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Patient feedback as a motivating force to quit smoking

Takashi Hanioka[1], Miki Ojima[2], Nobuyuki Hamajima[3] and Mariko Naito[3]

[1]Department of Preventive and Public Health Dentistry, Fukuoka Dental College, Fukuoka, [2]Department of Preventive Dentistry, Graduate School of Dentistry, Osaka University, Osaka, [3]Department of Preventive Medicine/Biostatistics and Medical Decision Making, Nagoya University Graduate School of Medicine, Nagoya, Aichi, Japan

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Abstract – *Objectives:* The effectiveness of a brief intervention by dental professionals utilizing feedback of oral symptoms and dental treatments specifically relevant to smoking was examined in terms of it being a motivating factor to quit smoking. *Methods:* Information pertaining to the present study was mailed to 208 dental clinics and 45 dentists agreed to participate. Dental patients who currently smoked were assigned consecutively to either an intervention (IG) or nonintervention group (NG) in each clinic during the 6-month experimental period. In IG, dental professionals provided brief explanations regarding oral symptoms and dental treatments specifically relevant to smoking. The effectiveness of intervention was evaluated with respect to attempts to quit and progression through the stages of behavioral changes involved in quitting using the standardized questionnaire. *Results:* Dropout was considerable; 10 clinics terminated their participation. Questionnaires of 797 patients (IG, 416; NG, 381) were received from 35 clinics and the records of 497 patients (IG, 248; NG, 249) were analyzed. Among patients in IG and NG, 12.1% and 4.8% reported attempts to quit, respectively. Odds ratios of quitting attempts and progression and regression through the stages of behavioral changes adjusted for sex, age, and stage at the first visit were 2.2 (95% confidence interval: 1.04, 4.5), 1.7 (1.1, 2.8), and 0.28 (0.15, 0.53) for all patients, respectively, and 3.1 (1.3, 7.5), 2.1 (1.3, 3.4), and 0.21 (0.11, 0.44), respectively, for patients who were not ready to quit. Trends in the movement through stages differed because of the stage at the first visit. *Conclusions:* As a result of the limitation imposed by the considerable dropout number, we concluded that a brief intervention by dental professionals potentially motivates smokers with respect to their attempts to quit smoking and promotes behavioral changes involved in quitting.

Key words: behavioral change; dental disease; dental professional; dental treatment; intervention study; quit smoking; quitting attempt

Takashi Hanioka, Department of Preventive and Public Health Dentistry, Fukuoka Dental College, 2-15-1 Tamura, Sawara-ku, Fukuoka 814-0193, Japan
Tel/Fax: +81-92-801-0616
e-mail: haniokat@college.fdcnet.ac.jp

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Numerous studies addressing the association between smoking and dental diseases appear in dental journals. Dental diseases were first introduced as an independent chapter in the series of the US Surgeon General's report on the health consequences of smoking in terms of causal associations involving a standardized protocol of systematic review, which was also applied to general diseases (1): Evidence is sufficient to infer a causal relationship for periodontitis, suggestive but not sufficient to infer a causal association for root-surface caries, and inadequate to infer the presence or absence of a causal relationship for coronal dental caries; moreover, relationships to oral cancer and oral clefts were ranked with the highest and second highest levels of evidence, respectively. Passive smoking may be correlated with pediatric caries (2), periodontal disease (3), and gingival pigmentation in children (4).

Smoking also has an impact on dental treatment: smoking increases the risk of root canal treatment (5); periodontal treatments in smokers are less effective than that in nonsmokers (6); failure of dental implants is more readily observed in smokers (7); smokers exhibit prolonged wound healing following tooth extraction (8); premature tooth loss because of smoking (9) may decrease the potential for mastication and aesthetic functions which are

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recovered by restorative and prosthetic treatments; and oral mucosal lesions, malodor and discoloration of the teeth, restorations (10), and lips as well as gingiva (11) are also associated with smoking.

Several types of tobacco dependence treatments involving counseling, behavioral therapy, and pharmacotherapy should be employed in all smokers who attempt quitting (12). A brief intervention is designed to motivate patients unwilling to attempt to quit. The FDI urged dental professionals to advise patients to quit smoking (13). An extensive range of studies has been conducted worldwide corresponding to attitudes among dental professionals toward smoking prevention (14) and quitting activities (15), barriers to the incorporation of such activities into routine dental practice (16), and intervention guidelines for dental professionals (17); moreover, reviews of these studies including the effectiveness of dental intervention in conjunction with that of medical settings also appear in the literature (18). Although much evidence has demonstrated the effectiveness of intervention by physicians, several papers have addressed its effectiveness in the dental setting (19–22). Most of these reports evaluated the effect on quitting and documented quitting rates comparable to those achieved by physicians. Significant barriers to the incorporation of these activities into general dental practice included the lack of education of dentists and hygienists in terms of being able to select effective treatments available to promote quitting activities (18, 23).

Various oral symptoms and dental treatments relevant to smoking may be applicable to motivate patients in dental clinics. To the best of our knowledge, the literature regarding the effectiveness of a brief intervention by dental professionals with respect to motivating patients to quit is sparse. The theoretical model for intervention with respect to behavioral approaches involves stage-based interventions (24). This model separates smokers into five different stages: precontemplation, contemplation, preparation, action, and maintenance. Progression through these stages is sequential, although relapse to an earlier stage could occur. The aim of the present study was to examine the effectiveness of a brief feedback of dental events specifically relevant to smoking in terms of motivating patients to give up smoking utilizing attempts to quit and promoting progression through the stages of behavioral changes.

Methods

Guidelines to quit smoking recommend that health professionals explain the relevant events associated with smoking to smokers who are not willing to quit (12). The WHO tobacco treaty endorses the need for larger warnings on cigarette packages that include pictures (25). In particular, a picture depicting a mouth was effective (26). Effects of smoking on oral symptoms are visible and include dental treatments. Color charts, which facilitate patient education in connection with dental events specifically relevant to smoking, were produced (Table 1). A total of 24 topics were described in the charts with a few sentences so that practitioners could address each topic routinely. We also developed reminder cards, which briefly described each topic as well as methods relating to quitting smoking based on behavioral and pharmacotherapy approaches.

Information pertaining to the clinical study was mailed to 208 dentists of an association of preventive dentistry in Japan. Materials and documents describing the research protocol were sent to 53 members who replied positively; 45 dentists agreed to participate. Each dentist was instructed to assign consecutively all those smoking patients aged 20 or older, who agreed to participate in either an intervention (IG) or a nonintervention (NG) group comprised of up to 20 subjects during a 6-month experimental period.

Intervention consisted of a brief explanation regarding dental events relevant to smoking, employing color charts (Table 1) and reminder cards. Intervention continued unless dental treatment was completed prior to the end of the 6-month experimental period. NG patients received no intervention other than dental treatments. A color sticker was pasted on patient records so as to permit differentiation between patient groups by dental professionals and to offer a reminder with respect to brief intervention at every visit (27). The intervention began in September 2004. The protocol was approved by the Ethics Committee of Fukuoka Dental College. Informed consent was obtained prior to assignment.

The level of changes in smoking behavior (24) and quitting attempts was assessed via a standardized questionnaire (Table 2). Four stages of behavioral changes involved in quitting smoking were categorized as follows: precontemplation stage lacking interest to quit, precontemplation stage

Table 1. Topics described in the color charts used to motivate smokers to quit

Categories	Topics	Photos and charts
Negative social consequences	Halitosis	Yellowish tongue coating
	Discoloration of teeth	Teeth with black deposits
	Gingival pigmentation	Gingiva with melanin pigmentation
	Discoloration of restoration	Resin restoration with black deposits in the margin
Subjective symptoms	Calculus	Calculus with black deposits
	Gingival abscess	Gingival abscess with scheme of subgingival calculus
	Taste	Tongue with scheme of taste bud
	Susceptibility to bacterial infection	Scheme of immune and microcirculatory system
Visible effects on oral mucosa	Oral cancer	Cancer of the tongue and oral vestibule
	Smoker's lip	Smoker's lip
	Leukoplakia	Leukoplakia in the tongue and buccal mucosa
	Smoker's palate	Smoker's palate
Negative treatment outcome	Prolonged wound healing following tooth extraction	Dry socket
	Failure of dental implant	Dental implant failure
	Effect of periodontal treatment	Comparison in the graph
	Effect on restorative and prosthetic treatments because of premature tooth loss	Extracted tooth with crown and inlay
Periodontal disease and premature tooth loss	Periodontal destruction	Scheme of periodontal disease
	Loss of alveolar bone	Attachment loss
	Suppression of gingival bleeding	Comparison in the graph
	Premature tooth loss	Comparison in the graph
Effects on the next generation and/or of passive smoking	Cleft lip and palate	Cleft lip and lip after treatment
	Passive smoking and pediatric caries	Pediatric caries
	Passive smoking and periodontal disease	Comparison in the graph
	Passive smoking and gingival melanin pigmentation	Gingival pigmentation of children

Table 2. Classification of behavioral change stages involved in quitting smoking and corresponding descriptions in the questionnaire

Stage	Description of smoking behavior
Precontemplation stage lacking interest to quit	You are not interested in quitting smoking
Precontemplation stage with interest to quit	You are interested in quitting smoking, but unwilling to quit within 6 months
Contemplation stage	You are willing to quit within 6 months but not ready to quit within 1 month
Preparation stage	You are ready to make an attempt to quit within 1 month
Attempt to quit	You attempted to quit during your dental visit

with an interest to quit, contemplation stage, and preparation stage. The questionnaires utilized at the first and final visits were analyzed for progression through these stages of behavioral changes. Experience with respect to quitting attempts during the dental visits was surveyed in the questionnaire at the final visit. Patients displaying a willingness to quit were defined as those in the preparation stage. Patients were classified into two categories according to their level of willingness to quit at the first visit: (i) patients who were not ready to quit smoking, and (ii) all patients including those in the preparation stage.

Statistics

Preliminary documentation capable of contributing to the determination of the sample size in the present randomized trial was limited. Furthermore, no published data pertaining to quitting attempts appear in the literature. Therefore, determination of the sample size was derived from the following reports: effectiveness of intervention in dental

clinics on abstinence of smoking (21, 27). Power analyses (Sample Power; SPSS Japan Inc., Tokyo, Japan) based on these reports indicated an appropriate sample size of 500–600 via consideration of the success rate of the reference group (0.1), the difference between groups (0.1), and a certain percentage of dropout patients (40%).

Differences in continuous variables between groups were assessed via the two-tailed *t*-test. Differences in the dropout rate between groups were evaluated with the chi-square test. The effectiveness of intervention relating to quitting attempts and progression through the stages of behavioral changes was evaluated by logistic regression analysis; NG served as a control. Statistical analyses were conducted with software (SPSS; SPSS Japan Inc.). The significance level was set at 5%.

Results

Questionnaires of 797 patients (IG, 416; NG, 381) were received from 35 dental clinics (Table 3). Ten clinics terminated their participation prematurely because of difficulties associated with the continuation of the study. Because of a lack of records or serious errors in the questionnaires, either at the initial or final visit, the records of 497 patients (IG, 248; NG, 249), aged 45.2 ± 15.3, were analyzed. The difference in the dropout rates between groups, 40.3% (IG) versus 34.6% (NG), was not significant ($P = 0.0948$). Subjects smoked 18.2 ± 8.8 cigarettes daily on average for 27.0 ± 15.7 years. No significant difference in age, the duration of smoking, and daily consumption was evident between the groups (data not shown). The mean frequency of dental visits was 4.7 ± 3.3; additionally, no significant difference was observed between groups (data not shown). Approximately, three quarters of patients consisted of individuals in the precontemplation stage, who reported an unwillingness to quit within 6 months (Table 4). Patients in IG were distributed at higher levels in terms of behavioral changes relative to those in NG.

Table 3. Distribution (%) of the study population by intervention group in 35 dental clinics

Number of patients	Intervention	Nonintervention	Total
Initially entered	416 (100)	381 (100)	797 (100)
Dropped out	168 (40.3)	132 (34.6)	300 (37.6)
Analyzed	248 (59.6)	249 (65.4)	497 (62.4)
Males	173	195	368
Females	75	54	129

The percentages of patients who attempted to quit, progressed, and regressed through stages are summarized by the stage of behavioral changes at the first visit (Table 5). A flow chart, which explains progression and regression through the stages of behavioral changes, is illustrated in Fig. 1. Higher percentages of patients attempted to quit in IG than in NG, and the trend was consistent among patients who were not ready to quit within 1 month; ratios of IG relative to NG varied between 2.2 and 5.6. The opposite trend was apparent in cases involving patients in the preparation stage. The percentages of patients who attempted to quit were 12.1% and 4.8% overall in IG and NG, respectively. In those patients in other than the preparation stage, the percentages were 9.1% and 3.3%, respectively.

Similar albeit smaller trends in the difference between groups were observed with respect to stage progression in patients in the precontemplation stage; the ratios were 1.2 and 1.6. Among subjects in the contemplation stage, no patient exhibited progression through the stages in NG, whereas 22.0% progressed in IG. The opposite trend was apparent in patients in the preparation stage. The percentages of patients who progressed through stages were 22.6% and 17.7% overall in IG and NG, respectively; the ratio was 1.3. These figures were similar in patients who were not ready to quit within 1 month. Six subjects in the preparation stage in IG progressed through the stages, although 10 patients attempted to quit smoking in the same group. This situation is not a contradiction,

Table 4. Distribution of patients in intervention and nonintervention groups by initial stage of behavioral change

Initial stage	Intervention	Nonintervention	Total
Precontemplation lacking interest to quit	33	72	105 (21.1%)
Precontemplation with interest to quit	137	138	275 (55.5%)
Contemplation	50	30	80 (15.9%)
Preparation	28	9	37 (7.4%)

Table 5. Percentages (*n*) of patients who attempted to quit, progressed, and regressed through the stages by the stage of behavioral change at the first visit in the intervention and nonintervention groups and the corresponding ratios

Movement	Stage at first visit	Intervention, % (*n*)	Nonintervention, % (*n*)	Ratio
Attempt	Precontemplation lacking interest to quit	12.1 (4)	5.6 (4)	2.2
	Precontemplation with interest to quit	5.1 (7)	2.2 (3)	2.3
	Contemplation	18.4 (9)	3.3 (1)	5.6
	Preparation	35.7 (10)	44.4 (4)	0.8
	All patients	12.1 (30)	4.8 (12)	2.5
	Patients not ready to quit	9.1 (20)	3.3 (8)	2.8
Progression	Precontemplation lacking interest to quit	39.4 (13)	33.3 (24)	1.2
	Precontemplation with interest to quit	19.0 (26)	11.6 (16)	1.6
	Contemplation	22.0 (11)	0 (0)	NA
	Preparation	21.4 (6)	44.4 (4)	0.5
	All patients	22.6 (56)	17.7 (44)	1.3
	Patients not ready to quit	22.7 (50)	16.7 (40)	1.4
Regression	Precontemplation with interest to quit	2.2 (3)	18.1 (25)	0.12
	Contemplation	28.0 (14)	43.3 (13)	0.65
	Preparation	25.0 (7)	33.3 (3)	0.75
	All patients	9.7 (24)	16.5 (41)	0.59
	Patients not ready to quit	7.7 (17)	15.8 (38)	0.49

NA, not applicable.

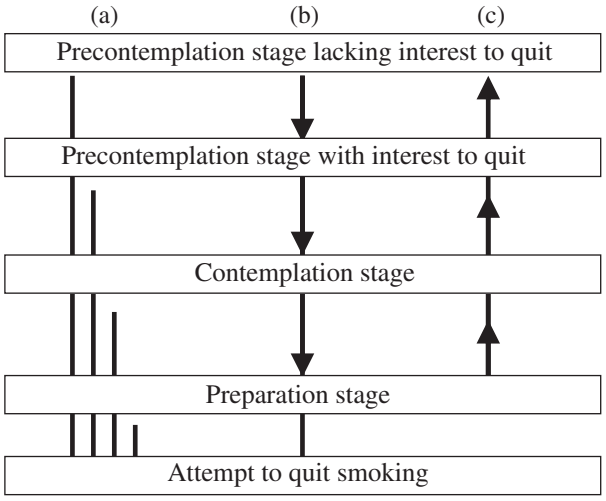

Fig. 1. Flow chart with respect to the behavioral changes of smokers who attempted to quit (a), progressed (b), and regressed (c) through the stages by the initial stage of behavioral change.

Table 6. Odds ratios (ORs) and 95% confidence intervals (CIs) of attempts to quit and transition through the stages in the intervention group relative to the nonintervention group for all patients and for patients who were not ready to quit

Stage transition	Crude OR (95% CI)	Adjusted OR[a] (95% CI)
All patients		
No intervention	1.0 (reference)	1.0 (reference)
Attempt to quit	2.7 (1.4, 5.4)	2.2 (1.04, 4.5)
Progression	1.4 (0.87, 2.1)	1.7 (1.1, 2.8)
Regression	0.54 (0.32, 0.93)	0.28 (0.15, 0.53)
Patients not ready to quit		
No intervention	1.0 (reference)	1.0 (reference)
Attempt to quit	2.9 (1.3, 6.7)	3.1 (1.3, 7.5)
Progression	1.5 (0.93, 2.3)	2.1 (1.3, 3.4)
Regression	0.45 (0.24, 0.81)	0.21 (0.11, 0.44)

[a]Adjusted for sex, age, and initial stage of change; initial stage significantly contributed to each equation ($P < 0.05$) except for attempts to quit among patients who were not ready to quit.

as an attempt to quit was an experience during the observation period.

The percentages of patients who regressed through the stages were lower in IG than in NG. This trend was consistent through the stages. The percentages of patients who regressed through the stages were 9.7% and 16.5% overall in IG and NG, respectively, and 7.7% and 15.8%, respectively, in patients who were not ready to quit within 1 month.

Odds ratios (ORs) of attempts to quit in IG relative to NG adjusted for sex, age, and stage of change were 2.2 overall and 3.1 in patients who were not ready to quit within 1 month (Table 6). ORs of progression through the stages in IG relative to NG were 1.7 and 2.1, whereas those of regression through the stages were 0.28 and 0.21, respectively. After adjustments for sex, age and stage of change, differences in all indices of behavioral changes between IG and NG were significant. The stage of behavioral change at the first visit contributed significantly to the difference in all indices of behavioral changes between groups ($P < 0.05$), with the exception of quitting attempts among those individuals who were not ready to quit within 1 month.

Discussion

Overall, stage-adjusted ORs of quitting attempts and progression through the stages of behavioral changes indicated significant differences in the behavioral modifications of patients between the intervention groups. Trends of effectiveness were similar by stages of behavioral changes at the first visit, except for the preparation stage. Therefore, intervention involving a brief feedback concerning dental events specifically relevant to smoking apparently increased patients' motivation to quit smoking. Similar findings have been reported recently. The incorporation of individualized personal feedback utilizing a point-of-care test for salivary nicotine metabolites in the dental clinic increased quitting rates in 8 weeks; 23% in patients versus 7% in controls (28). Effectiveness in the present study might be biased by the difference in subject distribution with respect to the stage of behavioral changes at the first visit between groups; as a result, this factor was utilized as an independent variable in the logistic regression model.

Guidelines to quit smoking recommend the use of the 'five Rs' for smokers who are not willing to quit (12): relevance, risks, rewards, roadblocks, and repetition. Dental professionals have repeated opportunities to provide reinforcement regarding a variety of risks and dental events specifically relevant to smoking. A color guidebook for the screening of visible symptoms in the mouth (10) was employed by several types of health professionals (Mecklenburg, written communication, 1995). Visible symptoms in the mouth may be an important factor in young adults, as an interpersonal factor influenced quitting attempts in young adults (29). Feedback involving an existing public health channel to reach smokers, i.e. home health care nurses, may potentially provide a large public health impact (30). Moreover, dental clinics could provide a public avenue to potentially reach smokers who vary in terms of their level of motivation to quit.

In the preparation stage, the percentage of smokers who attempted to quit was not greater in IG relative to NG. Brief feedback to smokers in the preparation stage may not be effective as individuals in this stage would be well motivated. An intervention study employing feedback regarding L-myc polymorphism did not influence smokers with cancer (31). Therefore, a higher OR of 3.1 in patients who were not ready to quit would afford a viable explanation regarding the effectiveness by dental professionals of brief intervention on attempts to quit.

Similar but less apparent effects of intervention were observed in terms of the progression through stages. The trend was obvious in patients in the contemplation stage in comparison with those in the precontemplation stage. The effect of feedback on regression through the stages was also evident, particularly among subjects in the precontemplation stage. These findings suggest that the level of effectiveness of feedback on movement through the stages differs according to the stage of behavioral change at the first visit. In terms of abstinence, clinicians are likely to believe that the level of willingness to quit may influence the success rate in patients. However, evidence was limited regarding the effectiveness of stage-based intervention with respect to the alteration of smoking behavior (32). In the present study, stage-based intervention was not employed for the motivation of smokers to quit. Transition through the stages was evaluated as an indicator of the effect of the simple approach to motivate quitting.

Another significant aspect of this investigation was the approximately three quarters of smokers in dental clinics who were in precontemplation stages. Effective intervention, particularly to motivate patients to quit, would be an important practice in dental clinics in Japan. This kind of intervention by dental professionals may also be important, as a variety of topics are available in dental settings to motivate quitting among both male and female smokers displaying a wide age range in comparison with medical settings. No training was implemented for dental professionals prior to the initiation of the current study. Although color charts and reminder cards were provided as a measure for intervention, descriptions on the materials were relevant to common dental symptoms and treatments; as a result, this intervention could be implemented in a conventional dental setting. Therefore, this study examined the effectiveness of intervention rather than its efficacy. The final goal of intervention by dental professionals is to assist smokers to successfully quit. The protocol was presented as the 'five As' approach in clinical practice guidelines: ask, advise, assess, assist, and arrange (12). The 'five Rs' protocol was applied to a person who was not willing to quit by assessment in the 'assess' procedure. This investigation, which evaluated the effect of intervention in terms of motivation, was conducted as the first part of

consecutive studies. Future parts of the study will assess the effect of intervention on smokers to quit.

A few limitations should be considered. First, considerable numbers of dentists, who were all private practitioners, prematurely terminated their participation in the trial. A few of these dentists cited anxiety related to the loss of patients possibly because of the provocation of alienation and denial and resistance of the dental staff. With respect to the graphic warnings on cigarette packaging in Canada, which appeared to serve as an effective intervention (25), about half of the participants in a longitudinal telephone survey reported negative emotional responses to the warning labels including fear and disgust (33). However, smokers who reported greater negative emotions were more likely to be motivated to quit. Participants who attempted to avoid the warnings were no less likely to engage in quitting behavior. Because of a fear of adverse outcomes, policymakers may be reluctant to introduce graphic warnings. Clinicians are able to directly provide positive images of quitting to their patients. Given the harmful effects of smoking on oral health and dental treatment, providing guidance pertaining to the risks of smoking should be an obligation of dental professionals. Brief training affording instructions as to how dental professionals might approach relevant oral events in smoking patients may be necessary. Smoking constitutes the highest priority with respect to general and oral health.

A large number of patient records could not be analyzed. Among these records, incomplete entries were detected in definitive questions, indicating the inexperience of private practitioners and staff with respect to paper transactions for research records. Practitioners may have mismanaged data recording at the final visit. However, no measure to assess individual patient reasons was available as a consequence of ethical considerations. Similar numbers of records were analyzed in both groups. These analyses revealed that demographic characteristics did not differ between groups; moreover, there was no difference in the dropout rate between groups. Although apparent features were similar between groups, the influence of differences in the quality of these records between groups should be considered carefully when the findings of the present study are generalized.

Behavioral modification was evaluated via a self-reported questionnaire. Chemical validation was not available in this study. Some subjects in NG might be highly motivated as the same dental-professional-treated IG patients in the same dental clinic. The difficulty with respect to controlling intervention trials in a private dental setting was suggested because of the diversity among dental practices (22). A quasi-experimental design was employed in dental trials (23).

In light of the limitations imposed by large dropout numbers and subjective measures of behavioral changes, we concluded that brief feedback related to oral symptoms and dental treatments specifically relevant to smoking by dental professionals increased the probability of quitting attempts in patients who were not ready to quit. Dental visits provide an important opportunity for health professionals to influence smokers with respect to motivating them to quit.

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