Impact of educational intervention on implementation of tobacco counselling among oral health professionals: a cluster-randomized community trial


Abstract – Objectives: Tobacco use adversely affects oral health. Clinical guidelines recommend that oral health professionals promote tobacco abstinence and provide patients who use tobacco with brief tobacco use cessation counselling. Research shows that these guidelines are seldom implemented successfully. This study aimed to evaluate two interventions to enhance tobacco use prevention and cessation (TUPAC) counselling among oral health professionals in Finland. Methods: We used a cluster-randomized community trial to test educational and fee-for-service interventions in enhancing TUPAC counselling among a sample of dentists (n = 73) and dental hygienists (n = 22) in Finland. Educational intervention consisted of 1 day of training, including lectures, interactive sessions, multimedia demonstrations and a role play session with standard patient cases. Fee-for-service intervention consisted of monetary compensation for providing tobacco use prevention or cessation counselling. TUPAC counselling procedures provided were reported and measured using an electronic dental records system. In data analysis, intent-to-treat principles were followed at both individual and cluster levels. Descriptive analysis included chi-square and \( t \)-tests. A general linear model for repeated measures was used to compare the outcome measures by intervention group. Results: Of 95 providers, 73 participated (76.8%). In preventive counselling, there was no statistically significant time effect or group-by-time interaction. In cessation counselling, statistically significant group-by-time interaction was found after a 6-month follow-up (\( F = 2.31; P = 0.007 \)), indicating that counselling activity increased significantly in intervention groups. On average, dental hygienists showed greater activity in tobacco prevention (\( F = 12.13; P = 0.001 \)) and cessation counselling (\( F = 30.19; P < 0.001 \)) than did dentists. In addition, cessation counselling showed a statistically significant provider-by-group-by-time interaction (\( F = 5.95; P < 0.001 \)), indicating that interventions to enhance cessation counselling were more effective among dental hygienists. Conclusions: Educational intervention yielded positive short-term effects on cessation counselling, but not on preventive counselling. Adding a fee-for-service to education failed to significantly improve TUPAC counselling performance. Other approaches than monetary incentives may be needed to enhance the effectiveness of educational

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Several studies have highlighted the role of oral health professionals in tobacco use prevention and cessation (TUPAC) counselling (1, 2), and World Health Organization has stated that enhancing adherence to TUPAC counselling guidelines should be one of the priority goals in dentistry today (3). Oral health professionals have a unique opportunity to engage in TUPAC counselling through frequent patient encounters and the easy identification of patients’ tobacco use. A growing body of evidence points to the efficacy and cost-effectiveness of TUPAC in oral health care (4–7). For example, recent systematic review reported that a brief tobacco use cessation counselling conducted by oral health professionals was found to be effective (odds ratio 1.4) at 12 months or longer (7). However, oral health professionals have been largely inactive in TUPAC counselling (8, 9). Studies have identified less than optimal attitudes, insufficient counselling training and lack of reimbursement as major constraints against the implementation of TUPAC counselling in oral health care (10–12).

In the Nordic countries, which have nationally subsidized oral health care provision systems, free oral health services are traditionally provided for children and young adults on a regular basis (13, 14). In Finland, coverage is high among children and youth, and since Oral Health Care reform in 2002, all citizens have been entitled to public oral health care (15). Although current care guidelines for health care professionals about smoking cessation interventions have also been provided since 2002 (16), there is room for more engagement among health care professionals (17).

Based on our earlier findings that environmental constraints, lack of skills and low self-efficacy pose potential barriers to implementation (18), educational intervention and monetary incentives could potentially be effective intervention techniques in enhancing TUPAC counselling (19). In addition, the consensus report prepared by the Second European Workshop on Tobacco Use Prevention and Cessation for Oral Health Professionals has proposed several ways to enhance TUPAC counselling (2). Recommendations suggested increasing undergraduate and continuing education on TUPAC counselling, as well as developing a TUPAC-related compensation system comparable to other oral health procedures. The effectiveness of such interventions, however, remains inconclusive.

**Aims**

Our aim was to develop and evaluate two interventions intended to increase the implementation of TUPAC counselling in the primary oral health care setting in Finland. This 6-month (September 2009–March 2010) community trial applied a randomized controlled design. Because of the community-based setting, we applied cluster-level randomization.

**Materials and methods**

**Participants**

This study was conducted in Finland. All dentists and dental hygienists employed by the municipal health care regions of Vaasa (nine clinics) and Tampere (28 clinics) were invited (in August 2009) to participate. Participants meeting the inclusion criteria received an explanatory description of the study, a consent form and instructions on how to participate (20).

**Interventions**

To enhance the provision of TUPAC counselling among our sample of oral health professionals, we developed two interventions: educational and fee-for-service interventions. These intervention techniques were selected based on earlier findings of possible implementation difficulties (10–12) and the ability to conduct interventions in primary care settings. A cluster-randomized community trial design served to classify the participating clinics into three groups (Fig. 1), including interventions described below.

**Control condition**

One-third of the clinics (five clusters) were randomly assigned to a control group (Fig. 1). The oral health care providers of these clinics received neither educational intervention nor monetary incentives for TUPAC counselling, such as those described below.
**Education condition**

The oral health professionals randomized to the educational intervention (four clusters) group received training specifically designed to address the perceived barriers and enablers, such as self-efficacy, skills and knowledge needed to provide TUPAC (18).

**Education + fee-for-service condition**

The oral health providers randomized to this group (four clusters) were to receive monetary incentives in addition to the educational intervention. Educational intervention for this group was provided during the same session as for the group with education only to ensure that such intervention was identical for both groups.

**Description of the education intervention**

Two senior professionals and experts in the field of tobacco dependence treatment and research (TK and THK) designed and implemented the educational intervention. These interventions were implemented separately in Tampere (15 September 2009) and in Vaasa (16 September 2009), but in as identical a manner as possible at both sites. The intensive education lasted 5 hours and included
lectures, interactive sessions, multimedia demonstrations and a role play session with standard patient cases that typically arise in oral health care settings. In these role play sessions, participants worked in smaller groups supervised by professional mentors. The study material included a binder with handouts of each teaching session as well as of the patient cases. Additionally, one session provided links to specific sites for a wide range of internet-based resources of relevant information. All these materials were also posted on the project website to make them accessible in electronic format later on for all participants of the educational intervention (username and password provided to the participants). The teaching modules were as follows: (i) epidemiology of tobacco use and its health consequences; (ii) role of oral health professionals in prevention and cessation of tobacco use; (iii) tobacco dependence; (iv) pharmacological treatment of tobacco dependence; (v) nonpharmacological treatment of tobacco dependence; (vi) how to implement brief TUPAC counselling intervention (the 6As in Finland) in oral health practice; (vii) youth and tobacco; (viii) resources and self-help materials; and (ix) standard patient case role play session, which took place in three groups. In addition to providing knowledge, all sessions included components to enhance the attitudes, motivation and self-efficacy of the participants in TUPAC counselling as part of their everyday routine. One important component was skill training, to which the last session was especially targeted. Altogether, there were six typical patient cases (two female/four male; two adolescent/four adult; four cigarette smokers/two smokeless tobacco users). These patient cases were assessed by professional actors or students or both. After the group sessions, all participants received feedback on possible solutions for each patient case for treatment and counselling. In addition, participants had access to a comprehensive selection of self-help materials and nicotine replacement therapy options in the treatment of tobacco dependence.

**Description of the fee-for-service intervention**

In Finland, primary care dentists are paid through a hybrid system involving (i) capitation (also intended to cover preventive treatments such as TUPAC counselling) and (ii) fee-for-service (per treatment item completed, comprising about 30–40% of one’s total salary). A dental hygienist’s salary consists of a fixed salary only (about 45% of a dentist’s total salary). In this study, both dentists and dental hygienists received time-based fees for providing cessation counselling comparable to other time-based fees-for-services in primary care provided by dentists. For preventive counselling, the fee was equivalent to that for short cessation counselling. All fees were paid monthly during the 6-month trial.

**Outcomes**

The outcome measures for TUPAC counselling, measured at the individual level, were created according to the meta-analysis by Fiore et al. (21), which showed that the time dedicated to counselling was one of the best predictors for the effect of counselling. We therefore measured whether TUPAC counselling was implemented at all and estimated the amount of time dedicated to it. For data collection, we created procedure codes for preventive and cessation counselling for the electronic dental record (EDR) system. A similar documenting system is widely used in Finland for all dental procedures. Based on the evidence from the meta-analysis by Fiore et al. (21), the codes were hierarchical in terms of time dedicated to counselling, so that the estimated odds ratios (OR) for TUPAC counselling were reported using the same counselling durations.

We assessed the prevention component of TUPAC counselling using one code that included asking a patient about his/her tobacco use, and for nonusers, encouraging them to remain tobacco free. For tobacco users, the following procedure-code categories were available for the cessation-related component of TUPAC counselling (20): minimal (<3 min) counselling = OR 1.3, low-intensity (3–10 min) counselling = OR 1.6 and high-intensity (>10 min) counselling OR = 2.3 (21). For preventive counselling, documented procedure codes were calculated per 100 patient visits. For cessation counselling, procedure codes were multiplied by the estimated ORs and summed per 100 patients, thereby creating a single continuous outcome score. Here, we assumed that whatever the rates of current tobacco use were in each clinic, the randomization should eliminate different tobacco prevalence in the three study groups. All codes were collected for the 6-month follow-up period in all clinics.

**Sample size**

Sample size was calculated based on a Finnish national survey (n = 5000) in which 10.5% of tobacco users visiting the dentist during the
past year reported having received cessation counselling (17). Our aim was to increase the proportion of counselled patients from 10.5% (control) to 33% in the education group and to 63% in the education + fee-for-service group, as validated by the EDR audit. Achieving 80% power with a two-sided 5% level of significance and an estimated intra-class correlation of 0.02 would require 72 participants and 12 clusters with an average of six participants. And obtaining a response rate of about 75% would require 95 oral health professionals.

Randomization
Before randomization, 34 clinics were matched to 13 clusters according to the following criteria: municipal health care regions (Vaasa or Tampere), number of oral health professionals per clinic and possibility of contamination. Oral health providers usually work in one clinic only, but when this was not the case, the chief dental officers merged two or more clinics into one cluster to reduce contamination across participants. After merging clinics and forming clusters, the chief dentists provided a concealed sequence of clusters to the investigators who allocated clusters randomly to the control, education or education + fee-for-service groups by drawing lots (Fig. 1). Allocation was concealed from the investigators until after completion of the data collection. Owing to the nature of the study setting, blinding participants to group allocation proved impossible.

Response rate and target population
Of the 95 randomized oral health professionals, 73 (76.8%) provided their informed consent. Compliance with educational intervention in the education group was 90.5% (of the 21 who provided their informed consent, 19 attended), whereas the corresponding figure for the education + fee-for-service group was 77.8% (21 of 27 attended). With regard to outcome measure, the analyses included all those who provided their informed consent before beginning the interventions (n = 73). Descriptive analyses included chi-square tests for categorical variables and t-tests for continuous variables. With regard to the outcome variables, preventive and cessation counselling, the intervention groups were analysed using seven repeated measures of baseline and follow-up months on a general linear model. We surrogated the cluster effect by including the randomization unit (clinic) into the model. Based on differences between groups in the distributions of baseline variables (Table 1), we tested the association of hospital district and education in TUPAC counselling received after graduation with the outcome variable and found it statistically insignificant. Thus, hospital district and education in TUPAC counselling received after graduation were not considered confounders and were therefore excluded from the final model. A general linear model for repeated measures served to compare the changes in outcome measures by intervention group.

These analyses provided us with the time effect (if the outcome measure changed significantly over time), the group effect (if, on average, the means of the outcome measure differed across/over various conditions) and the group-x-time interaction (if the time effect differed significantly under the conditions analysed). These effects were indicated by F-values and corresponding P-values.
Results

Two background variables showed statistically significant differences between the groups. First, the education group had fewer participants from the Tampere health care region (42.9%) than did the control group (76.0%) ($P = 0.022$) (Table 1). Second, participants in the education + fee-for-service group had received more TUPAC counselling education after graduation (59.3%) than had participants in either the control group (16.0%) ($P = 0.001$) or the education group (28.6%) ($P = 0.034$).

In the analyses where preventive counselling was an outcome, reported tobacco prevention increased more in the education and education + fee-for-service groups than in the control group (Table 2, Fig. 2). However, assessment revealed no statistically significant time effect or group-by-time interaction (Table 3 and Fig. 2). In addition, assessment revealed no statistically significant time-by-group interaction between the education and education + fee-for-service groups at 2 months ($F = 0.47; P = 0.63$) or at any other time point (Table 2, Fig. 2). When examining the provider effect, dental hygienists showed greater activity in tobacco prevention than did dentists ($F = 30.19; P < 0.001$). In addition, provider-by-time interaction was statistically significant ($F = 5.95; P < 0.001$), thus indicating that during the study, dental hygienists increased their cessation counselling in intervention groups more than did dentists. However, no statistically significant group-by-time interaction among dental hygienists was observed between the education and education + fee-for-service groups ($F = 1.78; P = 0.12$).

Discussion

The aim of this community trial was to evaluate the impact of educational and fee-for-service interventions on implementing TUPAC counselling in primary oral health care settings in Finland. This trial was designed and conducted according to the UK’s Medical Research Council guidelines on complex interventions (20, 23). In preventive counselling frequency increased in both intervention groups during the first 2 months, after which it relapsed. Despite the relapse, cessation counselling frequency still remained higher than in the control group after the 6-month follow-up period [$F = 2.31; P = 0.007$; effect size 0.52 (95% confidence interval 0.034–1.02)] (Tables 2 and 3, Fig. 3). The education and education + fee-for-service groups showed no statistically significant group-by-time interaction at 1 month ($F = 1.45; P = 0.24$) or at any other time point assessed (Table 2, Fig. 3). With regard to provider type, dental hygienists were on average more active in cessation counselling than were dentists ($F = 30.19; P < 0.001$). In addition, provider-by-time-by-group interaction was statistically significant ($F = 5.95; P < 0.001$), thus indicating that during the study, dental hygienists increased their cessation counselling in intervention groups more than did dentists. However, no statistically significant group-by-time interaction among dental hygienists was observed between the education and education + fee-for-service groups ($F = 1.78; P = 0.12$).
counselling, neither intervention yielded statistically significant results. Independent of interventions, dental hygienists were more active in preventive counselling than were dentists. In cessation counselling, we observed a statistically significant group-by-time interaction, which suggests that the provision of cessation counselling increased more in both intervention groups than in the control group. Fee-for-service seemed to have no additional effect over educational intervention alone. In addition, TUPAC counselling performance increased more among dental hygienists than among dentists in both intervention groups.

Educational intervention seemed to have an immediate intervention effect, being statistically significant in cessation counselling during the 6-month trial period. Soon after the 2-month point, however, the effect of the single educational event began to fade rapidly. Interestingly, the added incentive of monetary compensation proved ineffective as a booster for education. In contrast, a recently published fissure-sealing trial found the opposite trial effect: educational intervention had no statistically significant intervention effect on fissure sealing among dentists, but monetary compensation did (24). The reason for these differing results may stem from the different implementation difficulties. We found previously that lack of skills, beliefs about capabilities and environmental support in providing TUPAC counselling were potential barriers to implementation among our sample of oral health professionals (18). The educational intervention might have been effective in increasing participants’ self-efficacy (beliefs about capabilities) and skills in TUPAC counselling. The monetary incentive, however, seemed to have no or only a minor effect on implementing TUPAC counselling. Presumably, the monetary incentive alone had insufficient impact on environmental factors. Additionally, as oral health professionals are usually more familiar with clinical procedures,
such as fissure sealing, than with patient counselling, varying intervention results are unsurprising.

When analysing the results separately by professional group, dental hygienists seemed to do better than dentists did regardless of group allocation. Additionally, both interventions were more effective in increasing cessation counselling among dental hygienists than among dentists. This is an important issue, especially in Finland where the number of dental hygienists as a proportion of the population is higher (the ratio of dental hygienists to the population is 1:3571) than in other countries such as the UK (1:12 432), Australia (1:27 713) or Germany (1:683 333) (25). In Finland, the curriculum for dental hygienist degrees has been implemented since 1975, so this profession benefits from a tradition of involvement in the oral health care of Finnish dental patients. Because the dental hygienists’ main responsibilities are to provide preventive services for patients, the present study supports the vital role of this professional group in TUPAC counselling (26, 27).

Discussions of the role of educational interventions in enhancing the performance of oral health professionals in TUPAC counselling often describe the evident lack of undergraduate education in TUPAC counselling internationally (28). Some studies, however, have reported a positive attitude and the need for further education in TUPAC counselling (28–30). In addition to the amount of education provided, one should also consider the content of the basic curriculum related to TUPAC counselling. Unfortunately, both medical and dental education researches have consistently reported that schools provide only basic knowledge-based curricula that rarely incorporate more effective, behaviourally based components affecting long-term change (31). This is important to acknowledge, because attitudes and motivation towards TUPAC counselling as part of oral health practice develop already during the curriculum.

During the follow-up, not only the participants in the intervention groups but also the controls showed improvement in TUPAC counselling. This can be attributed to the initial information

Table 3. The effect of interventions (education and education + fee) compared to the control group during the 6-month follow-up (n = 73)

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<th>Group-by-time effect</th>
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<td>Preventive counselling</td>
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<td>3 months</td>
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<td>4 months</td>
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<td>6 months</td>
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*Significant P < 0.05.
**Significant P < 0.01 (one way).

![Fig. 3. The effect of educational intervention on tobacco cessation in the control and intervention groups during the follow-up.](image-url)
provided to all groups about the new EDR coding system for TUPAC counselling and the plausible traditional trial effect. We cannot deny the possibility of some contamination effect, for example, through communication between staff members, as this is often a limitation in community trials. The finding that economical incentive failed to increase the effect of TUPAC counselling may be sensitive to study setting, that is, public health centres rather than private practitioners. While 6-month follow-up is the standard length used in tobacco cessation efficacy studies (21), research with longer follow-up is needed to fully see the impact of this type of interventions in primary care dental settings.

The strengths of this study include its high participation rate (76.8%), the lack of losses in follow-up and our sample’s representation of community oral health professionals in Finland (20). Also, the setting in which we conducted the community trial was suitable, as Finland is part of the Nordic health care system where health care is publicly funded through taxation, and high-quality dental care is available to all. This provides an excellent opportunity for oral health professionals to have a significant public health impact, especially among youth, therefore providing a feasible and justified setting for us to conduct the study. Although health care systems differ from country to country, the implementation challenges of TUPAC counselling among oral health professionals seem quite similar (10–12, 18). While our sample of oral health professionals was working in primary health care, our positive results may be applicable to and should at least encourage those working in the private sector.

We conducted the outcome data collection using registered data from electronic patient records. These results are likely an underestimation rather than an overestimation, as the under-reporting and under-registering of services provided are common among oral health professionals (32, 33). In addition, because the results of education + fee-for-service group were comparable to the education group, monetary compensation presumably caused no over-reporting bias (i.e. that TUPAC counselling would have occurred more among the education + fee-for-service group).

Researchers recommend that intervention trials apply intent-to-treat analysis to compare the outcomes of different conditions. Optimally, this means that all participants who were initially randomized into the study groups should be included in the analyses, even if not all of them participated later on (22). According to a study by Hollis and Campbell (22), however, in many trials this is not the case. In our trial, for example, we did not analyse all those who had been randomized and who provided their informed consent. Thus, one could say that this study approached an intent-to-treat analysis. On the other hand, it is important that data be available on the outcome of all those included in the analyses; our study satisfies this requirement.

Based on the results of our 6-month follow-up, educational intervention seems to have a short-term favourable impact on implementing cessation counselling among oral health professionals. Adding monetary incentives, however, seems to have no such intervention effect. Producing a more sustainable effect may require supporting actions such as continuing education and reminders to oral health professionals. Further studies with focus on how to achieve long-term changes in TUPAC counselling activity among oral health professionals are needed.

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