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Original Investigation

Short-, intermediate-, and long-term outcomes of Pennsylvania's continuum of tobacco education pilot project

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Abstract

Introduction: The most effective time to introduce formal tobacco use treatment training for physicians is during the medical school experience. However, few medical schools have adopted standardized curricula, missing an important opportunity to influence future physician behavior. The Pennsylvania Continuum of Tobacco Education pilot project was undertaken from spring 2003 through summer 2005 to evaluate a generalizable method of improving students' knowledge, attitudes, and behaviors related to tobacco use treatment.

Methods: Intervention methods included a 1-day intensive multiformat seminar, followed by a reinforcement session 4 weeks later, within an internal medicine clerkship. Outcome measures included changes in students' attitudes, rates of "ask" and "advise" behaviors during clinical encounters, and performance on end-of-year clinical skills examinations.

Results: Short, intermediate, and long-term outcomes related to both smoking assessment and counseling improved as a result of the intervention. The percentage of students who obtained tobacco histories and counseled patients in clerkships increased following the seminar compared with the baseline. Nearly, all students demonstrated relevant skills during a clinical skills assessment at the end of the third year.

Discussion: The introduction of a standardized tobacco curriculum into medical school training is both feasible and effective. Results were sustained following the intervention, and the effects were reflected across several valid outcomes.

Introduction

The U.S. Department of Health and Human Services has published comprehensive clinical practice guidelines, establishing the technical standards for the treatment of tobacco use (Fiore et al., 2000). The guidelines recommend that every patient who uses tobacco be appropriately identified and offered treatment. Given that physicians generally have not been viewed as proactive in providing these services (Anda, Remington, Sienko, & Davis, 1987; Frank, Winkleby, Altman, Rockhill, & Fortmann, 1991; Thorndike, Rigotti, Stafford, & Singer, 1998; U.S. Department of Health and Human Services, 1993), the guidelines also attempt to change clinical culture and entrenched tobacco use treatment practice. As early as 1989, evidence indicated that the most effective time to introduce formal tobacco use treatment training was during the medical school experience (Cummings et al., 1989). Unfortunately, a decade later, only a minority of schools reported substantial resources dedicated to clinical smoking cessation instruction within the 4-year curriculum (Ferry, Grissino, & Runfola, 1999). Though increasing attention is being given to this important training goal, the most appropriate methods for delivering this information and for evaluating the impact on clinical behavior have yet to be settled (Geller et al., 2005).

In 1994, the National Cancer Institute convened an expert panel charged with assessing the evidence regarding tobacco treatment in undergraduate medical education. Their report suggested several important considerations for maximizing the impact of undergraduate training on tobacco use treatment. Important recommendations included the notion that tobacco curricula should be based on current evidence, should

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be sufficiently flexible to meet a school's idiosyncratic needs, and should be evaluated to measure the effectiveness of the intervention (Fiore, Epps, & Manley, 1994).

Following its participation in the Master Settlement Agreement, the Commonwealth of Pennsylvania developed a strategic vision for comprehensive tobacco control, based in large part on the *Centers for Disease Control and Prevention Best Practices for Comprehensive Tobacco Control Programs* recommendations for fully integrated policies (U.S. Department of Health and Human Services, 1999). An organized effort to improve provider participation in tobacco treatment initially focused on improving the level of training that physicians and trainees receive within the state. The explicit goals of the Continuum of Tobacco Education project were to (a) create a curriculum model that would allow sufficient flexibility in application, (b) create a research framework within which educational hypotheses could be tested properly, and (c) engage three medical schools from geographically diverse areas of the state to pilot the project. A leadership working group of key faculty, with expertise in tobacco treatment, curriculum design, or educational outcome measurement, devised the implementation plan and facilitated integration into the pilot schools.

Development of educational interventions was site specific and confined by existing curriculum structure. Prior to implementation, each school's proposed strategy was evaluated for its capacity to (a) demonstrate direct relevance to tobacco use treatment, (b) provide sufficient opportunity for clinical instruction, (c) provide sufficient opportunity for self-reflection, (d) facilitate formal program evaluation, (e) be equivalently experienced by the entire class, (f) enjoy sufficient faculty support, and (g) minimize disruption to existing instructional methods. Jefferson Medical College selected an implementation strategy that involved a compressed educational exposure within the internal medicine clerkship of junior year. We report the short-, intermediate-, and long-term outcomes of this intensive tobacco training intervention, which used a single point-of-contact strategy for instruction.

Methods

Research was conducted within established educational settings, involved normal educational practices, and was intended to evaluate the effectiveness of instructional techniques. As such, the project received a waiver of the informed consent requirement by the institutional review board of the Thomas Jefferson University. Confidentiality of subject data was ensured by first linking data from various sources and then removing identifiers prior to making the data available for analysis.

Educational intervention

Third-year medical students participated in a 5-hr seminar devoted exclusively to the diagnosis and treatment of tobacco dependence during their required internal medicine clerkship. The didactic portion of the training focused on developing the students' tobacco-related knowledge and attitudes. Knowledge objectives included developing an understanding of the neurophysiological impact of nicotine and its resulting behavioral manifestations, the need for tobacco use assessment beyond simple pack-years, and the content necessary to recommend and discuss available cessation resources. Faculty addressed students' tobacco-related attitudes by exploring myths and misconceptions surrounding tobacco use and redefining tobacco dependence as a chronic disease requiring appropriate attention and empathy. Fallacies potentially interfering with the provision of care, such as "Smokers have to want to quit smoking before I can help" or "I can make them quit by threatening to stop care," were challenged to expunge any counterproductive attitudes. Effective behavioral counseling techniques based on U.S. Public Health Service guidelines, such as practical counseling, intratreatment social support, and extratreatment social support, were introduced. In addition to this counseling content, the theoretical bases of cognitive behavioral therapy and motivational interviewing were explored briefly.

The students were given a unique opportunity to integrate their newly developed knowledge, skills, and attitudes by interviewing standardized patients. A cadre of nine standardized patients was trained specifically to help students develop empathy and respect while treating nicotine-addicted patients. All standardized patients were trained on four case scenarios, specifically the care of the willing patient, the care of the reluctant patient, the care of the patient following relapse, and the care of the hospitalized smoker. Their training consisted of a general review of the complexity of nicotine addiction, followed by a thorough analysis of each case, including pertinent teaching points and scripts. Standardized patients practiced each case and were critiqued by the project director and manager. After each student interview, the standardized patient provided the student with constructive feedback based on checklists developed to identify the aspects of the encounter that were performed correctly. Aspects related to history taking and the ability to assist the smoker included a demonstrated attempt to assess past quit attempts, an ability to answer questions regarding nicotine replacement therapy side effects, and a demonstrated ability to provide both intra- and extratreatment social support. Items related to nonverbal communication skills also were included, such as the ability to create a supportive atmosphere and the demonstrated ability to remain nonjudgmental. Dichotomous checklist items were scored yes–no, whereas qualitative items were scored on a 5-point Likert scale. The checklist was developed as a guide for instructional feedback; consequently, results did not affect the medicine clerkship grade. Summary descriptions of standardized patient cases, training materials, and checklists, as well as links to the material, are available at http://services.aamc.org/jsp/mededportal/.

Outcome measures

Three indicators were used to measure the impact of the project. Given that preexisting beliefs regarding tobacco use can influence physicians' behavior, we decided that it would be important to gauge changes in students' attitudes as a short-term indicator of the effectiveness of the program (Chung, Lam, & Cherkin, 2003; Meridith, Yano, Hickey, & Sherman, 2005; Spangler, George, Foley, & Crandall, 2002). We combined 55 previously validated items drawn from both published and unpublished sources into a single instrument, the Confidential Tobacco Survey (Chung et al., 2003; L. Kanzleiter, S. Evers-Casey, & F. Leone, unpublished data). A subset of 50 items was presented with instructions to respond on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The remaining five items were presented in a multiple-choice format with five

appropriate options for each item. The survey was administered to the students at the beginning of each session and again 1 month later during an integration session during which students discussed their tobacco-related clinical experiences.

As an intermediate measure of program effectiveness, we monitored the change in the rate of students' self-reported key behaviors over time. Students at Jefferson Medical College routinely use a computerized Patient Encounter Log System (PELS) to record data about their encounters with patients during their third- and fourth-year clinical clerkships (Rattner et al., 2001). The PELS was modified before the initiation of the study to include three items reflecting key behaviors derived from tobacco treatment guidelines. A touch screen checklist labeled "History Information" was modified to include a checkbox for "smoking status obtained" (the "ask" behavior), and the "Counseling Details" screen was modified to include checkboxes for "smoking cessation counseling" and "prevention of tobacco use" (the "advise" behavior). PELS modifications were reviewed by the Curriculum Committee and assessed for responsiveness to change across time, clerkship, and institution (Evers-Casey, Veloski, Patkar, & Leone, 2005). Measurements were standardized relative to the point at which the student participated in the educational intervention. In this way, each student served as his or her own control, minimizing the effect of the inherent performance improvements expected from progression through general medical training.

Clinical skill assessments using standardized patients are widely accepted as an important long-term measure of educational outcomes (Burdick et al., 1996; Cerilli, Merrick, & Staren, 2001; Rose & Wilkerson, 2001). Students at Jefferson must pass a comprehensive examination of their clinical skills at the end of the third year of the curriculum. Examination cases were prepared by faculty to measure students' overall data gathering, communication, and interpersonal skills. Case details and evaluation checklists were modified to capture the performance related to ask, advise, and assist indicators (Fiore et al., 2000). For example, a case that revolved around oral contraception was modified to include a history of smoking and five checklist items related to tobacco use assessment and counseling. To eliminate cueing, none of the cases were designed to address tobacco use as the principal patient problem. The standardized patients used for the examination were selected and trained independently of those used for the educational intervention.

Data analyses

Responses to each item on the Confidential Tobacco Survey were transformed to a 5-point score scale, with higher values corresponding to positive attitudes, and subjected to item analysis procedures and factor analysis using principal components analysis followed by varimax rotation. We identified factors with eigenvalues greater than 1 and calculated alpha reliability coefficients. We computed subtest scores for each student on each of these factors by calculating the mean of the transformed scores for the items on that factor and by standardizing the mean scores across students for each factor to a mean of 50 and *SD* of 10. We compared mean standard scores for each factor at baseline to the mean at follow-up using paired *t* tests.

We examined the PELS data for encounters with adult and adolescent patients reported by students during the two academic years and identified the subset of encounters within which students reported any history taking or counseling activity. This denominator enabled us to calculate each student's rate of tobacco-specific histories and counseling during each month before, during, and after the medicine clerkship.

Mean tobacco history and counseling rates were compared between groups using chi-square tests and *z* tests for proportions. Pre- and postscores on the Confidential Tobacco Survey were compared using paired *t* tests. Differences with two-tailed Type I error rates below 0.05 were considered statistically significant.

Results

The program was administered to 448 third-year students between August 2003 and June 2005. Baseline surveys were completed by 420 (94%) and follow-up surveys by 384 (86%) students. A total of 414 students (92%) reported data on their patient encounters, and all the 448 students participated in the comprehensive assessment of clinical skills at the end of the third year of medical school.

Survey of knowledge, beliefs, and attitudes

Factor analysis of the Confidential Tobacco Survey responses in the first year of the project yielded five independent factors with eigenvalues greater than 1, which accounted for 75% of the total variance. The first and largest factor (eigenvalue = 7.3, 37% of variance) included six items related to students' self-assessment of knowledge and skills related to tobacco cessation (e.g., "I am comfortable prescribing medications that help in cessation"). Other factors were related to students' perceptions regarding tobacco advertising, the utility of nicotine replacement therapy, prospects for counseling patients in an ambulatory setting, and their level of frustration with smokers who choose not to quit.

Table 1 summarizes the changes in standard scores on the five factors between baseline and the 1-month follow-up assessment at the end of the medicine clerkship. The largest changes were observed in the factors related to students' self-assessment of their skills and their understanding of nicotine replacement therapy. We found a significant change in their beliefs about counseling in ambulatory settings and no statistically significant change in advertising or frustration factor scores.

Patient experiences in clerkships

Students reported data for 85,728 encounters with adult and adolescent patients during the study period, of which 62,418 included a clinical history. Of the encounters with a clinical history, 37,023 (59%) included documentation that a smoking history was obtained. The highest rate of collecting the smoking history (86%) was seen during the medicine clerkship (Table 2). The lowest rates were reported in pediatrics (29%) and surgery (25%). PELS remained responsive across time, rotation type, and location, reflecting anticipated differences between primary versus tertiary care, community versus university settings, and pre- versus posttraining (Evers-Casey et al., 2005).

When the rates of obtaining a smoking history were calculated in relation to the number of months before and after the intervention month, we observed a dramatic change in students'

Table 1. Change in mean attitude scores within each of five subtests identified through factor analysis, pre- versus postintervention

	Baseline		Clerkship end			
Subscale	*M*	*SD*	*M*	*SD*	*t* score	*p* value
Self-assessment of cessation skills (six items, alpha = .93)	47.1	7.2	57.5	5.9	15.7	<.001
Attitudes toward tobacco advertising (two items, alpha = .66)	49.2	14.8	50.9	14.1	1.2	*ns*
Nicotine replacement therapy (three items, alpha = .75)	49.2	6.2	60.8	5.4	19.8	<.001
Counseling in ambulatory settings (four items, alpha = .74)	49.4	10.1	55.0	9.2	5.7	<.001
Frustration with unwilling patients (two items, alpha = .60)	41.4	10.1	43.4	9.8	2.0	*ns*

Note. Scores are reported on a scale with an overall mean of 50 and an *SD* of 10 for the five subtests. Positive changes reflect a desirable effect on attitude.

behavior during the clerkship and a sustained increase in the rate of obtaining a smoking history compared with the baseline rate (Figure 1). The baseline rate at which students obtained a tobacco history was 52% in the months preceding the intervention. As expected, the tobacco history rate appeared to rise dramatically during the intervention month to more than 85% ($p < .001$). Rates remained elevated for an additional 2 months but declined to a new plateau (average = 59.3%) beginning in the third month after the intervention month. The observed postintervention rates remained statistically significantly higher than the baseline rate for the remainder of the observation period ($p < .001$). At the observed pace of encounters, the intervention produced a clinically significant increase in the targeted "ask" behavior of 4,653 instances over the course of the two academic years ($p < .001$).

The intervention also was associated with a significant effect on the "advise" counseling behavior. Because students were instructed to report all types of clinical encounters, including those during which health maintenance counseling might have been inappropriate or impossible, only a small subset of encounters included self-reported data referable to any counseling behavior at all. A total of 30,224 entries included any data entered on any counseling-related PELS screen; this was considered the subsample within which tobacco counseling was possible. The rate of counseling in the medicine clerkship was high compared with most other clerkships, but overall rates remained low. The highest rate of tobacco counseling was observed during the pediatric clerkship, whereas the lowest rates were observed during surgery and psychiatry ($p < .001$; see Table 2).

The baseline rate at which students counseled patients regarding tobacco use was 14% during the months preceding the

Table 2. Number and percentage of patient encounters that included a tobacco history or counseling.

	Tobacco history		Counseled	
Rotation	Number	%	Number	%
Family medicine	13,275	56.7	1,862	14.4
Internal medicine	7,806	85.9	1,069	21.5
Obstetrics/gynecology	7,792	65.7	832	15.4
Pediatrics	648	28.8	374	23.4
Psychiatry	5,188	81.4	398	10.4
Surgery	2,314	24.6	135	8.6
Total	37,023	59.3	4,670	15.4

Note. Results expressed as number of encounters in which the student obtained a tobacco history or provided counseling in each clerkship and the percentage of the total encounters with adult or adolescent patients in that clerkship in which the student obtained a history or provided counseling.

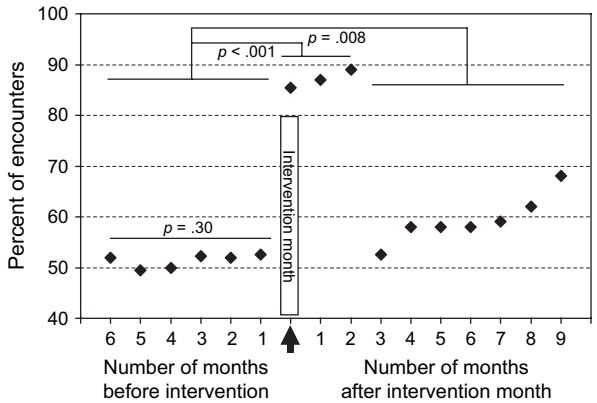

Figure 1. Rate at which students obtained a tobacco history (ask), standardized by time to/from intervention. History rates were derived from data submitted by 414 students who reported 62,418 encounters with adolescent and adult patients that involved taking a history. The graph traces the rate at which students obtained a tobacco history before the intervention month (months −6 through −1), during the intervention month (arrow), during the peri-intervention period (months 0, 1, and 2), and during the postintervention period (months 3 through 9). The overall baseline rate was 52% during the months before the medicine clerkship for all students. Average rates were 87.2% during the peri-intervention period and 59.4% during the postintervention period.

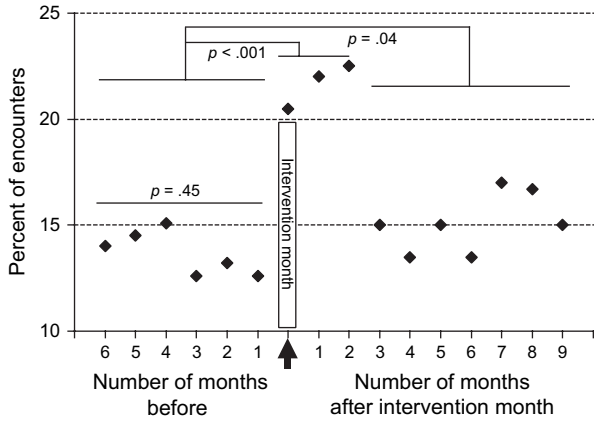

Figure 2. Rate at which students counseled (advised) patients about tobacco prevention or cessation, standardized by time to/from intervention. Counseling rates were derived from data submitted by 414 students who reported 30,224 encounters with adult and adolescent patients that involved some type of health counseling. The graph traces the rate at which students provided counseling about tobacco before the intervention month (months −6 through −1), during the intervention month (arrow), during the peri-intervention period (months 0, 1, and 2), and during the postintervention period (months 3 through 9). The overall baseline rate was 14% during the months before the medicine clerkship for all students. Average rates were 21.7% during the peri-intervention period and 16.1% during the postintervention period.

intervention. In a pattern similar to that observed with the "ask" behavior, "advise" rates rose during the peri-intervention period to approximately 22% (Figure 2). The postintervention counseling rate settled at a new plateau of 16.1% ($p = .04$). Though small, the observed difference in counseling rates produced an absolute marginal increase in the targeted "advise" behavior of 699 instances over the course of 2 years ($p < .005$).

Clinical skills at the end of the third year

The comprehensive assessment of clinical skills was completed by 448 students at the end of their third year. Some 93% of the students asked about smoking history while evaluating a standardized patient with chest pain. Likewise, 89% asked about smoking when talking with a young woman who was inquiring about options for contraception. Virtually, all the students (99%) asked either of these patients about their history of tobacco use. Only 4 of the 448 students did not.

The contraception case also included two checklist items related to tobacco counseling. Students received credit for either item if it led to even a brief discussion of the patient's smoking behavior. More than half (51%) of the students asked the patient whether she had ever attempted to quit, and 67% asked her whether she now had a desire to quit. Overall, 71% of the students asked either of these questions. We found no identifiable relationship between elapsed time from intervention and likelihood of performing either the history or the counseling checklist items.

Discussion

Physician advice has been shown to be a highly effective motivator in changing patients' tobacco behaviors. Actively motivating patients to commit to quit dates, encouraging quitline use, and prescribing pharmacological support all substantially increase a smoker's likelihood of a cessation attempt (Demers, Neale, Adams, Trembath, & Herman, 1990; Russell, Wilson, Taylor, & Baker, 1979; Stewart & Rosser, 1982). Most physicians report a sense of responsibility with respect to cessation and even acknowledge that they have an important effect on the smoker's likelihood of quitting (Batra, Leone, Patkar, Weibel, & Rowane, 2001; Gill, Diamond, Leone, Pellini, & Wender, 2004). However, the rate of physician counseling regarding smoking cessation is quite low. Less than 30% of smokers identified as willing to quit are advised by a physician on how to proceed or prescribed medications to assist with their cessation attempt (Thorndike et al., 1998). In fact, less than 5% of smoking patients report ever having been advised by their clinicians to use available state-sponsored quitline support (Kava, Taylor, Gamble, & Partridge, 2000).

Although provider knowledge may be relatively modifiable, their attitude toward treating tobacco use and their perceived lack of self-efficacy may be more substantial obstacles to changing their behavior (Evers-Casey, Patkar, Weibel, & Leone, 2004; Kviz, Clark, Slezak, & Davis, 1999; Ozer et al., 2004). Factors that influence self-efficacy and potentially inform long-term behaviors are otherwise poorly understood. From a practical standpoint, educational efforts aimed at changing provider behavior should not focus purely on knowledge base or attitudes about cessation. Interventions also should attempt to ameliorate the natural sense of helplessness engendered when dealing with an addiction disorder often characterized by chronic cycles of remission and relapse.

Addressing tobacco treatment early enough in training may favorably influence future attitudes and behaviors among practicing physicians (Fiore et al., 1994). However, designing and implementing tobacco treatment curricula in medical schools can present significant challenges. First, any curriculum content should attempt to integrate instruction in current evidence-based approaches to treatment with an opportunity to practice clinical sensitivity and judgment. Like many other curricular elements in medical training, core tobacco content may be mastered relatively easily. However, unlike other topics, the appropriate application of content is rather difficult to teach in the abstract. Important clinical behaviors are generally modeled by faculty and learned empirically by the student. Unfortunately, because counseling interventions are more private by nature and because the rate at which physicians engage in cessation counseling remains relatively low, there may be few opportunities for students to observe and emulate effective role models.

Nationally, attempts to design instructional strategies should simultaneously be standardized to include several guideline core concepts, remain flexible enough to easily meet any school's idiosyncratic needs, and demonstrate a sustainable effect. The strength of the approach taken by the Continuum of Tobacco Education project lies in its ability to meet these criteria. The present study suggests that tobacco-related knowledge, attitudes, and behaviors are substantially modifiable within a medical school education by focusing on simple and broadly applicable learning objectives and that the sustained effects are measurable on year-end clinical skill examinations. To the extent that clinical skill examinations accurately reflect a student's

ability to emulate desired behaviors, an intensive 1-day instruction method can substantially change the observed behaviors within a medical school class. The direct effects are also measurable; following our intervention, each student recorded an average of 11.2 additional "ask" encounters and an additional 1.7 "advise" encounters, over what would have been expected at the baseline rate. Because the pool of available students is so large, we estimate that an additional 4,653 encounters included the "ask" behavior and an additional 699 encounters included some form of "advise" behavior as a result of our intervention. Given that even brief interventions by a health care provider are expected to increase spontaneous quit attempts (Fiore et al., 2000), we expect that our educational intervention resulted in a significant number of additional quit attempts by our hospitalized patients.

Our intervention was associated with a curious pattern of change in both the "ask" and "advise" rates. Generally, it is no surprise when rates of a target behavior rise immediately following an educational intervention. In our case, however, we experienced what appeared to be a dual-phased response pattern. Following the initial month's increase, rates appeared to plateau at their maximum for an additional 2 months. Given that students leave the intervention month and rotate into any of the possible subspecialty clerkships, this pattern is difficult to explain on the basis of either patient or instructor characteristics. Beginning in the third month following the intervention, rather than observing a linear decay, we found that both "ask" and "advise" rates declined abruptly to what appeared to be a new and sustained baseline. Though the marginal difference between the pre- and postintervention periods was statistically and clinically significant, the substantial dropoff represents a substantial lost potential. Sustainable behavior change requires that students continue to learn from the experience of others and that they, along with other members of the health care team, participate in developing collective solutions to difficulties encountered (Nguyen, Gauvin, Martineau, & Grignon, 2005). Future projects focused on developing group competencies may minimize this lost potential.

The present study has some limitations. As is the case with most educational intervention studies, practical limitations mandated that the study be conducted using a pre–post cohort design within which students served as their own controls. Perhaps, a design in which students are randomized to receive either an active or a "placebo" intervention would more precisely quantify the effect of the project. However, it is difficult to conceive of a randomization scheme that would be both effective and ethical while truly remaining free of the halo bias inherent in teaching subject matter to half of a class. The relative performance of individuals between two groups is arguably less important than measuring the overall change in norms within the learning environment.

The outcomes chosen for any educational study are of critical importance. We chose several recognized measures of performance, including measures generally accepted to predict future performance. However, time and fiscal limitations prohibited direct monitoring of patient care habits among students over time. Measuring ultra–long-term behaviors, such as retention of learned behaviors throughout and following residency training, would provide better insight into the mechanisms by which targeted behaviors are either fixed or extinguished over time. In addition, they may allow for evaluation of strategies for enhancing the effectiveness of student training efforts.

Though the Continuum of Tobacco Education project has been implemented in several health care provider schools across Pennsylvania, it is conceivable that the methods and results described may not be generalizable to a broader set of schools and students (Patkar, Hill, Batra, Vergare, & Leone, 2003). Regional differences in available resources, faculty availability, patient characteristics, and medical student roles may influence the application of this model elsewhere. The magnitude of the effect may vary between institutions, but it is reasonable to expect that all schools should experience some positive effect.

The introduction of a standardized tobacco curriculum into medical school training is both feasible and effective. The measured short-, intermediate-, and long-term effects of training provide sufficient rationale for introducing standardized curricula into the medical school experience nationwide. Because the number of student–patient encounters is so high, educators and administrators should expect that any program implemented to train students in tobacco use treatment principles will result in an increased rate of cessation attempts within their patient population. It remains to be seen whether training programs also improve patient care outcomes and compliance with tobacco-related quality indicators.

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Declaration of Interests

None declared.

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References

Anda, R. F., Remington, P. L., Sienko, D. G., & Davis, R. M. (1987). Are physicians advising smokers to quit? The patient's perspective. *Journal of the American Medical Association*, *257*, 1916–1919.

Batra, V., Leone, F., Patkar, A., Weibel, S., & Rowane, J. (2001, March). Health beliefs of Pennsylvania physicians regarding

smoking cessation counseling. *Proceedings of the Society for Research on Nicotine and Tobacco, PO1 34*, 42.

Burdick, W. P., Ben-David, M. F., Swisher, L., Becher, J., Magee, D., McNamara, R., et al. (1996). Reliability of performance-based clinical skill assessment of emergency medicine residents. *Academic Emergency Medicine*, *3*, 1119–1123.

Cerilli, G. J., Merrick, H. W., & Staren, E. D. (2001). Objective structured clinical examination technical skill stations correlate more closely with postgraduate year level than do clinical skill stations. *American Surgeon*, *67*, 323–326.

Chung, T. W. H., Lam, T. H., & Cherkin, D. C. (2003). Knowledge and attitudes about smoking in medical students before and after a tobacco seminar. *Medical Education*, *30*, 290–295.

Cummings, S. R., Coates, T. J., Richard, R. J., Hansen, B., Zahnd, E. G., VanderMartin, R., et al. (1989). Training physicians in counseling about smoking cessation. A randomized trial of the "Quit for Life" program. *Annals of Internal Medicine*, *110*, 640–647.

Demers, R. Y., Neale, A. V., Adams, R., Trembath, C., & Herman, S. C. (1990). The impact of physicians' brief smoking cessation counseling: A MIRNET study. *Journal of Family Practice*, *31*, 625–629.

Evers-Casey, S., Patkar, A., Weibel, S., & Leone, F. (2004). Tobacco-related knowledge and attitudes do not relate to provider self-efficacy. *Proceedings of the Society for Research on Nicotine and Tobacco, RP-030*, S08.

Evers-Casey, S., Veloski, J., Patkar, A., & Leone, F. T. (2005, February). Longitudinal method of assessing medical students' tobacco training retention. *Proceedings of the Society for Research on Nicotine and Tobacco, RP-074*, S19.

Ferry, L. H., Grissino, L. M., & Runfola, P. S. (1999). Tobacco dependence curricula in US undergraduate medical education. *Journal of the American Medical Association*, *282*, 825–829.

Fiore, M. C., Bailey, W. C., Cohen, S. J., Dorfman, S. F., Goldstein, M. G., Gritz, E. R., et al. (2000). *Treating tobacco use and dependence. Clinical practice guideline.* Rockville, MD: U.S. Department of Health and Human Services. Public Health Service.

Fiore, M. C., Epps, R. P., & Manley, M. W. (1994). A missed opportunity. Teaching medical students to help their patients successfully quit smoking. *Journal of the American Medical Association*, *271*, 624–626.

Frank, E., Winkleby, M. A., Altman, D. G., Rockhill, B., & Fortmann, S. P. (1991). Predictors of physician's smoking cessation advice. *Journal of the American Medical Association*, *266*, 3139–3144.

Geller, A. C., Zapka, J., Brooks, K., Dube, C., Powers, C., Rigotti, N., et al. (2005). Tobacco control competencies for US medical students. *American Journal of Public Health*, *95*, 950–955.

Gill, J. M., Diamond, J. J., Leone, F. T., Pellini, B., & Wender, R. C. (2004). Do physicians in Delaware follow national guidelines for tobacco counseling?. *Delaware Medical Journal*, *76*, 297–308.

Kava, T., Taylor, J., Gamble, E., & Partridge, M. R. (2000). The availability of smoking cessation advice from health professionals—A census from one East London District. *Respiratory Medicine*, *94*, 983–984.

Kviz, F. J., Clark, M. A., Slezak, J. A., & Davis, A. M. (1999). Providers' smoking cessation attitudes and practices for older patients. *Behavioral Medicine*, *25*, 53–61.

Meridith, L., Yano, E., Hickey, S., & Sherman, S. (2005). Primary care provider attitudes are associated with smoking cessation counseling and referral. *Medical Care*, *43*, 929–933.

Nguyen, M. N., Gauvin, L., Martineau, I., & Grignon, R. (2005). Sustainability of the impact of public health interventions: Lessons learned from the Laval Walking Clubs experience. *Health Promotion Practice*, *6*, 44–52.

Ozer, E. M., Adams, S. H., Gardner, L. R., Mailloux, D. E., Wibbelsman, C. J., & Irwin, C. E., Jr. (2004). Provider self-efficacy and the screening of adolescents for risky health behaviors. *Journal of Adolescent Health*, *35*, 101–107.

Patkar, A. A., Hill, K., Batra, V., Vergare, M. J., & Leone, F. T. (2003). A comparison of smoking habits among medical and nursing students. *Chest*, *124*, 1415–1420.

Rattner, S. L., Louis, D. Z., Rabinowitz, C., Gottlieb, J. E., Nasca, T. J., Markham, F. W., et al. (2001). Documenting and comparing medical students' clinical experiences. *Journal of the American Medical Association*, *286*, 1035–1040.

Rose, M., & Wilkerson, L. (2001). Widening the lens on standardized patient assessment: What the encounter can reveal about the development of clinical competence. *Academic Medicine*, *76*, 856–859.

Russell, M. A., Wilson, C., Taylor, C., & Baker, C. D. (1979). Effect of general practitioners' advice against smoking. *British Medical Journal*, *2*, 231–235.

Spangler, J. G., George, G., Foley, K. L., & Crandall, S. J. (2002). Tobacco intervention training current efforts and gaps in US medical schools. *Journal of the American Medical Association*, *288*, 1102–1109.

Stewart, P. J., & Rosser, W. W. (1982). The impact of routine advice on smoking cessation from family physicians. *Canadian Medical Association Journal*, *126*, 1051–1054.

Thorndike, A. N., Rigotti, N. A., Stafford, R. S., & Singer, D. E. (1998). National patterns in the treatment of smokers by physicians. *Journal of the American Medical Association*, *279*, 604–608.

U.S. Department of Health and Human Services. (1993). Physician and other health-care professional counseling of smokers to quit—United States, 1991. *MMWR Morbidity and Mortality Weekly Report*, *42*, 854–857.

U.S. Department of Health and Human Services. (1999). *Best practices for comprehensive tobacco control programs—August 1999.* Atlanta, GA: Centers for Disease Control and Prevention.