Cardiology Rx for Change: Improving Clinical Attention to Tobacco Use and Secondhand Smoke Exposure in Cardiology

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ABSTRACT

Background: Heart disease is the leading cause of tobacco-related death in smokers and of deaths due to secondhand smoke (SHS) exposure in nonsmokers. This study centers on the development and evaluation of an evidence-based model curriculum for improving clinical attention to tobacco use and SHS exposure in cardiology.

Hypothesis: We hypothesized that the curriculum would be associated with improvements in clinician tobacco-related knowledge, attitudes, confidence, and counseling behaviors from pre- to post-training and at the 3-month follow-up.

Methods: The 1-hour *Cardiology Rx for Change* curriculum was evaluated with 22 cardiology fellows and 77 medical residents with consistent training effects observed between the 2 groups.

Results: Trainees' tobacco treatment knowledge increased significantly from pre- to post-training ($t[81] = 6.51$, $P < 0.001$), and perceived barriers to providing cessation treatment decreased significantly ($t[81] = -3.97$, $P < 0.001$). The changes, however, were not sustained at the 3-month follow-up, suggesting the need for booster training efforts. From pretraining to 3-month follow-up, the training was associated with significant sustained gains in clinician confidence for treating tobacco dependence ($t[61] = 3.69$, $P = 0.001$) and with improvements in clinicians assessing patients' readiness to quit smoking (from 61% to 79%, $t[59] = 3.69$, $P < 0.001$) and providing assistance with quitting (from 47% to 59%, $t[59] = 2.12$, $P = 0.038$). Asking patients about tobacco use, advising cessation, and arranging follow-up also increased over time, but not significantly. All participants (100%) recommended the curriculum for dissemination to other training programs.

Conclusions: Available online via <http://rxforchange.ucsf.edu>, *Cardiology Rx for Change* offers a packaged training tool for improving treatment of tobacco use and SHS exposure in cardiology care.

Introduction

Cardiovascular disease is the leading cause of death among smokers.¹ Additionally, of the 53 000 annual U.S. nonsmoker deaths attributed to secondhand smoke (SHS) exposure, about 40 000 are deaths from heart disease.² The relative risks for increased heart disease incidence or death are 1.78 for active smokers and 1.31

for passive smokers.³ Tobacco's adverse effects on the cardiovascular system are immediate and largely due to activation of platelets and impairment of endothelial function, leading to vascular thrombosis and impaired vasodilation, which results in reduced coronary or cerebral blood flow, and myocardial ischemia (MI) or infarction and stroke.^{2,4} Long-term tobacco use also accelerates atherogenesis in coronary, cerebral, and peripheral blood vessels.

Reducing tobacco use and SHS exposure among patients with documented cardiovascular disease can yield critical health benefits. Quitting smoking reduces the recurrence risk of coronary events to that of a nonsmoker within 3 years and reduces mortality following a heart attack by up to 50% over 3 to 5 years.⁵⁻⁸ Protection from SHS also

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reduces cardiovascular disease. Meta-analyses of studies examining regional adoption of comprehensive smoke-free legislation report an associated 17% reduction in acute coronary events.^{9–11}

Clinician advice doubles the likelihood that smokers will quit, and the 2008 *Clinical Practice Guideline for Treating Tobacco Use and Dependence* recommends clinicians ask all patients about tobacco use at each clinical encounter, and for those who smoke, advise cessation, assess readiness to quit, assist with treatment, and arrange follow-up, referred to as the 5 As framework for treating tobacco use.¹² Yet, provider assistance and follow-up with treating tobacco dependence or SHS exposure is generally infrequent. A retrospective cohort analysis of 9041 inpatients treated for acute MI at 83 hospitals in Canada from 1999 to 2001 found that only 52% of smokers were offered inpatient smoking cessation counseling.¹³ Compared to family physicians, hospital admission under the care of a cardiologist or internist predicted a lower likelihood of cessation counseling. Adjusting for predictors of post-MI mortality, patients who received cessation counseling exhibited a 37% reduction in risk of 1-year mortality than those who were not counseled. In analysis of outpatient care, the 2001 to 2004 National Ambulatory Medical Care Survey data indicated 81% of smokers did not receive provider assistance, and <2% received a prescription for cessation pharmacotherapy.¹⁴ Similarly, a 2003 survey of 1263 smokers in Wisconsin indicated that 77% were asked by a healthcare provider about tobacco use, and 61% were advised to quit, but only 1 in 5 were provided clinical assistance with quitting smoking.¹⁵

Tobacco treatment training increases healthcare professionals' attention to patients' tobacco use.^{16,17} Historically, U.S. health professional degree programs have failed to provide adequate levels of training for provision of tobacco cessation assistance,^{18–22} and to date, tobacco cessation curricula have not specifically targeted cardiology training programs. The current study aimed to develop and evaluate an evidence-based model curriculum for improving attention to tobacco use and SHS exposure in cardiology training and clinical practice.

Built on the *Rx for Change* curriculum originally developed for schools of pharmacy,^{23–25} we developed a 1-hour tobacco treatment curriculum for cardiology fellowship and medical residency training programs. To our knowledge, this is the first curriculum specifically focused on clinical issues unique to treating tobacco use and SHS exposure among patients of cardiology providers. Evaluated with cardiology fellows and medical residents at the University of California San Francisco, School of Medicine, we hypothesized the *Cardiology Rx for Change* curriculum would be associated with significant improvements in trainees' knowledge, attitudes, confidence, and counseling behaviors for addressing tobacco use and SHS exposure, with initial changes from pre- to post-training sustained at the 3-month follow up.

Methods

Procedures

The curriculum was evaluated using a quasi experimental design to estimate impact on cardiology fellows' and medical residents' tobacco-related knowledge, attitudes, and

behaviors through anonymous online surveys administered at pre- and post-training and at the 3-month follow-up. The institutional review board at the University of California San Francisco, School of Medicine approved the study procedures, and participants provided informed consent. Respondents were paid \$25 for each completed survey with notifications of survey completion emailed separately to ensure anonymity. The pretraining, post-training, and 3-month follow-up surveys were linked through a unique respondent-generated code (last four digits of their Social Security number and first initial of their mother's maiden name). Seven trainings were held from 2009 through 2010, 4 with cardiology fellows and 3 with medical residents. The lead author, a clinical health psychologist with expertise in tobacco cessation treatment, taught the curriculum in 1-hour sessions. The trainings were scheduled during the lunch or evening hour, with food provided separately from the study.

Curriculum Development and Description

We applied Kern and colleagues' framework for medical education curriculum development²⁶ and created a fully referenced curriculum slide deck that integrated didactic and interactive learning strategies. The curriculum was built on the *Rx for Change* framework with an emphasis on the tobacco control research literature in cardiology, including the 2009 Institute of Medicine report on *Secondhand Smoke Exposure and Cardiovascular Effects*,¹¹ the 2004 and 2006 Surgeon General reports on the health consequences of smoking⁵ and involuntary exposure to tobacco smoke,² and meta-analyses on heart health SHS effects³ and cessation interventions with patients with cardiovascular disease.^{27,28} The research team, with expertise in cardiology, nicotine pharmacology, SHS effects, tobacco cessation treatment, and curriculum development further refined the materials. The 1-hour *Cardiology Rx for Change* curriculum includes faculty lecture slides and a trainee resource packet. The training emphasizes evidence-based, patient-oriented tobacco treatments relevant for all tobacco users, including those not yet ready to quit. Key topics include the epidemiology and cardiovascular risk of tobacco use and SHS exposure, nicotine addiction and withdrawal, clinical practice guidelines and the role of cardiology, pharmacological tobacco treatments, motivational and behavioral counseling, and review of the cessation treatment literature in cardiovascular patients. Recommended treatments range from comprehensive care integrated into cardiology practice to brief cessation advice and referral to the national quit-line (1-800-QUIT-NOW).

Measures

Items were drawn from existing measures for the *Rx for Change* curriculum with prior demonstrated sensitivity to training effects.^{23,29} Measures of knowledge, confidence, and attitudes were included at all 3 time points. Knowledge, assessed with multiple-choice items covering the epidemiology, health effects, and treatment (pharmacological and psychosocial) of smoking in cardiology patients, was calculated as the percent correct out of 5 items. Three sets of items (15 in total) were administered at different time

points among the different trainees so that changes over time would not be due to memory effects. Attitudes regarding potential barriers to addressing tobacco use in clinical practice were assessed with 9 items rated on a 5-point scale (1 strongly disagree, 5 strongly agree) averaged into a single scale score (Cronbach's $\alpha = 0.73$ at baseline). An additional item assessed the role of cardiology care providers in treating tobacco use. Five items rated on a 5-point scale (1 not at all confident, 5 extremely confident) and averaged into a single scale score (Cronbach's $\alpha = 0.75$), assessed confidence with sensitively advising cessation to patients who use tobacco, helping to motivate patients to quit, knowledge of cessation pharmacotherapy, skills for assisting patients with quitting, and providing appropriate referrals. Behavioral items, assessed at pretraining and 3-month follow-up, assessed the frequency (never, sometimes, often, always) of engaging in the 5 As for treating tobacco dependence: ask, advise, assess, assist, and arrange follow-up (Cronbach's $\alpha = 0.86$). Participant characteristics assessed at baseline were race/ethnicity, training status (fellow/resident), training year, and personal tobacco-use history. Curriculum satisfaction items evaluated curriculum content with recommendations for dissemination.

Analyses

The primary hypotheses of interest concerned changes from pretest in trainees' knowledge, attitudes, confidence, and behaviors post-training and at the 3-month follow-up. Group comparisons and initial linear regression models that included trainee status (fellows vs medical residents) as a covariate indicated no significant differences in pretraining values or changes over time on any of the outcome measures. Therefore, combined analyses are reported for χ^2 tests of differences in proportions and paired samples t tests for analyses of changes over time. Bonferroni corrections were used to control for family-wise type I error with an adjusted P value of 0.017 for tests that examined changes across the 3 time points.

Results

Participation Rate and Sample Description

Seventeen first- and second-year cardiology fellows (87% participation), 2 interventional, and 3 research fellows attended. Fifty-eight first-year medical residents (65% participation), 9 second-year residents, 8 third-year residents, and 2 chief residents also attended.

The Table 1 summarizes characteristics of the cardiology fellows and medical residents participating in the study. At pretraining, nearly all participants reported being moderately (17%), very (37%), or extremely (45%) interested in learning how to help their patients quit smoking, and 96% believed cardiology needed to be more active in helping patients quit smoking.

Pretraining surveys were received online from 23 individuals who did not attend the training. Analysis of the pretraining surveys by attendance indicated training attendance was unrelated to training status (fellow or resident), tobacco treatment knowledge, confidence, behaviors, or interest in tobacco treatment training (all P values >0.10). Those who

Table 1. Demographic Characteristics of the Trainee Participants (N = 99)

	Cardiology Fellows, n = 22	Medical Residents, n = 77
Ethnicity, %		
African American	0	3
Asian American	43	37
Caucasian	57	54
Multiracial/other	0	6
Female, %	40	40
Year of training, %		
1	43	7
2	33	14
3	14	13
4	10	3
Smoking status, %		
Never smoked ^a	100	91
Former smoker	0	6
Current, nondaily	0	3

^aDefined as <100 cigarettes smoked in one's lifetime.

did not attend the training, however, were more likely to be ever smokers (35% vs 7%, $\chi^2[1] = 13.14$, $P < 0.001$), report greater barriers to treating tobacco dependence (M [standard deviation SD] = 3.00[0.74] vs 2.33[0.83], $F[1,110] = 12.51$, $P = 0.001$), and were more likely to believe cardiology already addresses patients' tobacco use sufficiently (17% vs 4%, $\chi^2[1] = 4.58$, $P = 0.032$).

For those who participated in the training session, survey completion rates were 93% at post-training and 68% at the 3-month follow-up; 8 additional surveys at post-training and 3 at the 3-month follow-up were received but could not be linked using the trainees' self-generated codes. Completion of the follow-up survey was higher among cardiology fellows than medical residents (91% vs 61%, $\chi^2[1] = 6.98$, $P = 0.008$) and among never smokers than ever smokers (74% vs 33%, $\chi^2[1] = 4.36$, $P = 0.037$). Follow-up rates did not differ by baseline knowledge, attitudes, confidence, or behaviors or in changes from pre- to post-training on these measures (all P values >0.10).

Tobacco Treatment Knowledge

Gains in tobacco treatment knowledge pre- to post-training were significant ($t[81] = 6.51$, $P < 0.001$), but declined from post-training to the 3-month follow-up ($t[58] = -4.14$, $P < 0.001$), back to pretraining levels ($t[60] = 1.03$, $P = 0.309$) (Figure 1a).

Attitudinal Barriers to Tobacco Treatment

Perceived barriers to treating tobacco dependence significantly decreased from pre- to post-training ($t[81] = -3.97$,

Figure 1. Changes from pretraining to post-training to the 3-month follow-up in cardiology fellows' and medical residents' tobacco-related (a) knowledge, (b) perceived barriers to treatment, and (c) confidence.

$P < 0.001$). At the 3-month follow-up perceived barriers increased slightly, and the comparison with pretraining levels was not statistically significant ($t[61] = -1.89$, $P = 0.064$) (Figure 1b).

Confidence for Identifying and Treating Tobacco Dependence

Overall confidence significantly increased from pretraining to post-training ($t[80] = 8.16$, $P < 0.001$) and in all 5 areas assessed. Confidence at the 3-month follow-up remained significantly higher than pretraining levels ($t[61] = 3.69$, $P = 0.001$) (Figure 1c).

Tobacco Treatment Behaviors at Baseline and 3-Month Follow-Up

At pretraining, reported rates of often or always asking patients about tobacco use (78%) and advising smokers to quit (87%) were high, whereas a minority often or always provided assistance (47%) or arranged follow-up (38%). Figure 2 shows the increases from pretraining to the

Figure 2. Reported engagement in the 5 As for treating tobacco use and dependence from pretraining to the 3-month follow-up (FU). *Significant change from pretraining to 3-month follow-up; $P < 0.05$.

3-month follow-up in trainees' reports of often or always engaging in each of the 5 As. The increase was significant for assessing readiness to quit, increasing from 61% to 79% ($t[59] = 3.69$, $P < 0.001$), and assisting with quitting increased from 47% to 59% ($t[59] = 2.12$, $P = 0.038$).

Curriculum Satisfaction Ratings

Most participants rated the curriculum's didactic components as useful, with the highest ratings for the material on cessation pharmacotherapy (94%), followed by psychosocial treatments (85%), and prevalence and health effects of tobacco in cardiology (83%). The trainees reported 35% of the curriculum content was new for them, 48% was a necessary review, and 17% an unnecessary review. On a 6-point scale (1 = poor to 6 = outstanding), trainees gave the curriculum a mean (SD) rating of excellent 5(0.7). All of the cardiology fellows and medical residents (100%) suggested that medical providers at other training programs would benefit from the *Cardiology Rx for Change* curriculum.

At the 3-month follow-up, in open-ended comments, the most frequent recommendation made by a third of respondents was to either hold a brief refresher course to consolidate knowledge or place the materials online for easy reference. The most frequently encountered difficulties reported by respondents in implementing cessation treatments were insufficient time to address patients' tobacco use in clinical practice (57%), challenges arranging follow-up to address patients' tobacco use and quit attempts (23%), and lack of insurance coverage for cessation pharmacotherapy (11%).

Discussion

Consistent with prior research, at pretraining a majority of cardiology fellows and medical residents reported asking about patients' tobacco use and advising smokers to quit, but only a minority often or always provided assistance with quitting smoking or arranged follow-up.¹⁵ Three months following the 1-hour *Cardiology Rx for Change* training, participants reported significant increases in assessing patients' readiness to quit smoking and providing assistance. Further, the curriculum was associated with sustained increases in clinician confidence for treating tobacco dependence across all areas assessed, including advising

cessation, motivating patients to quit, assisting with quitting, prescribing pharmacotherapy, and arranging follow-up.

Significant gains in tobacco treatment knowledge and reductions in perceived barriers to treatment from pre- to post-training, however, were not sustained at the 3-month follow-up, suggesting the need for booster trainings. Further, at post-training, the sample still scored poorly on the knowledge assessment, averaging 68% correct, indicating key treatment aspects were not retained. Use of interactive online trainings with feedback provided on missed knowledge items could be useful for ensuring key treatment components are learned. Incorporation of continuing education credits, which generally require a 70% passing rate to receive credit, might increase the likelihood that participants will retain information learned and heighten performance in the post-training assessment. Additionally, providing real-time booster information and decision support via mobile devices could further improve the reach and impact of the *Cardiology Rx for Change* tobacco treatment training program.

The current study documented high levels of interest and participation among cardiology fellows and medical residents in learning to help their patients quit smoking in a 1-hour training session. Training outcomes were comparable for cardiology fellows and medical residents, suggesting broad relevance of the *Cardiology Rx for Change* curriculum.

The ever-smoking rate was very low among those who attended the training (7%) and notably higher among those who did not attend (35%). Although nonattenders reported comparable levels of interest in the training, they reported greater perceived barriers to tobacco treatment and were more likely to believe cardiology was already sufficiently addressing patients' tobacco use. Tobacco treatment training and promotion efforts tailored to these clinicians should focus on decreasing their perceived barriers to care and increasing the perceived benefits of tobacco treatment. Study limitations include the quasi experimental design, evaluation in a single training program, reliance on self-reporting, and the loss to follow-up, although some attrition was due to the inability to link surveys with respondents' inconsistent self-identified codes. Of note, ever smokers and medical residents were more likely to be lost to follow-up. Without a control group, it is unknown if a positive self-reporting bias contributed to some of the changes in attitudes, confidence, and self-reported behaviors.

The *Cardiology Rx for Change* curriculum was rated highly, with 83% of the material viewed as useful and either new or in need of review. Designed to be delivered in 1 hour for feasible integration into training programs and/or grand rounds activities, the most frequent recommendation was that refresher presentations be provided and/or that the material be made available online. All attendees recommended dissemination of the curriculum. Available online via <http://rxforchange.ucsf.edu>, *Cardiology Rx for Change* aims to improve clinical practice in addressing tobacco use and SHS exposure in cardiology.

Conclusion

Taking a broader view, training clinicians for treating tobacco dependence is a critical component within a

larger treatment framework. To optimize training effects, institutions should create smoking cessation policies and systems, including routine computer-prompted screening for tobacco use and supported onsite cessation counseling. As the Joint Commission's standards extend to all hospitalized smokers and out to 1-month following hospitalization, the demand for provider training in evidence-based tobacco treatment is likely to increase. Future work will examine dissemination of the *Cardiology Rx for Change* curriculum via the internet.

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