

# An Electronic Linkage System for Health Behavior Counseling

## Effect on Delivery of the 5A's

Alex H. Krist, MD, MPH, Steven H. Woolf, MD, MPH, Charles O. Frazier, MD, Robert E. Johnson, PhD, Stephen F. Rothemich, MD, MS, Diane B. Wilson, EdD, RD, Kelly J. Devers, PhD, J. William Kerns, MD

**Background:** A variety of factors limit the ability of clinicians to offer intensive counseling to patients with unhealthy behaviors, and few patients (2%–5%) are referred to the community counseling resources that do offer such assistance. A system that could increase referrals through an efficient collaborative partnership between community programs and clinicians could have major public health implications; such was the subject of this feasibility evaluation.

**Methods:** At nine primary care practices, an electronic linkage system (eLinkS) was instituted to promote health behavior counseling and to automate patient referrals to community counseling services. Patients were offered 9 months of free counseling for weight loss, smoking cessation, and problem drinking at a choice of venues: group counseling, telephone counseling, computer care, and usual care. The delivery of behavioral counseling, measured by the 5A's (ask, address, advise, assess, agree, arrange) and patients' reported experiences with eLinkS, was examined.

**Results:** For 5 weeks eLinkS was used, until high referral volumes depleted counseling funds. Of the 5679 patients visiting the practices, 71% had an unhealthy behavior. Of these patients, 10% were referred for intensive counseling from a community program, most often for weight loss. Counseling and referrals occurred regardless of visit type—wellness, acute, or chronic care. eLinkS was used more often for middle-aged adults and women and by more-experienced clinicians.

**Conclusions:** The intervention increased the rate at which patients were referred for intensive behavioral counseling compared to current practice norms. Given the evidence that intensive counseling is more effective in promoting behavior change, implementing eLinkS could have substantial public health benefits.

(Am J Prev Med 2008;35(5S):S350–S358) © 2008 American Journal of Preventive Medicine

### Background

Four unhealthy behaviors—tobacco use, unhealthy diet, physical inactivity, and risky alcohol use—account for approximately 37% of deaths in the U.S.<sup>1</sup> Addressing these behaviors could help stem the rising prevalence and cost of chronic diseases,<sup>2–4</sup> and clinicians can play a pivotal role. Americans have

regular contact with clinicians and value their advice. A clinician's recommendation to change behavior is widely cited as a motivating factor.<sup>5,6</sup> Guidelines recommend that clinicians use the 5A's (assess [A1]; advise [A2]; agree [A3]; assist [A4]; and arrange [A5]) to promote healthy behaviors (Table 1).<sup>6–11</sup>

Following such guidelines is difficult for clinicians due to inadequate time, staff, reimbursement, and familiarity with counseling techniques.<sup>12</sup> Few patients report being asked regularly by clinicians whether they engage in unhealthy behaviors.<sup>13</sup> Intensive counseling, often a necessity to help patients adopt and maintain healthy behaviors, is rarely possible in primary care settings; the percentage of patients who receive intensive counseling is probably less than 2%–5%.<sup>14,15</sup> Increasing this percentage, even modestly, could have substantial public health implications, given the population-attributable risk of unhealthy behaviors and the benefits of intensive counseling.<sup>9,16–18</sup>

From the Department of Family Medicine (Krist, Kerns, Frazier), the Departments of Family Medicine, Epidemiology and Community Health (Woolf), the Departments of Biostatistics and Family Medicine (Johnson), the Departments of Internal Medicine and Family Medicine, Massey Cancer Center, (Wilson), and the Departments of Health Administration and Family Medicine (Devers), Virginia Commonwealth University, Richmond, Virginia; the Fairfax Family Practice Residency (Krist), Fairfax; the Riverside Family Practice Residency (Frazier), Newport News; and the Shenandoah Family Practice Residency (Kerns), Front Royal, Virginia

Address correspondence and reprint requests to: Alex H. Krist, MD, MPH, P.O. Box 980251, Richmond VA 23298-0251. E-mail: ahkrist@vcu.edu.

**Table 1.** The 5A's applied to health behaviors<sup>8</sup>

Assess (A1)	Assess health behaviors and factors affecting behaviors
Advise (A2)	Provide clear, specific, personalized advice, including harms and benefits associated with behaviors
Agree (A3)	Select treatment goals and approach based on patient's needs
Assist (A4)	Aid patient in achieving agreed-upon goals through self-help, counseling, and adjunctive medical treatments as appropriate
Arrange (A5)	Arrange follow-up contacts to provide ongoing assistance

Few practices can undertake redesign efforts to systematically offer high-quality behavioral counseling.<sup>19,20</sup> Exceptional practices and health systems have the infrastructure support, multidisciplinary team members, and staff to follow up with patients and motivate health behavior change,<sup>12,21</sup> but these conditions are atypical.<sup>22</sup> Ironically, the communities where clinicians practice are often home to programs and services that do offer this level of counseling. Such programs commonly report that local physicians refer few patients.

This study tested the feasibility of an electronic linkage system (eLinkS) to help connect these entities to support behavioral counseling. Utilizing the electronic medical record (EMR) as a platform, eLinkS was designed to (1) help clinicians systematically perform elements of the 5A's that are feasible in busy practice settings (i.e., asking about health behaviors, offering brief advice, and agreeing on next steps); (2) make it fast and easy to refer patients to intensive counseling outside the office; and (3) establish bidirectional communication between practices and community counselors.<sup>23,24</sup> This article examines the effects of eLinkS on counseling rates.

## Methods

### Setting

Nine primary care practices in the Tidewater region of Virginia were recruited.<sup>25</sup> The practices, members of a single medical group and of the Virginia Ambulatory Care Outcomes Research Network (ACORN), share a common type of EMR (GE Centricity Physician Office<sup>®</sup>) that is managed by a central informatics staff. The practices have used the EMR for 3 to 10 years. Practice size ranged from 1 to 30 clinicians (median=3), and 48 (87%) clinicians participated in the study. Two sites were solo practices, five had three clinicians, one had eight clinicians, and one (a family medicine residency program) had 30 part-time clinicians and residents.

### Intervention

The design of eLinkS reflects early input from clinicians at the study sites, solicited through site visits. The final version functioned as follows:

Practices could distribute a flyer in the waiting room that informed patients about the following four referral options, which were available for free for up to 9 months:

- Group counseling was offered in community locations: for weight loss by Weight Watchers; for tobacco use, by the local hospital's wellness center<sup>26</sup>; and for risky alcohol use, by Alcoholics Anonymous (AA).
- Telephone counseling, offered for smoking cessation and weight loss, was delivered by trained counselors at the University of Kentucky Health & Wellness Program Behavioral Health Improvement Program (BeHIP).<sup>27</sup>
- Computer care provided patients access both to an informative website developed previously by ACORN<sup>28–30</sup> and to an e-counseling service that ACORN and BeHIP designed for this project. The e-counseling program followed the BeHIP telephone counseling protocol but was used asynchronously online.
- Usual care included options other than the above (e.g., physician counseling, pharmacotherapy, or even inaction).

When staff who take patients to the examination rooms ("rooming" staff) obtained patients' vital signs and entered them into the medical record, the EMR displayed a screen prompt to remind the staff to enter height, weight, and tobacco-use status (A1). If a patient was overweight or obese (BMI  $\geq 25$  kg/m<sup>2</sup>); smoked; or had an EMR entry of risky alcohol use, a prompt appeared when the clinician opened the patient's record. The prompt asked if the clinician wanted to address the flagged behavior(s) at that visit. If the clinician clicked *yes*—a step that was classified as Address (Ad)—the EMR would open a form (Figure 1). The form included checkboxes wherein clinicians could document whether they gave brief advice to change behavior (A2); whether the patient was ready to improve and engage in the process (A3); whether the patient wanted to be referred outside the practice to one of the intensive-counseling options noted above (A4); and by what means (telephone, appointment, or e-mail) the patient sought follow-up by the practice (A5).

To allow the clinician to view all of the patient's unhealthy behaviors, automatic prompts would not display until the rooming staff entered both weight and tobacco-use status. A current or past height measurement also was required for BMI calculation. At any point in any encounter, clinicians could also load the form manually.

The screen displays and the EMR programming were designed to make the interface with clinicians easy and fast, to automate the referral process electronically, and to facilitate proactive counseling. When telephone or group counseling was selected through eLinkS, the EMR automatically e-mailed contact information to the intensive-counseling program staff, who then would contact the patient (rather than having the patient call the intensive-counseling program [reactive counseling]). When clinicians selected *computer care*, the EMR forwarded an e-mail to the patient with a link to the educational website and instructions for e-counseling. AA referrals were reactive; the EMR would print a list of AA meetings for clinicians to hand to patients.

### Exposure Period

Training sessions for eLinkS of 1-hour duration were held at all practices prior to launch. The intervention went live on

P4H Form: EVAN J. TEST

<p><b>Unhealthy P4H Behaviors</b></p> <p><b>Overweight Counseling</b></p> <p>Reset Form</p>	<p><b>Overweight BMI &gt; 30</b></p> <p><b>Observations:</b> Current BMI: <input type="text" value="34.99"/></p> <p><b>Patient Counseling</b></p> <p>Patient advised to modify diet and/or increase physical activity: <input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> not addressed</p> <p>Patient ready to improve diet and/or physical activity: <input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> not addressed</p> <p>Patient engaged in what to do next: <input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> not addressed</p> <p><a href="#">View Patient Counseling Script</a></p>
<p><b>Patient Referral Options</b></p> <p><input type="radio"/> Group Classes <input checked="" type="radio"/> Computer Care <input type="radio"/> Telephone Counseling <input type="radio"/> Usual Care</p> <p><b>Follow-up Options</b></p> <p><input checked="" type="radio"/> Telephone <input type="radio"/> Office Visit <input type="radio"/> Email <input type="radio"/> None</p> <p><b>Please verify correct patient email address :</b> (corrections or additions must be made in registration)</p> <p><input type="text" value="ejtest@rivhs.com"/></p> <p><input checked="" type="checkbox"/> Add translation to note</p> <p>Prev Form (Ctrl+PgUp) Next Form (Ctrl+PgDn) <span style="float: right;">Close</span></p>	

**Figure 1.** The electronic linkage system (eLinkS) dialogue box (form). The eLinkS form would appear after the clinician was prompted that the patient had an unhealthy behavior and clicked *yes* to an invitation to open the form. In the example portrayed in the figure, the clinician chose to address the patient's obesity. The form provides the current BMI and response options to document the advice given to the patient, the patient's choice of intensive-counseling options, and the arrangements for follow-up. In this example, the clinician has indicated that the patient was advised to modify diet and/or increase physical activity, was ready to change behavior and engage in next steps, and desired computer care for intensive counseling and follow-up by telephone. *View Patient Counseling Script* is a button that clinicians clicked to review potential scripts for brief advice. By clicking *Add translation to note*, the clinician could transfer the response options to the encounter note to document health behavior counseling in the patient's formal medical record. The response options clicked by the clinicians participating in this study were captured for analysis in this study. See text for further details about group counseling, computer care, telephone counseling, and usual care.

April 16, 2006, and was discontinued 5 weeks later (May 22, 2006) when an overwhelming surge in referrals for intensive counseling exceeded available funds. Patients referred to intensive counseling during the exposure period were eligible to receive services for up to 9 months (through February 2007). Weekly feedback reports notified participating clinicians of the number of counseling referrals they had placed.

### Data Collection

The delivery of the 5A's (this report's main outcome variables) was measured by clinicians' entries in the EMR dialogue box. EMR data were collected for all adults (aged  $\geq 18$  years) visiting the practice from 2 years prior to the encounter to 1 year afterward. Dependent variables were either patient-specific (age, gender, and ICD-9 codes for comorbid conditions) or encounter-specific (weight, tobacco-use status, documentation of any alcohol disorder, patient's stated reason for visit, and Current Procedural Terminology [CPT] codes). The reason for the visit was classified as acute, wellness, or selected chronic conditions, based on the criteria in Table 2.

Postal surveys were mailed 2 weeks after the encounter to all counselees (patients referred to an intensive-counseling option or receiving usual care), and asked respondents to describe the encounter. An established mailing protocol (modified Dillman technique<sup>31,32</sup>) was used to optimize response rates. Surveys completed by office managers provided information about clinicians, practices, and whether only clinicians or clinician-nurse teams used eLinkS.

### Data Analysis

Statistical calculations were performed in SAS version 9.1.3. Differences in percentages were tested for significance using Fisher's exact test. A logistic regression was performed for each of the 5A's. The initial regressor variables were those that could theoretically influence eLinkS usage: the patient's age, gender, health behaviors, and comorbidities; encounter type and complexity; and the physician's age, gender, training, years in practice, and practice site. Variables were retained in the model in a stepwise method that used  $p \leq 0.25$  as the entry criterion and  $p \leq 0.10$  as the retention criterion. The patient was the unit of analysis. Practices were selected purposively, and fixed-practice effects were con-

sidered. This study was approved by the IRBs of Virginia Commonwealth University and Riverside Health System.

## Results

### Study Population

A total of 5679 adult patients visited the practices during the 5-week exposure period. Their ages (median=53 years); gender (64% female); and frequency of prevention visits (14%) were typical of adult primary care populations (Table 2).<sup>33</sup> The frequency of chronic-care visits at other places was lower than published norms (9% vs 44%)<sup>33</sup> because only visits for selected reasons met this study's definition of relevant chronic illnesses. The prevalence of circulatory diseases was similar to the general population's (34% vs 36%); the prevalence of neoplasms (9% vs 7%) was slightly higher, as was the prevalence of diabetes (15% vs 7%).<sup>34</sup> The prevalence of multiple unhealthy behaviors resembled national norms.<sup>35</sup> Rates

**Table 2.** Patient and clinician demographics (*n*/*%* unless otherwise noted)

Characteristics	Overall
<b>PATIENT<sup>a</sup> (N=5679)</b>	
Median age, years (range)	53 (18–105)
Gender (% women)	64
<b>Reason for visit</b>	
Acute illness/injury <sup>c</sup>	2028 (25)
Selected chronic illnesses <sup>c</sup>	532 (9)
Wellness/prevention <sup>c</sup>	657 (14)
Other <sup>c</sup>	2388 (62)
<b>Comorbidities</b>	
Circulatory disease <sup>d</sup>	1921 (34)
Diabetes <sup>d</sup>	533 (9)
Neoplasm (any type) <sup>d</sup>	826 (15)
Respiratory disease <sup>d</sup>	2849 (50)
<b>Behavioral risk factors<sup>e</sup></b>	
BMI >25–29 kg/m <sup>2</sup>	1415 (25)
BMI ≥30 kg/m <sup>2</sup>	2197 (39)
Current smoking	922 (16)
Alcohol misuse	286 (5)
<b>Total number of risk factors</b>	
0	1649 (29)
1	3294 (58)
2	682 (12)
3	54 (1)
<b>CLINICIAN<sup>b</sup> Overall (N=48)</b>	
Median age, years (range)	37 (26–62)
Gender (% women)	52
<b>Clinician type</b>	
Physician	23 (48)
Resident	21 (44)
Mid-level provider	4 (8)
Median years in practice (range)	7.5 (2–31)
Average number of full-time equivalent clinicians in the office (range)	6.3 (0.9–8.0)
<b>Complete use of eLinkS</b>	
Clinician only <sup>f</sup>	38 (79)
Team approach <sup>f</sup>	10 (21)

<sup>a</sup>Based on electronic medical record (EMR) data

<sup>b</sup>As determined from surveys administered to office managers and participating clinicians (response rate=100%)

<sup>c</sup>Reason for visit classification: *Acute illness/injury* included any self-limited condition (lasting days or weeks). *Selected chronic illnesses* included chronic disorders for which counseling regarding the three target risk factors might be particularly relevant, including chronic cardiovascular disease, respiratory disease, or diabetes. *Wellness/prevention* included visits focused on wellness or prevention, but it excluded visits focused on specific wellness screening tests. *Other* included visits not encompassed by the above categories and those for which the focus could not be determined accurately.

<sup>d</sup>Comorbidities were defined by examining the ICD-9 codes in a patient's EMR database for the index and all prior visits. Patients were classified as having circulatory disease, diabetes, neoplasm, or respiratory disease if their records included an ICD-9 code of 390–459, 250, 140–239, or 460–519, respectively.

<sup>e</sup>The number of behavioral risk factors refers to how many of the three target risk factors (tobacco use, overweight/obesity, risky alcohol use) were documented in the EMR database.

<sup>f</sup>In *clinician only* practices, the only involvement of rooming staff with the electronic linkage system (eLinkS) was to collect and record vital signs; the prompts and forms appeared only for the clinician. In *team approach* practices, both rooming staff and clinicians could access and use the forms.

for overweight/obesity, tobacco use, and risky alcohol use were consistent with local norms.<sup>36–38</sup>

The postal survey was mailed to 583 counselees and was returned by 358 (61%). The age, gender, weight, and comorbid conditions of survey respondents did not differ significantly from those of nonrespondents. Participating clinicians were not representative of primary care clinicians generally, because a large percentage (44%) were family medicine residents, a group that is younger and comprises more women than nonresidents.<sup>39</sup>

## Delivery of the 5A's

The delivery of the 5A's is depicted in Figure 2.

**Assess (A1).** Rooming staff collected both BMI and tobacco-use information for 2117 patients, 37% of the 5679 patients who visited the practices (Figure 2). Data were missing more often for tobacco-use status than for BMI. When BMI data were incomplete, the missing information was more often height than weight (97% vs 45%).

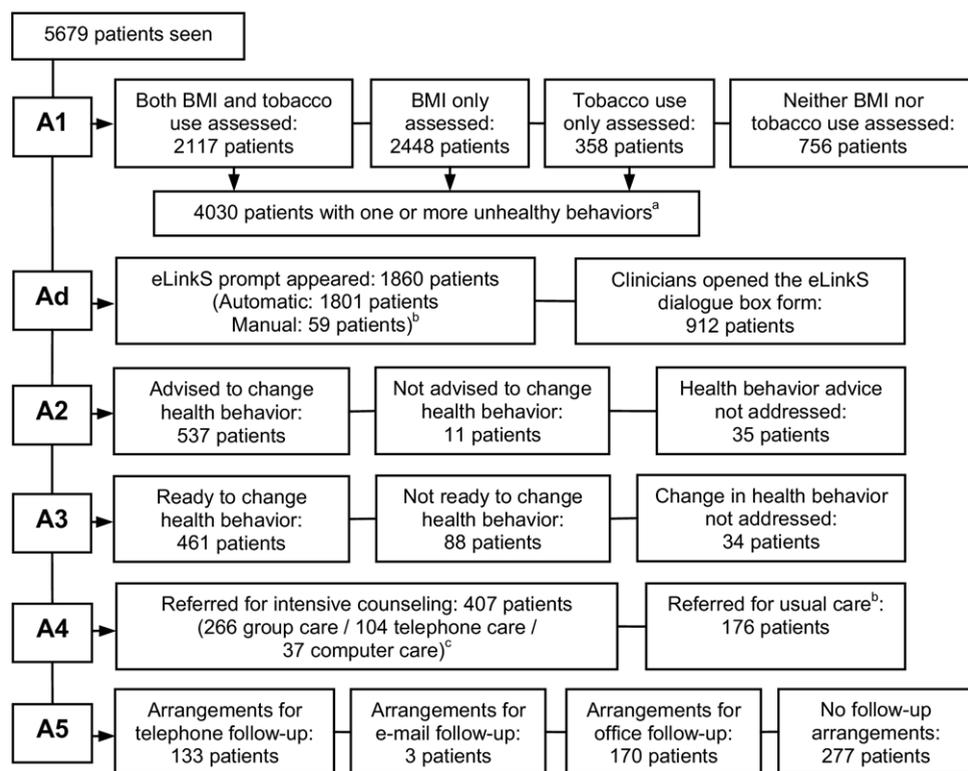
**Address (Ad).** eLinkS prompts appeared for 1860 patients, 1801 occurring automatically and 59 initiated by the clinician. When confronted with these prompts, clinicians elected to open the dialogue box form (*address* the behavior) for 912 (49%) patients.

**Advise (A2).** Clinicians advised 537 patients to change their health behavior, 13% of patients with an unhealthy behavior (*n*=4030) and 29% of patients for whom a prompt appeared (*n*=1860; Figure 2). A2 was documented for 20% of smokers, 7% of overweight patients, 17% of obese patients, and 13% of problem drinkers.

Respondents to the postal survey reported higher advice rates. Among those referred for weight loss, 75% reported receiving advice on this topic, and more than half reported clinician advice about diet or exercise. Among those referred for smoking cessation, 97% recalled clinician advice about smoking. Fully 86% of counselees considered it appropriate for the clinician to discuss health behaviors, and 54% were unsure whether they would have mentioned the topic if their clinician had not done so.

**Agree (A3).** Clinicians recorded that 461 patients were ready to improve the targeted behavior, and 441 were engaged in what to do next. This represents 86% and 82%, respectively, of patients who received clinician advice (*n*=537).

**Assist (A4).** Fully 407 patients were referred for intensive counseling, 10% of patients with an unhealthy behavior or 76% of patients who received A2 (Figure 2). The population that received A4 included 12% of obese patients, 3% of overweight patients, and 8% of smokers; no risky drinkers were referred for intensive counseling. Two thirds of patients who sought intensive



**Figure 2.** Exposure to eLinkS and delivery of the 5A's to the study population. The above figure depicts the delivery of the 5A's (ask [A1]; address [Ad]; advise [A2]; assess [A3]; agree [A4]; and arrange [A5]) for health behavior counseling as recorded by eLinkS for all adult patients seen in the study practices during the exposure period (April 16, 2006–May 22, 2006). <sup>a</sup>This value (4030) represents the number of patients who had (1) either BMI or tobacco use status assessed ( $n=4923$ ) and (2) abnormal results from this assessment. A denominator of 4030, or 70% of patients seen ( $N=5679$ ), is used in the text when reporting the number of patients with an unhealthy behavior. <sup>b</sup>Prompts appeared automatically ( $n=1801$ ) only when (1) both the BMI and tobacco-use status were assessed and (2) the patient had evidence of an abnormality. Clinicians could also manually load the form, if BMI and/or tobacco use status were not assessed, and this occurred for 59 patients. A denominator of 1860 is used in the text when reporting the percentage of patients who were identified by prompts and received counseling. <sup>c</sup>See text for description of counseling options.

counseling chose group counseling as the venue, primarily Weight Watchers. Usual care was requested by 176 patients.

Only 64% of postal survey respondents, including the usual-care group, recalled being invited by the clinician to try an intensive-counseling option. Higher percentages reported that the clinician was helpful and provided enough information to make a choice (80% and 87%, respectively). One third cited the clinician's recommendation over other factors (e.g., convenience) as the primary consideration in selecting an A4 option. When surveyed  $\geq 2$  weeks after the visit, 65% of referred patients indicated that they were still planning to pursue intensive counseling.

**Arrange (A5).** Arrangements for follow-up with the practice were made for 306 patients. Office visits, or nurses' telephone calls to monitor progress, were the preferred arrangements (Figure 2).

## Predictors of Use

While all of the practices used eLinkS, significant variation was observed by practice and by individual patient and clinician characteristics. For example, the crude rate for A2 was greater for female patients than for male patients (33% vs 23%, respectively). Even after adjustment (Table 3), ORs for delivering most of the 5A's were generally greater when patients had unhealthy behaviors and were either female or middle-aged (aged 45–60 years) and when clinicians had had longer tenures in practice. Most of the 5A's occurred less frequently at acute-care visits, but patients were referred to intensive counseling at all types of visits: 23% at acute-care visits, 26% at chronic-care visits, and 34% at wellness visits. Unexpectedly, the presence of comorbid diseases that benefit from behavioral counseling (e.g., diabetes) was not predictive of eLinkS use.

## Discussion

This study was designed to observe whether clinicians would use eLinkS, what options the patients would self-select, and what effect the intervention would have on counseling practices and patients' behaviors. The results are encouraging. The prompts appeared at more than one third of the encounters (due to the prevalence of overweight/obesity). The use of eLinks was steady throughout its 5 weeks of availability, and occurred at all manner of office visits, not just those devoted to prevention. In semistructured interviews conducted for a qualitative study, clinicians and office managers commented on the usefulness and feasibility of the system, and patients welcomed the selection and quality of the counseling services.

## Public Health Implications

Evaluating eLinkS' effect on health behaviors requires a randomized trial, but this report's data seem encour-

**Table 3.** Regression results—predictors for delivery of the 5A's

	AOR (95% CI) for delivery of the 5A's					
	Ask (A1)	Address (Ad)	Advise (A2)	Agree (A3)	Assist (A4)	Arrange (A5)
<b>Patient characteristics</b>						
Age (years) <sup>a</sup>						
18–29 (vs ≥75)	—	1.8 (0.9–3.4)	1.6 (0.8–3.1)	<b>2.2 (1.1–4.6)</b>	<b>2.2 (1.0–4.7)</b>	<b>4.0 (1.7–9.5)</b>
30–44 (vs ≥75)	—	<b>2.3 (1.3–4.2)</b>	<b>2.1 (1.2–3.8)</b>	<b>3.1 (1.6–6.0)</b>	<b>3.1 (1.5–6.3)</b>	<b>3.5 (1.6–7.6)</b>
45–59 (vs ≥75)	—	<b>2.4 (1.4–4.2)</b>	<b>2.3 (1.3–3.9)</b>	<b>3.4 (1.8–6.3)</b>	<b>3.1 (1.6–6.1)</b>	<b>3.5 (1.7–7.3)</b>
60–75 (vs ≥75)	—	<b>1.8 (1.0–3.2)</b>	1.6 (0.9–2.9)	<b>2.2 (1.1–4.2)</b>	<b>2.0 (1.0–3.9)</b>	<b>2.6 (1.25–4)</b>
Gender, female (vs male)	—	<b>1.8 (1.4–2.4)</b>	<b>1.8 (1.4–2.3)</b>	<b>1.9 (1.5–2.5)</b>	<b>2.4 (1.9–3.3)</b>	<b>1.8 (1.2–2.3)</b>
Overweight (BMI >25–29 kg/m <sup>2</sup> )	<b>2.4 (1.9–3.0)</b>	—	0.6 (0.4–1.0)	—	—	—
Obese (BMI ≥30 kg/m <sup>2</sup> )	<b>2.6 (2.1–3.1)</b>	<b>2.9 (2.2–3.8)</b>	<b>2.0 (1.3–3.2)</b>	<b>2.9 (2.2–3.9)</b>	<b>2.7 (2.0–3.7)</b>	<b>3.1 (2.2–4.2)</b>
Smoker	—	<b>3.1 (2.3–4.3)</b>	<b>3.2 (2.3–4.5)</b>	<b>1.8 (1.3–2.6)</b>	<b>2.1 (1.5–2.8)</b>	<b>2.1 (1.5–2.9)</b>
Cancer comorbidity	<b>1.4 (1.1–1.7)</b>	<b>1.5 (1.0–2.1)</b>	1.5 (1.0–2.1)	—	—	—
Respiratory comorbidity	<b>1.3 (1.1–1.6)</b>	—	—	—	—	—
Diabetes comorbidity	<b>0.7 (0.5–0.9)</b>	—	—	—	—	—
<b>Encounter characteristics</b>						
Acute visit (vs wellness)	<b>1.7 (1.2–2.6)</b>	<b>0.5 (0.3–0.8)</b>	<b>0.5 (0.3–0.7)</b>	<b>0.4 (0.2–0.5)</b>	<b>0.4 (0.3–0.7)</b>	<b>0.5 (0.3–0.8)</b>
Chronic visit (vs wellness)	<b>1.8 (1.1–3.1)</b>	0.9 (0.6–1.5)	0.8 (0.5–1.3)	0.7 (0.4–1.1)	0.9 (0.5–1.5)	0.9 (0.5–1.6)
Moderate visit CPT (vs simple)	1.1 (0.8–1.5)	—	—	1.2 (0.7–2.0)	1.1 (0.6–1.8)	1.6 (0.9–3.2)
Complex visit CPT (vs simple)	<b>1.5 (1.0–2.2)</b>	—	—	1.1 (0.7–2.0)	0.9 (0.5–1.6)	1.8 (0.9–3.7)
Wellness visit CPT	<b>10.2 (5.8–17.9)</b>	—	—	—	—	—
<b>Clinician characteristics</b>						
Gender, female (vs male)	—	<b>0.5 (0.4–0.8)</b>	0.7 (0.5–1.1)	<b>0.6 (0.4–1.0)</b>	<b>0.6 (0.4–0.9)</b>	—
Years in practice (1 year)	<b>1.0 (1.0–1.0)</b>	<b>1.1 (1.0–1.1)</b>	<b>1.1 (1.0–1.1)</b>	<b>1.1 (1.0–1.1)</b>	<b>1.1 (1.0–1.1)</b>	<b>1.1 (1.1–1.2)</b>
Trained clinician (vs resident)	0.8 (0.5–1.5)	—	—	—	—	—

Note: Data fields with no values (—) represent variables not retained in the logistic regression model. Bolded numbers represent significant differences. See Table 2 for definitions of cancer comorbidity, respiratory comorbidity, and diabetes comorbidity. Simple visits, moderate visits, complex visits, and wellness visits were those receiving CPT codes of 99212/99201, 99213/99202, 99214–99215/99203–99205, 99239x/99238x, respectively.

<sup>a</sup>Each age group compared to the ≥75 age group  
CPT, Current Procedural Terminology

aging on several grounds. Brief clinician advice (A2) is itself effective in promoting smoking cessation and, potentially, weight loss,<sup>4,9</sup> and clinicians reported giving such advice at one third of the encounters in which the eLinkS prompt appeared. Patients referred for intensive counseling reported that the topic, if not initiated by the clinician, might not have come up. According to Health Plan Employer Data and Information Set (HEDIS) data,<sup>40</sup> 74% of patients who smoke recall receiving a clinician's advice to quit smoking in the past year, a larger percentage than this study reports. However, clinician counseling was examined for only 5 weeks, rather than 1 year, and A2 was monitored as documented in the patient's record. Brief advice by clinicians is underreported in medical records compared to patient recall.<sup>41</sup>

Intensive counseling is substantially more effective than A2,<sup>9,16–18</sup> and eLinkS referred patients for up to 9 months of intensive counseling. As a subsequent article will describe, patients referred to these programs reported significant improvements in health behaviors. Controlled trials document the effectiveness of proactive telephone and group counseling.<sup>42–44</sup> Group weight-loss programs, the most commonly selected intensive-counseling option

in this study, report reductions of 3 to 6 kg over 6 to 12 months.<sup>16,17,45</sup>

The percentage of patients with unhealthy behaviors who received intensive counseling through eLinkS (10%) appears to exceed practice norms. If approximately 62% of patients are overweight/obese,<sup>46</sup> a clinician who sees 30 patients daily would have to refer 2 patients for intensive weight-loss counseling to achieve a comparable referral rate as observed with using eLinkS. Data on the existing rate at which clinicians refer patients for intensive counseling are sparse.<sup>47</sup> Clinicians refer approximately 1%–5% of smokers to quitlines,<sup>15,48,49</sup> percentages lower than the referral rate observed in this study (8%). Some studies report that A4 is delivered to 13% to 43% of smokers.<sup>40,50–54</sup> However, what constitutes A4 in such studies is variable, and may not equate with intensive counseling as defined here. For example, HEDIS reports a high rate for A4, but any discussion either of medications or strategies to quit can qualify.<sup>40</sup> In contrast, patients receiving A4 through eLinkS participated over 9 months in as many as 70 sessions of up to 120 minutes each. Published A4 rates for weight loss appear significantly lower than for smoking cessation, and equally brief.<sup>55–59</sup> The

more-extensive counseling offered in this study would be expected to produce substantially greater effects on behavior than seems currently possible in ordinary practices.

### Caveats and Confounding Variables

Several elements of this intervention may have enhanced the referral rate:

- Intensive counseling was free to patients, eliminating cost as a barrier.
- Participating practices were experienced with EMRs.
- The intervention employed active prompts; EMR vendors prefer passive prompts, which are less effective but also interfere less with workflow.<sup>60–62</sup>

Conversely, several factors may have attenuated the intervention's effectiveness:

- Displaying prompts only after rooming staff had entered both BMI and tobacco-use data restricted the number of patients receiving the full intervention.
- eLinkS was operational for only 5 weeks. The early shutdown limited patients' exposure to the intervention over multiple visits, and gave little time for clinicians to acclimate to eLinkS and community partners.
- Participating clinicians were younger and more inexperienced than practicing physicians, an artifact of including the residency program.
- eLinkS was used more for middle-aged patients and women, perhaps because the available services (e.g., Weight Watchers) appealed to this group.
- Problem drinkers received little benefit from eLinkS. By protocol, rooming staff assessed BMI and tobacco-use status but not alcohol use. Fewer intensive-counseling options were available for risky alcohol use, and referrals were reactive rather than proactive.

Other study limitations include the nonrandomized, pre–post design. While this design was appropriate for an initial evaluation of feasibility, comparisons among groups are subject to biases and confounding. Second, the study involved only nine practices, and the fidelity of the intervention varied among sites. Third, EMR data were used to document the 5A's; clicking an onscreen response option does not clarify what actually occurred during the encounter. Finally, the external validity of the counselees' survey responses is limited because they represent a subset of patients.

### Conclusion

Collaboration between clinicians and community resources, as occurred here, presents a win–win scenario for patients, clinicians, and community programs. Patients obtain more-intensive assistance. Clinicians, who frequently cannot provide intensive counseling them-

selves,<sup>63</sup> welcome an easy means to connect patients with the help they need. Community programs, which often struggle to attract clients through media and advertising, appreciate the influx of referrals from the medical community.

This process has implications that extend beyond behavioral counseling. A system like eLinkS that facilitates systematic screening and referrals could, with some modification, help clinicians arrange screening tests and chronic disease management—all with the click of a mouse. Clinician–community collaboration long has been advocated for these purposes,<sup>64</sup> but applying modern technology to make collaboration easy holds considerable promise.

---

This work was funded under grant #53769 from the Robert Wood Johnson Foundation and the Agency for Healthcare Research and Quality under the Prescription for Health initiative. The authors thank the practices in Riverside Medical Group that participated in this study: Bruton Avenue Family Medicine, Eagle Harbor Primary Care, Elizabeth Lakes Family Practice, Hilton Family Practice, Mathews Medical Center, Mercury West Medical Center, Patriot Primary Care, Riverside Family Medicine, and Williamsburg Medical Arts Family Practice. They also thank the staff of Weight Watchers (Stephanie Schoemer, MS, RD); Riverside Wellness Center (Holly Hicks); and BeHIP (Tammy Akins), for their assistance both in arranging intensive-counseling services for the study subjects and in data collection. They thank Sharon Flores, MS, for coordinating the project; Amy Burgett, RN, for interfacing with the practices; Steven Mitchell for database management; Tina Cunningham, MS, for statistical analysis; and Kristen Mertz for the EMR programming that underlies eLinkS. They received invaluable advice and assistance on the design and conduct of the study and on draft manuscripts from Carole Hale, Anton Kuzel, MD, MPHE, Daniel Longo, ScD, David Marsland, MD, and Paul Mazmanian, PhD, and from the following expert consultants: Richard Botelho, MD, Russell Glasgow, PhD, John Hickner, MD, MSc, Abby King, PhD, Jesse Crosson, PhD, and Atif Zafar, MD. They thank Michael Fleming, MD, MPH, for his attempts to identify intensive-counseling options for problem drinkers. Finally, the study received extensive support from the staff of the Prescription for Health National Program Office (led by Larry A. Green, MD, and Maribel Cifuentes, RN, BSN); the Prescription for Health evaluation team at the University of Medicine and Dentistry of New Jersey (led by Benjamin Crabtree, PhD, MA, and Deborah Cohen, PhD); the National Advisory Committee for Prescription for Health; and the project officers (Sue Hasmill, PhD, RN, and Laura Leviton, PhD) of the Robert Wood Johnson Foundation.

No financial disclosures were reported by the authors of this paper.

### References

1. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the U.S., 2000. *JAMA* 2004;291:1238–45.
2. Agency for Healthcare Research and Quality. Counseling to prevent tobacco use and tobacco-caused disease: recommendation statement. U.S.

- Preventive Services Task Force. AHRQ Pub. No. 04-0526. Rockville MD: Agency for Healthcare Research and Quality, 2003.
3. Eden KB, Orleans CT, Mulrow CD, Pender NJ, Teutsch SM. Does counseling by clinicians improve physical activity? A summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2002;137:208–15.
  4. McTigue KM, Harris R, Hemphill B, et al. Screening and interventions for obesity in adults: summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2003;139:933–49.
  5. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q* 2005;83:457–502.
  6. Goldstein MG, Whitlock EP, DePue J. Multiple behavioral risk factor interventions in primary care. Summary of research evidence. *Am J Prev Med* 2004;27(2S):61–79.
  7. Whitlock EP, Orleans CT, Pender N, Allan J. Evaluating primary care behavioral counseling interventions: an evidence-based approach. *Am J Prev Med* 2002;22:267–84.
  8. Ranney L, Melvin C, Lux L, McClain E, Morgan L, Lohr K. Tobacco use: prevention, cessation, and control. Evidence Report/Technology Assessment No. 140. Rockville MD: Prepared by the RTI International–University of North Carolina evidence-based practice center under Contract No. 290-02-0016, 2006.
  9. Fiore MC, Bailey WC, Cohen SJ. Treating tobacco use and dependence. Clinical practice guideline. Rockville MD: USDHHS, Public Health Service, 2000.
  10. Ockene JK, Adams A, Hurley TG, Wheeler EV, Hebert JR. Brief physician-and nurse practitioner-delivered counseling for high-risk drinkers: does it work? *Arch Intern Med* 1999;159:2198–205.
  11. Goldstein MG, DePue J, Nazura A, Niaura R. Models for provider-patient interaction: applications to health behavior change. In: Shumaker SA, Schron EB, Ockene JK, eds. *The handbook of health behavior change*. New York: Springer, 1998.
  12. Rosal MC, Ockene JK, Luckmann R, et al. Coronary heart disease multiple risk factor reduction: providers' perspectives. *Am J Prev Med* 2004;27(2S): 54–60.
  13. Coups EJ, Gaba A, Orleans CT. Physician screening for multiple behavioral health risk factors. *Am J Prev Med* 2004;27(2S):34–41.
  14. Rothemich SF, Woolf SH, Johnson RE, et al. Effect on cessation counseling of documenting smoking status as a routine vital sign: an ACORN study. *Ann Fam Med* 2008;6:60–8.
  15. Cummins SE, Bailey L, Campbell S, Koon-Kirby C, Zhu SH. Tobacco cessation quitlines in North America: a descriptive study. *Tob Control* 2007;16(1S):i9–15.
  16. Heshka S, Anderson JW, Atkinson RL, et al. Weight loss with self-help compared with a structured commercial program: a randomized trial. *JAMA* 2003;289:1792–8.
  17. Truby H, Baic S, deLooy A, et al. Randomised controlled trial of four commercial weight loss programmes in the UK: initial findings from the BBC "diet trials". *BMJ* 2006;332:1309–14.
  18. Dansinger ML, Gleason JA, Griffith JL, Selker HP, Schaefer EJ. Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *JAMA* 2005;293:43–53.
  19. Solberg LI, Brekke ML, Fazio CJ, et al. Lessons from experienced guideline implementers: attend to many factors and use multiple strategies. *Jt Comm J Qual Improv* 2000;26:171–88.
  20. Solberg LI, Asche SE, Boyle RG, Boucher JL, Pronk NP. Frequency of physician-directed assistance for smoking cessation in patients receiving cessation medications. *Arch Intern Med* 2005;165:656–60.
  21. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA* 2002;288:1775–9.
  22. Crabtree BF, Miller WL, Aita VA, Flocke SA, Stange KC. Primary care practice organization and preventive services delivery: a qualitative analysis. *J Fam Pract* 1998;46:403–9.
  23. Woolf SH, Glasgow RE, Krist A, et al. Putting it together: finding success in behavior change through integration of services. *Ann Fam Med* 2005;3(2S): S20–7.
  24. Ockene JK, Edgerton EA, Teutsch SM, et al. Integrating evidence-based clinical and community strategies to improve health. *Am J Prev Med* 2007;32:244–52.
  25. Riverside Health System. Riverside online: Riverside medical group. [www.riverside-online.com/physicians/](http://www.riverside-online.com/physicians/).
  26. Riverside Health System. Riverside online: Riverside wellness and fitness centers. [www.riverside-online.com/rwfc/](http://www.riverside-online.com/rwfc/).
  27. University of Kentucky Health & Wellness Program. BeHIP: overview. [www.uky.edu/HR/wellness/behipoverview.html](http://www.uky.edu/HR/wellness/behipoverview.html).
  28. Virginia Commonwealth University Department of Family Medicine. My healthy living. [www.myhealthyliving.net](http://www.myhealthyliving.net).
  29. Krist AH, Woolf SH, Rothemich SF, Johnson RE, Wilson DB. It takes a partnership: the value of collaboration in developing and promoting a Web site for primary care patients. *Ann Fam Med* 2005;3(2S):S47–9.
  30. Woolf SH, Krist AH, Johnson RE, Wilson DB, Rothemich SF, Norman GJ. A practice-sponsored website to help patients pursue healthy behaviors: an ACORN study. Proceedings of the 33rd Annual Meeting of the North American Primary Care Research Group; 2005 Oct 15–18; Quebec City, Quebec.
  31. Dillman D. *Mail and Internet surveys: the total design method*. 2nd ed. Hoboken NJ: John Wiley and Sons, Inc., 1999.
  32. Edwards P, Roberts I, Clarke M, et al. Increasing response rates to postal questionnaires: systematic review. *BMJ* 2002;324:1183.
  33. Cherry DK, Woodwell DA, Rechtsteiner EA. National ambulatory medical care survey: 2005 summary. *Adv Data* 2007:1–39.
  34. Pleis JR, Lethbridge-Cejku M. Summary health statistics for U.S. adults: National Health Interview Survey, 2005. *Vital Health Stat* 10 2006:1–153.
  35. Fine LJ, Philogene GS, Gramling R, Coups EJ, Sinha S. Prevalence of multiple chronic disease risk factors. 2001 National Health Interview Survey. *Am J Prev Med* 2004;27(2S):18–24.
  36. Behavioral Risk Factor Surveillance System. SMART: selected metropolitan/micropolitan area risk trends. 2006–Virginia Beach–Norfolk–Newport News, VA–NC metropolitan statistical area. Overweight and obesity (BMI): Weight classification by body mass index (BMI). [apps.nccd.cdc.gov/brfss-smart/MMSARiskChart.asp?yr=2006&MMSA=90&cat=OB&qkey=4409&grp=0](http://apps.nccd.cdc.gov/brfss-smart/MMSARiskChart.asp?yr=2006&MMSA=90&cat=OB&qkey=4409&grp=0).
  37. Behavioral Risk Factor Surveillance System. SMART: selected metropolitan/micropolitan area risk trends. 2006–Virginia Beach–Norfolk–Newport News, VA–NC metropolitan statistical area. Tobacco use: adults who are current smokers. [apps.nccd.cdc.gov/brfss-smart/MMSARiskChart.asp?yr=2006&MMSA=90&cat=TU&qkey=4396&grp=0](http://apps.nccd.cdc.gov/brfss-smart/MMSARiskChart.asp?yr=2006&MMSA=90&cat=TU&qkey=4396&grp=0).
  38. Behavioral Risk Factor Surveillance System. SMART: selected metropolitan/micropolitan area risk trends. 2006–Virginia Beach–Norfolk–Newport News, VA–NC metropolitan statistical area. Alcohol consumption: heavy drinkers (adult men having more than two drinks per day and adult women having more than one drink per day). [apps.nccd.cdc.gov/brfss-smart/MMSARiskChart.asp?yr=2006&MMSA=90&cat=AC&qkey=4413&grp=0](http://apps.nccd.cdc.gov/brfss-smart/MMSARiskChart.asp?yr=2006&MMSA=90&cat=AC&qkey=4413&grp=0).
  39. American Academy of Family Physicians. Table 3. Percentage of AAFP members by selected characteristics, January 1, 2007. [www.aafp.org/online/en/home/aboutus/specialty/facts/3.html](http://www.aafp.org/online/en/home/aboutus/specialty/facts/3.html).
  40. National Committee for Quality Assurance. The state of health care quality 2007. [www.ncqa.org/tabid/543/Default.aspx](http://www.ncqa.org/tabid/543/Default.aspx).
  41. Stange KC, Zyzanski SJ, Smith TF, et al. How valid are medical records and patient questionnaires for physician profiling and health services research? A comparison with direct observation of patients visits. *Med Care* 1998;36:851–67.
  42. Stead LF, Perera R, Lancaster T. Telephone counselling for smoking cessation. *Cochrane Database Syst Rev* 2006;3:CD002850.
  43. Stead LF, Lancaster T. Group behaviour therapy programmes for smoking cessation. *Cochrane Database Syst Rev* 2005;2:CD001007.
  44. McAfee TA. Quitlines a tool for research and dissemination of evidence-based cessation practices. *Am J Prev Med* 2007;33(6S):S357–67.
  45. Rock CL, Pakiz B, Flatt SW, Quintana EL. Randomized trial of a multifaceted commercial weight loss program. *Obesity (Silver Spring)* 2007;15: 939–49.
  46. Behavioral Risk Factor Surveillance System. Weight classification by Body Mass Index (BMI). 2006. [apps.nccd.cdc.gov/brfss/list.asp?cat=OB&yr=2006&qkey=4409&state=All](http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&yr=2006&qkey=4409&state=All).
  47. Harvey EL, Glenny A, Kirk SF, Summerbell CD. Improving health professionals' management and the organisation of care for overweight and obese people. *Cochrane Database Syst Rev* 2001;2:CD000984.
  48. Bentz CJ, Bayley KB, Bonin KE, Fleming L, Hollis JF, McAfee T. The feasibility of connecting physician offices to a state-level tobacco quit line. *Am J Prev Med* 2006;30:31–7.
  49. Unrod M, Smith M, Spring B, DePue J, Redd W, Winkel G. Randomized controlled trial of a computer-based, tailored intervention to increase smoking cessation counseling by primary care physicians. *J Gen Intern Med* 2007;22:478–84.
  50. Hazlehurst B, Sittig DF, Stevens VJ, et al. Natural language processing in the electronic medical record: assessing clinician adherence to tobacco treatment guidelines. *Am J Prev Med* 2005;29:434–9.
  51. Katz DA, Muehlenbruch DR, Brown RL, Fiore MC, Baker TB. Effectiveness of implementing the agency for healthcare research and quality smoking

- cessation clinical practice guideline: a randomized, controlled trial. *J Natl Cancer Inst* 2004;96:594–603.
52. Solberg LI, Davidson G, Alesci NL, Boyle RG, Magnan S. Physician smoking-cessation actions: are they dependent on insurance coverage or on patients? *Am J Prev Med* 2002;23:160–5.
53. Wadland WC, Holtrop JS, Weismantel D, Pathak PK, Fadel H, Powell J. Practice-based referrals to a tobacco cessation quit line: assessing the impact of comparative feedback vs general reminders. *Ann Fam Med* 2007;5:135–42.
54. Ellerbeck EF, Ahluwalia JS, Jolicoeur DG, Gladden J, Mosier MC. Direct observation of smoking cessation activities in primary care practice. *J Fam Pract* 2001;50:688–93.
55. Nawaz H, Adams ML, Katz DL. Weight loss counseling by health care providers. *Am J Public Health* 1999;89:764–7.
56. Jackson JE, Doescher MP, Saver BG, Hart LG. Trends in professional advice to lose weight among obese adults, 1994 to 2000. *J Gen Intern Med* 2005;20:814–8.
57. Galuska DA, Will JC, Serdula MK, Ford ES. Are health care professionals advising obese patients to lose weight? *JAMA* 1999;282:1576–8.
58. Abid A, Galuska D, Khan LK, Gillespie C, Ford ES, Serdula MK. Are healthcare professionals advising obese patients to lose weight? A trend analysis. *MedGenMed* 2005;7:10.
59. Podl TR, Goodwin MA, Kikano GE, Stange KC. Direct observation of exercise counseling in community family practice. *Am J Prev Med* 1999;17:207–10.
60. Shea S, DuMouchel W, Bahamonde L. A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. *J Am Med Inform Assoc* 1996;3:399–409.
61. Hunt DL, Haynes RB, Hanna SE, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review. *JAMA* 1998;280:1339–46.
62. Weingart SN, Toth M, Sands DZ, Aronson MD, Davis RB, Phillips RS. Physicians' decisions to override computerized drug alerts in primary care. *Arch Intern Med* 2003;163:2625–31.
63. Yarnall KS, Pollak KI, Ostbye T, Krause KM, Michener JL. Primary care: is there enough time for prevention? *Am J Public Health* 2003;93:635–41.
64. Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q* 1996;74:511–44.

**Did you know?**

You can stay updated on key articles with saved searches and table of content e-mail alerts.

Visit [www.ajpm-online.net](http://www.ajpm-online.net) today to see what else is new online!