Original Article

Use of the Vital Sign Stamp as a Systematic Screening Tool to Promote Smoking Cessation

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• *Objectives*: To examine the ability of a simple system-wide screening assessment tool, an expanded vital sign stamp, to increase rates of smoker identification, physician advice to quit smoking, and physician assistance in quitting and abstinence rates.

• *Participants and Methods*: This study is a pretest, posttest design in which 5 primary health care clinics were randomly assigned to either the intervention condition, which received the vital sign stamp, or the control condition. Participants (N=9439) were surveyed by using exit interviews at the 5 clinics, both before and after the vital sign intervention was implemented. Participants who were identified as smokers were then contacted 1 year later for follow-up. The study began in February 1995, and all follow-up visits were completed by December 1998.

• *Results*: Implementation of the vital sign stamp significantly increased the rates at which physicians asked participants about their smoking status (17.2% vs 7.5%). However, the rates of physicians advising smokers to quit, assisting them in quitting, and arranging follow-up either stayed constant or decreased. The number of quit attempts and abstinence rates also stayed constant.

• *Conclusion*: A simple system-wide screening assessment tool, while effective in identifying more tobacco users, did not increase the rates at which physicians advised or assisted smokers to quit. Further system-wide changes may be needed to ensure that effective tobacco-dependence treatments are given to smokers.

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NRT = nicotine replacement therapy; PHS = Public Health Service

Current estimates are that 46.5 million adults (23.3% of the US adult population) are current smokers.[1] The vast majority of these smokers are dependent on tobacco and therefore have a chronic disease as recently categorized by the Public Health Service (PHS).[2] Every year this chronic disease results in more than 400,000 smoking-attributable deaths, and direct smoking-attributable health care costs are as high as $50 billion.[3,4] Fortunately, approximately 70% of smokers report that they want to quit.[5]

The recent PHS guideline *Treating Tobacco Use and Dependence*[2] identifies numerous interventions that significantly improve smokers' chances of quitting. These interventions include brief physician advice to quit, pharmacotherapy, and intensive counseling strategies such as problem solving and skill training. More specifically, the PHS guideline recommends the "5 As" for intervention with tobacco users: *ask*, *advise*, *assess*, *assist*, and *arrange*. Clinicians should *ask* every patient at every visit if he or she uses tobacco, and the patient's tobacco use status should be recorded. Clinicians should provide all smokers with clear, strong, and personalized *advice* to quit. *Assess* involves assessing whether an individual is willing to attempt to quit smoking. For individuals who state that they are ready to quit or who are thinking about quitting, clinicians should *assist* them by using interventions found to be effective in the PHS guideline (eg, counseling, pharmacotherapy). Finally, clinicians should *arrange* follow-up to provide long-term support for individuals who try to quit.

Seven of 10 smokers visit a primary care physician each year.[6] Therefore, the primary care setting offers numerous opportunities for tobacco-dependence treatment. Certain factors make the health care setting appropriate for tobacco intervention, eg, the credibility of the physician as a health care advisor, the opportunity to link tobacco use with symptoms and disease risk, and the ability to integrate both over-the-counter and prescription pharmacotherapies into a cessation attempt. In addition, smokers appear to appreciate clinic-based smoking interventions. A recent study found that smokers whose physicians addressed the issue

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of smoking (ie, the physician asked about tobacco use or provided cessation advice) reported higher satisfaction with physician help.[7]

Although ample reasons exist for smokers to initiate or plan cessation attempts in the primary care setting, early research suggested that this was occurring relatively infrequently. A study in California showed that fewer than half of the current smokers surveyed reported that their physician had advised them to quit, and only 3.6% of the former smokers surveyed reported that their physicians had helped them quit.[8] An earlier study reported that only 44% of smokers had ever been advised by a physician to quit smoking, and individuals with other cardiovascular risk factors, such as obesity or hypertension, were no more likely to be advised to quit than were smokers who did not have these risk factors.[9] A national survey in 1991 revealed that only 37.2% of the 51 million smokers reported receiving advice from a health care professional to quit smoking.[5] This lack of use of the clinic setting for tobacco cessation may have occurred for various reasons: clinicians' reluctance or inability to identify tobacco users, clinicians' inability or reluctance to intervene with tobacco users (eg, due to temporal constraints, lack of training), etc. However, more recent data from the Centers for Disease Control and Prevention[10] suggest that some progress has been made in increasing identification rates, especially among elderly smokers.

Various changes in health care delivery systems have been suggested to surmount the barriers to effective clinic-based tobacco intervention. One such proposed change is the incorporation of tobacco use as one of the vital signs to be collected at every health care visit.[11] Studies[12-14] have shown that implementing a system-wide prompt, such as a vital sign stamp that includes smoking status, increases rates at which clinicians ask patients about their smoking and advise them to quit. However, there is little evidence that a systems intervention that increases the identification of tobacco users (ie, asking) results in physicians continuing the intervention sequence and advising, assessing, assisting, and arranging follow-up for smokers. This study examines the impact of the vital sign stamp on 4 of the 5 As: asking patients if they smoke, advising smokers to quit, assisting them in quitting, and arranging follow-up for smokers who have quit.

This study investigates 3 hypotheses. First, the expanded vital sign assessment tool will result in increased smoker identification, replicating previous results. Second, using the expanded vital signs will increase the rate at which physicians advise, assist, and arrange follow-up. Finally, the expanded vital signs will not only boost delivery of smoking interventions (eg, asking, advising, assisting, arranging) but will also increase patients' long-term abstinence from tobacco.

PARTICIPANTS AND METHODS

Between February 1995 and December 1998, 9439 adults from Dane County, Wisconsin, participated in this study. Participants were approached as they exited 1 of 5 selected health care clinics in Madison. Any adults willing to participate were included. This resulted in a sample of 1611 participants who were current smokers, were older than 18 years, attended only 1 health care clinic, and gave informed consent to participate in the study. General demographic information is provided in Table 1.

Clinics

Five Madison outpatient health care clinics were selected to be part of the study. Initially, 6 clinics were chosen; however, 1 clinic was dropped from the study when it independently implemented a vital sign stamp into its visit protocol. Four of the clinics (A, B, C, and D) were part of 1 health maintenance organization in central Wisconsin, and 1 clinic (E) was a satellite of the University of Wisconsin clinics system. Of note, clinic E is located in an ethnically diverse neighborhood and therefore serves a higher proportion of nonwhite patients. This higher proportion of nonwhite participants may have affected some outcomes.

Design

Baseline Phase.—During the baseline phase of the study, all clinics provided usual care without the vital sign stamp to remind clinicians to ask about smoking status. On exiting the clinic, participants were asked by a research assistant to answer a small number of questions (initial contact questionnaire), and informed consent was obtained from participants who smoked so that they could be contacted at 1 year to provide follow-up information (follow-up questionnaire). Initial contact questions included tobacco-related items such as whether the physician had asked the participant about cigarette smoking status, if the participant currently smoked cigarettes, if the participant planned to quit in the next 12 months, as well as demographic information such as sex, race, highest grade of education completed, and date of birth. At this point, current smokers also provided contact information so that they could be reached a year later for a follow-up telephone call. Follow-up questions focused exclusively on tobacco-related issues such as the mean number of cigarettes smoked per day, whether the participant had made a serious quit attempt within the past year, and whether the participant had smoked in the past 7 days. Because of the sample size and financial constraints of this study, there was no biochemical confirmation of abstinence.

Intervention Phase.—In the intervention phase, each clinic was randomly assigned to either the vital sign intervention condition (clinics A, B, and C) or the control

Table 1. **Demographics of Study Participants*†**

	Intervention			Control	
	Clinic A (n=1917)	Clinic B (n=2094)	Clinic C (n=1571)	Clinic D (n=2691)	Clinic E (n=1166)
Smoking status					
Ever	61.3	50.5	63.0	56.4	59.7
Current	18.9	26.1	44.8	20.9	49.7
Female	58.6	73.0	54.3	53.9	66.2
	60.8	*65.2*	*54.4*	*55.3*	*71.1*
Race					
White	96.9	95.8	91.6	95.2	69.1
	93.7	*94.7*	*89.4*	*88.6*	*56.5*
African American	1.4	1.6	5.5	3.0	23.1
	4.5	*3.4*	*8.0*	*9.1*	*37.0*
Asian	0.5	0.7	0.4	0.5	2.9
	0.4	*0.4*	*0.0*	*0.0*	*0.9*
American Indian	0.2	0.2	0.0	0.1	0.5
	0.4	*0.0*	*0.0*	*0.0*	*1.2*
Hispanic	0.6	0.8	1.6	0.9	3.3
	0.0	*0.4*	*1.6*	*1.9*	*3.0*
Other	0.3	0.8	0.9	0.4	1.1
	0.9	*1.1*	*0.9*	*0.3*	*1.5*
Education					
Less than high school	11.1	4.2	8.2	5.1	12.2
	12.9	*7.3*	*10.6*	*6.0*	*20.6*
Graduated high school	44.0	26.3	43.1	33.8	30.0
	52.5	*38.8*	*51.1*	*45.9*	*44.1*
Some college	23.4	24.2	26.7	23.9	25.7
	22.6	*30.0*	*26.5*	*27.4*	*27.4*
College degree	21.5	45.2	22.0	37.3	32.1
	12.0	*23.8*	*11.7*	*20.8*	*7.9*
Mean age (SD) (y)	61.25	41.34	43.74	52.27	39.33
	(16.26)	(15.46)	(15.82)	(15.57)	(13.31)
	52.25	*37.50*	*38.93*	*46.22*	*37.15*
	(15.49)	*(12.85)*	*(12.58)*	*(14.41)*	*(11.81)*
No. of cigarettes smoked per day, mean (SD)	16.4 (10.9)	13.9 (11.3)	15.9 (10.0)	15.3 (9.5)	14.5 (11.1)

*Values are percentages.
†Statistics for current smokers are italicized.

condition (clinics D and E). The clinics assigned to the vital sign condition used progress notepages stamped with the expanded vital signs that included smoking status, blood pressure, temperature, and pulse and respiratory rate (Figure 1). Staff members at the intervention clinics who usually take vital signs (eg, medical assistants and nurses) received in-service training on how to assess and document smoking status (eg, currently smoking, smoked in the past, or never smoked) as a part of the regular collection of vital signs. The control clinics continued to use the standard vital signs that did not include smoking status, and the staff at these clinics received no in-service training. Data collection procedures were the same for both the intervention phase and the baseline phase. Those who participated in the baseline phase were also eligible to participate in the intervention phase.

RESULTS

To analyze the data regarding physician behavior, we conducted both descriptive and inferential analyses, with patient report serving as the basis for inference regarding physician behavior. For the descriptive analyses, we calculated the proportion of participants who reported that their physician had asked about smoking, advised them to quit, provided assistance in quitting, and arranged follow-up during the baseline and intervention phases. We also used these data to examine rates of quit attempts and cessation rates.

To perform inferential statistical analyses on preintervention vs postintervention change, the data set had to be modified so that the data included exit reports only from participants who had seen an "analyzable physician," defined as a physician who had had at least 10 patients interviewed during *both* the baseline and the intervention phase. Although approximately 130 physicians saw patients at both the vital signs clinics and the control clinics, there were only 18 analyzable physicians at the vital signs clinics and 28 analyzable physicians at the control clinics. Of the analyzable physicians, 8 worked at clinic

A, 6 at clinic B, 4 at clinic C, 11 at clinic D, and 17 at clinic E. Thus, while more patients were actually seen at vital signs clinics, there were fewer analyzable physicians at these clinics. To determine whether there had been a statistically significant change in physician behavior, we calculated a change score for each physician for each dependent variable and compared data from physicians who worked in vital signs clinics with data from physicians who worked in control clinics.

The first hypothesis was that implementation of the vital sign stamp would increase the rates of smoker identification. Examination of the proportion of all participants asked by any clinic staff person (eg, physician, nurse, medical assistant) about smoking both before and after the experimental manipulation of the vital sign stamp revealed overall increases of 9.6% and 30.9% in the control and intervention clinics, respectively (Table 2). The percentage of participants who were asked by their physician if they smoked (vs other clinic staff) increased from 24.0% to 41.2% in the vital signs clinics and from 27.1% to 34.6% in control clinics (Table 2). The results of the independent samples t test, using the restricted data set from physicians who had seen at least 10 participants during both the baseline and the intervention phase (analyzable physicians), revealed that the mean increase in asking behavior of physicians at the vital signs clinics (mean, 13.76; SD, 7.50) was statistically significantly greater than that of physicians at control clinics (mean, 2.89; SD, 12.90; t_{44}= –3.61; P=.002).

The second hypothesis was that the expanded vital signs would increase the rates at which physicians advised identified smokers to quit. Using the complete data set, results showed that identified smokers were actually less likely to report being advised by their physician to quit during the postintervention period compared with the preintervention period. This reduction in rates of advising identified smokers to quit was evident for 4 of the 5 clinics, with the fifth clinic having essentially no change (Table 3). Using the restricted data set, we found no statistical difference between the control and intervention clinics in the decline of physicians advising identified smokers to quit (t_{44}=0.33; P=.74). Overall, 58.7% of physicians who had seen at least 10 patients during both the baseline and the intervention phase decreased their rates of advising smokers to quit between the baseline survey and the intervention survey.

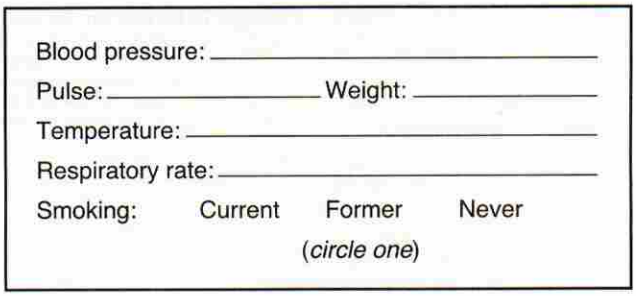

Figure 1. Vital sign stamp.

Results from the full data set also showed an overall decrease over time in both the control and the intervention clinic in the percentage of smokers who received assistance in quitting (help in setting a quit date, prescription for nicotine replacement therapy [NRT]) and in the percentage of smokers who scheduled follow-up visits to address smoking cessation (Table 3). These trends also occurred when data were restricted to identified smokers (data not shown).

The final hypothesis was that identified smokers would be more likely to quit. Follow-up data revealed that approximately half of the identified smokers reported making a serious quit attempt within the past year during both the baseline and the intervention phase (Table 4). Similarly, there was little change in self-reported rates of point-prevalence abstinence (ie, complete abstinence during the previous 7 days) from the baseline phase to the intervention phase in either experimental condition (Table 5). Statistical analysis using the restricted data set revealed no statistically significant difference between the 2 experimental groups in the change in point-prevalence abstinence from

Table 2. **Percentage of Participants Who Were Asked About Smoking**

	Intervention				Control		
	Clinic A	Clinic B	Clinic C	Overall	Clinic D	Clinic E	Overall
At baseline							
By any staff	24.6	24.7	29.7	25.9	22.5	47.6	32.0
By physician	23.1	21.8	28.9	24.0	19.9	38.8	27.1
At intervention							
By any staff	59.1	47.3	65.6	56.8	37.0	55.4	41.6
By physician	41.9	33.7	49.3	41.2	31.9	43.0	34.6
Change							
Any staff	34.5	22.6	35.9	30.9	14.5	7.8	9.6
Physician	18.8	11.9	20.4	17.2	12.0	4.2	7.5

Table 3. **Changes in Physician Advice, Assistance, and Arranging Follow-up Visit***

	Intervention				Control		
	Clinic A	Clinic B	Clinic C	Overall	Clinic D	Clinic E	Overall
Identified smokers advised by a physician to quit							
At baseline	73.9	38.9	66.3	60.0	70.2	50.5	56.9
At intervention	33.8	12.8	48.9	37.1	69.6	32.3	52.1
Change	–40.1	–26.1	–17.4	–22.9	–0.6	–18.2	–4.8
Current smokers given help by a physician to set a quit date							
At baseline	5.9	4.4	3.6	4.4	11.1	4.8	6.8
At intervention	1.0	1.6	1.7	1.5	1.9	3.1	2.4
Change	–4.9	–2.8	–1.9	–2.9	–9.2	–1.7	–4.4
Current smokers prescribed NRT by a physician							
At baseline	18.6	4.4	5.7	8.5	19.4	4.8	9.3
At intervention	1.9	1.6	2.1	1.9	3.4	3.1	3.3
Change	–16.7	–2.8	–3.6	–6.6	–16.0	–1.7	–6.0
Current smokers whose physician arranged follow-up							
At baseline	9.0	3.5	3.6	4.9	18.1	4.8	8.9
At intervention	0.0	0.8	0.9	0.6	1.9	3.1	2.4
Change	–9.0	–2.7	–2.7	–4.3	–16.2	–1.7	–6.5

*Values are percentages. NRT = nicotine replacement therapy.

the baseline to the intervention phase (t_{42}=1.12; P=.27). Furthermore, χ^2 analyses showed that abstinence was independent of being asked about smoking, receiving advice to quit, being prescribed NRT, and having a follow-up appointment (data not shown).

DISCUSSION

Although the vital sign stamp did increase the rates at which smokers were identified, it did not appear to promote further tobacco intervention efforts or subsequent successful quitting. Thus, the expanded vital signs changed behavior but only the specific behavior it targeted—asking about smoking. In this study, the vital sign stamp did not increase the rates at which physicians advised smokers to quit, offered assistance in quitting, or arranged follow-up. In fact, the descriptive data suggest that clinicians, irrespective of experimental group status, became less likely over time to advise smokers to quit and provide assistance. This trend is disturbing given the fact that the 2000 PHS guideline meta-analysis has shown that brief (<3 minutes) physician advice significantly increases the likelihood that a smoker will quit.[2]

These results contrast those of other studies and the PHS guideline that have shown that a system-wide prompt, such as the vital sign stamp, increases rates at which physicians advise smokers to quit.[15-18] However, it is important to note that, although the vital sign assessment tool did significantly increase the rates of physicians asking about smoking, the rates of smoker identification were not higher than 66%. This suggests that even with this assessment tool physicians were identifying only two thirds of the smokers. This finding contrasts that in other studies with identification rates of approximately 80% or greater.[15,18,19] This suggests that participating clinics were somewhat atypical. However, the results of our study are similar to studies that have shown that chart-based reminders do not affect smoking cessation counseling practices of residents and that chart prompting failed to maintain behavior change over time.[20,21]

This pattern of results—stable or decreasing rates of advising, assisting, and arranging follow-up—may reflect an important deficit in physician training. Studies have shown that, for systematic interventions such as chart reminders to be effective, physician training is an important component.[15,17] Our study provided training only to the clinic staff responsible for taking vital signs (eg, medical assistants, nurses). We provided no training to physicians on how to treat tobacco dependence effectively. As with practically everything in medicine, it appears that a simple system-wide intervention like the vital sign stamp is effective in improving treatment only if clinicians know how to treat the condition that has been identified.

Although training physicians in tobacco-dependence treatment may increase the rate of physician intervention,[20] it appears that providing other system-wide interventions to facilitate treatment of tobacco dependence is important. In addition to lack of training, physicians cite general systems barriers to providing smoking cessation treatment, including lack of time and lack of support.[22,23] Physicians

Table 4. **Percentage of Identified Smokers Who Made a Serious Quit Attempt**

	Intervention				Control		
	Clinic A	Clinic B	Clinic C	Overall	Clinic D	Clinic E	Overall
At baseline	55.3	45.2	58.8	54.1	45.7	56.7	52.6
At intervention	44.9	53.1	51.7	50.4	52.1	56.9	54.1
Change	–10.4	7.9	–7.1	–3.7	6.4	0.2	1.5

might be more likely to engage in tobacco-dependence treatment if time were provided for such treatment, possibly through a change in physician reimbursement policies.

Other system changes that may improve the delivery of tobacco-dependence treatment include improved smoking cessation health care benefits.[15] Individual and team feedback after chart reviews has also been shown to increase rates of advice, assisting in quitting, and arranging follow-up.[13] Studies have shown that computer-reminder systems are effective in improving preventive medical care in both inpatient and outpatient settings.[24,25] Finally, incorporation of a specific smoking cessation clinician into a clinic staff who is available for referrals might improve the rates that physicians intervene with smokers.

It is becoming more evident that 1 system-level change is insufficient to capitalize on the accessibility and efficacy of physicians to treat tobacco dependence—more comprehensive systems interventions are needed. Given the extant data, it is possible that incorporating the effective treatments recommended in the PHS guideline into a computerized reminder system, training clinicians to provide treatments such as the 5 As, using report card assessments and providing feedback, allowing physicians the time and the ability to receive reimbursement for these services, and providing expert clinicians available for referrals might facilitate efficient delivery of effective clinical intervention with smokers.

Secular changes may have played a role in this lack of behavior change among physicians. For instance, greater pressure on clinicians' time in managed care settings may have discouraged intervention in both vital signs and control clinics, or availability of over-the-counter NRT products may have discouraged physicians from intervening more aggressively with smokers.

In addition to the lack of improvement in the rates of advising and assisting, this study also revealed a lack of effect of advice to quit, prescriptions for NRT, and follow-up appointments. In other words, these interventions did not produce increased rates of abstinence. These findings contradict those of the PHS guideline. The lack of effect of advice to quit may be due to several different factors. It may have been influenced by the lack of clinician training on how to provide clear, personalized advice to quit or it may have been that clinicians were more likely to intervene with smokers who were more dependent and/or heavier smokers or those who were at greater risk for smoking-related disease. As such, it is possible that the smokers who were receiving the best interventions were the smokers who had the least likelihood of being able to maintain abstinence. However, this supposition is speculative because we did not assess dependence level in this study. Finally, this study did not assess patient compliance with tobacco-dependence treatment; thus, a lack of patient follow-through in obtaining and using NRT and/or a lack of follow-through with follow-up appointments may have also influenced the outcome.

This study had several limitations. First, it was conducted in Madison, which has a population that does not adequately represent the ethnic and socioeconomic diversity of smokers in general. Second, this study did not assess aspects of physician behavior that would account for the low levels of physician intervention, eg, this study did not elicit information on bupropion prescriptions per se. Third, only 5 clinics were surveyed, and there appeared to be considerable variability among these clinics, even among the clinics in each experimental condition. Clinic atmosphere and culture, which were not assessed, might have

Table 5. **Percentage of Identified Smokers Who Were Abstinent at 1-Year Follow-up (Self-Report)***

	Intervention				Control		
	Clinic A	Clinic B	Clinic C	Overall	Clinic D	Clinic E	Overall
At baseline	11.6	19.6	16.2	15.9	14.6	11.5	12.7
At intervention	12.7	15.6	9.7	11.8	11.6	16.4	13.6
Change	1.1	–4.0	–6.5	–4.1	–3.0	4.9	0.9

*Abstinence equals 7-day point-prevalent abstinence.

played an important role in the treatment of tobacco dependence. Finally, there was no tracking of patients and little information obtained regarding the clinic visit itself (eg, purpose, length), which prevented us from analyzing certain factors that may have influenced outcomes. For example, we did not determine when the same patient participated in both the baseline and the intervention phase of the study. Thus, we were unable to determine whether a physician responded to a particular patient differently the first time vs the second or third time. It is possible that intervention rates declined from the baseline to intervention phase in some clinics because physicians were reluctant to intervene repeatedly with the same patient. However, although such information would have allowed us to examine additional questions, this limitation does not detract from the overall finding that, despite use of a systematic screening tool to identify smokers, physicians were not consistently intervening with smokers.

CONCLUSION

The data point to an important although disturbing trend that a simple system-wide intervention is sufficient to change only the behavior it targets. The current intervention targeted asking about smoking, and it effectively increased rates at which participants were asked about their smoking. However, the vital sign stamp intervention was insufficient to instigate treatment of a chronic disease as complex as tobacco dependence. Given that the PHS guideline and other recent studies have shown that there are effective ways to treat tobacco dependence, these interventions need to be provided to smokers. The question remains, How can we ensure that smokers are provided with effective counseling and pharmacotherapy?

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