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Feasibility of incorporating computer-tailored health behaviour communications in primary care settings

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ABSTRACT

Background We set out to investigate the feasibility of incorporating a computer-tailored health behaviour program into routine care in a group of primary care practices in Rhode Island.

Methods Two existing computer programs (physical activity, smoking) that tailored text and graphical feedback to survey responses were combined and adapted for use in primary care directly by patients. Ten primary care practices were recruited and worked closely with project staff to develop a practice-specific plan for incorporating the program into the workflow and office routine. Feasibility was measured by the percentage of patients who used the program during the day of their visit.

Results Only one of the ten offices was able to successfully incorporate the program into their office workflow and delivery of routine care. The main categories of barriers to incorporating the computer program into routine care included:

- the program was viewed overall as inconsistent with practice workflow
- the staff was inexperienced with the program
- technical problems with the computer and/or printer

- the program placed an additional time burden on staff who already felt overworked.

Suggestions for improving the program or the way that it was incorporated into routine care included:

- shortening the program
- modifying the program's orientation to a target population (such as patients with hypertension) and incorporating decision-support feedback to help physicians manage the target condition
- modifying the program to include other programs pertinent to primary care (for example, depression screening)
- selecting patients to use the program, rather than asking all patients to use it.

Conclusions After working closely with ten highly motivated primary care offices, we were unable to fully implement a point-of-care health behaviour computer system for patients and providers. Suggestions for disseminating computer-tailored health behaviour communications in primary care settings are discussed.

Keywords: computer-tailored, health behaviour, point-of-care

Background

Over the last decade, evidence has emerged to suggest that computer-tailored health communications can help individuals modify their health behaviours, including smoking, physical inactivity and diet.[1–7] Identifying opportunities for disseminating these computer applications is now an important area for investigation. The primary care office has several advantages over other dissemination channels, including the internet, as:

- over 70% of the population see a primary care physician at least once per year
- many Americans still do not have access to the internet
- data collected and used to create the tailored written report can also be used to prompt and guide primary care physicians to counsel their patients, a skill they repeatedly note that they lack.[8–12]

We set out to investigate the feasibility of incorporating an innovative computer-tailored health behaviour program in a group of primary care practices in Rhode Island. Our main hypothesis was that, after working closely with practices to develop a practice-specific plan for incorporating the program into routine care, at least 50% of patients seen by the providers during the study period would have used the program before on the day of their office visit.

Methods

Practice recruitment and physician focus groups

Practices were recruited via three methods: letters were sent to a random sample of 120 primary care providers and to physicians practising in low-income public health clinics in Rhode Island. From these letters, 25 providers participated in focus group discussions and, among those, 11 primary care providers in separate practices were recruited to participate. One solo practitioner dropped out before the computer was installed, as the physician was decreasing his clinical load significantly and decided not to participate. Of the ten remaining practices, six were solo or dual-physician practices, and four were low-income public health clinics staffed by at least three primary care providers. Providers were paid US$2000 each for participating in the study to partially compensate for the time spent on the study, in meeting with study staff and time spent with their staff in modifying their current practice routine. Office staff members were not compensated directly by the project.

Program design

Computer-tailored health communication programs have essentially the same design: data are collected by a number of methods (for example, paper and pencil, scansheet, graphical user interface) and, based on those data, a series of algorithms allow the selection of textual or graphical health-related content to be presented to the user via some communication medium (such as text, audio, video).[13] Most programs that have been studied have used a paper-based data collection system; data were then entered into a computer and a report was generated and mailed to the subject. To minimise eventual costs to the practice in terms of manpower, and to facilitate ongoing use of the program, the system was designed to allow patients to enter their own data and for the graphical user interface to be self-explanatory.

We chose to address two health behaviours that are common to primary care patients – smoking and physical inactivity – to allow the program to have utility to all primary care patients. Several of the

co-authors have developed and tested a physical activity promotion-tailored message program that has been shown to be effective at increasing the adoption of regular physical activity.[2] Details of the program are published elsewhere; the program collects data and provides feedback based on the following physical activity variables: activity level, readiness to change, decisional balance, physical activity, processes of change and self-efficacy.[14–17] We considered providing feedback only to those with certain health conditions that were related to smoking or physical inactivity (such as hypertension). However, we chose to design the intervention in keeping with a primary prevention focus, given the goals of the federal government to encourage smoking cessation and physical activity for all adults, rather than just for adults with health conditions that have resulted from these health behaviours.[18–20] Also, we were concerned that asking the physician to target the intervention to certain higher-risk individuals would have limited the utility of the physician counselling prompts and potentially increased his or her work.

We adapted a smoking cessation-tailored messaging program that is being used as one component in a multi-component intervention trial. The program provides feedback to subjects based on the following variables: readiness to quit smoking; temptations to smoke; beliefs about the effects of, and symptoms related to, smoking; perceived stress; nicotine dependence and risk factors related to smoking (for example, asthma).[21–26]

In addition to adding a human–computer interface, this program was modified for use in primary care settings in three ways:

- questions were added to assess a subject's risk factors and frequency of symptoms that related to physical inactivity (e.g. fatigue)
- feedback was provided about how becoming physically active would improve these risk factors and symptoms
- a feedback report was created for physicians to prompt and guide them in counselling their patients to adopt or maintain physical activity.

The graphical user interface was pre-tested with approximately a dozen primary care patients from several of the enrolled practices to ensure its usability. The program, as designed, required an average of ten minutes for typical primary care patients to complete.

Procedures

Physicians agreed to allow our research team to install the computer in their office after a series of between three and ten meetings with project staff over a six-month period. Physicians agreed to identify a member of the practice to serve as a liaison with the project staff member. For three practices this was the enrolled physician, for the other seven the liaison was the office manager. Project staff members met with office staff members an average of 3.5 times before, and 2.7 times after, the computer was installed. The project staff worked closely with the practice liaison to develop a practice-specific plan for implementing this office system intervention.[27–29] The goal of these meetings was to answer questions such as:

- Where should the computer be installed?
- How, and by whom, will patients be encouraged to use the program?
- Will it be used before or after their visit?

Once the office and the project staff members agreed on how the program would be incorporated into the workflow and office routine, the program was installed for a one-month trial period. Computers and printers were standard consumer models, and no hardware modifications were made. Each office was provided with a single laptop computer and a single printer, though the project had two extra printers and laptop computers which could be switched, rather than waiting for repairs, in the event of a technical problem.

After installation, we allowed for a two-month period to get the hardware and software up and running in each office. During this period, the research associate (RA) assigned to the practice made one weekly visit to the practice and one weekly phone call to the practice liaison. The goals of the visits and phone calls were to discuss any problems with the computer and potential solutions to such problems as well as the program's incorporation into the office routine.

Data collection

After this two-month trial period, we began to track the use of the program passively through the software for a period of three months. We chose to wait three months to give the offices a chance to incorporate the program into routine care and thus reach a 'steady state' of use. During this period, the RA assigned to each practice made one monthly visit to the practice and another monthly phone call to the practice liaison, as previously. The RA also responded to technical problems, with the goal of providing on-site support within 24 hours to all but the most simple technical support problems, to minimise extra work for the office staff. At the end of this three-month period, each practice provided the RA with a list of the name, gender and visit date of the last 50 patients seen by the physician who were enrolled in the study. During this period, patients received no special compensation or incentive to use the program. The underlying plan was that the practices would

make the use of the program the new 'standard' for a doctor visit, much as filling out a questionnaire is standard the first time many patients see a physician. This list was compared to the database of users; as each user entered their initials, their gender and the date was recorded automatically. This was used to calculate the proportion of people who used the program from those who had appointments during the same period (see Table 1). Usage was checked twice by project staff, before and one month after a formal meeting between the principal investigator (CNS), the project staff, office staff and office physician, in which the usage of the program was discussed. These meetings were audiotaped and representative quotes from the meetings appear in Box 1. We included a second data collection time ('Time 2' in Table 1) to allow the project staff and office staff to incorporate potentially useful changes identified in the above meetings.

Results

Use in routine care

Only one of the ten offices was able to incorporate the program successfully into their office workflow and delivery of routine care. Of the last 50 patients seen by each of the providers involved in the study, in only one of the practices did more than half of the patients use the program on the day of their visit at either Time 1 or Time 2. Use at Time 2, after project staff had met individually with each of the practices to review the practices' performance on this measure, was no greater than use at Time 1.

Table 1 Percentage of patients who had used the computer during the day of their visit

Office no.	Time 1	Time 2
1	0 (0/55)	4 (2/47)
2	10 (5/50)	0 (0/50)
3	0 (0/48)	0 (0/75)
4	0 (0/50)	8 (4/50)
5	4 (2/50)	0 (0/50)
6	0 (0/44)	0 (0/50)
7	0 (0/50)	0 (0/50)
8	90.5 (38/43)	61 (28/46)
9	0 (0/50)	0 (0/50)
10	6 (3/50)	12 (6/49)

Comments from providers and their staff

Several themes emerged from discussions with healthcare providers and their staff. The main categories of barriers to incorporating the computer program into routine care included:

- the program was viewed overall as being inconsistent with practice workflow
- the staff were inexperienced with the program
- there were technical problems with the computer and/or printer
- the program placed an additional time burden on staff who already felt overworked.

Suggestions for improving the program or the way that it was incorporated into routine care included:

- shortening the program
- modifying the program's orientation to a target population (for instance, patients with hypertension) and incorporating decision-support feedback to help physicians manage the target condition[30,31]
- modifying the program to include other programs pertinent to primary care (for example, depression screening)
- selecting patients to use the program, rather than asking all patients to use it.

Discussion

The main finding was that the program was underutilised consistently in routine care. In a group of highly motivated, highly selected primary care providers, only one of the ten practices was able to incorporate the program into routine care, defined by at least 50% of their patients using the program on the day of their visit. Many barriers were noted to routine use of the program and many suggestions for improvement were offered by project physicians and their staff. Many of the barriers raised at the end of the study were the same as those that were raised in initial physician focus groups and that we had previously spent considerable time and energy trying to address in both our program design and implementation plan for each practice. Despite these efforts, a great many barriers remained to using the program routinely. Given these findings, and the concomitant growth of the internet,[9] future attempts

Box 1 Barriers to incorporating the CHIP program into the office routine and suggestions for improving the program: quotes from meetings with physicians and office staff in ten practices

Barriers

Inconsistent with practice workflow

'Several times the patient was still using the computer and the doctor was ready to see them.'
'We have a short waiting time, which gets in the way of getting done with the computer.'
'We already tell them to come in early and they don't.'
'It causes problems if we're ready to see them before they're done.'
'Our bonus from a major payer is dependent on the percentage of patients in and out the door within 45 minutes.'

Lack of experience of office staff with program

'I'd like to go through and try it out – I wasn't sure what the patient was getting.'
'I was busy; I haven't had a lot of experience with it.'
'It would be good if we knew what questions were being asked.'

Technical problems

'It was unreliable at the beginning.'
'The printer sometimes stops in the middle.'
'It's been down a lot.'

Time burden on overworked staff

'If you get behind by five minutes, you slow down the whole flow.'
'We've been down a front office person for a month and a half.'
'We're really overwhelmed here.'
'It eats up time.'
'I had to help a couple of people go through the whole thing.'
'We're worried that the kids will break it and it will be our responsibility.'
'One more problem for the desk to deal with.'

Utility to practice

[Doctor] 'Report was not particularly useful, as most items are covered anyhow.'

Lack of staff encouragement of patients to use program

'[Staff member] could do a harder sell with coming early.'
'We need to push it a bit more.'
'I [staff member] personally haven't asked anyone to use it.'

Patient acceptance of computer program

'They're too intimidated to use it.'
'We have an older population. I think they're afraid of the computer.'

Number and complexity of questions

'Needs to be shorter.'
'Many of the questions seemed to be repeating.'
'Questions were hard to understand.'
'Our literacy is low.'

Suggestions for improvement

Shorten program

'It was a little redundant . . . a little too long.'
'Some people started it and weren't able to finish it.'

Change orientation from behaviour to medical condition(s)

'Better if it were oriented to diseases instead of behaviours.'

Box 1 Continued

Technical changes
'We'd like to install other educational programs on it.'
'Need more use out of the computer . . . the one program alone is not enough reason to keep it.'
'You might want a touch screen.'

Triage patients to use it rather than have all use it
'[Staff member] wants to identify smokers and direct them to use it.'
'The doctor can suggest certain patients to use it.'
'We'd like to use it just for physicals.'
'The provider should be the one to decide who should use it and recommend it.'
'May schedule a repeat visit if they used it after seeing the doctor.'

Modifications to program and reports
'I think it should be more interactive . . . more fun.'
'It should generate an exercise prescription for the doctor to sign.'

Advertise better in office
'There should be a poster above it.'
'Can you put up a bigger sign?'

at having a majority of patients use point-of-care computer systems may be more successful if they:

- are targeted to clinical conditions
- are applied only to selected (and therefore fewer) patients
- minimise intrusions to the office staff.

A wide variety of barriers and suggestions for improvement were noted by physicians and practice staff members. A consistent finding from all of the practice meetings was that the program created a time burden on staff. This is consistent with the findings of many studies examining reasons why healthcare providers do not counsel their patients about health behaviours.[32,33] Another consistent finding from the discussions was that the program's functions were viewed as inconsistent with the practice's goals with respect to quality improvement as measured by payers. This was best exemplified by one of the practices, who admitted that a major barrier to their involvement was that their reimbursement from one of the major managed care organisations with which they contract was linked to throughput, as measured by the percentage of patients whose visits are completed within 45 minutes. This barrier may be mitigated by the emerging interest in paying providers for performance as measured by patient outcomes as opposed to logistics and patient flow variables.[34]

Overall, the results were similar to those of Williams *et al*, who found that a computerised health information system, used by patients in the waiting room, was used infrequently.[35] The current study was designed to build on that of Williams *et al*, by attempting to make the use of such a program routine. Despite designing a practice-specific implementation plan for each practice, the use of the current program was not significantly better than the experience of Williams *et al*. In fact, our experience was probably worse because the program studied by Williams *et al* included information about screening tests (such as mammograms), which is more in keeping with traditional physician functions and training than addressing health behaviours.[11]

The barriers noted, and low rates of use of the CHIP (Computerized Health Promotion in Primary Care) program, need to be viewed in light of decades of literature on the diffusion of innovations, and are consistent with this model.[36] Rogers notes that people and organisations are more likely to adopt innovations that they perceive to:

- be better than other methods ('relative advantage')
- be consistent with their needs, values and past experiences ('compatibility')
- be simple to use and understand ('complexity')
- be acceptable after a period of use ('trialability')
- have results that are readily apparent ('observability').[36]

We believe that a main barrier to the use of the CHIP program, in light of this model and our findings, is its lack of a 'relative advantage'. This is exemplified in the quote 'report was not particularly useful as most items are covered anyhow' (see Box 1). In addition, the period of use for each practice did not convince the practices that the CHIP program was acceptable ('trialability'), as in the multiple comments regarding the time burden of the program. It was clear from the comments that the program might have a better chance of success if it were used by fewer, and more targeted, patients. Another potential avenue for improvement is to involve physicians to a greater extent in the design and

implementation of future programs. Though office staff also participated, physicians directly participated in only a single focus group prior to the system design and in only two meetings during the implementation phase. More intensive or different types of involvement might have led to different levels of feasibility, as interventions that physicians feel are designed to meet their needs are likely to be easier to disseminate.[37] This needs to be balanced against physician time demands, but perhaps a system that is configurable during installation to meet varying needs of different physicians would be more successful. This is in keeping with a recent review of dissemination innovations in primary care by Berwick, who notes that simplification and modification are nearly universal among innovations that have been successfully disseminated.[38]

Though not generalisable, it is instructive to examine the one office that was quite successful in implementing the program, in the context of dissemination theory. This practitioner's practice and management style differed from others. A solo provider, there was no formal office manager and a tendency to micromanage the staff's work. Consequently, the staff did what they were told to do. Also, this physician was a firm believer in the role of health behaviours in disease and repeatedly noted spending a great deal of time counselling patients about health behaviours. In many ways, this was behaviour quite typical of the 'innovators', the first group who adopt innovations. This physician went to medical meetings frequently, owned one of the first commercially available mobile phones that included a personal digital assistant (PDA), and was interested in having our team write additional computer programs for the patients to use before their visit. These are all typical of innovators, who frequently travel to learn how things are done in other places, test more than one innovation at a time and are tolerant of risk. These individuals are called 'innovators' as they, on average, adopt innovations more than two standard deviations earlier than average. To disseminate innovations, however, a slightly later but far larger group, called 'early adopters', must be engaged in the adoption process. These individuals are typically highly connected opinion-leaders and often set the stage for more widespread dissemination.[36,39]

Despite the strengths of this study, including the enrolment of community-based primary care providers rather than academic-based providers, and the inclusion of office staff in all phases of the study, the conclusions must be viewed in the context of several potential limitations. First, the percentage of patients who used the program might have been greatly improved by addressing each of the barriers and suggestions for improvement prior to completing the study. We believe that many of these issues were addressed as well as possible given available resources, and addressing others, such as shortening the program, would have been outside the scope of the project. Future investigators should heed these barriers and suggestions for improvement, many of which require practice-specific solutions, such as adapting the program to each practice's workflow. Though episodic technical problems may have interfered with program implementation in some of the practices, we do not believe this to be a significant issue as most of these problems were addressed promptly and significantly decreased over the course of the project.

Second, the results of the study cannot be applied to other types of interventions. The great majority of computer programs that have been studied for use in primary care settings have been designed to improve preventive services delivery.[40–48] Also, most tailored health behaviour message programs seek to modify only one health behaviour, so our findings may not be applicable to those programs. We chose to include more than one health behaviour (smoking and physical activity), based on our initial feedback with physicians who felt that the investment of time and office space for the computer would be better if it had more utility to the practice, given the large number of issues that fall into the hands of primary care providers. This is consistent with the comment that, despite adding a second health behaviour, one physician noted 'we'd like to install other educational programs on it'. On the other hand, the comments about the time burdens of the program would have been minimised if the program were only for smokers, so that fewer than a third of the patients would have been asked to use the program. Future studies will be necessary to address this question.

Third, this analysis does not examine patient-level feedback in any detail. Patients who used the program were also surveyed. These data have been published elsewhere and further analyses are underway.[49,50] One finding from these analyses was that those patients who actually used the program during a doctor visit were significantly less enthusiastic about doing so routinely than a group of patients who were surveyed before the program was installed in the offices. This suggests that there might have been patient factors which contributed to the poor performance of the program. We expect, however, that many of these complaints are reflected in the comments of the staff (for instance, 'they're too intimidated to use it'; Box 1), but some may not have been.

We set out to examine whether or not a smoking cessation and physical activity computer-tailored message program could be incorporated into routine use in primary care settings. Many investigators have found that computer-tailored message programs can help people to improve their health behaviours, including smoking, physical activity and diet.[1–3,5,6,51,52] Effective methods for disseminating these programs, however, have not been identified. Given the rapid growth of the internet and our study results, we believe

that this dissemination will be most successful over the internet. If the internet is used as a dissemination strategy for computer-tailored interventions, effective methods for overcoming the 'digital divide' will have to be devised.[9,10] Our findings suggest that future efforts that are targeted to clinical conditions and minimise intrusions to the office staff will be more successfully implemented.

This study also highlights the need to both analyse and publish negative findings to enable improvements for future iterations of similar interventions. Computerised applications in primary care settings are not going away, so we need negative studies to be published to identify critical variables that need to be modified to increase the chances of future success. While negative randomised trials are often published, they frequently include so little detail about the design and implementation of the application that other investigators are doomed to make the same mistakes.[37,53] Analysing and publishing more detailed analyses, such as we have done here, is one step toward that end.

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CONFLICTS OF INTEREST

None.

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