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What factors need to be addressed to support dental hygienists to assist their patients to quit smoking?

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Abstract

Introduction

Dental hygienists are well placed to assist their patients to quit smoking. Smoking affects oral health and dental treatments, and hygienists report greater time with patients than dentists with more focus on prevention. However, there has been little research into the extent to which hygienists assist patients to quit smoking, and strategies to support them in this role.

Methods

A two stage survey of Australian dental hygienists was conducted. The first survey measured potential predictors of asking patients about smoking and assisting patients to quit smoking using the Theory of Planned Behaviour as a framework. The second survey measured these behaviours in the past week. Structural equation modelling was used to examine predictors of the two behaviours.

Results

A total of 362 hygienists returned the first questionnaire. Intentions to ask and assist patients were high. The 273 hygienists who returned the second questionnaire assisted an estimated total of 1,394 patients to quit smoking in one week. Predictors within the Theory of Planned Behaviour framework explained significant variance in asking (11%) and assisting (29%) behaviours, with self-efficacy the most critical predictor in both cases ($\beta =.27, .32$ respectively).

Conclusions

Dental hygienists may be a viable and willing avenue for addressing smoking. Hygienists may be best supported in this role through increasing skills and confidence around asking sensitively about smoking, building rapport, and assisting patients to quit smoking. . Incorporation of smoking status into general history taking and adoption of organisational policies on assisting patients to quit smoking could also be encouraged.

Introduction

The most recent National Drug Strategy Household Survey (Australian Institute of Health and Welfare, 2008a) estimates the national smoking rate at 17% (18% of males and 15% of females). This is a significant drop in prevalence from 27% of males and 22% of females in 1991 (Australian Institute of Health and Welfare, 2005), and an even greater decrease from the 1950s, when 70% of males and 30% of females were estimated to have smoked (Australian Institute of Health and Welfare, 2006). The decline is attributed to concerted public health efforts to prevent uptake of smoking, increase quit rates among smokers, and apply greater smoking restrictions (Chapman & Wakefield, 2001). Nonetheless, smoking remains the single greatest cause of preventable disease and death in Australia, responsible for 7.8% of Australia's burden of disease (Australian Institute of Health and Welfare, 2010) and further avenues to reduce smoking rates are being sought.

Smoking affects oral health, including increasing gum disease, tooth loss, and potentially fatal cancers (Johnson & Bain, 2000; US Department of Health and Human Services, 2004). Smoking negatively affects outcomes of dental treatment such as oral surgery, implants, and the treatment of gum disease (Johnson & Bain, 2000; Sanchez-Perez, Moya-Villaescusa, & Caffesse, 2007; Strietzel, et al., 2007), and has an aesthetic impact such as stained teeth. All of the above may offer a 'teachable moment' where patient receptiveness to quitting smoking is likely to be high (Gordon, Lichtenstein, Severson, & Andrews, 2006; Hébert, 2005; Stevens, Severson, Lichtenstein, Little, & Leben, 1995). As a consequence, there is increased attention on the dental setting as an opportunity to encourage smoking cessation (Edwards, Freeman, & Roche, 2006;

Gordon, Andrews, Crews, Payne, & Severson, 2007). In Australia, 60% of the population visit the dentist at least once per year (Carter & Stewart, 2003), including men and adolescents, who are less likely to visit health professionals such as General Practitioners (Campbell, Sletten, & Petty, 1999; Parker, 2003).

Past research has typically focused on the role of dentists. There has been less research attention on dental hygienists. Dental hygienists have a stronger focus on prevention than dentists (Gordon, et al., 2006), have more time to spend with patients (Edwards, et al., 2006; Gordon, et al., 2006), and report fewer barriers to providing smoking interventions (Edwards, et al., 2006; Helgason, Lund, Adolfsson, & Axelsson, 2003).

Brief smoking interventions have a strong evidence base for their effectiveness (Heckman, Egleston, & Hofmann, 2010). Interventions by dental hygienists have been found to achieve quit rates of 15% (Binnie, McHugh, Jenkins, Borland, & Macpherson, 2007) to 25% (Nasry, et al., 2006). However, as with other professions, adoption is often less than optimal (Barker, Williams, Taylor, & Barker, 2001; Edwards, et al., 2006; Tremblay, Cournoyer, & O'Loughlin, 2009).

The major barriers for dentists and hygienists in the adoption of smoking interventions assisting patients to quit smoking identified in the international literature include practitioner knowledge, skills, and confidence, perceived patient resistance, time barriers, concerns of low effectiveness, and lack of reimbursement (Albert, et al., 2005; Brothwell & Gelskey, 2008; Croucher, 2011; Helgason, et al., 2003; Stacey, et al., 2006).

In the only Australian study of dental hygienists identified, Edwards et al. (2006) found that barriers to Australian dental hygienists' smoking cessation activity included

lack of confidence, fear of alienating patients, and low perceived efficacy in regard to helping patients to quit. The objective of the current study is to build on this study by examining hygienists' perceived barriers in more detail and to evaluate the most important predictors of identifying patients who smoke and assisting patients to quit smoking.

Methods

The study was conducted by the National Centre for Education and Training on Addiction, Flinders University, South Australia, with ethics approval from the Flinders University Clinical Research Ethics Committee. The study design was a prospective survey of a national sample of dental hygienists.

Theoretical Underpinnings

The Theory of Planned Behaviour was used as a guiding theoretical framework. The theory has been widely used to understand and predict behaviours (Armitage & Conner, 2001). It incorporates actors' attitudes, the influence of other individuals and norms (subjective norms), the ability to perform the behaviour (perceived behavioural control) and intentions to perform the behaviour, in order to predict a particular behaviour (Ajzen, 1991). Perceived behavioural control is often split into two dimensions: controllability, which relates to perceptions of whether the behaviour is within their control; and self-efficacy, which relates to having the requisite skills and confidence to perform the behaviour (Trafimow, Sheeran, Conner, & Finlay, 2002). Attitudes, subjective norms, and perceived behavioural control are determined by underlying

beliefs, termed behavioural beliefs, normative beliefs, and control beliefs (Ajzen, 1991). These often neglected beliefs provide detailed information on the issues underlying the determinants of behaviour.

Procedures

Using the Theory of Planned Behaviour framework, a three step method was employed: 1) a preparatory qualitative study, 2) a questionnaire examining predictors of behaviour, and 3) a second questionnaire measuring behaviour.

1. Preparatory study. An initial qualitative study was conducted in accordance with Ajzen's (2002) guidelines for eliciting underlying beliefs, employing critical case sampling (Grbich, 1999). A sample of 75 hygienists was randomly selected from members of the Dental Hygienists' Association of Australia (DHAA) to participate. The DHAA is the professional body representing dental hygienists in Australia, with members in all states and territories. Data collection involved structured telephone interviews conducted by one researcher, TF, using a standardised script. A total of 22 hygienists participated (response rate = 29%). Two coders undertook thematic analysis following rigorous guidelines for reliability and validity (Boyatzis, 1998). The findings provided: 1) lists of underlying behavioural, normative and control beliefs for asking and assisting patients, and 2) strategies used to ask or assist patients who smoke. These were then included as items in the main study questionnaires, using wording as close as possible to participants' own words.

2. First Questionnaire: Predictors of Behaviour. The first questionnaire was informed by the preparatory study and constructed according to Ajzen's (2002)

guidelines for Theory of Planned Behaviour questionnaires. The questionnaire was piloted through a focus group with six hygienists, and changes made in response to feedback.

Hygienists were recruited through the dental registration board in each state and territory with the exception of New South Wales, where participants were recruited through the DHAA. The survey mail out included all hygienists in Australia, with the exception of non-DHAA members in New South Wales: a total participant pool of 833. Forty seven questionnaires were returned to sender with outdated or incorrect addresses, and two hygienists indicated they were no longer practising, leaving a total of 784 potential participants.

Participants were asked their age, gender, years of experience, and their smoking status. Participants also indicated tobacco-specific education or training undertaken, and details of any workplace policy governing identification of patients who smoke or assisting patients to quit smoking.

Attitudes, subjective norms, self-efficacy, controllability, intention, and underlying beliefs for both 1) identifying patients who smoke and 2) assisting patients to quit smoking were measured using five point semantic differential scales. After completing the rating for underlying beliefs, participants then ranked the five most important beliefs in each set (van der Pligt & de Vries, 1998).

The questionnaire also measured organisational factors suggested by the qualitative study to be potentially relevant: role adequacy (having the skills to address smoking), using the role adequacy subscale of the Alcohol and Alcohol Problems Perception Questionnaire (AAPPQ) (AAPPQ; Cartwright, 1980), with the item wording

altered to reflect smoking rather than alcohol consumption; role legitimacy (feeling addressing smoking was a legitimate part of their role), using the role legitimacy subscale of the AAPPQ (Cartwright, 1980); workload, using the role overload subscale of the Michigan Organization Assessment Questionnaire (MOAQ) (Cammann, Fichman, Jenkins, & Klesh, 1983); autonomy, using the freedom subscale of the MOAQ (Cammann, et al., 1983); and co-worker and supervisor support, using the co-worker support and supervisor support subscales of the Job Content Questionnaire (Karasek, et al., 1998). All of these factors were measured on a scale from 1 (low) to 5 (high).

   3. Second Questionnaire: Behaviour. Each participant was asked to complete two questionnaires to allow a separate measure of their behaviour for the week following measurement of the predictors. Upon return of a completed first questionnaire, the second questionnaire and a reply paid envelope were sent to the nominated address, timed to be received one week after return of the first. Participants were instructed to complete it for the week worked following completion of the first questionnaire. The two questionnaires were matched using a unique anonymous code. This addresses important criticisms of contemporaneous measurement of behaviour: that it measures past rather than future behaviour and that consistency bias artificially inflates relationships between predictors and behaviour (Armitage & Conner, 1999; Elliott, Armitage, & Baughan, 2003). As for the first questionnaire, the second questionnaire was constructed according to Ajzen's (2002) guidelines, informed by the preparatory study, and piloted with the same focus group of six hygienists. Participants were informed that there would be a second questionnaire "to follow up on some of the issues", but not that it was a measure of behaviour.

The second questionnaire measured frequency of identifying patients who smoke and assisting patients to quit (or cut down on) smoking using various strategies elicited from the preparatory study. Participants were also asked to estimate how many patients they had seen in the last week and how many they had intervened with in regard to smoking. Both questionnaires are available as supplementary materials online.

Analysis

Descriptive analysis. Univariate normality was assessed using skewness and kurtosis statistics and the Kolmogorov-Smirnov test. Medians and interquartile ranges (IQR) were used in place of means and standard deviations for non-normal variables. T-tests were used to compare participants who did or did not return the second questionnaire. Demographics of the full sample were compared to a national dental hygienist labour force estimate (Australian Institute of Health and Welfare, 2008b) using chi-square and one-sample t-tests to examine sample representativeness of the wider dental hygienist population. Descriptive statistics for predictor variables and the rankings of each set of underlying beliefs were calculated on the full sample.

Structural equation modelling. The theoretical models were examined using structural equation modelling with maximum likelihood estimation to assess the ability of the Theory of Planned Behaviour to predict rates of behaviour. The structural equation modelling used only the subset of participants who returned both questionnaires. Per patient measures of behaviour were calculated by dividing reported rates by the estimated number of patients seen in the preceding week. In order to include interaction terms in the

analysis, intentions, perceived behavioural control, and controllability were centred to reduce multicollinearity (Aiken & West, 1991).

Since there were non-normal variables present, Lei and Lomax's (2005) guidelines for SEM with nonnormal data were followed – NFI, NNFI, and CFI fit indexes are emphasised, and the sample size exceeded their minimum recommendation of 100 participants. As well as variance explained in the behaviours, Cohen's (1992) f^2 was calculated as an indication of effect size.

Results

A total of 362 initial questionnaires were returned (46%). Of these, 288 returned the second questionnaire (80% of those who returned the first questionnaire). Six (2%) could not be matched to the first questionnaire, and nine (3%) indicated they had not seen any patients in the intervening week, leaving 273 valid behaviour responses (35% of potential sample). Comparisons indicated no significant differences between those who did or did not return a valid behaviour response for theoretical predictors of identifying or assisting, or the organisational factors.

Demographics

Most hygienists were female (351/362, 97.0%, 95% CI = 95.2-98.7%). The mean age was 37.2 (SD = 9.1) and the mean length of hygienist experience was 10.2 years (SD = 8.8). The majority of respondents worked in the private sector (306/359, 3 missing cases, 85.2%, 95% CI = 81.6-88.9%), with few working in the public sector (36/359, 10.0%, 95% CI = 6.9-13.1%), or in both (3/359, 5%, 95% CI = 0.0-1.8%). The gender,

age, and private/public sector profile of the current sample was not significantly different from the Australian Institute of Health and Welfare's (2008b) dental hygienist labour force estimate (gender: χ^2 (1, N = 1,235) = 0.65, p = 0.42; age: M = 36.8, t(358) = 0.89, p = .37; sector: χ^2 (1, N = 1,215) = 0.00, p = 0.99).

Fifteen hygienists (4.1%, 95% CI = 2.1-6.2%) were smokers, well below the national prevalence rate of 17% (15% for females, Australian Institute of Health and Welfare, 2008a).

Theoretical Variables and Organisational Factors

Mean scores on all Theory of Planned Behaviour variables were above the scale midpoint (see Table 1). Intentions to identify patients who smoke were particularly high, with 90% (326/362, 95% CI = 87%-93%) of participants scoring a 4 (30%, 109/362, 95% CI = 25%-35%) or 5 (60%, 217/362, 95% CI = 55%-65%) out of 5. Mean scores on the organisational factors were also positive: average levels of role adequacy, role legitimacy, autonomy, co-worker support, and supervisor support were high, while average levels of workload were low.

The majority of hygienists had completed smoking cessation education or training (226/362, 62.4%, 95% CI = 57.4-67.4%). Most indicated they received this training either during undergraduate studies (145/362, 40.1% of total sample, 95% CI = 35.0-45.1%) or from a Quit seminar (84/362, 23.2% of total sample, 95% CI = 18.9-27.6%). Approximately a quarter of hygienists (98/362, 27.1%, 95% CI = 22.5-31.6%) were aware of an organisational policy concerning identifying or assisting patients who smoke. Policies most frequently covered asking about smoking as part of the medical history.

Underlying beliefs

The five behavioural beliefs and five control beliefs ranked most important for identifying patients who smoke and assisting patients to quit smoking are shown in Table 2. The top five behavioural beliefs for identifying and assisting represent the potential advantages of identifying and assisting rather than disadvantages. The selected control beliefs spanned practitioner factors (such as skills and confidence), patient factors (such as signs of smoking and rapport), and system factors (such as time in the appointment).

For normative beliefs, the most important person to consider was the patient (Top 5: 84%, #1: 71%), followed by the hygienist's employer (Top 5: 75%, #1: 12%), health professionals (Top 5: 70%, #1: 3%), the patient's family (Top 5: 59%, #1: 1%), and the tobacco control organisation Quit (Top 5: 45%, #1: 4%).

Behaviour

Identifying patients who smoke. On average, hygienists asked one in three patients if they smoked (34%, 95% CI = 33%-35%, 3020 out of 9019 total patients) and used medical histories or visible signs of smoking to ascertain the smoking status for 56% of their patients (95% CI = 55%-57%, 5026 out of 9019 total patients). Hereafter, these behaviours are combined as 'identifying patients who smoke'. Eight hygienists (3%, 95% CI = 1%-5%) reported not asking about smoking or otherwise ascertaining smoking status for any patients.

Assisting patients who smoke. Twenty nine hygienists (11%, 95% CI = 7%-14%) recorded not intervening with any smokers during the preceding week. The remaining 244 hygienists reported intervening with a total of 1394 patients (*median* = 5 patients,

IQR 2-8). Use of different assisting strategies is shown in Table 3 grouped according to the 5A's approach (Ask, Advise, Assess willingness to quit, Assist, Arrange follow up, Fiore, et al., 2008). Participants were more likely to advise than assist.

Prediction of Behaviour

For both identifying and assisting patients, controllability was not independently related to intentions or behaviour, and there was no interaction effect between controllability and intentions. Hence, controllability was removed from the analysis. Similarly, supervisor support, experience, workload, and education were not found to be related to behaviour or theoretical predictors, and these factors were removed. The results of the analysis are presented in Figure 1. Theoretical predictors accounted for a small to medium amount of variance in identifying ($f^2 = .12$) and a large amount of variance in assisting ($f^2 = .41$).

The goodness of fit indices for identifying (χ^2 (36) = 113.46 (p < .001), NFI = .79, NNFI = .67, CFI = .84,) and assisting (χ^2 (36) = 164.13 (p < .001), NFI = .81, NNFI =.66, CFI = .84) indicated a moderately good fit.

The interaction between intentions and self-efficacy was explored in terms of the relationship between intentions and behaviour at levels of self-efficacy. For identifying patients who smoke, higher levels of self-efficacy were associated with a *weaker* relationship between intentions and behaviour: the standardised path coefficient for the relationship between intentions and behaviour was .24 at low self-efficacy (one SD below the mean), .16 at average self-efficacy, and .24 at high self-efficacy (one SD above the mean). In contrast, for assisting patients, higher levels of self-efficacy were associated

with a *stronger* relationship between intentions and behaviour: .14 at low self-efficacy, .27 at average self-efficacy, and .40 at high self-efficacy.

Discussion

The findings indicate dental hygienists may be a willing and active workforce assisting people to quit smoking. The 273 hygienists who returned valid behaviour measures reported assisting an estimated total of 1,394 patients to quit smoking in one week. This shows the scope for dental hygienists to contribute to reducing smoking rates and smoking-related harm. The finding that hygienists focused more on advising strategies than assisting and arranging concords with previous research with a range of health professions (Edwards, et al., 2006) and indicates scope to support more comprehensive interventions. For example, arranging referrals for patients may further improve quit rates – while previous research has placed hygienist-led intervention cessation success rates at between 15-25% (Binnie, et al., 2007; Nasry, et al., 2006), the Australian Quitline has reported cessation success rate of 28% (Miller, Wakefield, & Roberts, 2003).

The Theory of Planned Behaviour predicted both identifying patients who smoke and assisting patients to quit smoking. The theory was also useful for identifying predictive factors, and the pathways (i.e., through changes in attitude, subjective norms, or perceived behavioural control) that these factors influence behaviour.

Asking patients about smoking

Compared to assisting, the theory was less able to predict identifying behaviour. This may be because the study did not include a wide enough range of predictors, or because there was a restriction of range for intentions, for which 90% of participants scored a four or five out of five. It is of course very positive that levels of intention were so high in the current sample, although this is likely to be at least in part due to self-selection bias among those who chose to participate in a study that was clearly about helping patients to quit smoking.

Given these high levels of intention, any improvements in identification of patients who smoke are likely to be achieved through addressing hygienists' self-efficacy. The influence of role legitimacy, role adequacy, and co-worker support were predictive of self-efficacy and may provide an indication of means by which to support hygienists. In this light, the control beliefs indicate that incorporating smoking status into the general history taking and assessment forms, and including how to ask about smoking sensitively in any smoking cessation training for hygienists may support hygienists to ask more patients about smoking.

A small interaction effect between intentions and self-efficacy was found, but in the opposite direction specified by the theory (Ajzen, 1991). We attribute this to a lower variance in intention scores for those with higher self-efficacy (≥ 4, SD for intentions = .89; for self-efficacy <4, SD for intentions = 1.00), which would attenuate the intentions-behaviour relationship. Alternatively, it may indicate that for those who perceived the behaviour of asking patients about smoking as harder (low self-efficacy), having strong intentions to do so becomes more important and thus more motivating producing a stronger relationship between intentions and behaviour.

Assisting patients to quit smoking

The Theory of Planned Behaviour explained a large amount of variance in assisting behaviour, exceeding the average of 27% of variance explained found in Armitage and Conner's (2001) meta-analysis of applications of the theory. The findings indicate that hygienists' intentions to assist patients to quit smoking are high, but that levels of self-efficacy reduce their ability to translate those intentions into action. Specifically, self-efficacy directly predicted intentions and behaviour, and also interacted with intention in predicting behaviour, such that when self-efficacy levels were low, intentions were less predictive of behaviour. These findings suggest that self-efficacy is a pivotal factor for dental hygienists to assist their patients to quit smoking. This is consistent with the findings from the only other Australian survey of dental hygienists on the issue of assisting patients to quit smoking, which indicated confidence was the most important predictor of behaviour (Edwards, et al., 2006).The two control beliefs (beliefs that underlie self-efficacy) rated as most important were having the knowledge and skills to address smoking and having a good rapport with the patient. Both are likely to be amenable to supportive intervention, although increasing knowledge and skills may not be as straight forward as providing training: the lack of predictive contribution from smoking education or training supports research that indicates training may not necessarily result in changes to work practice, and that workplace factors such as available co-worker or supervisor support, or the presence of organisational policies, can influence workers' ability to transfer training into practice (Goldstein & Ford, 2002). Introducing organisational policies that address assisting patients to quit smoking may

also indirectly raise hygienists' intentions to assist their patients to quit smoking through subjective norms.

Benefits of Applying the Theory of Planned Behaviour

A benefit of applying the Theory of Planned Behaviour is that it may explain the pathways through which different factors impact behaviour. Ajzen (1991) argued that the predictor variables contained in the theory are the proximal predictors of behaviour. Additional, more distal factors, such as training or environmental factors, will only influence behaviour through influencing one of these predictor variables. In this study, self-efficacy emerged as the most important predictor, and role legitimacy, role adequacy, and co-worker support (for asking about smoking) were identified as targetable factors that predicted self-efficacy. In particular, the model suggests role legitimacy is more influential than co-worker support, and also influences dental hygienists' attitudes and subjective norms. Hence, the theory provides more detailed guidance on which factors may be best targeted to support the desired behaviours.

Limitations

The representativeness of the current sample is supported by its similarity with the labour force estimates. The response rate was similar to other surveys in this field (e.g., Barker, et al., 2001; Brothwell & Gelskey, 2008). While this rate was reduced for the second questionnaire, no systematic differences were found between those who did or did not complete the second questionnaire. This notwithstanding, there was likely to be a self-selection bias among those who participated in the survey, and it may be that the

findings reflect a 'best case scenario' derived from the most motivated and involved hygienists. Behaviours were self-reported, and hence the usual caveats around self-report apply, such as potential biases and accuracy of recall.

In supporting dental hygienists to address smoking, two important qualifications need to be made. First, the whole dental team, including the dentist, assistants, and reception staff would ideally be involved in efforts to assist patients to quit smoking, not just hygienists (Warnakulasuriya, 2002). Second, as reflected in the demographics of this sample, there are few hygienists in the public sector in Australia (Australian Institute of Health and Welfare, 2008b). Confining efforts to hygienists would therefore confer benefits to private patients only, which is likely to exacerbate socio-demographic inequities in healthcare and health. Alternative, more equitable avenues also need to be sought.

Conclusion

Dental hygienists may be a viable and very willing avenue for achieving further smoking rate reductions. These findings suggest the best way to support hygienists in this role is through increasing hygienists' skills and confidence around asking sensitively about smoking, building rapport with clients, and assisting patients to quit smoking, and through encouraging dental surgeries to incorporate smoking status into general history taking and assessment, and to implement organisational policies on assisting patients to quit smoking. The scope for public health benefits through reduced smoking rates if these strategies are enacted is considerable.

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Table 1

Means and standard deviations (or median and IQRs for non-normal variables) for
Theory of Planned Behaviour variables and organisational factors

Variable	*M*	*SD*	Range
Theory of Planned Behaviour Variables			
Ask patients about smoking			
Intention*	*m* = 5.0	IQR = 4.0-5.0	1.0 – 5.0
Self-efficacy	4.2	0.7	1.3 – 5.0
Controllability	3.9	0.8	1.0 – 5.0
Attitude*	*m* = 4.3	IQR = 3.8-4.5	1.0 – 5.0
Subjective norms	4.0	0.6	1.5 – 5.0
Assist patients to quit smoking			
Intention	3.9	0.9	1.0 – 5.0
Self-efficacy	3.4	0.7	1.3 – 5.0
Controllability	3.4	0.9	1.0 – 5.0
Attitude	4.0	0.6	1.8 – 5.0
Subjective norms	3.7	0.6	1.5 – 5.0
Organisational Factors			
Role adequacy	3.4	0.9	1.0 – 5.0
Role legitimacy	3.9	0.6	2.0 – 5.0
Workload	2.3	0.8	1.0 – 4.7
Autonomy	3.8	0.8	1.3 – 5.0
Amount of education and training	0.8	0.7	0.0 – 3.0
Co-worker support	4.3	0.6	1.0 – 5.0
Supervisor support	4.1	0.8	1.0 – 5.0

* Variable is non-normal. Medians and interquartile ranges (IQR) are presented.

Note. For all variables except amount of education and training (number of
different education and training options selected out of 4 options), scales range from 1
(low) to 5 (high). *N*s ranged between 356-362.

Table 2

Top five behavioural and control beliefs for asking patients about smoking and assisting

patients to quit smoking (*N*=273)

	% ranked in Top 5 (*%* ranked as #1)
Asking patients about smoking	
Behavioural beliefs (advantages or disadvantages)	
Allows me to assess the patient's oral health	86% (55%)
Allows me to plan their treatment	84% (7%)
Contributes to a consistent anti-smoking message	81% (11%)
Provides an opportunity to talk about smoking	77% (11%)
May strengthen my rapport with the patient	51% (0.3%)
Control beliefs (factors making it easier/more difficult)	
The patient has visible signs of smoking	73% (6%)
If the question is part of the general history taking/assessment	69% (29%)
The patient has oral cancer / other smoking-related pathology	67% (31%)
Approaching smoking in a non-judgemental manner	61% (9%)
Knowing how to ask about smoking sensitively	56% (6%)
Assisting patients to quit smoking	
Behavioural beliefs (advantages or disadvantages)	
Improve the patient's oral health	91% (40%)
Improve the patient's general health and lifestyle	90% (47%)
Improve the outcomes of dental treatment	86% (2%)
Improve the patient's oral aesthetics (e.g. staining)	76% (0.6%)
Reduce the amount of dental work needed in the future	52% (0.6%)
Control beliefs (factors making it easier/more difficult)	
Having the confidence and knowledge to talk about smoking	86% (43%)
Having a good rapport with the patient	86% (18%)
Having regular appointments with the patient	75% (8%)
The amount of time available in an appointment	75% (4%)
Having personal experiences or success stories to talk about	74% (9%)

Table 3

Percentage of dental hygienists (*N*=273) using each strategy for assisting patients to quit

smoking, and frequency of use for those who used the strategy

Strategy	% who used in last week (95% CI)	Median # patients (and IQR) if used
Advise		
Advised patient to quit smoking	77% (72-82%)	5.0 (2.0-7.5)
Advised patient to cut down on smoking	71% (65-76%)	5.0 (2.0-8.0)
Discuss dental health effects of smoking	93% (91-96%)	5.0 (2.0-10.0)
Showed patient effect of smoking in their mouth	75% (70-80%)	3.0 (2.0-6.0)
Showed patients photos of possible dental effects	16% (11-20%)	4.0 (2.0-10.0)
Assist		
Set a quit smoking date with patient	8% (5-11%)	1.0 (1.0-4.3)
Gave patient a Quit brochure or pack	18% (13-23%)	3.0 (1.0-5.0)
Discussed strategies/options for quitting	50% (44-56%)	3.0 (2.0-5.0)
Referred patient to Quit line	23% (18-28%)	2.0 (1.0-4.0)
Referred patient to GP for smoking	11% (7-14%)	2.0 (1.0-5.0)
Referred patient to pharmacist for smoking	13% (9-17%)	2.0 (1.0-5.0)
Arrange Follow Up		
Offered or provided follow up around smoking	19% (14-24%)	4.0 (2.0-5.8)

Figure Captions

Figure 1. Standardised path coefficients and variance explained for asking patients about

smoking (top coefficients) and assisting patients to quit smoking (bottom coefficients).

* $p < .05$, ** $p < .01$, *** $p < .001$

Policy — .12** / .11* → Subjective Norms

Subjective Norms (28% / 30%)

Subjective Norms → .07 / .30*** → Intention

Intention (11% / 40%)

Smoking Status — .19*** / .11*

Attitudes (17% / 26%)

Attitudes → .31*** / .29*** → Intention

Role Legitimacy — .49*** / .51***

Role Legitimacy — .36*** / .49***

Role Legitimacy → .29*** / .38*** → Self-efficacy

Self-efficacy (21% / 37%)

Self-efficacy → .02 / .28*** → Intention

Intention → .16** / .27*** → Behaviour

Intention x Self-efficacy → -.12* / .19** → Behaviour

Self-efficacy → .27*** / .32*** → Behaviour

Behaviour (11% / 29%)

Role Adequacy → .15* / .28** → Self-efficacy

Co-worker support → .15** / .08 → Self-efficacy