Changing Adolescent Health Behaviors
The Healthy Teens Counseling Approach

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Background: Brief motivational interventions that have been provided in addition to routine primary care have changed adolescent health behaviors. Whether health screening and motivational-interviewing–based counseling provided by clinicians during routine care can change behaviors is unknown.

Methods: Healthy Teens was a primary care, office-system intervention to support efficient, patient-centered counseling at well visits. Healthy Teens utilized a personal digital assistant (PDA)–based screener that provided the clinician with information about a teen's health risks and motivation to change. Changes in adolescent self-report of diet and activity health behaviors 6 months later were assessed in two cross-sectional samples of teens from five rural practices in 2005 and 2006. Usual-care subjects (N=148) were recruited at well visits prior to the intervention, and the Healthy Teens subjects (N=136) were recruited at well visits after the Healthy Teens system was well established.

Results: At 6-month follow-up, the Healthy Teens group had significantly increased self-reported exercise levels and milk-product intake. In the models exploring covariates, the only significant predictors for improvement in exercise levels were intervention-group status (p=0.009) and post-visit interest in making a change (p=0.015). Interest in changing predicted increased milk intake (p=0.028) in both groups. When teens planned an action related to nutrition, physical activity, or both after a well visit, Healthy Teens participants were more likely to report multiple planned actions (68% Healthy Teens vs 32% usual care, $p<0.05$).

Conclusions: Changes in office systems using low-cost technology to screen adolescents and promote patient-centered counseling appear to influence teens to increase exercise and milk intake.
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Introduction

Adolescent health–compromising behaviors can persist into adulthood and contribute to chronic disease and mortality. National surveys reveal that 70% of adolescents report one or more of eight health-risk behaviors.[1] To address these challenges, national guidelines recommend screening and preventive services for adolescents.[2,3] Adolescents consider healthcare providers a credible source of information, and most want to discuss health risks with their clinician.[4] While most adolescents apparently want to discuss risk behaviors, clinician inquiry and discussion, however, are infrequent.[5,6] When adolescents respond to computer or paper screening, they are more likely to be honest about sensitive issues like substance use.[7] But screening-questionnaire use has not been widely embraced by clinicians, and oral questioning has been inconsistent. For example, only 5% of pediatricians reported routinely using screening questionnaires that assessed substance use.[8]

The Healthy Teens intervention, designed to enhance the adolescent well visit, included (1) a comprehensive health- and behavior-risk screener via a low-cost personal digital assistant (PDA (e.g., Palm®); (2) clinician training in brief motivational-interviewing techniques, complemented by information from the PDA screening that prompted clinicians to use a motivational-interviewing approach; and (3) information about outside resources for practices and adolescents. The hypothesis was that adolescents who received well visits enhanced by the Healthy Teens intervention would later report improved health behaviors compared to adolescents seen in these practices prior to the Healthy Teens implementation. The Healthy Teens project was supported by the second round of the Robert Wood Johnson Foundation Prescription for Health program.

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Methods

Study Design, Context, and Subjects

The Healthy Teens project was conducted in five rural primary care practices using a pre–post evaluation study design from 2005 to 2006. Prior to the Healthy Teens implementation, a control group of adolescents with usual care was enrolled after well visits. Clinicians and practices were then trained to implement the Healthy Teens intervention. After Healthy Teens components had been in regular use for at least 6 months, a second evaluation group of adolescents who received the Healthy Teens intervention was enrolled after well visits.

Practices in New Hampshire and Vermont from the practice-based research network Clinicians Enhancing Child Health were selected to include a range of practice size (1–9 full-time equivalents) and specialty mix (family medicine [1]; pediatric [3]; and mixed family medicine/pediatric [1]). In these practices, patients were 95% Caucasian, and had Medicaid insurance rates varying from 10% to 40%.

The evaluation groups were recruited consecutively at teen health visits over two 3-week periods in July–August 2005 and July–August 2006. First, teens completed in the office an anonymous exit survey at baseline. Those who consented to enrollment were mailed a follow-up survey 6 months later. The intervention sample was recruited 1 year later to have similar seasonal variations in both samples. Of adolescents in the usual-care group who completed the baseline survey, 76% enrolled in the study. Of the potential intervention group, 87% enrolled. Small financial incentives were given for the initial ($3) and follow-up survey ($10). Adolescents aged ≥18 years signed informed consent at enrollment, and those aged <18 years provided assent along with parental consent. The Dartmouth Medical School IRB approved the study protocol.

Clinicians were surveyed both prior to training and 18 months later to assess changes in their attitudes and perceived counseling skills as well as in their views about PDA use. The post-survey was taken during the maintenance period when all practices had used the Healthy Teens system for at least 12 months.

The Healthy Teens evaluation was guided by the Reach, Efficacy/Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework.[9,10] The adolescent-outcome measures addressed the efficacy of the intervention. Reach was measured by the percentage of teens that completed PDA screeners during health visits at 18 months. The uptake of the program by practices was a measure of adoption, and maintenance was based on the number of clinicians who used PDAs during the project and then reported the intention to continue PDA use at 18 months.

Intervention

The intervention provided clinicians with tools and strategies to incorporate into the well visit. Teens completed a screener via PDA in the office prior to clinician contact. Screener questions were derived from existing adolescent health behavior screening questionnaires as well as from the suggestions of a panel of practicing pediatricians and family physicians.[11] For the health behaviors targeted by the Prescription for Health program (tobacco use, unhealthy diet, physical inactivity, and risky alcohol use), the screener assessed the teen's interest in making a change and perceived importance and confidence that the teen could change each specific behavior. Prior to the visit, the clinician reviewed a PDA summary of the patient's health concerns, risky and healthy behaviors, and interest in change. All clinical staff and clinicians received the same training in using the PDA, and received assistance in incorporating this technology into existing office operations.

Clinician training in brief motivational-interviewing counseling skills was provided to support patient-centered counseling because of its potential to improve health behaviors.[12–14] All clinicians received 3 hours of interactive training that included reflective listening, methods of addressing ambivalence, and goal setting. Training was provided at all sites by a clinician and health psychologist.

Each site had three lunchtime presentations by community services to enhance links to local resources. Practices chose presentations from available programs based on interest, so topics and content varied across sites. Presenters ranged from police departments to mental health services to teen activity programs. Because of limited local resources for supporting behavior change, a pocket card of regional and national web-based resources and toll-free numbers was developed.

Measures

The evaluation questions were selected by the Prescription for Health program office[10]; they measured current adolescent health behaviors regarding eating patterns (consumption of fruits and vegetables, milk, and sweetened beverages); physical activity excluding physical education (days/week when moderately active for 30 minutes or more, hours of weekday television and non-academic computer use); cigarette smoking; and alcohol consumption.

In the initial survey, for each of the above-mentioned behaviors, subjects were asked if the topic had been discussed in the visit. If the topic had been discussed, the subject's interest in making a change was determined. Response options were a simplification of the stages-of-change model[15] and included *doing well no need, not interested, thinking about changing, willing to try to change,* and *already trying to change.* Subjects with any active interest (*thinking . . .*, *willing to try . . .*, or *already trying to change*) were considered to be interested in change after clinician interaction. Those who responded *no need* or *not interested*, or who never discussed the topic, were classified as not interested in change.

Subjects in the initial survey were also asked to list any change they planned to make following this visit with their clinician. Responses were coded as a planned nutrition change, a planned physical activity/sedentary behavior change, or some other planned health behavior change (e.g., alcohol/drugs, sexual health, mental health). Subjects with any response were classified as having made an action plan for that item. The total number of planned actions was calculated for each subject.

A clinician survey assessed perceived counseling skills and roles prior to and 18 months after the Healthy Teens implementation. Clinicians were asked their level of agreement with statements using a 5-point scale (1=*strongly agree* to 5=*strongly disagree*). Post-surveys included additional items pertaining to motivational-interviewing skills and PDA implementation. Perceived confidence in these skills and the use of a PDA were assessed post-intervention only.

Data Analysis

The current analysis focused on comparing the self-reported changes in health behaviors after 6 months between the two teen groups. To assess the full impact of the Healthy Teens program, the evaluation samples were limited to 136 teens in the usual-care group who had not used the PDA screener and to 148 teens in the Healthy Teens group who had PDA screening. Baseline comparisons of age, gender, and all health-risk behaviors between the analysis group and the subjects excluded by the above criteria showed no significant differences using t-tests and chi-square. The same statistical method was used to compare the baseline characteristics of the final usual-care and Healthy Teens groups and to determine whether health risks at baseline differed for completers and noncompleters of the follow-up survey.

Health behavior change scores were calculated for each subject's Prescription for Health health behavior by subtracting baseline from 6-month responses. The sign was reversed for screen time and sweetened beverages so that a positive change was always an improved health behavior.

The primary outcomes analyses assessed average changes in health behaviors after 6 months and the predictors of changes in health behaviors. First, t-tests were performed to examine group differences. Next, univariate ANCOVA analyses, controlling for practice site, were performed for fruits and vegetables, milk, sweetened beverages, physical activity, and screen time. Covariates were intervention status, gender, discussion of the topic in the visit, and interest in changing the behavior. Age showed no differences in univariate analyses and was excluded. Because of the wide age range, two of the health risks (recent alcohol or tobacco use) had low prevalence, and the number of subjects was too small to analyze. Only variables with complete data in analyses were used, with no imputations for missing data.

Ongoing PDA usage was tracked by the monthly downloading of Health Insurance Portability and Accountability Act of 1996 (HIPAA)–delimited data from PDA screeners. Appointment records of the number of health visits and PDA screener data for 1 month were compared at 15 months' post-training. Clinician surveys were analyzed with paired t-tests to compare means of pre–post items. All analyses were conducted using SPSS version 13.

Results

Delivery of the Intervention

Among clinicians, 11% (4/35) chose not to participate and did not use PDAs. These nonparticipating clinicians were similar to participating clinicians in age and gender. Adolescent health risk screening via PDA was established as a routine in the five practices. Over 15 months, PDA screening was completed by 1670 teens. The PDA was used in 68%–74% of all adolescent health visits. Office staff said that patient refusal of PDA screening seldom occurred. The most common reported reason for non-use were breaks in office screening routines and late arrival.

Of the 31 clinicians who participated in the study, 23 completed the initial survey, 24 completed the follow-up survey, and 16 completed both. After the intervention, there were two changes in the surveyed clinicians' perceptions of their health counseling. While their views of counseling roles and effectiveness were unchanged, the clinicians found health counseling easier and thought that they listened better (Table 1). The majority of all providers perceived that use of the PDA enhanced their visit and expressed confidence in new motivational-interviewing skills 18 months after training (Table 2). In addition, 75% of the post-survey respondents reported that they definitely planned to continue using the PDAs.

Adolescent Outcomes

Surveys at the 6-month follow-up were completed by 68% of subjects in both the usual-care and Healthy Teens group (usual care, 92/136; Healthy Teens, 101/148). Respondents were aged 11–20 years. Age, gender, and ethnicity did not differ significantly by group (Table 3). Baseline health behaviors differed between groups only for sweetened-beverage intake and days/week with moderate physical activity (Table 2). Baseline characteristics were not different between subjects in

Table 1. Clinician self-perceived counseling skills and responsibilities, prior to and after Healthy Teens intervention (N=16)

Survey item	Pre-PDA use M[a] (SD)	With PDA use M[a] (SD)	*p*-value
In general, it is easy to incorporate health behavior counseling in my daily practice.	2.94 (0.85)	2.31 (0.70)	**0.01**
I am a good listener with my patients.	2.25 (0.68)	1.88 (0.62)	**0.03**
I am effective in helping patients change.	2.56 (0.63)	2.50 (0.63)	0.58
I do not have enough time to counsel patients about changing health behaviors.	2.88 (1.09)	2.81 (1.17)	0.86
It is important for me to counsel my patients about changing health behaviors.	1.25 (0.45)	1.25 (0.45)	1.00
I need to learn new strategies for helping my patients change health behaviors.	1.67 (0.82)	2.07 (0.70)	0.11
It is my responsibility to determine the patient's priorities for the visit.	2.63 (1.20)	2.25 (0.86)	0.30

Note: Analysis by paired t-test. Boldface text designates which findings were significant at $p<0.05$ level.
[a]1–5 scale from *strongly agree* to *strongly disagree*
PDA, personal digital assistant

Table 2. Post-intervention clinician self-perceptions of motivational-interviewing skills and use of the personal digital assistant (PDA) screener (N=24)

Survey item	Agree/strongly disgree[a] *n* (%)
I feel confident:	
using reflective listening	17 (70.8)
discussing pros and cons	18 (75.0)
using importance/confidence scaling questions	10 (43.5)
Using the PDA screener:	
helps me identify sensitive issues	21 (87.5)
helps me set priorities for the visit	20 (83.3)
allows me to use the time in the visit more effectively	18 (75.0)

[a]1–5 scale from *strongly agree* to *strongly disagree*

Healthy Teens or usual care among completers of 6-month surveys and those lost to follow-up, except that usual-care noncompleters were more likely to drink >1 sweetened beverage per day (83% vs 64%, $p=0.04$).

After the visit, there was a trend for teens in the Healthy Teens intervention group to report a specific nutrition/physical activity planned action (42% Healthy Teens vs 32% usual care, $p=0.097$). If they planned specific actions, the Healthy Teens cohort was significantly more likely to have reported multiple intended actions (>1 planned action, 68% Healthy Teens vs 32% usual care, $p<0.05$).

While the number of adolescents in these samples currently using substances (tobacco, alcohol) was too small to analyze outcomes, preliminary data were obtained about the challenge for clinicians in motivating adolescents with recent use to change their consumption. Among the 11% who had used tobacco in the prior month, 35% (9/26) left the visit interested in making a change after clinician discussion. Among the 15% who reported alcohol use in the past month, if clinicians discussed the topic, only 15% (6/37) left the visit interested in making a change in their drinking. In contrast, among teens with low exercise levels (<3days/week), 90% of the Healthy Teens and 65% of the usual-care teens left the visit interested in making a change to be more active after discussion with the clinician.

Comparisons of unadjusted average changes in teen health behaviors from baseline to 6 months between Healthy Teens and usual-care teens are provided in Table 4. All changes in behaviors favored the intervention group except for those involving sweetened beverages. However, the only significant changes were for milk intake and physical activity.

Controlling for practice site, ANCOVA models that predicted health behavior change over 6 months were significant for both milk intake and physical activity (both $p=0.01$). Specific predictors of improvement in physical activity level after 6 months were the Healthy Teens intervention group ($p=0.009$) and an interest in making a change at baseline ($p=0.015$). The interaction of the Healthy Teens group with interest in making a change played a lesser role ($p=0.09$). Gender did not emerge as a significant predictor in the model ($p=0.447$), nor was there interaction between gender and intervention status. The only significant predictor of improved milk intake was interest in making a change at baseline ($p=0.028$).

Discussion

This study was designed to assess the potential effectiveness of coupling PDAs for health behavior assessment with training and prompts that supported the use of brief motivational-interviewing techniques to counsel about health risks. Adolescents participating in this

Table 3. Participant characteristics and self-reported health behaviors at baseline

	Intervention (*n*=148)	Usual care (*n*=136)	*p*-value
Characteristics (%)			
Female	50.0	47.3	0.37
White	96.0	93.5	0.32
Hispanic ethnicity	3.5	2.2	0.47
Aged ≤14 years	45.3	44.9	0.52
Baseline health behavior (M, SD)			
Screen time[a] (hours/weekday)[b]	3.89 (3.80)	3.93 (3.49)	0.93
Physically active ≥30 minutes (days/last week)	4.25 (2.09)	4.86 (1.83)	**0.01**
Sweetened beverages (servings/days)[b]	2.45 (2.54)	3.36 (3.12)	**0.01**
Glasses of milk (8 oz servings/day)[b]	2.28 (1.74)	2.27 (1.64)	0.95
Fruits and vegetables (servings/day)[b]	3.69 (1.93)	3.91 (2.21)	0.38
Used alcohol in the past month (%)	11.8	16.3	0.27
Among drinkers, days with ≥1 alcoholic drink	0.45 (1.38)	0.69 (2.67)	0.35
Smoked in past month (%)	10.1	8.8	0.71
Among smokers, days smoked	6.67 (11.49)	6.43 (10.20)	0.93

Note: Boldface text designates which findings were significant at $p<0.05$ level.
[a]Screen time includes television and computer games.
[b]Item asks about health behavior for a typical day.

Table 4. Average change[a] in health behaviors from baseline to 6 months

Change in health behaviors[b]	Intervention (n=101)	Usual care (n=92)	p-value
Physical activity ≥30 minutes (days/week)	0.581	−0.220	**0.006**
Fruits and vegetables (servings/day)	0.165	−0.094	0.386
Milk (servings/day)	0.190	−0.313	**0.012**
Sweetened beverages (servings/day)	−0.151	0.638	0.059
Screen time[c] (hours/weekday)	0.687	0.286	0.414

Note: Boldface text designates which findings were significant at $p<0.05$ level.
[a]t-test (<5 missing subjects for any individual health behavior)
[b]Self-reported
[c]Screen time includes television and computer games.

primary care intervention utilizing low-cost technology were more likely to be interested in addressing some obesity-related health behaviors and to plan specific behavior-change actions. Six months later, adolescents who had a Healthy Teens visit reported significant increases in their amount of exercise. Effective screening and skill-building among clinicians supported more patient-centered counseling that may have activated patients. These results are consistent with those of Patrick et al.,[16] who found that a stage-of-change–based approach, using interactive computer programs at teen health visits with additional health counselors, improved diet and physical activity but had a greater effect when the teen set a goal of improving physical activity. A similar program has been effective for smoking cessation, but did not increase fruit and vegetable intake.[17]

Why were no improvements found in nutrition outcomes? The nutrition measures selected by the program office assessed the typical-day intake of several items rather than the 24-hour recall or 3-day diaries used in other adolescent studies that have improved intake.[16,18] The less-precise recall measures of dietary intake used in this study may obscure dietary changes. The limited nutrition items also did not capture broader changes in nutrition planned by the subjects (e.g., *stop eating so much food, make healthier choices*). The PDA assessed teen interest in "eating healthier," not in changing any of the specific survey items. This less-specific interest measure may have triggered nutrition discussions not captured here. The focus of the Healthy Teens program on healthy behaviors, not weight loss, also may have contributed to fewer reported changes in food intake. Unfortunately, there are no height or weight data on this population to determine the outcomes for overweight adolescents.

There are additional limitations to consider in interpreting these findings. This is a small study that explored whether modest changes in clinician screening and brief training can influence adolescents' health behaviors. Limited resources and the desire to implement an office-level intervention that could be realistically disseminated did not allow extensive time for training in motivational interviewing, direct assessment of clinicians' delivery of counseling, or more extensive community linkages. It is recognized that the adolescents were not randomly selected and depended on their families' willingness to stay after the visit to complete the initial survey. Adolescents who attend well visits have fewer health risks than adolescents screened in schools.[19] Given these factors, along with subjects lost to follow-up, it is possible that a population may have been selected that was more amenable to addressing some issues. The limited number of practices and small samples allowed control at the practice level but not at the clinician level. Only 52% of clinicians responded to pre–post surveys, but similar positive clinicians' appraisals of the program's impact were found in follow-up surveys completed by 77% of the clinicians.

These study results are promising in several ways. In contrast to other primary care interventions that tailored counseling for health-risk behaviors, the Healthy Teens intervention was incorporated into existing practices without requiring additional staff or computer access for patients.[16,17] Teens used PDAs while waiting to be seen, reducing staff and clinician time to gather and review health information. This allowed the clinician to set priorities and use the limited time for counseling. This appears to have been most effective for exercise. While beyond the scope of this report, the Healthy Teens approach helped clinicians discuss sensitive topics such as family and peer concerns as well as emotional and sexual issues. The provision of comprehensive screening, along with more in-depth information if risks existed, may explain why clinicians planned to keep using the PDAs after the study.

In summary, a review of the Healthy Teens program within the RE-AIM framework found that the impact of the program was positive for each component. Nearly three quarters of the patients in participating practices were reached. Adolescents who were screened and received enhanced counseling reported improved physical activity (efficacy). The Healthy Teens program was flexible at the practice level and allowed clinicians to use the tools differently, leading to adoption by most clinicians. Project staff facilitated uptake but implementation efforts were local, leading to implementation across all sites. The computerized screening ensured the fidelity of that component, and clinicians' self-report of enhanced counseling skills indicated that

their training was helpful. The fact that Healthy Teens program components were integrated into existing office systems utilizing current staff led to maintenance of the program. At the time of this report—14 months later—four of the five practices continue to use the adolescent PDA screeners.

Conclusion

This study suggests that clinicians can be effective change agents when provided efficient screening tools and training. After a well visit, reported exercise levels improved in the intervention group and declined without the Healthy Teens approach. The importance of assessing motivation and customizing counseling is supported. Further large-scale research is needed that links the effectiveness of the clinician in motivating the adolescent with later patient outcomes.

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