effective behavioral counseling?

IHC Modalities

Most current IHCs present materials (i.e., stimuli) to the patient as text, graphics, audio, or video images, in response to patient inputs (e.g., as responses to questions posed by the IHC or by selecting items from a menu). In many cases, counseling IHCs are modeled

on what a human counselor would say and do (with the addition of multimedia presentations). Although speech input can be used, generally the patient interacts with IHCs via an input device such as touch screen, keyboard, mouse, or telephone keypad. Very little research has been done to compare the behavioral counseling efficacy of alternative stimulus formats or input modalities. Rather, the choice of modalities often is determined pragmatically. Keyboard and mouse inputs usually are the simplest to program. Where keyboarding or mouse skills are a potential barrier, alternatives such as touch screens typically are used. Speech recognition is still quite imperfect for most applications but will be used increasingly in the future.

When compared with human counselors, most IHCs are seriously constrained by available technology, despite rapid technological advances. Basic speech recognition is still marginal, and the ability to sense affect from inflection (e.g., humor or sarcasm) or to decode facial expressions (e.g., a grimace or smile) is still under development. On the other hand, current IHC technologies can query patients and prepare tailored responses, including the display of on-screen models uniquely selected to match a patient's characteristics, from race/ethnicity to risk-factor status, medical condition(s), and behavioral history. Such increased matching of stimuli to the individual patient has been hypothesized to be critical to increasing motivation and self-efficacy.²⁰

The primary uses of IHCs for counseling in clinical settings to date have been based on existing models of direct counseling, such as smoking cessation,^{21,22} diabetes management,¹⁸ dietary change, genetic counseling,²³ and decision making.^{24,25} Interactive health communications, however, have expanded and extended the reach of active counseling beyond the clinical setting. For example, a recent series of computer games was designed to teach disease-management skills (for diabetes and asthma) in the home setting as well as in clinical settings. Similarly, telephone applications,²⁶⁻²⁸ such as telephone-linked care applications, are fully interactive, but usually are conducted with patients in their homes. Finally, IHCs may be considered to include applications that produce tailored print communications (TPCs) that are provided to patients (via mail or otherwise).²⁹ The generation of tailored print materials need not be immediately interactive in response to patient input, although it can be. For example, a patient could call a hot line, answer some questions, and receive a mailed TPC providing counseling. As Skinner and colleagues³⁰ describe, technologic advances are not only providing many new opportunities for changing health-related behaviors, but they also are blurring distinctions, such as those between education and counseling and those in which "clinical" care takes place. With "store and forward" technologies (such as E-mail), even the "when" of care is changing, as the

time when the counseling stimulus is sent is separated from the time it is received.

The evidence, to date, is generally supportive of IHCs as being behaviorally effective.^{18,31-34} Also, there is great face validity to the assertion that both patient and provider adherence to recommended regimen tasks and guidelines can be increased by IHC applications, which provide prompts, reminders, feedback, and reinforcement for accomplishment of prevention activities. However, despite a large and growing number of research and demonstration projects, there are few large-scale implementations of IHCs for counseling in clinical settings. Although development technologies continue to improve, lowering costs and increasing capabilities, capturing expert counselor behaviors with a computer remains a complicated task. The number of successful programs in the literature clearly shows that this can be done, however. The primary problems at this time are those that impede adoption and institutionalization.

Adoption and Institutionalization Issues

Lack of desire to do the right thing, or not knowing what to do, is not the major problem with implementing prevention practices such as counseling into medical practice. Rather, information overload; competing priorities; and the lack of systems, decision-making guidelines, and principles upon which to decide what should be done given limited resources are exacerbating our health care crisis.³⁵⁻³⁷ The vast majority of physicians and other health care providers are well intentioned and at some level familiar with the literature on the importance and long-term benefits of preventive practices, including behavioral counseling interventions. There are, however, many practical barriers in most clinical settings to "putting prevention into practice." Several of the more common barriers³⁸⁻⁴⁰ are listed in Table 1 and discussed briefly below.

Most of the barriers listed in Table 1 are the result of competing priorities. Primary care in particular is being asked to do more and more in less and less time. It has been calculated that for an average adult patient, during a routine visit, to be in compliance with U.S. Preventive Services Task Force Guidelines, the health care provider would need to perform 25 preventive activities and address 15 risk factors, in addition to addressing the patient's presenting problem.⁴¹ The barriers of time and cost, as well as lack of information, can be addressed by IHCs. For example, having patients complete an optical scan survey before their visit, or complete answers on a touch screen computer that immediately scores and summarizes this information, saves valuable time and can present prioritized information to both patients and providers in an efficient manner. Other barriers, such as provider concern

Table 1. Common barriers to adoption and institutionalization of medical office-based counseling practices

1. Time required.
2. Lack of information on patient status and needs (“I forgot—or was not aware—that Mrs. C was a smoker.”).
3. Lack of convenient information on prevention guidelines or effective evidence-based interventions at the time needed.
4. Low self-efficacy in ability to deliver/implement counseling (“I don’t know enough about, and do not have clinical experience with, X.”).
5. Low expectations of counseling benefit (e.g., “Few smokers will quit anyway.”).
6. Concern about negative patient reactions (“I don’t want to risk losing or offending any more patients.”).
7. Competing prevention priorities.
8. Lack of reimbursement or incentives for counseling (“Only if I wait until Mr. X develops lung cancer and is hospitalized will I be reimbursed for counseling.”).

about lack of skill or training in delivering intervention or counseling, can be shifted to the IHC expert system.

Of course, some IHC applications are more widely adopted than others. In our experience, this is due to how well the above barriers are addressed, how the product is marketed (including price point), and two additional considerations: (1) the degree to which the IHC allows the user to make adaptations and choose among different options and formats (i.e., the fit to the user’s situation and needs); and (2) the degree to which the program fits within typical patient flow.⁴² The low demands on office staff in deploying well-designed IHC interventions, along with their emerging but generally impressive record in producing change and their appeal to patients, do increase their chances for being adopted and implemented.

It is clear that many factors other than effectiveness influence the adoption and institutionalization of IHCs. However, the actual effectiveness of IHCs is still critically important, even though neither providers nor patients will necessarily adopt innovative practices and recommendations based on empirical evidence. Despite its importance, evaluation of IHCs poses challenges for all parties involved: developer, purchaser, and patient.

Evaluation of Computer-Delivered Counseling Applications

There are many reasons that IHCs should be evaluated, including their potential to do harm. Some features of IHCs require a unique approach to evaluation, but many aspects can be evaluated in the same manner as traditional counseling programs.⁴³ The “gold standard” usually is considered to be the degree of long-term behavior change observed in randomized clinical trials. However, this often is expensive and time consuming to evaluate. Furthermore, such an approach may be rela-

Table 2. Current dimensions of the RE-AIM evaluation framework

- % REACH (what proportion of the panel of patients in each setting will receive or be willing and able to participate in this intervention?)
- X % EFFICACY (success rates if implemented as in guidelines; defined as positive outcomes minus negative outcomes)
- X % ADOPTION (how many settings, practices and plans will adopt this intervention?)
- X % IMPLEMENTATION (how often is the intervention implemented as intended in the real world?)
- X % MAINTENANCE (extent to which program is sustained over time)
- = PUBLIC HEALTH IMPACT (population-based effects) of an intervention

tively insensitive to differences by type of patient and other factors, unless a study is very large and permits subgroup analyses. Although we believe that an evidence-based approach to IHC evaluation is very important, it should be recognized that it may not apply in all situations. All types of data and evidence, including single-subject designs and qualitative analyses, not just statistical significance, ought to be considered.¹² An actual framework for determining the quality of an IHC application is beyond the scope of this article but has been discussed elsewhere.⁴⁴

Two features of IHCs pose special challenges for evaluation. One is the unique nature of the treatment each patient may receive. Many IHCs provide a high degree of tailoring, and any two patients may see little or nothing in common. Thus, some parts of the program may be highly effective and other parts not. In addition, many if not most IHCs are constantly being upgraded to take advantage of new technologies, findings, and program materials. This rapidly moving target is hard to evaluate. If the IHC includes access to ancillary materials (e.g., via Web “browsing”), it may be very difficult to parse out the impact of the intervention per se as opposed to the ancillary materials.

The recently proposed RE-AIM framework for evaluating health promotion interventions that are to be delivered in real-world settings is very applicable to IHCs. As shown in Table 2, the five RE-AIM dimensions of Reach, Efficacy, Adoption, Implementation, and Maintenance combine to determine the public health impact of an intervention.⁴⁵

Future Research Needs

Over the last several years, we have seen rapid advances in IHCs and the emergence of several complex and challenging questions that need to be resolved by future research. From a conceptual perspective, a central question is, “What is (are) the optimal way(s) to tailor health communication messages and strategies?” A key subquestion under this general heading includes,

“How many and which sociodemographic differences are critical when targeting messages (e.g., age, gender, race, ethnicity, and geographic location) and for which purposes?” It is unlikely that health communications will need to be comprehensively tailored on each of these dimensions for every application, but this may well differ depending on the content area (e.g., such tailoring may be less essential for encouraging immunizations than for designing family eating and meal plans).

Although there have been several demonstrations that indicate that tailored or targeted messages are superior to either usual-care or nonpersonalized messages,^{46–50} there have been few comparisons of different theories for tailoring interventions. Present psychosocial theories⁴² vary enormously in their complexity, the length and comprehensiveness of assessment procedures required to operationalize the theory, and the magnitude and cost of the “expert systems” necessary to deliver tailored interventions. We need direct comparisons—and especially trials using representative populations—of different conceptual approaches. Also needed is empirical documentation that sophisticated psychological approaches to tailoring are superior to the much more straightforward patient-centered option of simply letting informed participants choose among a variety of intervention options.⁵⁰ We recommend this latter condition as a type of minimal IHC control condition⁵¹ that should be widely included and necessary to justify use of the more complex and costly theory-based interventions.

It has now been demonstrated that IHCs can be efficacious as either stand-alone interventions^{46,48} or as supplements to usual care.⁴⁹ The vast majority of these studies, however, have been conducted by leading research teams (that developed the intervention packages) and tested under optimal efficacy conditions.^{18,50,52} What is needed now are effectiveness demonstrations, showing whether these IHC interventions work under everyday, real-world conditions with unmotivated patients and when introduced by busy staff with many other patient care responsibilities. In contrast to many other psychology and behavioral interventions, there are reasons to believe that IHCs may prove to be consistently implemented and effective under such conditions. (See Table 1 and accompanying discussion.) This is because many IHCs are designed to consistently deliver tailored interventions and take little or no staff time. Still, this needs to be demonstrated under a variety of conditions and with different health issues rather than simply asserted.

Assuming that IHCs prove to be effective, then the even more challenging questions of reach⁴⁵ and cost-effectiveness become relevant.^{18,50} In particular, it will be important to demonstrate that IHCs can attract and involve frequently underserved populations such as lower-income, older, rural, minority, and less educated

and less literate populations. From a social justice perspective, it seems essential to determine whether IHCs can help reduce, will simply perpetuate, or will even further exacerbate present gaps in health care between “have” and “have nots” in our society.⁵³

A final issue for review groups, investigators, and potential purchasers to consider is how far ahead of present-day technology applications one should be researching. For example, IHCs that use intelligent software agents and require very high bandwidth connections to the Internet may not be practical in most settings at this time. However, CD-ROM drives were not common several years ago, but nearly all personal computers sold today have CD-ROM drives (or DVD-ROM drives that can read CD-ROMs), and interventions on CD-ROM are becoming common.³¹ A case can be made given the rapidity of technological change and the time it takes to acquire research funding, and conduct, analyze, and report a study, that one should be researching 4–5 years ahead of currently available IHCs. There is much merit to this argument, the main counter being that if one guesses wrong, time may actually be lost.

Conclusion

In conclusion, there are structural factors, such as time constraints, that are likely to lead to increasing adoption of IHCs for counseling applications. Despite current limitations in technology, IHCs already have demonstrated efficacy and made important contributions to health care. Further adoption will depend largely on how institutional barriers to the acceptance and dissemination of IHCs are addressed. Some characteristics of IHCs have profound implications for the patient–provider relationship. Overall, the use of IHCs could be a significant force in the advancement of preventive medicine.

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