A Randomized Clinical Trial of a Web-Based Tobacco Cessation Education Program

AUTHORS: Judith S. Gordon, PhD,^a E. Melinda Mahabee-Gittens, MD, MS,^b Judy A. Andrews, PhD,^c Steven M. Christiansen, BA,^d and David J. Byron, MD^a

^aDepartment of Family and Community Medicine, University of Arizona, Tucson, Arizona; ^bDivision of Emergency Medicine, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, Ohio; ^cOregon Research Institute, Eugene, Oregon; and ^dInterVision Media, Eugene, Oregon

KEY WORDS

tobacco, smoking, cessation, continuing education, respiratory therapy, nursing

ABBREVIATIONS

CEU—continuing education unit
CHD—The Children's Hospital, University of Colorado at Denver, Health Sciences Center
CHOP—Children's Hospital of Philadelphia
NP—nurse practitioner
RN—registered nurse
RT—respiratory therapist
SHSe—second-hand smoke exposure
WeBREATHe—Web-Based Respiratory Education About Tobacco and Health

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Address correspondence to Judith S. Gordon, PhD, Associate Professor, Department of Family and Community Medicine, University of Arizona, 1450 E. Cherry Ave, Tucson, AZ 85719. E-mail: judithg@email.arizona.edu

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WHAT'S KNOWN ON THIS SUBJECT: Children exposed to second-hand smoke have high rates of hospitalization for respiratory illness. These visits represent a “teachable moment” when parental smokers can be motivated to quit. However, pediatric health care practitioners receive little training in tobacco cessation.

WHAT THIS STUDY ADDS: The Web-Based Respiratory Education About Tobacco and Health online training program was effective at increasing the provision of an effective tobacco cessation intervention by pediatric hospital-based respiratory therapists, registered nurses, and nurse practitioners to adult smokers.

abstract

OBJECTIVES: We report the results of a randomized clinical trial of a 3-hour, web-based, tobacco cessation education program, the Web-Based Respiratory Education About Tobacco and Health (WeBREATHe) program, for practicing pediatric respiratory therapists (RTs), registered nurses (RNs), and nurse practitioners (NPs).

METHODS: Two hundred fifteen RTs ($n = 40$), RNs ($n = 163$), and NPs ($n = 12$) employed at the Children's Hospital of Philadelphia and the Children's Hospital, University of Colorado at Denver, participated in this study. All study activities were completed online. After consenting, participants were randomly assigned to either the training (intervention) or delayed training (control) condition. The training condition consisted of a 3-hour continuing education unit course plus ongoing online resources. Participants were assessed at baseline, 1 week, and 3 months after enrollment.

RESULTS: Participants in the training condition were more likely to increase their tobacco cessation intervention behaviors than their delayed training counterparts ($F[1, 213] = 32.03, P < .001$). Training participants showed significantly greater levels of advise ($F[1, 213] = 7.22, P < .001$); assess ($F[1, 213] = 19.56, P < .001$); and particularly assist/arrange ($F[1, 213] = 35.52, P < .001$). In addition, training condition participants rated the program highly on measures of consumer satisfaction.

CONCLUSIONS: The WeBREATHe program is the first evidence-based education program in tobacco cessation designed specifically for pediatric RTs, RNs, and NPs. Engagement in WeBREATHe increased participants' tobacco cessation-related behaviors. *Pediatrics* 2013;131:e455–e462

There is mounting evidence that childhood second-hand smoke exposure (SHSe) can have pervasive and lasting effects on an individual's health throughout the life span.^{1–4} SHSe is particularly of concern in children because it places them at increased risk for allergies, eczema, bronchiolitis, asthma, respiratory tract infections, recurrent ear infections, and middle ear disease.^{5–11} A recent investigation demonstrated that SHSe resulted in 10.9 million disability-adjusted life-years lost, with 61% of disability-adjusted life-years occurring in children worldwide.¹² The highest disease burden caused by SHSe is from lower respiratory tract infections in children <5 years of age and asthma in children <15 years of age.¹² Estimates of population-attributable risk for home SHSe in children range from 9% for asthma prevalence to 25% for hospital admissions caused by respiratory symptoms.¹³

Despite the known risks associated with SHSe, up to 41% of children in the United States are regularly exposed to SHSe or live in homes with a smoker,^{13,14} and this rate remains highest for very young children.¹⁵ In 2007, there were 121.0 emergency department visits with a primary diagnosis of asthma per 10 000 children <5 years of age.¹⁶ In 2009, asthma and pneumonia were the most common conditions requiring a hospital stay in children 1 to 9 years of age. In the 3- to 5-year-old group, there were 48 stays per 10 000 population for asthma, and asthma was the most common admission diagnosis in the 6- to 9-year-old group at 37 stays per 10 000 population.¹⁷ In 2007, 13.9 million visits for asthma were made to private physician offices (7.2 million for adults and 6.7 million for children 0–17 years of age) and 1.4 million visits to hospital outpatient departments (0.6 million for adults and 0.8 million for children 0–17 years of age). There were 1.75 million emergency department

visits (1.11 million for adults and 0.64 million for children 0–17 years of age) and 456 000 asthma hospitalizations (299 000 for adults and 157 000 for children 0–17 years of age). There were 3447 deaths caused by asthma in 2007 (3262 among adults and 185 among children 0–17 years of age).¹⁸

When children are hospitalized for a respiratory illness, parents are aware that SHSe can exacerbate their child's illness, and they are often motivated to quit smoking at this time.^{19,20} Because the visit focuses on the child's overall health and the etiology of the medical problem, there may be higher parental motivation in this setting.^{21,22} The child's respiratory illness may represent a "teachable moment" when parents are concerned about the effects of their smoking on their child's health, and they may be willing to consider quitting smoking.^{19,20} Also, there are already a number of messages discouraging smoking in the hospital environment, which may reinforce the parent's decision to quit.^{19,21}

Hospital-based pediatric respiratory therapists (RTs), registered nurses (RNs), and nurse practitioners (NPs) are an untapped resource for providing advice and brief counseling to smokers. Given the high correlation between SHSe and respiratory illnesses, RTs, RNs, and NPs are in a position to motivate and assist smokers to quit, and there is a large body of evidence that shows they can be effective.^{23,24} In addition, the hospital visit provides a unique opportunity to bring up the issue of tobacco and its detrimental effect on the health of the smoker's child.²⁵

The American Association of Respiratory Care, the American Nursing Association, and others have a long history of discouraging tobacco use and advocating tobacco cessation counseling by RTs and nurses.^{26–32} Although RTs, RNs, and NPs are interested in addressing

tobacco use with patients, few incorporate cessation into routine care.^{23,29,33–38} Many lack confidence in providing cessation advice and fear that they may antagonize and alienate the smoker.^{36,39} Provision of tobacco cessation intervention training and self-help materials can offset these concerns. After training and provision of patient materials, health care professionals in our previous work reported increased confidence in addressing tobacco use.^{40–42} We demonstrated significant reductions in reported tobacco use by patients receiving a tobacco cessation intervention delivered via their health care professional.^{40–42}

Although workshops and training have been useful in disseminating effective interventions, there is a strong need for more disseminable training opportunities that are based on empirically validated programs. Online continuing education has been applied across a variety of professional disciplines, including medical practitioners, with resultant increases and retention in knowledge, changes in clinical practices, and overall acceptability by users.^{43–49} An interactive web-based instructional program that can be tailored to the user and offers video vignettes that model the intervention with varied populations in the user's specific health care context may address these competing demands.^{50–52}

We report on the results of a randomized clinical trial of a web-based, brief tobacco cessation intervention training program adapted from the *Clinical Practice Guideline for Treating Tobacco Use and Dependence*.⁵³ The Web-Based Respiratory Education About Tobacco and Health (WeBREATHe) program aimed to teach pediatric RTs, RNs, and NPs an empirically based approach to motivating and assisting parental smokers to quit. The development and preliminary evaluation of the program has been described previously.⁵⁴ We hypothesized that RTs, RNs, and NPs

who participated in the WeBREATHe program would show increases in their tobacco cessation intervention behaviors, positive attitudes, and self-efficacy in providing tobacco cessation interventions to their patients' parents, and decreases in their perceived barriers to providing these interventions.

METHODS

Inclusion Criteria

RTs, RNs, and NPs employed at 2 large urban children's hospitals, Children's Hospital of Philadelphia (CHOP) and The Children's Hospital, University of Colorado at Denver, Health Sciences Center (CHD), were eligible to participate in the research study.

Recruitment

Four large children's hospitals in the United States were identified through professional contacts of one of the authors (MMG). That author made initial contact by e-mail, and the lead author (JG) made subsequent contacts by e-mail and phone with hospital and research staff to invite them to participate in the study. All 4 hospitals agreed to participate, but because of budget limitations, only 2 sites (CHOP and CHD) were selected to best represent different geographical regions and patient populations. Study coordinators at each participating hospital recruited participants by sending e-mail messages to RTs, RNs, and NPs, posting flyers describing the research study in staff areas, and making announcements at staff meetings over a 2-month period. Interested practitioners were given a link to the WeBREATHe Web site, where they were informed of the study purpose, eligibility, and requirements and invited to complete an online informed consent document and baseline assessment. No other contact was made with potential participants until they were enrolled in the study.

Study Design

The study was approved by the Institutional Review Boards at the Oregon Research Institute (institutional review board no. WeBREATHe; 12/16/10), CHOP (institutional review board no. 091209), and CHD (institutional review board no. 09-0557). Participants were enrolled between December 2009 and January 2010; follow-up assessments were completed by May 2010. All participants completed an informed consent document.

Participants completed the informed consent document and all assessments online. After completion of the enrollment process, participants were blindly randomly assigned by the computer-based program by using an automatic algorithm to 1 of 2 study conditions: (1) training (intervention), in which participants were granted immediate access to the WeBREATHe Web site; or (2) delayed training (control), in which participants were informed that they would receive access to the WeBREATHe Web site on completion of the final assessment. Participants in the training condition were instructed to use the program for at least 3 hours over the course of the following week. One week was chosen as the time frame for program completion for 2 reasons: (1) study logistics required timely completion of the program and subsequent assessments, and (2) we anticipated that giving participants a specific short-term goal would result in higher rates of program completion. Participants received up to 3 reminders to complete the program on their own time during that 1-week period. The WeBREATHe continuing education program provided 3 continuing education units (CEUs). Participants who passed the continuing education test received 3 CEUs and a certificate of completion.

Participants were assessed at baseline, 1 week, and 3 months after enrollment. The 1-week assessment was used to gather immediate posttraining

outcomes and consumer satisfaction data. The 3-month survey assessed long-term outcomes. The time point for this assessment was constrained by the project time line and budget. Prompts to complete the assessment were sent via e-mail. After 3 prompts, nonresponders were contacted via telephone. At the 1-week assessment, 212 participants (98.6%) responded, and 215 participants (100%) completed the 3-month assessment. More than 90% of participants ($n = 194$) completed the surveys online, with the remainder completing via phone.

WeBREATHe Program Content

The WeBREATHe continuing education program consists of 5 sections: (1) getting started, which contains information on program requirements and suggestions for optimizing the learning experience; (2) help people quit smoking, which provides step-by-step instructions for providing the evidence-based Clinical Practice Guidelines for Treating Tobacco Use and Dependence,⁵³ specifically tailored for pediatric RTs, RNs, and NPs via inclusion of data on the health effects of SHSe on children, case studies of children with SHSe-related illness, scripts for use with smoking parents presenting with their children for different types of treatment (eg, inpatient versus emergency), and video vignettes showing pediatric RTs, RNs, and NPs interacting with parental smokers; (3) resources, a repository for provider and patient materials and links to other tobacco cessation resources on the internet; (4) Continuing Education (CE), where the user must pass the posttest and complete the course evaluation to print their certificate of completion; and (5) ask the expert, where users can post questions and receive answers from program instructors about intervening with smokers. A detailed description of the program and its development has been published previously.⁵⁴

Measures

At baseline and all follow-up points, participants completed an assessment of demographics, previous tobacco cessation training, tobacco cessation-related knowledge, behaviors, attitudes, perceived barriers, and self-efficacy. Demographics included gender, race/ethnicity, age, education, occupation, and smoking status. Knowledge about program material was assessed via 10 items focusing on facts contained in the help people quit smoking section. Behaviors were measured by 15 items focusing on the “5 As” (ask, advise, assess, assist, arrange) recommended in the Clinical Practice Guidelines.⁵³ Previous training was assessed by the following question: “In the last year, have you personally received any training in helping your patients/parents quit using tobacco?” Attitudes toward provision of adult tobacco cessation interventions in the pediatric setting were assessed by 9 items, barriers toward providing tobacco cessation services were measured by 7 items, and self-efficacy was measured by 6 items. All items were measured by using a 5-point scale. For behaviors, 1 = never and 5 = always; for attitudes and self-efficacy, 1 = strongly disagree and 5 = strongly agree; and for barriers, 1 = not a barrier and 5 = a strong barrier. At the 1-week assessment, participants also completed a 10-item consumer satisfaction survey to assess Web site design, organization, ease of use, and satisfaction with the program.

Analyses

Preliminary analyses found no differences between conditions on any variables at baseline. Preliminary factor analyses indicated that the items measuring attitudes, barriers, and self-efficacy grouped into their respective factors. However, items measuring the 5 A behaviors grouped into 4, rather than 5, factors (ask, advise, assess, assist/

arrange). Therefore, these 4 factors, rather than the original 5, were used as outcome variables. We used repeated-measures univariate analyses of variance to analyze change in each of the above outcomes as a function of condition. We also assessed change in all behavior factors combined. We used Mplus v6.1 (Mplus; Muthen and Muthen, Los Angeles, CA) for the Compplier Average Causal Effect analysis (complier versus noncomplier for missing data analysis) and SPSS for Windows version 19 (IBM SPSS Statistics; IBM Corporation, Armonk, NY) for all other analyses.

RESULTS

Participant Retention and Characteristics

As displayed in Fig 1, there were ~2400 RTs ($n = 200$) and RNs ($n = 2200$) (numbers not available for NPs) employed at both sites in active clinical care at the time of the study. Of those, 1488 potential participants began the screening process, and 217 participants completed the informed consent document and the baseline assessments. Two participants subsequently withdrew from the study, leaving a sample of 215: 108 randomized to the training condition and 107 randomized to delayed training. More than 98% of participants completed the 1-week assessment, and 100% of participants completed the 3-month follow-up assessment.

As shown in Table 1, the majority of participants were RNs (75.8%), female (88.3%), and white (89.3%), with a college or advanced degree (96.7%). All of the RTs were registered RTs (not shown in Table 1). The mean age was 35.7 years ($SD = 9.7$; range = 22–58 years). Most of the participants reported never smoking (52.6%). Almost all of the participants (95.3%) reported receiving no training in tobacco cessation in the 12 months before enrolling in WebBREATHe.

Program Exposure

Participants in the training condition were instructed to use the program over a 1-week period. To claim their CEUs, participants needed to pass the CE test with a score of at least 80% correct. Of the 107 users in the training condition, the average number of Web site logins over the week was 3.72. The mean time spent was 112.63 minutes ($SD = 78.88$); the median time was 131.35 minutes (range = 40.6–424.9 minutes). There were 90 (85.7%) participants who took the CE test, with 75 (71.4%) participants passing the CE test. The average time spent for users passing the CE test was 142.76 minutes, which showed no difference compared with the average time spent (144.46 minutes) for users not passing the test.

Change at 3 Months After Enrollment

Behaviors

As shown in Table 2, participants in the training condition changed their behaviors more than did those in the delayed training as assessed at the 3-month follow-up. Participants in the training condition were more likely to increase their behaviors (sum of all 4 factors) than their delayed training counterparts ($F[1, 213] = 32.03$, $P < .001$; $\eta^2 = 0.131$). Examining each type of behavior, we found no change in the ask variable as a function of training, but there were significant changes in all other behaviors. Training condition participants showed significantly greater change in levels of advise ($F[1, 213] = 7.22$, $P < .001$; $\eta^2 = 0.030$); assess ($F[1, 213] = 19.56$, $P < .001$; $\eta^2 = 0.085$); and particularly assist/arrange ($F[1, 213] = 35.52$, $P < .001$; $\eta^2 = 0.143$).

Attitudes, Barriers, and Self-Efficacy

As displayed in Table 2, participants in the training control condition reported a greater increase in positive attitudes ($F[1, 213] = 27.90$, $P < .001$; $\eta^2 = 0.116$),

FIGURE 1
Consolidated Standards of Reporting Trials diagram.

TABLE 1 Participant Characteristics
(N = 215)

Characteristics	
Gender, %	
Female	88.3
Race/ethnicity, %	
African American	5.6
Asian	2.8
White	89.3
Hispanic/Latino	3.3
Mean age, y (SD)	35.7 (9.7)
Tobacco use history, %	
Current smoker	3.3
Former smoker	15.8
Experimenter	28.4
Never smoked	52.6
Education, %	
Some college	3.3
College graduate	77.2
Advanced degree	19.5
Occupation, %	
RN	75.8
RT	18.6
NP	5.6
Prior tobacco training, %	
No	95.3

a greater decrease in perceived barriers ($F[1, 213] = 31.46, P < .001; \eta^2 = 0.129$), and a greater increase in self-efficacy toward providing tobacco cessation interventions ($F[1, 213] = 42.89, P < .001; \eta^2 = 0.168$) than did participants in the delayed training condition. As shown in Table 2, these variables changed in the anticipated direction among participants in the training condition. However, participants in the delayed training condition had a slight increase in negative attitudes and perceived barriers and a decrease in self-efficacy over time.

Consumer Satisfaction

We collected consumer satisfaction data from the training condition participants at the 1-week assessment. Items measuring consumer satisfaction included program organization, usefulness of

information, ease of use, format/design, and ratings of program components. All items were measured by using a 5-point scale, with 5 being the highest/best rating. As shown in Table 3, participants rated the program highly, with most scores on average being >4 . Participants found the program to be well organized, easy to use, and containing useful information and would recommend it to colleagues.

DISCUSSION

The use of tobacco represents a significant public health problem both in mortality and morbidity.^{1–12} Hospitalizations for respiratory-related visits represent a teachable moment when parental smokers can be motivated to quit smoking to reduce the impact of SHSe on their child.^{19–22} Although national respiratory and nursing associations and others

TABLE 2 Change in Behaviors, Attitudes, Barriers, and Self-Efficacy From Baseline to Follow-up

Variable	Training			Delayed Training			T0 to 1 Wk		T0 to 3 Mo	
	T0	1 Wk	3 Mo	T0	1 Wk	3 Mo	<i>F</i> (1, 213) ^a	η^2	<i>F</i> (1, 213) ^a	η^2
Behaviors	1.04	1.22	1.69	0.99	1.05	1.20	2.01	0.009	32.03**	0.131
Ask	2.13	2.21	2.52	2.01	2.10	2.19	0.031	0.000	2.59	0.012
Advise	1.76	1.57	2.30	1.68	1.51	1.93	0.027	0.000	7.22**	0.030
Assess	0.05	1.11	1.28	0.37	0.93	0.57	0.050	0.000	19.56**	0.085
Assist and arrange	0.56	0.85	1.30	0.57	0.64	0.77	5.71*	0.026	35.52**	0.143
Attitudes	3.85	4.07	4.02	3.90	3.82	3.72	29.28**	0.122	27.90**	0.116
Barriers	2.66	2.22	2.14	2.68	2.74	2.78	21.58	0.093	31.46**	0.129
Self-efficacy	3.61	4.07	4.11	3.61	3.57	3.52	33.70**	0.138	42.89**	0.168

All items were measured by using a 5-point scale. For behaviors, 1 = never and 5 = always; for attitudes and self-efficacy, 1 = strongly disagree and 5 = strongly agree; and for barriers, 1 = not a barrier and 5 = a strong barrier. T0, baseline.

^a *F* is for the time $\times$ condition effect.

* $P < .05$;

** $P < .001$.

TABLE 3 Consumer Satisfaction Ratings for Intervention Participants ($N = 104$)

WeBREATHe Program	Mean
Overall	4.01
Organized	4.44
Provides new information	4.40
Easy to use	4.32
Addresses issues	4.30
Format/design	4.19
Interesting	4.11
Helpful role models	4.06
Recommend to colleagues	4.31

The scale is 1 to 5, with 1 being lowest (not at all) and 5 being highest (most/very).

have long advocated for regular provision of tobacco cessation interventions by their members,^{26–33} pediatric RTs and RNs still do not use their patients' visits to motivate parents to quit smoking.^{23–38} Our study provides additional evidence to support this claim. It also showed that, before enrolling in WeBREATHe, participating RTs and RNs asked parents about their tobacco use only some of the time and almost never provided any type of assistance.

Findings from our study provide further evidence that pediatric RTs and RNs have had little to no recent training in helping adult smokers. In our sample, >95% of participants reported that they had not received any training in tobacco cessation in the 12 months before enrolling in our study. In addition, recent surveys indicate that it is likely that many of our participants received little or no education or

training in evidence-based tobacco cessation skills (eg, the 5 As) as part of their baccalaureate or postbaccalaureate programs.^{31,55}

Although workshops and training can be useful in teaching effective interventions, they are neither cost-effective nor easily disseminated.^{43,56} We sought to develop an online, evidence-based, training program to overcome these barriers. The WeBREATHe program is the first effective, web-based instructional program to train pediatric RTs and nurses to provide brief, hospital-based tobacco cessation interventions to parents of pediatric patients. These results are particularly promising based on the relatively short amount of training (~3 hours) received by the participants and the fact that there was no personal contact with the participants, because all training and study activities were conducted entirely online.

Pediatric practitioners in the training condition significantly increased their tobacco cessation intervention behaviors, including advising parents to quit, assessing their readiness to quit, and providing evidence-based assistance, compared with practitioners in the delayed training condition at 3 months after enrollment. Compared with those who did not complete the program, the WeBREATHe training program also had a significant effect on increasing pediatric practitioners' positive attitudes

toward intervening with tobacco-using parents and self-efficacy toward providing those services and decreasing perceived barriers in providing tobacco cessation interventions to their patients' parents. Over the same period of time, participants in the delayed training condition showed more negative attitudes and perceived barriers and less self-efficacy. These findings could be a result of the effect of repeated testing,⁵⁷ which was counteracted by the receipt of the program in the training condition.

The study provides evidence for the acceptability of tobacco cessation training among pediatric practitioners. Of the 2400 RNs and RTs employed at the research sites, 1488 (62%) were eligible and began the screening process. No contact was made with potential participants who began but did not complete the consent and survey process, which might have returned a higher number of participants. Although we anticipated enrolling 150 participants over a 3- to 4-month recruitment period, we enrolled >215 participants within 2 months and were forced to cap enrollment and turn away potential participants because of budgetary constraints. We enrolled 20% of all RTs and 7.5% of all RNs in the participating hospitals before capping enrollment. A higher percentage might have participated if the enrollment window had been extended. Another indicator of acceptability was that participants in the training condition reported high levels of program satisfaction, and many participants continued to use the WeBREATHe Web site after they had completed the CE test.

Our study had several limitations. We had a relatively small sample size, which was not stratified by provider. Because we randomized by participant and not by institution, there was potential contamination between conditions. At the 1-week assessment, 67.6% of participants

in the training condition reported that they had discussed WeBREATHe training with a colleague. It is unknown whether content was discussed or merely the opportunity to participate in the research study. However, to our knowledge, no delayed training participants accessed the program before completing their 3-month assessment. There was a lack of racial/ethnic diversity and a lack of men in our sample. However, our sample was representative of the

population of RTs and nurses in the United States, which is predominantly white (RTs = 75.1%; RNs = 83.2%) and female (RTs = 62%; RNs = 93.4%).^{58,59} Finally, our final follow-up assessment was conducted at 3 months after enrollment, which is considered to be a short-term follow-up point.

CONCLUSIONS

The WeBREATHe program is the first evidence-based continuing education

program in tobacco cessation designed specifically for pediatric RTs and nurses. Engagement in the WeBREATHe program resulted in increases in tobacco cessation-related behaviors among pediatric RTs, RNs, and NPs. Given the success of this study, we plan to evaluate it in a larger effectiveness trial, with a longer-term follow-up, and if it remains effective, disseminate the WeBREATHe program on a much larger scale.

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