Computer-Assisted Health Counselor Visits

A Low-Cost Model for Comprehensive Adolescent Preventive Services

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Objective: To evaluate a low-cost strategy for providing preventive health services to adolescents using computerized health assessments with individualized educational videos, trained health counselors, and nurses.

Design: Feasibility study, cost analysis, and comparative evaluation of health problems identified, guidance delivered, and patient satisfaction.

Setting: Eleven sessions at nontraditional sites including schools, universities, shopping malls, and after-hours clinics on Oahu, Hawaii.

Participants and Intervention: Adolescents (N=258, mean age 17 years) completed confidential computerized health assessments, received individualized feedback, and viewed automatically selected educational videos on a laptop computer. The computer additionally printed a prioritized problems list for the graduate student–level health counselor to review with the adolescent. The counselor subsequently reviewed each encounter with a nurse-educator who performed further counseling and physical examinations when indicated.

Results: Visit length averaged 44 minutes. Subjects spent an average of 21 minutes completing the automated health assessment and viewing interactive multimedia and 15 minutes with the health counselor. One third of subjects required further evaluation and counseling by the nurse (average, 8 minutes). A team of 2 counselors and 1 nurse provided comprehensive screening, health counseling, and physical examinations to 1 patient every 10 minutes at a salary cost of $7.46 per visit. This model identified risk behaviors at levels consistent with local behavioral data, and addressed and documented them significantly more often than do physicians in traditional settings. Subjects (71%) preferred the computer-assisted visits to standard office visits, and 92% felt the amount of time spent was acceptable.

Conclusions: Computer-assisted delivery of adolescent preventive services using nonphysician health counselors is a feasible, economical, and acceptable alternative to traditional clinical practice for screening young people for health-compromising behaviors and providing individualized health education and routine physical examinations. This model would likely increase adolescents' access to needed preventive services at a very modest cost.


Editor's Note: This pilot study should be emulated in numerous settings with a variety of adolescent “types” (now there’s a word to stimulate interesting conversation). Whatever the outcomes, I hope we won’t forget the value of human-to-human contact.

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Health-compromising behaviors and psychological problems—as opposed to biomedical diseases—are the major threats to adolescent health.1,7 A large proportion of chronic disease and premature death in adulthood arises from behaviors initiated during adolescence.8 In fact, behavioral factors have been estimated to contribute to about half of all deaths in the United States.9

Accordingly, recent recommendations for the content and delivery of adolescent preventive care (including the Guidelines for Adolescent Preventive Services [GAPS],10 Bright Futures, Guidelines for Health Supervision of Infants, Children, and Adolescents,11 and the age-specific recommendations from the US Preventive Services Task Force12) emphasize addressing the behavioral and psychological aspects of adolescent health. The GAPS and Bright Futures guidelines recommend annual health supervision visits throughout adolescence, deemphasize screening for uncommon biomedical problems, and stress screening and
MATERIALS AND METHODS

Computer-assisted comprehensive adolescent preventive visits were offered at 11 sites by mobile teams of 2 graduate student health educators and 1 nurse. Privacy was ensured both when interacting with the computer and when meeting with the health educator and nurse. During the encounter, adolescents initially completed an automated health assessment using YHP software running on a laptop computer with headphones and an attached printer. This specialized health screening and education software has been in development for more than a decade.20,21 The current version of this program conducts a health assessment based on GAPS. Questions are presented in either English or Spanish, both as printed text on the computer screen and aurally through headphones. The sequence and content of questions are individualized based on the adolescent’s answers. Following the health assessment, the computer program generates an individualized multimedia presentation of medical advice and anticipatory guidance for the adolescent to review. The ethnicity and sex of the characters in the videos are matched to the adolescent. Subsequently, the program prints a health summary and personalized advice for the adolescent, as well as a summary health assessment and prioritized problem list for the health educator or clinician to review.

For this demonstration project, 12 social work, nursing, and health education university graduate students were trained to provide computer-assisted preventive visits using the YHP (Table 1). For each clinical session, a team of 2 health educators and 1 specifically trained registered nurse would travel to the clinic site. A volunteer provided patient registration and clerical help. Approximately 10 minutes were needed to set up the clinic with 2 multimedia laptop computers and portable printers before each session. Sessions were offered at nontraditional sites on Oahu, Hawaii, including secondary schools, university health services, shopping malls, and after-hours or weekend clinics. Recruitment of patients was via communitywide media, and patients selected a location. Appointments were booked 1 to 30 days in advance by calling an appointment center, and were scheduled for 1 visit every 10 minutes. After completing the computerized assessment and viewing the educational videos, each adolescent met with 1 of the health educators for a scheduled 20-minute session. The health educators reinforced the automated educational messages and addressed problems that required counseling and/or referral using a guided decision-making approach.22 Subsequently, the educator reviewed each encounter with the nurse, who, when indicated, did further evaluation and counseling, performed physical assessments, and made referrals for medical or counseling services. Patients needing pelvic examinations, immunizations, or laboratory tests were referred to their regular primary care provider or the appropriate laboratory.

Data about the health problems identified and health counseling provided during these encounters were obtained by review of educators’ and nurses’ case records as well as exit questionnaires completed by each subject. Demographic information was collected directly from the adolescents via the computer program.

Additionally, we conducted a retrospective medical record review of 230 preventive visits by adolescents of comparable age, sex, race, and geographic distribution to 16 pediatricians and family practitioners working in a health maintenance organization setting on Oahu who used structured forms for checklist documentation of preventive services. Medical records were abstracted to determine the health problems identified and health counseling provided during the index preventive visits. These data were then used to contrast the effectiveness of the computer-assisted visits to identify health problems and provide health counseling with standard physician office visits. The $\chi^2$ test for independence was used when comparing the frequencies of identified health problems and counseling provided for each group.

We calculated the unit cost for a comprehensive preventive visit by dividing the total costs of training, equipment, and personnel salaries by the number of preventive encounters completed. Fixed costs include those incurred for training and equipment whereas variable costs include those incurred for salaries, travel expenses, and other ongoing expenses. Patient feedback was elicited by a written questionnaire. Informed consent was obtained from each subject. This study was approved by the Interhospital Research Committee and Institutional Review Board of Kaiser Foundation Hospitals, Honolulu, Hawaii.
assisted preventive visits. Specifically, we (1) describe the process for providing computer-assisted preventive visits with a team of 2 paraprofessionals and 1 nurse-educator using the Youth Health Provider (YHP), an interactive health education software program (HealthMedia Corp, Lafayette, Colo); (2) report the effectiveness of these visits to identify health problems and provide health counseling; (3) calculate the fixed and variable costs for providing preventive visits; and (4) report the adolescents’ appraisal of the services provided.

**RESULTS**

Two hundred fifty-eight subjects participated in the program. The mean number of adolescents attending each of the eleven 4-hour sessions was 23, with a range of 21 to 25. Of the 264 scheduled appointments, only 29 adolescents (11%) did not show up. Most (23/29) open appointments were taken by accompanying friends or walk-in traffic. Participants ranged from 12.9 to 24.9 years of age with a mean age of 17.2 years. Seventy percent of participants were between 14 and 21 years old; 56% were female. Only 17% came with a parent to the session; 34% brought a friend. Total visit length averaged 44 minutes (range, 22–82 minutes), and 90% of visits were completed within 1 hour. Subjects spent an average of 21 minutes privately completing the automated health assessment and viewing interactive multimedia. Discussions with a health counselor averaged 15 minutes (range, 3–30 minutes). Case review between nurse and counselor averaged 2 minutes. Only 36% of subjects received further evaluation and counseling by the nurse (average time of nurse encounters, 8 minutes; range, 0–28 minutes), and only 15% needed a physical examination.

Two hundred fifty-four subjects (98%) receiving computer-assisted preventive visits had 1 or more risk behaviors identified, and only 4 had none. The mean number of risk behaviors identified was 3.2 (SD = 2.3; range, 0–11) per adolescent. Fifteen percent of subjects were referred for reproductive health services and 18% for personal counseling services. This computer-assisted model identified risk behaviors at levels consistent with comparable local behavioral data from the 1995 Hawaii Youth Risk Behavior Survey (Table 2). The educator-nurse teams identified and documented risk behaviors and health problems significantly more often than physicians practicing in traditional settings during preventive visits for most health issues (3 behaviors per visit vs <1 behavior per visit; P < .05) (Table 3). The teams also gave more anticipatory guidance than physicians on sexual behavior, drug avoidance, and alcohol avoidance.

In our demonstration project, the total cost per comprehensive computer-assisted preventive visit was $33.74, whereas the variable cost per visit was only $7.46. For this project, each of 10 graduate students received $7 per hour, the nurse-instructor received $21 per hour, and the project director received $50 per hour. All calculations included 25% fringe benefits for employees. Initial training included 2 hours by the project director, 13 hours by the nurse-instructor, and 15 hours for each of the 10 trainees. Thus, the initial training budget was $1778.75. The 2 laptop computers with printers cost about $2500 each. During the project, volunteers were used for scheduling and as clinic receptionists; therefore, the salary costs for clinical sessions included only the nurse and 2 educators. Hence, total salary costs were $43.75 per hour including fringe benefits. The total personnel cost for the eleven 4-hour sessions was $1925. Start-up costs for training and equipment totaled $6779.

Most adolescents (71%) liked the computer-assisted visits, 3% did not, and 26% were undecided. Most preferred the alternative sites (schools, University Student Health Center, shopping centers, after-hours or weekend clinics) to traditional medical settings (60% vs 2%, with 38% undecided). Nearly all adolescents (92%) felt the amount of time spent with the health educators and the nurse was appropriate. Additionally, health educators noted that only 3% of adolescents exhibited discomfort discussing issues during the visits.

To estimate the adolescents’ recall of the counseling provided during these visits, we compared the prob-

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**Table 1. Educator Training Curriculum**

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<tr>
<th>Day 1 (5 h)</th>
<th>Day 2 (5 h)</th>
<th>Day 3 (5 h)</th>
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<tr>
<td>Adolescent tasks and psychosocial growth and development</td>
<td>Advanced communication and interview skills</td>
<td>Prioritized high-risk cases</td>
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<tr>
<td>Communicating with adolescents</td>
<td>Evaluation of suicidality, sexual abuse, substance abuse</td>
<td>Flow process, supervision, referral, documentation</td>
</tr>
<tr>
<td>Health promotion, prevention, anticipatory guidance, empowerment</td>
<td>Risk assessment and prioritization</td>
<td>Demonstration scenarios, practice, and competency evaluation practicums</td>
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<tr>
<td>Motivational interviewing, brief negotiation intervention, behavior change</td>
<td>Automated health assessment, prevention protocols</td>
<td>Validation of current risks/problem list (interview practice)</td>
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<td></td>
<td>Process site demonstration</td>
<td>Counseling based on priority list and anticipatory guidance (role play)</td>
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<tr>
<td></td>
<td>Client flow, supervision, documentation, referral</td>
<td>Present issues to nurse and do case managment plans (role play)</td>
</tr>
<tr>
<td>Home study (1 wk)</td>
<td>Interpret lists of risk behaviors</td>
<td>Documentation and present referrals and action steps to adolescent (role play)</td>
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<td></td>
<td>Apply and prioritize high-risk case lists</td>
<td>Final program logistics</td>
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<td></td>
<td>Computer program practice</td>
<td>Adelman computer software</td>
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<td>Anticipatory guidance content reading</td>
<td>Adolescent sexuality videotape</td>
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les identified and counseling provided, as documented by the educators and nurse, with the adolescents’ reports of what they discussed during these visits. In contrast to data obtained from review of standard clinical records, it is reasonable to assume that documentation by the health counselors was accurate in this pilot study because they were specially trained and used structured forms for documentation. On exit survey, adolescents recalled 81% of the documented discussions about identified problems and 64% of the documented anticipatory guidance.

**COMMENT**

Our study demonstrates that the indicated comprehensive risk behavior screening, individualized health counseling, and periodic physical examinations, as outlined in current guidelines for adolescent preventive care, can be efficiently and economically provided in nontraditional settings with a mobile team of 2 educators, 1 nurse, and a clerical aide using interactive health education software running on portable multimedia computers. The computer-assisted visits effectively detected risk behaviors at levels consistent with local behavioral data. The health educators identified problems and provided counseling more often than clinicians in traditional settings on important health issues such as suicide risk, seat belt use, riding with an impaired driver or driving while impaired, sexual activity, alcohol use, physical or sexual abuse, safety helmet use, stress, communication skills, family issues, and violence exposure. Adolescents engaged the system as planned, and most adolescents preferred this model to traditional visits.

Computer-assisted preventive visits are very inexpensive compared with traditional clinical services. The costs presented here are those incurred for this project; a more useful figure might be the projected costs for fielding a full-time team by a large health care system or a health maintenance organization. Assuming most nurses and health educators work part-time, these projected costs include training costs for 4 educators, 2 nurses, and 2 receptionists. Salary levels are estimated to be $11 per hour for a health educator, $21 per hour for a nurse, $50 per hour for a physician, and $8 per hour for a receptionist. Employee fringe benefits at 25% are included. Training costs include allowances for both a senior physician (8 hours) and the nurse (8 hours) to review materials prior to conducting the training. Our projection assumes that team personnel would turn over annually. Training costs total $2450, and 2 computers with printers cost about $5000. The salary cost for fielding 1 team for 40 hours per week for 48 weeks per year is $122 400. The team would be expected to provide 6 visits per hour for 6 hours during each 8-hour day (allowing for transportation to and from sites as well as preparation and take-down time). During this year, 8640 visits could be provided. With these assumptions, the total cost would be about $15 per visit. For comparison, standard preventive visits using physician and nurse practitioner providers cost about $70 per visit. Therefore, computer-assisted preventive visits using health educators and registered nurses would entail only about one fifth of the cost of standard preventive visits.

Gans et al have estimated that adolescents incur direct medical costs of approximately $859 per adolescent per year, and that nearly half of these costs are preventable. Assuming that these visits would reduce adolescent morbidities by about 5%, widespread implementation of such a program could reduce direct per capita medical costs by $21.48. Hence, implementation of this program would result in an annual net reduction of $6.48 in direct medical costs per adolescent, or about $253 million for the 39 million adolescents in the United States.

Limitations of this study include that the project was conducted in a single geographic area and only 1 model of computer-assisted preventive visits using graduate student–level health counselors and nurse-educators was tested. Computer-assisted preventive visits can likely be implemented in several different models such as office-based screening and health education or school-based services. Each of these models would have different factors affecting feasibility and costs. Additionally, the measures used here to assess the frequency of health problems, the comprehensiveness of visits, and the adolescents’ appraisals of the services are untested. Medical record review is not a reliable measure of nontechnological services such as health counseling and...
ences in documentation practices between project educators and the office-based clinicians may potentially have biased the findings. However, no more reliable measure was available. Additionally, the adolescents who participated in this pilot may have been different from those seeking standard clinical preventive visits, even though they were demographically similar. Thus, the comparison of the problems identified and the health counseling provided between the computer-assisted preventive visits and standard physician visits must be interpreted with caution. However, the consistency of results suggests the computer-assisted visits were more comprehensive. Future studies might optimally address this concern through directly surveying adolescents. Likewise, our comparison of the proportion of adolescents identified as having specific health problems by the computer-assisted visits to the 1995 Hawaii Youth Risk Behavior Survey data must be interpreted carefully. We selected only those health problems most closely matching Hawaii Youth Risk Behavior Survey questions for comparison, but the differences between self-administered anonymous questionnaires and clinician-documented problems must not be overlooked. Nonetheless, the similar percentages of adolescents with identified problems suggest that the adolescents participating in the program were representative of the larger adolescent population, and that the computer-assisted preventive visits accurately identified those with health problems. Future studies might better address this issue by having participants complete selected questions from the Hawaii Youth Risk Behavior Survey after completing the computer-assisted visits.

Computer-assisted delivery of preventive services using a team of health educators and a nurse offers an economical alternative to traditional clinical preventive visits that effectively identifies and addresses health-compromising behaviors, is attractive to adolescents, and can increase adolescents’ access to comprehensive preventive services.

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REFERENCES