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Research Article

Knowledge levels of family medicine residents regarding smoking cessation counseling: the effect of an educational program

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Abstract:

Objective: Screening for tobacco use and providing brief smoking cessation interventions are among the most cost-effective preventive services in primary care. Family physicians play a key role in tobacco control; however, in Türkiye, family medicine residents have limited access to Ministry of Health smoking cessation training programs. To address this gap, a brief training was incorporated into the residency curriculum. This study evaluated its effect on residents' knowledge regarding smoking cessation counseling.

Methods: This single-group pretest–posttest study included 66 family medicine residents at the Department of Family Medicine, Çukurova University Faculty of Medicine. Participants received a three-hour theoretical training delivered by a pulmonologist involved in Ministry of Health smoking cessation programs. Knowledge was assessed using a questionnaire administered before and after the training. Analyses were conducted with residents who completed both assessments.

Results: The mean age was 31.68 ± 7.31 years, and 56.1% were female. Current smokers comprised 18.2%, and 4.5% were former smokers. Only 10.6% had prior experience in a smoking cessation clinic. Most residents (69.7%) perceived their knowledge as partially sufficient, and 7.6% considered it adequate; 95.5% expressed willingness to receive training. Post-training knowledge scores increased significantly compared with pre-training scores (10.70 ± 3.19 vs. 13.87 ± 2.71; $t(60) = -6.203$; $p < 0.001$).

Conclusion: A brief three-hour theoretical training significantly improved residents' knowledge of smoking cessation counseling. Integrating clinic rotations and evaluating long-term outcomes may further strengthen effectiveness.

Keywords: Family medicine, smoking cessation, residency training, tobacco control

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Introduction

Smoking remains one of the leading causes of preventable mortality worldwide. Approximately 7.7 million deaths each year are attributed to tobacco use, with reported smoking prevalence rates of 33% among men and 7% among women (GBD 2019 Tobacco Collaborators, 2021; U.S. Department of Health and Human Services, 2020). Although smoking rates have declined in high-income countries, its continued prevalence in low- and middle-income countries poses a major challenge to global tobacco control efforts. Smoking is closely associated with cardiovascular diseases, lung cancer, chronic obstructive pulmonary disease, and numerous other chronic conditions (World Health Organization, 2022). Therefore, smoking cessation is of critical importance for both prolonging life expectancy and improving quality of life (World Health Organization, 2022; Jha et al., 2013).

Family physicians working in primary care play a pivotal role in the early identification of tobacco use and the provision of effective smoking cessation counseling. Their close and continuous contact with the community, ability to assess patients regularly regardless of the reason for visit, and provision of comprehensive, continuity-based care position them uniquely in tobacco control efforts. Smoking cessation counseling, recognized as a highly cost-effective intervention, requires primary care physicians to possess a high level of knowledge and skills in the management of tobacco dependence (Centers for Disease Control and Prevention, 2014).

In Türkiye, however, family medicine residents face various barriers to participating in smoking cessation training programs organized by the Ministry of Health, which aim to enhance the quality of brief cessation interventions. This highlights the need to incorporate smoking cessation counseling knowledge and skills into residency training programs (World Health Organization, 2022; Stead et al., 2013). Accordingly, a brief smoking cessation training module was integrated into the structured educational activities, and the effectiveness of this intervention constituted the focus of the present study. In practice, participation in these programs may be limited by structural and logistical barriers, including restricted training quotas, scheduling conflicts related to the intensive workload of residency programs, geographic constraints for residents working outside major urban centers, and limited access to accredited training opportunities.

The aim of this study was to evaluate the effect of the structured "Basic Smoking Cessation Counseling Training Program" delivered at the Department of Family Medicine, Çukurova University Faculty of Medicine, on residents' knowledge levels regarding smoking cessation counseling.

Theoretical Framework

Tobacco dependence is a complex health problem with biopsychosocial components, requiring a multidimensional treatment approach. International guidelines emphasize that smoking cessation interventions should be structured around three main components—psychological support, behavioral interventions, and pharmacotherapy—which together form the basis of the theoretical framework of the present study.

The psychological foundations of smoking cessation counseling focus on enhancing individuals' awareness of nicotine dependence, assessing readiness to change, and strengthening intrinsic motivation (Miller & Rollnick, 2013; West et al., 2015). The Transtheoretical Model proposed by Prochaska and DiClemente suggests that individuals progress through distinct stages during the cessation process and that interventions should be tailored accordingly (Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997). From this perspective, the family physician's primary role is to accurately assess the patient's readiness for change and to select an appropriate counseling strategy aligned with the individual's stage of change (Fiore et al., 2008). Motivational interviewing techniques facilitate the exploration of ambivalence, the linking of cessation to personal values, and the internalization of behavior change (Miller & Rollnick, 2013).

Thus, the psychological component constitutes a core dynamic of smoking cessation counseling and provides a framework that enhances the effectiveness of other intervention modalitis.

Behavioral interventions target smoking-related routines, triggers, and habit loops. Among the most commonly used approaches are the "5A's" (Ask, Advise, Assess, Assist, Arrange) and the "5R's" (Relevance, Risks, Rewards, Roadblocks, Repetition), particularly for unmotivated smokers (Prochaska & Velicer, 1997; Fiore et al., 2008), they continue to be endorsed in updated international recommendations, including the U.S. Preventive Services Task Force and the World Health Organization guidelines on tobacco cessation (USPSTF, 2021; World Health Organization, 2023). These structured approaches remain central to the delivery of brief interventions in primary care settings.

The neurobiological dimension of nicotine dependence necessitates effective management of withdrawal symptoms. Clinical guidelines indicate that pharmacological agents such as nicotine replacement therapy, bupropion, and varenicline significantly increase smoking cessation success, particularly when combined with behavioral counseling (Fiore et al., 2008; World Health Organization, 2020). While each component may be effective independently, evidence suggests that cessation rates increase substantially when psychological, behavioral, and pharmacological components are applied in a comprehensive and integrated manner (Stead et al., 2013). Therefore, smoking cessation counseling should be approached as a multidimensional, patient-centered process rather than a single-faceted intervention (USPSTF, 2021). In this context, the Basic Smoking Cessation Counseling Training aimed to provide residents with a holistic perspective encompassing psychological, behavioral, and pharmacological aspects of smoking cessation.

Methods

Study Design and Participants

This study employed a single-group pretest–posttest quasi-experimental design to evaluate the knowledge levels of family medicine residents regarding smoking cessation counseling at the Department of Family Medicine, Çukurova University Faculty of Medicine. The intervention consisted of a structured three-hour theoretical training session on smoking cessation counseling.

The study population comprised all residents enrolled in the family medicine specialty training program at the department (n = 126). Of these, 66 residents (52%) agreed to participate and completed the pretest questionnaire. Five participants did not complete the posttest; therefore, analyses were conducted using data from 61 participants with complete pretest and posttest measurements. Accordingly, paired samples t-test analyses were performed with 60 degrees of freedom.

Data Collection Instrument

Data were collected using a self-administered questionnaire developed by the research team. The questionnaire consisted of three sections and a total of 42 items, designed to assess participants' sociodemographic and professional characteristics, tobacco use status, knowledge of smoking cessation counseling, and attitudes toward electronic cigarettes.

The first section included 16 items assessing age, gender, marital status, type and year of residency training, years of medical practice, current and past tobacco use, motivation to quit smoking, previous training on smoking cessation counseling, and self-reported knowledge regarding smoking cessation counseling and electronic cigarettes. These variables were used solely for descriptive and grouping purposes and were not included in the knowledge score.

Development of the Knowledge Questionnaire

The knowledge questionnaire was developed through a structured, multi-step process. First, a comprehensive review of national and international clinical practice guidelines and key resources on tobacco dependence and smoking cessation counseling was conducted to identify core knowledge domains relevant to routine family medicine practice (e.g., Fiore et al., 2008, and national guidelines). Based on this review, an initial pool of 23 multiple-choice items was generated by the research team.

In the second step, the draft items were independently reviewed by three subject-matter experts in family medicine and addiction/pulmonary medicine. The experts evaluated the items in terms of content relevance, clinical applicability, and clarity. Based on their feedback, items that were overlapping, insufficiently clear, or not directly applicable to primary care practice were revised or removed. This process resulted in a final set of 20 knowledge items.

The second section of the questionnaire consisted of 20 multiple-choice items designed to assess basic and clinically applicable knowledge of smoking cessation counseling in the context of family medicine. The items covered key domains including fundamental concepts of nicotine dependence (e.g., definitions of relapse, lapse, and third-hand smoke), assessment tools (e.g., components of the Fagerström Test for Nicotine Dependence), evidence-based pharmacological treatments (e.g., nicotine replacement therapy, bupropion, varenicline, and cytisine), management of withdrawal and relapse, the role of healthcare professionals in tobacco control, and national epidemiological data and guideline recommendations.

All items were formatted as multiple-choice questions with a single correct answer. Scoring was conducted using a dichotomous approach: each correct response was awarded 1 point, while incorrect or "don't know" responses received 0 points. No negative scoring was applied. Accordingly, total knowledge scores ranged from 0 to 20, with higher scores indicating greater basic smoking cessation counseling knowledge. No cutoff score was defined, and the total score was analysed as a continuous variable.

The knowledge questionnaire was intentionally designed to assess essential, practice-oriented knowledge expected of family medicine residents rather than advanced or specialist-level expertise.

The third section comprised six Likert-type items assessing attitudes toward electronic cigarettes (e.g., "Using electronic cigarettes is healthier than using conventional cigarettes" and "Electronic cigarette use is a public health problem"). Participants rated their level of agreement on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). These items were analysed descriptively and were also used to examine changes in attitudes before and after the training.

The pretest questionnaire was administered immediately before the training session, and the posttest questionnaire was administered immediately after completion of the training. The full knowledge questionnaire is provided as Supplementary Material.

Educational Intervention

As part of the structured residency education program, participants received a three-hour face-to-face theoretical training delivered by a faculty member from the Department of Pulmonology at Çukurova University, who also provides services in a smoking cessation clinic. The training was designed to comprehensively cover psychological, behavioral, and pharmacotherapeutic foundations of smoking cessation counseling. Due to the intensive residency schedule, the training was designed to be brief and focused, and no additional self-directed learning assignments were provided.

Details of the intervention are presented in Table 1 in accordance with the TIDieR-Education (Template for Intervention Description and Replication) framework.

Table 1. Description of the smoking cessation counseling educational intervention according to the TIDieR checklist

Section	Description
Rationale	*A short, structured educational program was required due to gaps in family medicine residents' knowledge of smoking cessation counseling and limited access to Ministry-provided training programs.*
Theoretical framework	*Transtheoretical Model, Motivational Interviewing, the 5A–5R brief intervention framework, cognitive–behavioral approach, and the biopsychosocial model of nicotine dependence.*
Learning objectives	*Explaining the fundamentals of addiction; applying the 5A–5R approach; using motivational interviewing principles; identifying pharmacotherapy options; integrating brief interventions into clinical practice.*
Intervention content	*Adaptation of the steps Ask, Acquire, Appraise, Apply, and Assess to smoking cessation counseling.*
Materials	*Slide presentations, guideline summaries, and knowledge tests (pre-test and post-test).*
Educational strategies	*Face-to-face lecture, case-based discussions, and question–answer sessions.*
Incentives	*No financial or material incentives were provided; participation was voluntary.*
Instructor	*A faculty member from the Department of Pulmonary Diseases at ..... University, also providing services at a smoking cessation outpatient clinic.*
Mode of delivery	*Face-to-face group training; instructor-to-participant ratio of 1:66.*
Setting	*Meeting hall of the Department of Family Medicine, Çukurova University Faculty of Medicine.*
Schedule and duration	*Single session lasting 3 hours; sequence: pre-test → training → post-test.*
Face-to-face / self-directed learning	*The intervention was entirely face-to-face; no self-directed learning assignments were included.*
Planned adaptations	*The training was intentionally brief and focused due to the intensive residency schedule.*
Unplanned modifications	*No changes were made during the intervention.*
Attendance	*Attendance was confirmed using a participation list; the attendance rate was 100%.*
Fidelity	*The intervention was delivered as planned with respect to duration, content, and materials.*

Rationale for the intervention: Identified deficiencies in family medicine residents' knowledge regarding smoking cessation counseling and limited access to Ministry of Health training programs necessitated the development of a short, structured educational intervention

Data Analysis

Descriptive statistics, including frequency, percentage, mean, and standard deviation, were calculated. To evaluate the effect of the educational intervention on knowledge levels, differences between pretest and posttest scores were analyzed using a paired samples t-test. When parametric assumptions were not met or when group distributions were notably imbalanced, the Kruskal–Wallis test was applied. Comparisons between categorical variables were conducted using Pearson's chi-square test.

Effect size was calculated to assess the magnitude of the intervention's impact, and Cohen's d was used for paired samples t-test results. According to Cohen's classification, $d = 0.20$ represents a small effect, $d = 0.50$ a medium effect, and $d \geq 0.80$ a large effect. Statistical significance was set at $p < 0.05$ for all analyses.

Results

Among the 66 residents (mean age = 31.68 ± 7.31 years), 56.1% were female, 59.1% were married, and 72.7% were full-time family medicine residents. A total of 89.4% reported no prior experience working in a smoking cessation clinic. Regarding smoking status, 77.3% had never smoked, 4.5% were former smokers, and 18.2% were current smokers. The majority (69.7%) described their knowledge level as "somewhat knowledgeable," while only 7.6% reported being "sufficiently knowledgeable." Nevertheless, 95.5% expressed a desire to receive smoking cessation counseling training (Table 2).

Table 2. Demographic characteristics and smoking-related variables of participants (n = 66)	
Variable	**n (%) / Mean ± SD**
Age (years)	*31.68 ± 7.31*
Years of medical practice	*6.97 ± 7.07*
Gender	
Female	*37 (56.1)*
Male	*29 (43.9)*
Marital status	
Married	*39 (59.1)*
Single	*27 (40.9)*
Resident type	
Full-time	*48 (72.7)*
Part-time / other	*18 (27.3)*
Smoking cessation clinic experience	
Yes	*7 (10.6)*
No	*59 (89.4)*
Smoking status	
Never smoker	*51 (77.3)*
Former smoker	*3 (4.5)*
Current smoker	*12 (18.2)*
Perceived knowledge of smoking cessation counseling	
No knowledge	*15 (22.7)*
Limited knowledge	*46 (69.7)*
Adequate knowledge	*5 (7.6)*

SD: standard deviation.

As shown in Table 3, knowledge scores increased significantly following the training, $t(60) = -6.20$, $p < .001$. The effect size was moderate to large (Cohen's $d = 0.79$), indicating a substantial improvement in participants' knowledge.

Table 3. Comparison of pre-test and post-test knowledge scores					
Test	**Mean ± SD**	**t (df)**	***p***	**95% CI**	**Cohen's d**
Pre-test	*10.70 ± 3.19*	*–6.203 (60)*	*< 0.001*	*–4.18 to –2.14*	*0.79*
Post-test	*13.87 ± 2.71*				

CI: confidence interval.

Given that the total possible score range was 0–20, potential floor (0–3) and ceiling (17–20) effects were examined, and no significant clustering at either extreme was observed. This finding suggests that the observed score increase reflects a true effect of the educational intervention rather than a limitation of the measurement tool. Additionally, the reduction in standard deviation from 3.19 in the pretest to 2.71 in the posttest suggests a more homogeneous knowledge level following the training.

No significant differences were found in pretest knowledge scores across the three subjective knowledge groups—participants who reported "I do not know anything," "I know a little," and "I have sufficient knowledge"—based on the Kruskal–Wallis test ($\chi^2(2) = 4.284$, $p = 0.117$). Similarly, no significant association was observed between pretest knowledge level and counseling practice patterns (providing counseling personally, referral, or other approaches) ($\chi^2(6) = 10.113$, $p = 0.120$).

In this study, behavioral outcomes were assessed through residents' self-reported smoking cessation counseling practices (providing counseling personally, referral, or other approaches) and the frequency of recommending smoking cessation to patients. Accordingly, no significant differences were found between smoking status (never smoker, former smoker, current smoker) and counseling practices ($\chi^2(4) = 4.310$, $p = 0.366$). Subjective knowledge levels regarding smoking cessation and pretest scores also did not differ according to the frequency of recommending smoking cessation to patients ($\chi^2(6) = 3.117$, $p = 0.794$; $\chi^2(3) = 0.934$, $p = 0.817$, respectively). Overall, pretest knowledge levels were not significantly associated with these counseling-related behaviors.

Analysis of the relationship between e-cigarette knowledge levels and attitudes revealed no statistically significant differences across knowledge groups regarding statements such as "E-cigarettes are healthier than conventional cigarettes," "E-cigarettes help with smoking cessation," "E-cigarettes serve as a gateway to conventional smoking," and "E-cigarette use is a public health problem." Although a trend toward decreased belief in the relative harmlessness of e-cigarettes was observed with increasing knowledge, this difference did not reach statistical significance ($p > 0.05$)

Discussion

This study demonstrated that a three-hour theoretical training significantly improved family medicine residents' knowledge levels regarding smoking cessation counseling. The moderate-to-large effect size observed (Cohen's $d = 0.79$) suggests that even brief educational interventions can yield substantial learning outcomes. Consistent with previous studies, educational interventions have been shown to enhance physicians' knowledge and self-efficacy, although these gains do not always translate directly into clinical practice (Stead et al., 2013). Recent evidence continues to support that even brief or blended training formats can improve clinicians' competence in brief tobacco interventions in primary care settings. For example, an online training aligned with WHO materials was associated with improved competency among primary care doctors, underscoring the potential impact of scalable educational formats (Moeteke et al., 2024).

Despite the significant increase in knowledge, no meaningful differences were observed between individual characteristics (smoking status, subjective knowledge perception, prior smoking cessation clinic experience) and counseling behaviors. The observed discrepancy between perceived knowledge sufficiency and actual knowledge performance suggests that self-assessment may not be a reliable indicator of competency. Likewise, the absence of an association between physicians' smoking history, perceived knowledge, and counseling practices indicates that knowledge alone is insufficient to explain counseling behavior. Consistent with this finding, preventive health behaviors are influenced by multiple factors, including motivation, time constraints, institutional support mechanisms, and patient demand (Zwar & Richmond, 2006; Hartmann-Boyce et al., 2021). Qualitative research from primary care settings further emphasizes the role of practical constraints (e.g., time pressure, routines, competing demands) and organizational structures in shaping the implementation of smoking cessation counseling, which may help explain why knowledge gains do not automatically translate into consistent practice (Dannapfel et al., 2023).

Findings related to e-cigarettes reflect a similar pattern. Although higher knowledge levels were associated with a trend toward more cautious attitudes, the differences were not statistically significant. The complex and often contradictory information environment surrounding e-cigarettes may play a role in shaping participants' attitudes (Hartmann-Boyce et al., 2021), highlighting the need to strengthen physicians' access to evidence-based information on this topic. The lack of statistically significant change may also be attributable to the relatively limited emphasis placed on electronic cigarettes within the training content, as well as the

possibility that participants held pre-existing and relatively stable attitudes shaped by ongoing public and professional debates. These findings suggest that smoking cessation training programs may benefit from dedicating more structured and evidence-based content to e-cigarettes, particularly addressing areas of uncertainty and conflicting information encountered in clinical practice.

Limitations

This study has several limitations that should be acknowledged. First, the use of a single-group pretest–posttest design makes the study susceptible to internal validity threats such as testing effects and time-related factors, which may complicate the attribution of the observed increase in knowledge solely to the intervention. In addition, the absence of a control group limits causal inferences regarding the effectiveness of the training. Furthermore, since the posttest was administered immediately after the training, only short-term knowledge gain could be evaluated, and it remains unclear whether the improvement in knowledge would be sustained over time. Finally, participation in the training was voluntary, which may have introduced selection bias; it is likely that residents who were more interested and motivated regarding smoking cessation counseling were overrepresented in the sample. Therefore, the findings should be interpreted as reflecting immediate post-training knowledge gains rather than knowledge retention. An ideal study design would include a follow-up assessment conducted 1–3 months after the intervention to evaluate the durability of the observed knowledge improvements. Future studies may also benefit from grouping knowledge items into thematic domains to examine domain-specific learning gains following smoking cessation training.

Conclusions

This study showed that a structured three-hour smoking cessation training program significantly improved family medicine residents' knowledge levels, with a strong effect size indicating that even brief theoretical interventions can enhance foundational knowledge. However, increased knowledge did not translate directly into counseling behaviors, suggesting that knowledge alone may be insufficient to ensure consistent implementation of smoking cessation counseling in clinical practice.

These findings highlight the need to complement theoretical training with practice-based components, such as clinical exposure and follow-up strategies, to support the integration of smoking cessation counseling into routine care. Further research using larger samples and longitudinal designs is warranted to better understand how educational interventions can lead to sustained behavioral change.

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Authorship Contributions

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