Interventions for tobacco cessation in the dental setting (Review)

Carr AB, Ebbert JO

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2007, Issue 4

http://www.thecochranelibrary.com

TABLE OF CONTENTS

Interventions for tobacco cessation in the dental setting (Review)

Carr AB, Ebbert JO

This record should be cited as:
Carr AB, Ebbert JO. Interventions for tobacco cessation in the dental setting. *Cochrane Database of Systematic Reviews* 2006, Issue 1. Art. No.: CD005084. DOI: 10.1002/14651858.CD005084.pub2.

This version first published online: 25 January 2006 in Issue 1, 2006.
Date of most recent substantive amendment: 03 November 2005

ABSTRACT

Background
Tobacco use has significant adverse effects on oral health. Oral health professionals in the dental office or community setting have a unique opportunity to increase tobacco abstinence rates among tobacco users.

Objectives
This review assesses the effectiveness of interventions for tobacco cessation offered to cigarette smokers and smokeless tobacco users in the dental office or community setting.

Search strategy
We searched the Cochrane Tobacco Addiction group Specialized Register (CENTRAL), MEDLINE (1966-April 2006), EMBASE (1988-April 2006), CINAHL (1982-April 2006), Healthstar (1975-April 2006), ERIC (1967-April 2006), PsycINFO (1984-April 2006), National Technical Information Service database (NTIS, 1964-April 2006), Dissertation Abstracts Online (1861-April 2006), Database of Abstract of Reviews of Effectiveness (DARE, 1995-April April 2006), and Web of Science (1993-April 2006).

Selection criteria
We included randomized and pseudo-randomized clinical trials assessing tobacco cessation interventions conducted by oral health professionals in the dental office or community setting with at least six months of follow up.

Data collection and analysis
Two authors independently reviewed abstracts for potential inclusion and abstracted data from included trials. Disagreements were resolved by consensus.

Main results
Six clinical trials met the criteria for inclusion in this review. Included studies assessed the efficacy of interventions in the dental office or a school community setting. All studies assessed the efficacy of interventions for smokeless tobacco users, one of which included cigarettes smokers. All studies employed behavioural interventions and only one offered pharmacotherapy as an interventional component. All studies included an oral examination component. Pooling of the studies suggested that interventions conducted by oral health professionals increase tobacco abstinence rates (odds ratio [OR] 1.44; 95% confidence interval [CI]: 1.16 to 1.78) at 12 months or longer. Heterogeneity was evident (I^2 = 75%) and could not be adequately explained through subgroup or sensitivity analyses.

Authors' conclusions
Available evidence suggests that behavioural interventions for tobacco use conducted by oral health professionals incorporating an oral examination component in the dental office and community setting may increase tobacco abstinence rates among smokeless tobacco users. Differences between the studies limit the ability to make conclusive recommendations regarding the intervention components that should be incorporated into clinical practice.

PLAIN LANGUAGE SUMMARY

Tobacco cessation counseling interventions delivered by dental professionals may be effective in helping tobacco users to quit.

As well as the well-known harmful effects of smoking on respiratory and cardiovascular systems, tobacco use is associated with an increased risk for oral disease, including oral cancer and periodontal disease. Dental professionals are in a unique position to help tobacco users who present for dental care by providing cessation assistance. We identified and pooled six studies that showed a benefit of tobacco cessation counseling by dental professionals. The odds ratio was 1.44 (95% confidence interval 1.16 to 1.78) at 12 months, in favour of counseling, compared with usual care or no contact. The major implications of these findings are for smokeless tobacco users in the dental settings, as we found limited evidence for the effectiveness of similar interventions for cigarette smokers.

BACKGROUND

In addition to the well-known harmful effects of smoking on respiratory and cardiovascular systems, tobacco use has significant adverse effects on oral health. Cigarette smoking is associated with an increased risk for oral disease (Gelskey 1999; Mecklenburg 1998; Salvi 2000). Tobacco exposes the oral cavity to toxic carcinogens that may have a role in initiation and promotion of cancer, or carcinoma (Mirbod 2000). Tobacco is the major inducer of oral squamous cell carcinoma (SCC) and is considered to be responsible for 50% to 90% of oral cancer cases worldwide (Epstein 1992; Holleb 1996). The incidence of oral SCC is four to seven times greater in smokers than non-smokers (Piyathilake 1995). Oral cancer and pre-cancer occurs more frequently in smokers, and quitting smoking decreases the risk for oral cancer within 5 to 10 years (EU Work group 1998). Tobacco exposure is also harmful to periodontal health, and smoking status is an important factor in the prognosis for periodontal therapy, oral wound healing, implant therapy, and cosmetic dentistry (Mecklenburg 1998). Smoking results in discolourations of both teeth and dental restorations, and is associated with halitosis, diminished taste, and an increased prevalence and severity of periodontal disease (EU Work group 1998). Cigarette smoking is causally associated with an increased prevalence and severity of periodontitis (Gelskey 1999), even when adequate oral hygiene is practiced (Kerdvongbundit 2002). Cessation of smoking may halt disease progression and improve outcomes of periodontal therapy (EU Work group 1998).

Smokeless tobacco use has been reported to cause tooth decay (Tomar 1999) and discoloration of dental restorations (Walsh 2000). Chewing tobacco, in particular, is associated with an increased risk for dental caries due to high sugar content and increased gingival recession. Abrasive particles in chewing tobacco may contribute to significant dental attrition which may require dental restorations in advanced cases (Bowles 1995; Milosevic 1996). Cross-sectional studies have suggested that smokeless tobacco users with co-existing gingivitis have high rates of gingival recession, mucosal pathology, and dental caries (Offenbacher 1985). Smokeless tobacco use has also been associated with irreversible gingival attachment loss resulting in root exposure (Ernster 1990). Effects of smokeless tobacco use are typically observed at anatomical locations where the tobacco contacts the mucosa, such as the labial vestibule and adjacent periodontium. Both the prevalence and severity of tobacco-related oral lesions demonstrate a dose-response relationship with the amount, frequency and duration of smokeless tobacco exposure (Little 1992a). Chronic exposure can lead to leukoplakia (Hirsch 1982), a premalignant condition (Silverman 1984; Silverman 1976). Smokeless tobacco use in the United States has been associated with an increased risk for oral cancer in a dose-response fashion (Stockwell 1986; Williams 1977; Winn 1981). Risk may vary depending upon the type of smokeless tobacco used, as the highest rates or oral cancer are observed in countries where smokeless tobacco is consumed with additives (e.g., areca nut) (Critchley 2003).

The dental practice setting provides a unique opportunity to assist tobacco users in achieving tobacco abstinence (Christen 1990). Widespread acceptance of tobacco use interventions in the dental setting have been lacking and limitations in primary care resources have curtailed further efforts (Warnakulasuriya 2002). Compared to other health care providers, dentists more accurately estimate patient tobacco use (Block 1999). However, dental practitioners are less consistent with and supportive of intervention, less likely to report having strong knowledge or skill levels regarding tobacco cessation, and more likely to perceive barriers to tobacco intervention (Block 1999). More than 40% of dentists do not routinely ask about tobacco use and 60% do not routinely advise tobacco users to quit (Tomar 2001).

While 61.5% of dentists believe their patients do not expect tobacco cessation services, 58.5% of their patients felt such services should be provided (Campbell 1999). Barriers to providing tobacco cessation service include concern for patient resistance (Campbell 1994), lack of knowledge, lack of time (Dolan 1997), lack of financial reimbursement (Fried 1992), and a concern for poor co-ordination of care between dentistry and tobacco cessation services (Campbell 1994).

OBJECTIVES

We assess the effectiveness of interventions for tobacco cessation

offered to cigarette smokers and smokeless tobacco users in the dental office or community setting. We were interested in testing the following hypotheses:

1) In dental settings, brief counseling cessation interventions are more effective than usual care for increasing tobacco abstinence rates among tobacco users.
2) Brief counseling cessation interventions conducted by dental professionals combined with nicotine replacement therapy (NRT) is more effective than NRT alone for increasing tobacco abstinence rates among tobacco users.
3) Tobacco use interventions incorporating personalized feedback from an oral examination is more effective than interventions without personalized feedback from an oral examination for increasing tobacco abstinence rates among tobacco users.
4) Tobacco use interventions conducted by dental health professionals are more effective than interventions conducted by other healthcare professionals for increasing tobacco abstinence rates among tobacco users.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

All randomized and pseudo-randomized (i.e., by patient number, date of birth, day of attendance) controlled trials were included. The unit of randomization was the dentist or practice for the studies in the dental office setting, and college or high school for the studies in the community setting.

Types of participants

Patients or subjects of any age reporting tobacco use and receiving oral health interventions by dental professionals were included. Subject recruitment and participation included both those actively seeking treatment and those who did not express an interest in quitting. All tobacco users (cigarette, cigar, and pipe smokers, and smokeless tobacco users) were included.

Types of intervention

We included any intervention to promote tobacco use cessation (intervention versus usual care or placebo, and/or intervention versus other intervention), which included a component delivered by a dentist, dental hygienist, dental assistant or office staff in the dental practice setting and any combination of these, as well as the same individuals providing intervention as part of a community effort. Interventions could include brief advice to quit, provision of self-help materials, counseling, pharmacotherapy or any combination of these, or referral to other sources of support. Interventions that were directed at both smokers and smokeless tobacco users were included. Interventions aimed at the training of dental health professionals were included.

Types of outcome measures

The outcome measure was smoking and tobacco use cessation, assessed at least six months from the delivery of the intervention. Trials which did not report tobacco use outcomes or did not have sufficiently long follow up were excluded. Biochemical validation of self-reported cessation was not required but was recorded.

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: methods used in reviews.

The Specialized Registers of the Cochrane Tobacco Addiction Group and the Cochrane Oral Health Group were searched for references to tobacco use interventions by dental health professional, in the dental practice setting or otherwise. We also searched the following electronic retrieval systems and databases:

- The Cochrane Central Register of Controlled Trials (CENTRAL), 2006, Issue 2
- MEDLINE (1966-April 2006)
- EMBASE (1988-April 2006)
- CINAHL (1982-April 2006)
- Healthstar (1975-April 2006)
- ERIC (1967-April 2006)
- PsycINFO (1984-April 2006)
- National Technical Information Service database (NTIS, 1964-April 2006)
- Dissertation Abstracts Online (1861-April 2006)
- Database of Abstract of Reviews of Effectiveness (DARE, 1995-April 2006)
- Web of Science (1993-April 2006).

The following terms were used to describe the **participants**: smokers; smoking; cigarettes; smokeless tobacco; chewing tobacco; oral tobacco; spit tobacco; snuff; quid; chew; plug; tobacco use(rs). The following terms described the **interventions**: randomized; dentists; dental; hygienists; dental-patient relations; behavior modification; conditioning therapy; therapy; behavior; therapy; conditioning; group therapy; cognitive therapy; counseling, behavioural intervention; pharmacotherapy; therapy, drug, patient education, and health promotion. The following terms were used to describe the **outcomes**: tobacco use cessation; smoking abstinence; tobacco abstinence. The following terms describe the intervention **environment**: dentists; dental; hygienists; dental-patient relations, oral health.

The Medical Subject Headings (MeSH) used in MEDLINE and CINAHL were also used to focus on the dental environment:

limit retrieval to the dentistry journals subset; or subject headings Oral Health/ or exp Dentistry/ or exp Dental Staff/ or exp DENTISTS/ or DENTIST'S PRACTICE PATTERNS/ or exp dental auxiliaries/ or dental hygienists. Keywords of the various oral specialties orthodont$, periodont$ and endodont$ were also searched. There were no language restrictions. In general, records were searched by conducting searches the following way: (participants OR outcomes) AND interventions. We contacted experts in the area to locate unpublished studies in an effort to minimise publication bias.

METHODS OF THE REVIEW

Two authors screened the records retrieved by the searches for potential relevance against stated inclusion criteria: randomized/ pseudo-randomized clinical trial, dental setting, tobacco cessation interventions, and cessation measures of six-month minimum follow up. Two authors checked studies of possible relevance for inclusion or exclusion, and independently extracted and compared data. We resolved disagreements by discussion and consensus (using a third author when necessary).

We extracted the following information about each study:

- Site: including country and type of dental practice
- Method of randomization and allocation concealment, and whether individual or cluster randomized
- Method of participant selection
- Characteristics of the intervention (behavioural/ pharmacologic, delivered by whom)
- Characteristics of participants (type of tobacco use, interest in quitting)
- Outcome assessment (length of follow up, definition of quitting, method for validation of self-report)

For each study we selcted the outcome with the most rigorous definition available with regards to maintenance of abstinence (i.e., continuous versus point prevalence) and type of tobacco abstinence (i.e., all tobacco versus smokeless tobacco only). Rates were based on an intention-to-treat analysis with drop-outs and losses to follow up assumed to be continuing tobacco users. We noted any difference in numbers lost to follow up between intervention and control groups.

Randomization and allocation concealment were graded A if the method is described in sufficient detail to ensure that allocation was blinded until after trial enrolment, B if there was insufficient detail, and C if allocation was not concealed (as in use of patient record numbers, day of attendance, etc). Where there appears to have been a large loss to follow up we assessed whether the findings were sensitive to the use of different denominators. In addition to the grading above, we assessed bias impact on strength of the evidence by identifying trials with multiple sources of bias, and we comment on the potential impact of the bias on the overall treatment effect.

The outcome from each trial was expressed as an odds ratio (OR). Where cessation is the outcome this was defined as (number of quitters in treatment group/number of smokers in treatment group)/(number of quitters in control group/number of smokers in control group). The OR was greater than 1 if people were more likely to quit in the treatment group. A pooled weighted average of ORs was estimated using a fixed-effect model, Mantel-Haenszel method, with 95% confidence interval. If any studies in a group to be pooled had corrected for clustering or differences between groups, and therefore generated ORs that do not derive directly from numbers of quitters, studies were pooled using the generic inverse variance method, with study results expressed as an estimate of treatment effect and a standard error (Higgins 2005). Where odds ratios were derived through this method, we have displayed the raw data for information in the Additional Tables section.

We hypothesized that the following would explain heterogeneity which was explored through subgroup analyses: 1) **Patients** - smokers (cigarette, cigar, pipe) versus smokeless tobacco users; patients enrolled based on their interest in tobacco cessation versus patients enrolled regardless of interest in quitting (e.g., subjects enrolled in a study requiring informed consent to participate versus subjects enrolled in a study implemented in a dental practice enrolling all patients who are treated clinically); highly dependent versus less dependent tobacco users using the Fagerstrom Tolerance Questionnaire or modifications of the this dependence measure (to the extent that dependence is similarly categorized across trials); specialty practice versus general practice dental settings; 2) **Interventions** - interventions delivered by dentists versus dental hygienists or other dental staff; behavioural interventions versus pharmacologic interventions; 3) **Outcomes** - all tobacco abstinence versus tobacco-specific (cigarette smoking, smokeless tobacco) outcomes; 4) **Method of randomization** - cluster versus individual. We assessed heterogeneity using the I^2 statistic (Higgins 2003).

Sensitivity analyses included assessment of changes in the estimate of the treatment effect using the random effects model compared with the fixed effects model.

DESCRIPTION OF STUDIES

The review included six studies (Andrews 1999; Gansky 2002; Gansky 2005; Severson 1998; Stevens 1995; Walsh 1999). One study had to be excluded due to unavailability of subgroup denominator values from the authors (Cohen 1989). An additional study (Walsh 2003) providing one-year outcome data for an included study (Gansky 2002) was retained in order to conduct a

sensitivity analysis with two-year outcomes versus one-year outcomes. Three studies were conducted in the dental office setting (Andrews 1999; Severson 1998; Stevens 1995), and three involved oral health professionals (dentists and dental hygienists) providing interventions to athletes within high school or college community settings (Gansky 2002; Gansky 2005; Walsh 1999). The school community studies included a dental professional intervention component as a major part of the intervention.

One dental office study targeted both smokers and smokeless tobacco users (Severson 1998) and data for the smokeless tobacco user component of this study are reported in another study included in this review (Andrews 1999). The remaining four studies targeted smokeless tobacco users. In the dental office studies, studies included tobacco users not actively seeking treatment (i.e., no consenting procedure) (Andrews 1999; Severson 1998; Stevens 1995). Interventions in the dental office setting occurred during hygiene visits in general dental practices (Andrews 1999; Severson 1998; Stevens 1995). In the school community studies, tobacco users had to agree to participate and informed consent was obtained (Gansky 2002; Gansky 2005; Walsh 1999). The dental office studies restricted enrolment to 15 years of age or older (Andrews 1999; Severson 1998; Stevens 1995), one of which placed gender restrictions on inclusion (Stevens 1995). The school community studies enrolled high school and college-aged male athletes with no pre-specified age criteria.

All of the school community studies based their intervention on the Cognitive Social Learning Theory (Bandura 1986), two of which reported that the Diffusion of Innovation Theory (Rogers 1983) was instrumental for incorporating the use of peer leaders. No such theoretical foundation was mentioned for the interventions applied to the dental office studies. Nicotine replacement therapy in the form of gum (2 mg) was used in one of the school community studies (Walsh 1999). The gum was reinforced with counseling by a dental professional. In the majority of the studies, dental professionals (dentists and dental hygienists) provided counseling interventions which most often included combinations of an oral examination, feedback from the examination as to oral effects of tobacco use, a message to quit, motivational counseling using printed material or media presentations, and self-help aids. In two of the three dental office studies, the usual care group included no structured intervention (Andrews 1999; Stevens 1995), and in all the school community studies the control schools received no formal training.

In two of the three dental office studies, the dental office was the unit of randomization (Andrews 1999; Severson 1998) after blocking by average number of hygiene visits per week and number of years dentist had been in practice. In the remaining study, the patient was the unit of randomization and assignment was based upon the last digit of their identification number (Stevens 1995). In the school community studies, the school was the unit of randomization following stratification based on baseline prevalence of tobbaco use.

For all included trials, participants were followed for at least 12 months and one study followed participants for 24 months (Gansky 2002). Of the five studies targeting smokeless tobacco users, four reported all tobacco abstinence outcomes (Andrews 1999; Gansky 2005; Severson 1998; Stevens 1995). Point prevalence was reported as the primary outcome in three studies (Gansky 2005; Stevens 1995; Walsh 1999). One study reported abstinence as one week (seven day) point prevalence (Stevens 1995) while three designated 30-day point prevalence abstinence (Gansky 2002; Gansky 2005; Walsh 1999). Three studies used continuous or 'sustained' abstinence requiring either no tobacco use at both 3 and 12 months (Andrews 1999; Severson 1998) or no current tobacco use at both 12 and 24 months after quitting before the one-month follow up (Gansky 2002).

METHODOLOGICAL QUALITY

Report of randomization in two studies (Gansky 2002; Gansky 2005) was sufficient and rated A. The remaining studies did not report how randomization was performed or reported it in insufficient detail to determine whether a satisfactory attempt was made to control for selection bias (Andrews 1999; Severson 1998; Walsh 1999). Pseudo-randomization based upon last digit of patient identification number was used in one study (Stevens 1995).

No biochemical confirmation was used to validate self report in three studies (Andrews 1999; Gansky 2005; Severson 1998). In the remaining three studies, biochemical confirmation was initially utilized and abandoned (Stevens 1995), or used to enhance self report (Gansky 2002; Walsh 1999) (i.e., the 'bogus pipeline' method).

Ability to blind was limited due to the nature of the behavioural interventions evaluated.

In one school-based study (Gansky 2005), the authors describe a 'spill-over' effect between the intervention and control group that was felt to bias the results of the trial.

RESULTS

All analyses were conducted following adjusting for clustering of patients within practices and schools using the reported intraclass correlation coefficients (ICCs) and generic inverse variance method.

When the six clinical trials of dental interventions compared to usual care or no contact controls are pooled (including all tobacco users) [Comparison 1, Outcome 1], a statistically significant increase in the odds of tobacco abstinence at 12 months or more was observed (odds ratio [OR] 1.44; 95% confidence interval [CI]:

1.16 to 1.78) but heterogeneity was evident between the studies (I^2 = 71.4%). Inclusion of the 12-month outcome data (Walsh 2003) instead of the two-year outcome data (Gansky 2002) did not change the results. Severson 1998 included a three-arm design for cigarette smokers (extended intervention versus minimal intervention versus usual care) and for the purposes of the pooling we included only the smokers in the extended intervention compared to usual care.

Heterogeneity was explored by assessing the prespecified potential explanations. **Patients**: Heterogeneity is not explained by separating cigarette smokers and smokeless tobacco users [Comparison 1, Outcome 1, Subgroups 1 and 2], although there is only one study that enrolled cigarette smokers (Severson 1998). When pooling of the studies in which subjects were enrolled based upon their tobacco use status and not upon an expressed interest to receive an intervention [Comparison 1, Outcome 2], an increased odds of tobacco abstinence was observed for those actively seeking treatment (OR 1.41; 95% CI: 1.07 to 1.86; Subgroup 1) and for those not actively seeking treatment (OR 1.48; 95% CI: 1.05 to 2.09; Subgroup 2). The two subgroups had overlapping confidence intervals. Since all of the studies in which subjects were enrolled based upon their tobacco use status were also conducted in the dental office setting, we cannot determine the influence of each factor independently. Dependence was measured differently or not at all across studies so a comparison cannot be made regarding differences in baseline dependence. Interventions in the dental office setting were conducted in general dental practices during hygiene visits within general dental practices only, so comparisons between general practice and subspecialty care cannot be made. **Interventions**: Interventions in all studies were a team effort with the dental hygienists as the primary behavioural interventionists. **Outcomes**: When the studies assessing interventions for smokeless tobacco users that reported smokeless abstinence rather than all tobacco abstinence at 12 months or longer were analyzed separately, the ORs and CIs were similar to the overall analysis and heterogeneity remained significant. **Method of randomization**: Subgrouping by type of randomization did not explain the heterogeneity [Comparison 1, Outcome 3]. Overall, the source of the heterogeneity is not well-explained.

Given the high proportion of heterogeneity present in the studies reported, we performed a sensitivity analysis using a random-effects model. For Outcome 1, the significant difference seen with the fixed-effect model for an increase in the odds of tobacco abstinence at 12 months or more remained with the random-effects model (OR 1.67; 95% CI: 1.09 to 2.57). For Outcome 2, the random-effects model yielded increased point estimates yet failed to maintain significance for the subgroups [actively seeking treatment OR 1.72; 95% CI: 0.80 to 3.71, not actively seeking treatment OR 1.64; 95% CI: 0.90 to 2.98]. For Outcome 3, the significant difference seen in cluster randomized studies remained using the random-effects model [OR 1.72; 95% CI: 1.06 to 2.89].

DISCUSSION

Our review reveals that limited published literature exists assessing the impact of tobacco use interventions conducted by oral health professionals. However, available evidence is consistent with the hypothesis that dental interventions conducted in the dental office and school community setting are more effective than usual care for promoting tobacco use cessation. The pooled tobacco abstinence at 12 months was 1.44 (95% CI: 1.16 to 1.78). This equates to a difference in cessation rates of 3% between the groups receiving the behavioural intervention and those that do not. The number-needed-to-treat with a tobacco use intervention conducted by an oral health professional is 33.

While the overall effect of the intervention may be small, the pooling of the studies in this review represents tobacco abstinence at 12 months or longer. No consensus has been reached on the duration of abstinence that should be reported in trials of interventions for tobacco use (Hughes 2003). However, reporting of 12-month outcomes or longer may equate more closely to life-long tobacco abstinence and be less likely to give false positive results (Hughes 2003).

The results of this analysis should be interpreted with caution in light of potential methodological limitations. The existence of publication bias cannot be ruled out as unpublished reports may not be represented in the effect estimate. The methodological quality of the studies could also be a source of concern due to the inability to blind, unclear methods of treatment allocation, tobacco cessation validation based upon self reports, and inconsistent content and delivery of dental-specific intervention within the pooled studies.

Although all of the included studies contained a dental intervention component, significant heterogeneity was evident. The source of heterogeneity is unclear and our methods to assess heterogeneity were unfruitful. Among the smokeless tobacco intervention studies, heterogeneity was explained by the removal of one study (Gansky 2005). However, the estimate of effect increased dramatically upon removal of this study (OR 2.32; 95% CI: 1.67 to 3.23) compared with the total subgroup of smokeless tobacco user interventions studies including this study (OR 1.54; 95% CI: 1.21 to 1.96) [Comparison 1, Subgroup 1]. The authors of Gansky 2005 did not observe a significant treatment effect and propose that a 'spill-over' effect had occurred from the intervention group to the control, thus washing out any potential treatment effect. The authors support this hypothesis through previously unpublished findings and the suggestion that California athletic trainers are a closely-knit group. One year earlier, a survey of athletic trainers found that 14% provided tobacco-cessation counseling. During the study period, a similar survey observed that 30% reported providing tobacco-cessation counseling. These results need to be interpreted with caution.

All of the studies included in this review included brief advice to quit by an oral health professional. Brief advice from physicians has been shown to be an effective means to promote cessation (Lancaster 2004), and this review suggests the same can be expected from dental professionals interacting with smokeless tobacco users. Clinical practice guidelines advise brief interventions in the clinical setting where patients are asked about their tobacco use and then advised to quit. If the user is ready to quit, the clinician can offer specific assistance and provide follow-up care. An insufficient number of studies are available to determine what specific assistance measures provide additional effectiveness beyond brief advice to the dental professionals intervention.

The public health benefits of tobacco cessation interventions within the dental setting are potentially significant. The findings for the smokeless tobacco users in this review suggest that there is an advantage of cessation interventions using dental professionals; however, the limited number of studies reviewed does not allow identification of intervention components most critical for cessation.

AUTHORS' CONCLUSIONS

Implications for practice

Interventions for smokeless tobacco users in the dental setting, either in the dental office or in the school community, may increase the odds of quitting tobacco. Insufficient evidence exists to make conclusions about the effectiveness of these interventions for cigarette smokers.

Implications for research

Additional study of tobacco cessation within the dental office setting is important to identify critical intervention components which are effective for this group of providers in this clinical setting. It is especially important to expand the knowledge base for interventions targeting cigarette smokers.

POTENTIAL CONFLICT OF INTEREST

None.

ACKNOWLEDGEMENTS

We would like to acknowledge Sylvia Bickley of the Cochrane Oral Health Group for her assistance in obtaining references for this review, and Rafael Perera of the Tobacco Addiction Group for his statistical assistance with adjustment for clustering effects. We would also like to thank Patricia Erwin, MLS, for her assistance with search strategy development and execution. We would like to than Dr. Kristen Vickers-Douglas for her review of the study protocol, and Drs Ian Needleman and Helen Worthington for comments and suggestions on the full review draft.

SOURCES OF SUPPORT

External sources of support

- 1R21DE016024, National Institute for Dental and Craniofacial Research USA

Internal sources of support

- No sources of support supplied

REFERENCES

References to studies included in this review

Andrews 1999 *{published data only}*

Andrews JA, Severson H, Lichtenstein E, Gordon JS, Barckley MF. Evaluation of a dental office tobacco cessation program: effects on smokeless tobacco use. *Annals of Behavioral Medicine* 1999;**21**:48–53.

Gansky 2002 *{published data only}*

Gansky SA, Ellison JA, Kavanagh C, Hilton JF, Walsh MM. Oral screening and brief spit tobacco cessation counseling: a review and findings. *Journal of Dental Education* 2002;**66**(9):1088–98.

Gansky 2005 *{unpublished data only}*

Gansky SA, Ellison JA, Rudy D, Bergert N, Letendre MA, Nelson L, et al. Cluster randomized controlled trial of an athletic trainer-directed spit (smokeless) tobacco intervention for college baseball athletes: results after one year. *Journal of Athletic Training* 2005;**40**(2):76–87.

Severson 1998 *{published data only}*

Severson HH, Andrews JA, Lichtenstein E, Gordon J. A dental office intervention for smokeless tobacco cessation. 10th World Conference on Tobacco or Health 24-28 August Beijing Abstract book. 1997.

Severson HH, Andrews JA, Lichtenstein E, Gordon JS. Smokeless tobacco cessation through dental offices: An intervention that works (AADR Abstract No. 1206). *Journal of Dental Research* 1988;**77**((AADR Abstracts)):256.

* Severson HH, Andrews JA, Lichtenstein E, Gordon JS, Barckley MF. Using the hygiene visit to deliver a tobacco cessation program: results of a randomized clinical trial. *Journal of the American Dental Association* 1998;**129**(7):993–9.

Stevens 1995 *{published data only}*

Stevens VJ, Severson H, Lichtenstein E, Little SJ, Leben J. Making the most of a teachable moment: a smokeless-tobacco cessation intervention in the dental office. *American Journal of Public Health* 1995; **85**(2):231–5.

Walsh 1999 *{published data only}*

Walsh MM, Hilton JF, Masouredis C, Gee L, Chesney MA, Ernster VL. A randomized controlled intervention trial to promote spit tobacco cessation among college athletes. *Journal of Dental Research* 1995;**Special Issue - Abstracts of Papers (73rd General Session and Exhibition of the International Association for Dental research June 28-July 1, 1995, Singapore)**:458 (Abs No 463).

* Walsh MM, Hilton JF, Masouredis CM, Gee L, Chesney MA, Ernster VL. Smokeless tobacco cessation intervention for college athletes: results after 1 year. *American Journal of Public Health* 1999;**89** (2):228–34.

Walsh 2003 *{published data only}*

Walsh MM, Ellison J, Hilton JF, Kavanagh C, Chesney M, Ernster V. Spit tobacco cessation: high school baseball athletes, 2 year findings. *Journal of Dental Research* 2001;**80**(January 2001 Special Issue AADR Abstracts):116 (Abstract 645).

* Walsh MM, Hilton JF, Ellison JA, Gee L, Chesney MA, Tomar SL, et al. Spit (smokeless) tobacco intervention for high school athletes: results after 1 year. *Addictive Behaviors* 2003;**28**(6):1095–113.

References to studies excluded from this review

Albert 2004

Albert DA, Anluwalia KP, Ward A, Sadowsky D. The use of 'academic detailing' to promote tobacco-use cessation counseling in dental offices. *Journal of the American Dental Association* 2004;**135**(12): 1700–6.

Barker 1995

Barker GJ, Taylor TS, Barker BF. Implementation of a tobacco cessation program in the student clinics. *Journal of Dental Education* 1995;**59**(8):850–5.

Barker 2001

Barker GJ, Williams KB, Taylor TS, Barker BF. Practice behaviors of alumni trained as students in tobacco use cessation interventions. *Journal of Dental Hygiene* 2001;**75**(2):165–9.

Barnfather 2005

Barnfather KD, Cope GF, Chapple IL. Effect of incorporating a 10 minute point of care test for salivary nicotine metabolites into a general practice based smoking cessation programme: randomised controlled trial. *BMJ* 2005;**331**:979–80.

Binnie 2003

Binnie V, McHugh S, MacPherson LM, Jenkins W, et al. Dental hygienists' delivery of smoking cessation: 3-month outcomes (JDR Abstract). *Journal of Dental Research* 2003;**82**(Special Issue B, June): B–373.

Boundouki 2004

Boundouki G, Humphris G, Field A. Knowledge of oral cancer, distress and screening intentions: longer term effects of a patient information leaflet. *Patient Education & Counseling* 2004;**53**(1):71–7.

Campbell 1997

Campbell HS, Petty TL, Meadows LM, Simpson L, Jennett PA. Improving tobacco cessation services in rural dental offices - recruitment to a randomized controlled trial. *Canadian Journal of Community Dentistry* 1997;**12**(2):15–22.

Christen 1984

Christen AG, McDonald JL Jr, Olson BL, Drook CA, Stookey GK. Efficacy of nicotine chewing gum in facilitating smoking cessation. *Journal of the American Dental Association* 1984;**108**(4):594–7.

Christen 1985

Christen AG, Beiswanger BB, Mallatt ME, Tomich CE, Drook CA, McDonald JL Jr, et al. Effects of nicotine-containing chewing gum on oral soft and hard tissues: A clinical study. *Oral Surgery, Oral Medicine and Oral Pathology* 1985;**59**(1):37–42.

Cohen 1987

Cohen SJ, Christen AG, Katz BP, Drook CA, Davis BJ, Smith DM, et al. Counseling medical and dental patients about cigarette smoking: the impact of nicotine gum and chart reminders. *American Journal of Public Health* 1987;**77**(3):313–6.

Cohen 1989

Cohen SJ, Stookey GK, Katz BP, Drook CA, Christen AG. Helping smokers quit: a randomized controlled trial with private practice dentists. *Journal of the American Dental Association* 1989;**118**(1):41–5.

Cooper 1989

Cooper TM, Clayton RR. Stop-smoking program using nicotine reduction therapy and behavior modification for heavy smokers. *Journal of the American Dental Association* 1989;**118**(1):47–51.

Gelskey 2002

Gelskey SC. Impact of a dental/dental hygiene tobacco-use cessation curriculum on practice. *Journal of Dental Education* 2002;**66**(9): 1074–8.

Glasgow 1993

Glasgow RE, Mullooly JP, Vogt TM, Stevens VJ, Lichtenstein E, Hollis JF, et al. Biochemical validation of smoking status: Pros, cons, and data from four low-intensity intervention trials. *Addictive Behaviors* 1993;**18**(5):511–27.

Gordon 2002

Gordon JS, Andrews JA, Severson HH, Stewart DCL. Tobacco cessation via public health dental clinics: preliminary results. Society for Research on Nicotine and Tobacco 8th Annual Meeting Rapid Communications Posters, Savannah, Georgia. 2002:RP–64.

Gordon 2005

Gordon JS, Andrews JA, Lichtenstein E, Severson HH. The impact of a brief tobacco cessation intervention in public health dental clinics. *Journal of the American Dental Association* 2005;**136**(2):179–86.

Gorin 2004

Gorin SS, .Heck JE. Meta-analysis of the efficacy of tobacco counseling by health care providers. *Cancer Epidemiology Biomarkers & Prevention* 2004;**13**:2012–22.

Gould 1998

Gould KA, Eickhoff-Shemek JM, Stacy RD, Mecklenburg RE. The impact of National Cancer Institute training on clinical tobacco use cessation: services by oral health teams. *Journal of the American Dental Association* 1998;**129**(10):1442–9.

Greene 1994
Greene JC, Walsh MM, Masouredis C. A program to help major league baseball players quit using spit tobacco. *Journal of the American Dental Association* 1994;**125**(5):559–68.

Gritz 1991
Gritz ER, Carr CR, Rapkin DA, Chang C, Beumer J, Ward PH. A smoking cessation intervention for head and neck cancer patients: trial design, patient accrual, and characteristics. *Cancer Epidemiology, Biomarkers & Prevention* 1991;**1**(1):67–73.

Gritz 1993
Gritz ER, Carr CR, Rapkin D, Abemayor E, Chang LJ, Wong WK, et al. Predictors of long-term smoking cessation in head and neck cancer patients. *Cancer Epidemiology, Biomarkers & Prevention* 1993; **2**(3):261–70.

Hovell 1995
Hovell MF, Russos S, Beckhelm MK, Jones JA, Burkham-Kreitner SM, Slymen DJ, et al. Compliance with primary prevention in private practice: creating a tobacco-free environment. *American Journal of Preventive Medicine* 1995;**11**(5):288–93.

Hovell 2001
Hovell MF, Jones JA, Adams MA. The feasibility and efficacy of tobacco use prevention in orthodontics. *Journal of Dental Education* 2001;**65**(4):348–53.

Johnston 1996
Johnston DW, O'Shea RM. Testing an evaluation instrument in a tobacco use intervention study. *Journal of Dental Research* 1996;**75** (5 (Divisional Abstracts)):1241 (Abstract 16).

Jones 1993
Jones RB, Pomrehn PR, Mecklenburg RE, Lindsay EA, Manley M, Ockene JK. The COMMIT dental model: tobacco control practices and attitudes. *Journal of the American Dental Association* 1993;**124** (9):92-104; discussion 106-8.

Kentala 1999
Kentala J, Utriainen P, Pahkala K, Mattila K. Can brief intervention through community dental care have an effect on adolescent smoking?. *Preventive Medicine* 1999;**29**(2):107–11.

Kirkwood 2001
Kirkwood KL, Ciancio SG, Mather ML. Clinical evaluation of a smoking deterrent mouthwash. *Journal of Dental Research* 2001;**80** (January 2001 Special Issue AADR Abstracts):223 (Abstract 1504).

Kirkwood 2002
Kirkwood KL, Ciancio SG, Mather ML. Clinical evaluation of a smoking deterrent breathspray compared to a placebo spray. *Journal of Dental Research* 2002;**81**(March 2002 Special Issue A):A-295 (Abstract 2328).

Koerber 2003
Koerber A, Crawford J, O'Connell K. The effects of teaching dental students brief motivational interviewing for smoking-cessation counseling: a pilot study. *Journal of Dental Education* 2003;**67**(4):439–47.

Little 1992b
Little SJ, Stevens VJ, Severson HH, Lichtenstein E. Effective smokeless tobacco intervention for dental hygiene patients. *Journal of Dental Hygiene* 1992;**66**(4):185–90.

Macgregor 1996
Macgregor ID. Efficacy of dental health advice as an aid to reducing cigarette smoking. *British Dental Journal* 1996;**180**(8):292–6.

Masouredis 1997
Masouredis CM, Hilton JF, Grady D, Gee L, Chesney M, Hengl L, et al. A spit tobacco cessation intervention for college athletes: three-month results. *Advances in Dental Research* 1997;**11**(3):354–9.

Morgan 2000
Morgan ML. Are you doing your part to help stamp out tobacco use?. *Journal of the Oklahoma Dental Association* 2000;**90**(4):30–3.

NCI 1994
NCI (National Cancer Institute). Tobacco and the Clinician: Interventions for Medical and Dental Practice. Smoking and Tobacco Control Monograph 5 1994.

NCI 1995
NCI (National Cancer Institute). Community-Based Interventions for Smokers: The COMMIT Field Experience. *Smoking and Tobacco Control Monograph 6*. Bethesda MD: National Cancer Institute, 1995:280 p..

O'Keefe 1995
O'Keefe J, Lessio A, Kassirer B. A pilot smoking cessation program involving dental offices in the borough of East York, Ontario: an initial evaluation. *Journal of the Canadian Dental Association* 1995; **61**(1):65–7.

Olson 1985
Olson BL, McDonald JL Jr, Gleason MJ, Stookey GK, Schemehorn BR, Drook CA, et al. Comparisons of various salivary parameters in smokers before and after the use of a nicotine-containing chewing gum. *Journla of Dental Research* 1985;**64**(5):826–30.

Secker-Walker 1988
Secker-Walker RH, Solomon LJ, Haugh LD, Welsh D, Tatro M, Witham L, et al. Smoking cessation advice delivered by the dental hygienist. A pilot study. *Dental Hygiene (Chicago)* 1988;**62**(4):186–92.

Smith 1998
Smith SE, Warnakulasuriya KAAS, Johnson NW, Cooper DJ, Feyerabend C, Belcher M. A smoking cessation programme conducted through dental practices in the UK. *British Dental Journal* 1998;**185** (6):299–303.

Williams 2002
Williams NJ. Comparison of effectiveness of a dental school based nicotine dependence program to dental hygiene student lead tobacco intervention counseling. Society for Research on Nicotine and Tobacco 8th Annual Meeting, Savannah, Georgia. 2002:Sym 6a.

Wood 1997
Wood GJ, Cecchini JJ, Nathason N, Hiroshige K. Office-based training in tobacco cessation for dental professionals. *Journal of the American Dental Association* 1997;**128**(2):216–24.

Additional references

Bandura 1986
Bandura A. *Social foundations of thought and action: a social cognitive theory*. New Jersey: Prentice-Hall, Inc, 1986.

Block 1999
Block DE, Block LE, Hutton SJ, Johnson KM. Tobacco counseling practices of dentists compared to other health care providers in a midwestern region. *Journal of Dental Education* 1999;**63**(11):821–7.

Bowles 1995
Bowles WH, Wilkinson MR, Wagner MJ, Woody RD. Abrasive particles in tobacco products: a possible factor in dental attrition. *Journal of the American Dental Association* 1995;**126**(3):327–31.

Campbell 1994
Campbell HS, Macdonald JM. Tobacco counselling among Alberta dentists. Journal of the Canadian Dental Association 1994; Vol. 60, issue 3:218-20, 223-6.

Campbell 1999
Campbell HS, Sletten M, Petty T. Patient perceptions of tobacco cessation services in dental offices. *Journal of the American Dental Association* 1999;**130**(2):219–26.

Christen 1990
Christen AG, Klein JA, Christen JA, McDonald JL Jr, Guba CJ. How-to-do-it quit-smoking strategies for the dental office team: an eight-step program. *Journal of the American Dental Association* 1990; **Suppl**:20S–27S.

Critchley 2003
Critchley JA, Unal B. Health effects associated with smokeless tobacco: a systematic review. *Thorax* 2003;**58**(5):435–43.

Dolan 1997
Dolan TA, McGorray SP, Grinstead-Skigen CL, Mecklenburg R. Tobacco control activities in U.S. dental practices. *Journal of the American Dental Association* 1997;**128**(12):1669–79.

Epstein 1992
Epstein JB, Silverman S Jr. Head and neck malignancies associated with HIV infection. *Oral Surgery, Oral Medicine and Oral Pathology* 1992;**73**(2):193–200.

Ernster 1990
Ernster VL, Grady DG, Greene JC, Walsh M, Robertson P, Daniels TE, et al. Smokeless tobacco use and health effects among baseball players. *JAMA* 1990;**264**(2):218–24.

EU Work group 1998
EU Working Group on Tobacco and Oral Health. EU Working Group on Tobacco and Oral Health Consensus Meeting. Abstracts. *Oral Disease* 1998;**4**(1):48–67.

Fried 1992
Fried JL, Cohen LA. Maryland dentists' attitudes regarding tobacco issues. *Clinical Preventive Dentistry* 1992;**14**(2):10–16.

Gelskey 1999
Gelskey SC. Cigarette smoking and periodontitis: methodology to assess the strength of evidence in support of a causal association. *Community Dentistry and Oral Epidemiology* 1999;**27**(1):16–24.

Higgins 2003
Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analysis. *BMJ* 2003;**327**:557–60.

Higgins 2005
Higgins JPT, Green S. Cochrane Handbook for Systematic Reviews of Interventions 4.2.4 [updated March 2005]. The Cochrane Library 2005, issue 2.

Hirsch 1982
Hirsch JM, Heyden G, Thilander H. A clinical, histomorphological and histochemical study on snuff-induced lesions of varying severity. *Journal of Oral Pathology* 1982;**11**(5):387–98.

Holleb 1996
Holleb AI. Comments from the former Chief Medical Officer of the American Cancer Society (1968-1988). *Cancer* 1996;**78**(12):2590–1.

Hughes 2003
Hughes JR, Keely JP, Niaura RS, Ossip-Klein DJ, Richmond RL, Swan GE. Measures of abstinence in clinical trials: issues and recommendations. *Nicotine and Tobacco Research* 2003;**5**(1):13–25.

Kerdvongbundit 2002
Kerdvongbundit V, Wikesjo UM. Prevalence and severity of periodontal disease at mandibular molar teeth in smokers with regular oral hygiene habits. *Journal of Periodontology* 2002;**73**(7):735–40.

Lancaster 2004
Lancaster T, Stead L. Physician advice for smoking cessation. *Cochrane Database of Systematic Reviews* 2004, Issue 4. Art. No.: CD000165. DOI:10.1002/14651858.CD000165.pub2.

Little 1992a
Little SJ, Stevens VJ, LaChance PA, Severson HH, Bartley MH, Lichtenstein E, et al. Smokeless tobacco habits and oral mucosal lesions in dental patients. *Journal of Public Health Dentistry* 1992;**52**(5):269–76.

Mecklenburg 1998
Mecklenburg RE. Tobacco: addiction, oral health, and cessation. *Quintessence International* 1998;**29**(4):250–2.

Milosevic 1996
Milosevic A, Lo MS. Tooth wear in three ethnic groups in Sabah (northern Borneo). *International Dental Journal* 1996;**46**(6):572–8.

Mirbod 2000
Mirbod SM, Ahing SI. Tobacco-associated lesions of the oral cavity: Part II. Malignant lesions. *Journal of the Canadian Dental Association* 2000;**66**(6):308–11.

Offenbacher 1985
Offenbacher S, Weathers DR. Effects of smokeless tobacco on the periodontal, mucosal and caries status of adolescent males. *Journal of Oral Pathology* 1985;**14**(2):169–81.

Piyathilake 1995
Piyathilake CJ, Macaluso M, Hine RJ, Vinter DW, Richards EW, Krumdieck CL. Cigarette smoking, intracellular vitamin deficiency, and occurrence of micronuclei in epithelial cells of the buccal mucosa. *Cancer Epidemiology, Biomarkers and Prevention* 1995;**4**(7):751–8.

Rogers 1983
Rogers E. *Diffusion of Innovations*. New York: Free Press, 1983.

Salvi 2000
Salvi GE, Lawrence HP, Offenbacher S, Beck JD. Influence of risk factors on the pathogenesis of periodontitis. *Periodontology* 2000;**14**:173–201.

Silverman 1976
Silverman S, Bhargava K, Smith LW, Malaowalla AM. Malignant transformation and natural history of oral leukoplakia in 57,518 industrial workers of Gujarat, India. *Cancer* 1976;**38**(4):1790–5.

Silverman 1984
Silverman S Jr, Gorsky M, Lozada F. Oral leukoplakia and malignant transformation. A follow-up study of 257 patients. *Cancer* 1984;**53**(3):563–8.

Stockwell 1986
Stockwell HG, Lyman GH. Impact of smoking and smokeless tobacco on the risk of cancer of the head and neck. *Head & Neck Surgery* 1986;**9**(2):104–10.

Tomar 1999
Tomar SL, Winn DM. Chewing tobacco use and dental caries among U.S. men. *Journal of the American Dental Association* 1999;**130**(11):1601–10.

Tomar 2001
Tomar SL. Dentistry's role in tobacco control. *Journal of the American Dental Association* 2001;**132**(Suppl):30S–35S.

Walsh 2000
Walsh PM, Epstein JB. The oral effects of smokeless tobacco. *Journal of the Canadian Dental Association* 2000;**66**(1):22–5.

Warnakulasuriya 2002
Warnakulasuriya S. Effectiveness of tobacco counseling in the dental office. *Journal of Dental Education* 2002;**66**(9):1079–87.

Williams 1977
Williams RR, Horm JW. Association of cancer sites with tobacco and alcohol consumption and socioeconomic status of patients: interview study from the Third National Cancer Survey. *Journal of the National Cancer Institute* 1977;**58**(3):525–47.

Winn 1981
Winn DM, Blot WJ, Shy CM, Pickle LW, Toledo A, Fraumeni JF Jr. Snuff dipping and oral cancer among women in the southern United States. *New England Journal of Medicine* 1981;**304**(13):745–9.

* *Indicates the major publication for the study*

TABLES

Characteristics of included studies

Study	Andrews 1999
Methods	Country: USA Recruitment: Hygiene patients Randomization: Practices were blocked (by average number of hygiene visits per week and years dentists had been in practice), then randomized to usual care or intervention groups.
Participants	633 ST users >= 15 years of age
Interventions	1. Intervention: Determine tobacco use, identify oral disease, strong advice to quit, set quit date within 2w, motivation video, written material, call patient within 2w. 2. Usual care
Outcomes	12 month 'sustained' abstinence from ST and all tobacco: subjects must have reported 7-day point prevalence ST and all tobacco abstinence at both 3m and 12m. Abstinence verifcation: None

Characteristics of included studies (*Continued*)

Notes	Intraclass correlation calculated < 0.0009. Intervention group more likely to have previously been advised by a dental care provider to quit use of ST and were less likely to be single. Loss to follow up was 26% (102/394) in intervention and 26% (62/239) in the control group.
Allocation concealment	B – Unclear

Study	**Gansky 2002**
Methods	Country: USA Recruitment: Principals from randomly selected high schools were contacted Randomized: High schools stratified by baseline number and size of teams and baseline prevalence of ST use, then within strata schools were randomized to intervention or control groups
Participants	ST users on high school baseball teams
Interventions	Intervention: 1) Peer-led component: 50- to 60-min educational meeting with videotape and discussion, slide presentation, small-group discussion on tobacco industry advertising; 2) Dental-component: Oral cancer screening in school environment by dental hygienist, advice to quit, identified oral findings related to tobacco use, self-help guide for quitting, offered 15-min counseling in groups, dental hygienists made 5- to 10-min follow-up call. Control: Usual care.
Outcomes	2-year continuous ST abstinence Abstinence verifcation: None
Notes	These data are the 2-year follow up of Walsh 2003. Reported < 10% loss to follow up.
Allocation concealment	B – Unclear

Study	**Gansky 2005**
Methods	Country: USA Recruitment: Contacted athletic trainers at California colleges Randomization: Schools stratified by tertiles of baseline ST use then within strata colleges were randomized to intervention or control group
Participants	College baseball athletes who use ST
Interventions	Based upon the innovation theory and social learning theory. Consisted of the following components: 1) Video conference and follow-up newsletter: 3-hours with ATCs/dentists/hygienists; 2) Dental component: dentists/hygienists provided oral cancer screening, advised ST users to stop, identified oral lesions, provided self-help guide, offered single 10-15 min individual counseling session focusing on ST addiction, set a quit date, developing a plan, training in action and thinking skills to get ready to quit and to prevent relapse. 3) ATC follow up and referral: follow up by ATC on quit date and 3 booster sessions 1w apart; 4) Peer-led component: 50-60 min education meeting with included 3 components: 2 videos and slides of facial disfigurement.
Outcomes	30-day point-prevalence ST abstinence at 12m Abstinence verifcation: None
Notes	Intraclass correlation: 0.0197. 24% loss to follow up not broken down by study arm.
Allocation concealment	B – Unclear

Study	**Severson 1998**
Methods	Country: USA Recruitment: Hygiene patients in private practices Randomization: Practices were blocked average number of hygiene visits per week and number of years dentists had been in practice, then randomized to usual care, minimal intervention, or extended intervention

Characteristics of included studies (*Continued*)

Participants	Cigarette smokers
Interventions	Steps for all patients in the minimal and extended intervention: 1) Determined tobacco use status from the patient's chart and health questionnaire; 2) Identified and recorded findings from the oral examination and related them to patient's tobacco use; 3) Gave advice to quit and relating advice to oral health; 4) Gave the patient a packet of materials that included pamplets of health problems/ways to quit; a quit kit with sugarless candy and gum, flavoured toothpicks, and rubber bands. In addition, the extended intervention asked the patient to set a quit date within 2w of visit, gave the patient a motivational video, and called the patient within 2w after the hygiene visit to ask if he/she read the materials, watched the video, and either quit or is now willing to set a quit date.
Outcomes	12m 'sustained' abstinence from ST and all tobacco: subjects must have reported 7-day point prevalence ST and all tobacco abstinence at both 3m and 12m. Abstinence verifcation: None
Notes	ST data included in Andrews 1999. Intraclass correlation for cigarette smoking was 0.00004. 24.3% loss to follow up not broken down by study arm or type of tobacco.
Allocation concealment	B – Unclear

Study	**Stevens 1995**
Methods	Country: USA Recruitment: Hygiene patients in HMO dental offices Randomization: Pseudo-randomized by clinic identification number
Participants	Male ST users
Interventions	Intervention: soft-tissue exam, cleaning, patient education, feedback on oral health and advice on self care, report of keratotic lesions asking where tobacco was placed, hygienist-directed advice to quit, dentists' strong advice to quit, 9 min video, setting a quit date, self-help booklet, 24-hour advice phone line, kit providing oral substitutes and tip sheets with advice on how to quit, 1w follow-up call by hygienist, plus monthly mailing of tip sheets and newsletter Control: usual care
Outcomes	12m 7-day point prevalence all tobacco abstinence 12m 7-day point prevalence ST abstinence 12m all tobacco sustained abstinence: subjects must have reported no tobacco use in the last 7 days at the 3m and 12m assessments 12m ST tobacco abstinence: subjects must have reported no ST use in the last 7 days at the 3m and 12m assessments Abstinence verifcation: None
Notes	Loss to follow up 51.9% (intervention) and 53.7% (control)
Allocation concealment	C – Inadequate

Study	**Walsh 1999**
Methods	Country: USA Recruitment: Publicly-supported colleges were contacted for permission to recruit athletes Randomized: Colleges were pair-matched based on baseline prevalence of ST use and 1 randomized to intervention, the other to control
Participants	ST users among college-baseball and football athletes
Interventions	Intervention: 3-5 min dental exam, advice to quit, discussed ST-related tissue changes, photographs of facial disfigurement due to oral cancer, self-help guide, offered a 10-15 min counseling session by the hygienist which included nicotine gum, review of addiction nature of ST and nicotine withdrawal, setting a quit date, developing a plan to quit, and identifying triggers for tobacco use. Phone calls were conducted by the hygienist on the quit date and 1m later.

	Control: No intervention.
Outcomes	30-day point prevalence ST abstinence at 12m Abstinence verifcation: None
Notes	Intraclass correlation value: 0.02. Loss to follow up 10% (intervention) and 5% (control)
Allocation concealment	B – Unclear

Study	**Walsh 2003**
Methods	Country: USA Recruitment: Principals from randomly selected high schools were contacted Randomized: High schools
Participants	High school baseball team members who use ST
Interventions	Intervention: 1) Peer-led component: 50- to 60 min educational meeting with videotape and discussion, slide presentation, small-group discussion on tobacco industry advertising; 2) Dental-component: Oral cancer screening in school environment by dental hygienist, advice to quit, identified oral findings related to tobacco use, self-help guide for quitting, offered 15 min counseling in groups, dental hygienists made 5 to 10 min follow up call. Control: Usual care.
Outcomes	Repeated point prevalence smokeless tobacco abstinence at 1m and 12m Abstinence verification: Yes, at 12m
Notes	Schools were stratified by baseline number, size of baseball team, and ST use prevalence. 19% loss to follow up not broken down by intervention group. This paper is the 2-year data for Gansky 2002, separated here for comparative purposes
Allocation concealment	B – Unclear

ATC: athletic training coach
HMO: Health Maintenance Organization
m: month(s)
ST: smokeless tobacco
w: week(s)

Characteristics of excluded studies

Study	**Reason for exclusion**
Albert 2004	No tobacco use outcomes reported. Study assessed the effectiveness of academic detailing.
Barker 1995	Not an RCT. School-wide tobacco cessation effort.
Barker 2001	Not an RCT. Survey of cessation practice behavior of hygienists and dentists.
Barnfather 2005	Short follow-up (8 weeks). Intervention included exam and counseling for both arms, with point-of-care test for salivary nicotine as the exposure variable.
Binnie 2003	3-month outcomes only. RCT assessing the effectiveness of smoking cessation counseling and nicotine replacement delivered by dental hygienists.
Boundouki 2004	Not an RCT. Use of a patient-information leaflet to improve knowledge of mouth cancer.
Campbell 1997	No tobacco use outcomes reported. This report describes the recruitment strategy and response rate for a 3-yr RCT to test the effectiveness of a dissemination strategy aimed at improving the tobacco cessation services offered by rural dental practices.
Christen 1984	15-week outcomes only. Assessed the efficacy of nicotine gum vs. advice to quit and videotape.
Christen 1985	Not an RCT. Assessed nicotine effects on oral health.
Cohen 1987	No tobacco use outcomes reported. Results of exit survey conducted during a study of the impact of nicotine gum and chart reminders on tobacco cessation.

Cohen 1989	Data reported in composite, without subgroup denominator values. There was no non-behavioural control group. Unable to contact corresponding author, and co-authors did not have access to the the data.
Cooper 1989	Not an RCT. Hospital-based smoking cessation program using behavioral modification and pharmacotherapy.
Gelskey 2002	Not an RCT. No tobacco cessation outcomes. Study of tobacco use cessation counseling by oral health professionals.
Glasgow 1993	Methods of individuals clinical trials are not included. Description of efforts to biochemically validate self-reports of smoking cessation from participants in four large-scale randomized trials. Study of RCT in dental clinics is reviewed elsewhere in this systematic review. See Little 1992.
Gordon 2002	Not an RCT. Assessed the effectiveness of tobacco use counseling through public health dental clinics.
Gordon 2005	Not an RCT. Assessed the effectiveness of a behavioral intervention delivered through public health dental clinics.
Gorin 2004	Meta-analysis included 5 dental intervention studies of 3 months duration and Stevens 1995, which is included in the review.
Gould 1998	Not an RCT. Survey of participants in an NCI training program for delivering tobacco use interventions.
Greene 1994	3-month outcomes only. Assessed the effectiveness of two interventions for smokeless tobacco cessation.
Gritz 1991	No tobacco use outcomes reported. Report describes aims, study design, and patient accrual/characteristics for an on-going randomized control trial evaluating surgeon and maxillofacial prosthodontist-delivered smoking cessation intervention for head and neck cancer patients.
Gritz 1993	Not in a dental setting. Hospital-based study assessing the impact of tobacco use counseling on head and neck cancer patients. Only 7/110 health care professionals were dental providers.
Hovell 1995	No tobacco use outcomes reported. Assessed the distribution of anti-tobacco materials in orthodontic offices.
Hovell 2001	Not an RCT. Assessed the effectiveness of a behavioral intervention delivered by orthodontists in preventing pre-teens from initiating tobacco.
Johnston 1996	Not an RCT. The questionnaire was being developed as part of a 2-year RCT of the effect of a multifaceted oral health education program on tobacco use among elementary school children in Ontario CA. This is a report of pretest evaluation for the questionnaire.
Jones 1993	Not an RCT. Baseline survey of tobacco use cessation activity and attitudes in community practices.
Kentala 1999	Prevention study. Assessed the effectiveness of behavioral counseling on preventing or treating adolescent smoking.
Kirkwood 2001	4 week outcomes only. Assessed the efficacy of a smoking deterrent mouthwash. No tobacco use outcomes reported.
Kirkwood 2002	4-week outcomes only. Assessed the efficacy of a smoking deterrent breathspray. Outcome is smoking reduction not cessation.
Koerber 2003	No tobacco use outcomes reported. Assessed the effects of teaching dental students brief motivational interviewing.
Little 1992b	3-month outcomes only. Assessed the effectiveness of behavioral intervention techniques delivered by dental hygienists during routine dental hygiene visits.
Macgregor 1996	Not an RCT. Evaluated the effectiveness of dental health advice for a reduction in cigarette smoking.
Masouredis 1997	3 month outcomes only. Assessed the effectiveness of a smokeless tobacco intervention in colleges.
Morgan 2000	Not an RCT. Recommendations for oral health professionals for addressing patient tobacco use.
NCI 1994	Collection of monographs addressing smoking cessation in medical and dental environments. Data from primary literature are covered elsewhere in this review. See Cohen 1987, Cohen 1989, Gritz 1993, Gritz 1990.
NCI 1995	Intervention not confined to the dental setting. Community-based interventions with communities as the unit of randomization. Tobacco control activities were promoted through medical and dental office settings.
O'Keefe 1995	Not an RCT. Study of dental practioner compliance with tobacco use intervention training.

Characteristics of excluded studies (*Continued*)

Olson 1985	15-week outcomes only of salivary parameters before and after among smokers using nicotine-containing chewing gum. No tobacco cessation outcomes.
Secker-Walker 1988	Not an RCT. Pilot study of smoking cessation advice among patients in a periodontal practice.
Smith 1998	Not an RCT. Case series of smoking cessation programs conducted in dental practices in the UK.
Williams 2002	Abstract unavailable. No additional information supplied by author.
Wood 1997	Not an RCT. 3-month data only. Office-based training in tobacco cessation for dentists.

RCT; operator blinded

ADDITIONAL TABLES

Table 01. Behavioural vs usual care: Smokeless tobacco users, >=12 months

Study	Treatment	Control (usual care)
Andrews 1999	40/394	8/239
Gansky 2002	32/141	21/166
Stevens 1995	25/245	19/273
Walsh 1999	60/171	30/189
Gansky 2005	103/285	130/352

Table 02. Behavioural vs usual care: Cigarette smokers, >= 12 months

Study	Treatment	Control (usual care)
Severson 1998b	35/1374	32/1350

Table 03. Behavioural vs usual care: Actively seeking treatment, >=12 months

Study	Treatment	Control (usual care)
Gansky 2002	32/141	21/166
Walsh 1999	60/171	30/189
Gansky 2005	103/285	130/352

Table 04. Behavioural vs usual care: Not actively seeking treatment, >=12 months

Study	Treatment	Control (usual care)
Andrews 1999	40/394	8/239
Stevens 1995	25/245	19/273
Severson 1998b	35/1374	32/1350

Table 05. Behavioural vs usual care: Cluster randomization

Study	Treatment	Control (usual care)
Andrews 1999	40/394	8/239
Gansky 2002	32/141	21/166
Walsh 1999	60/171	30/189
Severson 1998b	35/1374	32/1350
Gansky 2005	103/285	130/352

Table 06. Behavioural vs usual care: Individual randomization

Study	Treatment	Control (usual care)
Severson 1995	25/245	19/273

ANALYSES

Comparison 01. Behavioural Interventions vs. Usual Care (adjusted)

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Tobacco Abstinence >= 12 months (adjusted)	6		Adjusted odds ratio (Fixed) 95% CI	1.44 [1.16, 1.78]
02 Tobacco Abstinence >= 12 months (adjusted)			Adjusted odds ratio (Fixed) 95% CI	Subtotals only
03 Method of Randomization (adjusted)			Adjusted odds ratio (Fixed) 95% CI	Subtotals only

INDEX TERMS

Medical Subject Headings (MeSH)

*Counseling; *Dental Offices; Oral Health; Randomized Controlled Trials; *Tobacco, Smokeless; Tobacco Use Cessation [*methods; psychology]

MeSH check words

Humans

COVER SHEET

Title	Interventions for tobacco cessation in the dental setting
Authors	Carr AB, Ebbert JO
Contribution of author(s)	JOE and ABC both conceived and planned the review, sought trials and extracted data; both were equally involved in writing the review.
Issue protocol first published	2005/1
Review first published	2006/1
Date of most recent amendment	12 September 2006

Date of most recent SUBSTANTIVE amendment	03 November 2005
What's New	The search was updated in April 2006. No new studies were identified. Two studies were reviewed and added to the excluded studies list. This minor update was first published in issue 1,2007.
Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	07 September 2006
Date authors' conclusions section amended	Information not supplied by author
Contact address	Dr Alan Carr Department of Dental Specialities Mayo Clinic 200 First Street SW Rochester MN 55905 USA E-mail: Carr.Alan@mayo.edu Tel: +1 507 284 2951 Fax: +1 507 284 0161
DOI	10.1002/14651858.CD005084.pub2
Cochrane Library number	CD005084
Editorial group	Cochrane Tobacco Addiction Group
Editorial group code	HM-TOBACCO

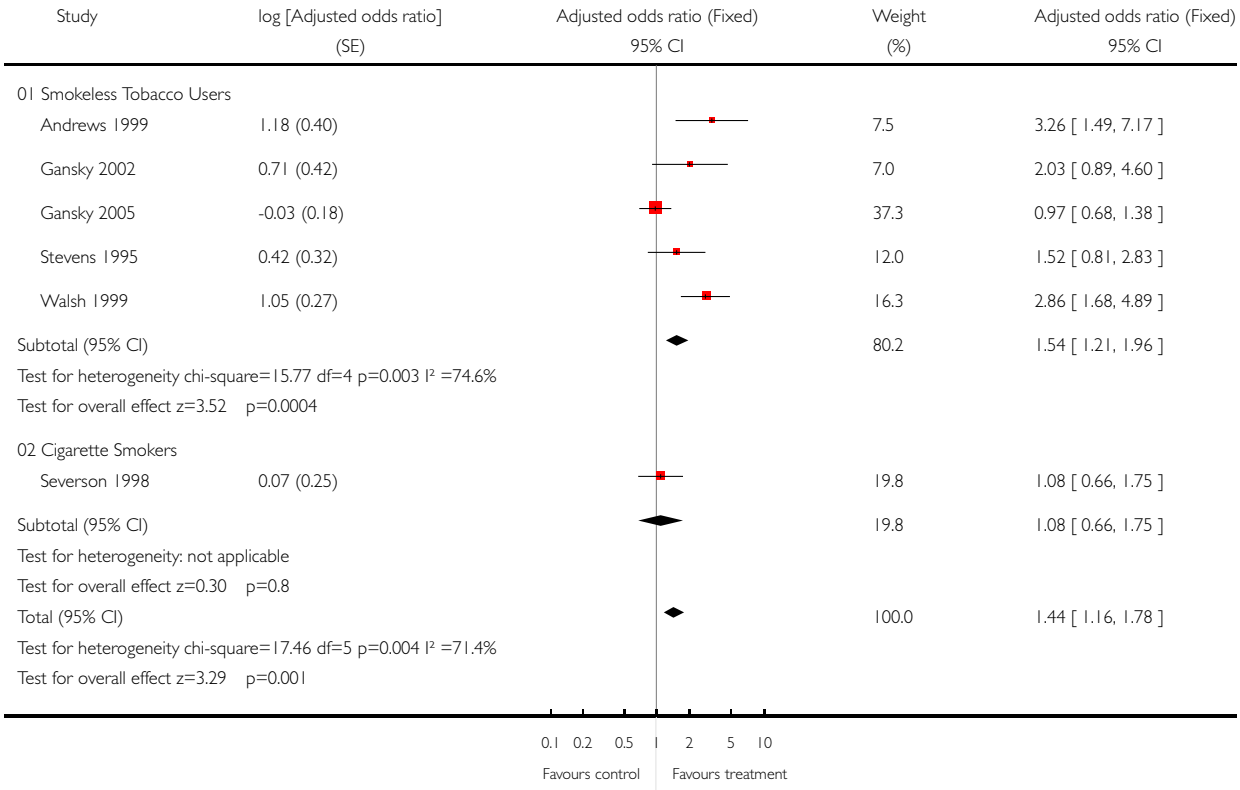
GRAPHS AND OTHER TABLES

Analysis 01.01. Comparison 01 Behavioural Interventions vs. Usual Care (adjusted), Outcome 01 Tobacco Abstinence >= 12 months (adjusted)

Review: Interventions for tobacco cessation in the dental setting

Comparison: 01 Behavioural Interventions vs. Usual Care (adjusted)

Outcome: 01 Tobacco Abstinence >= 12 months (adjusted)

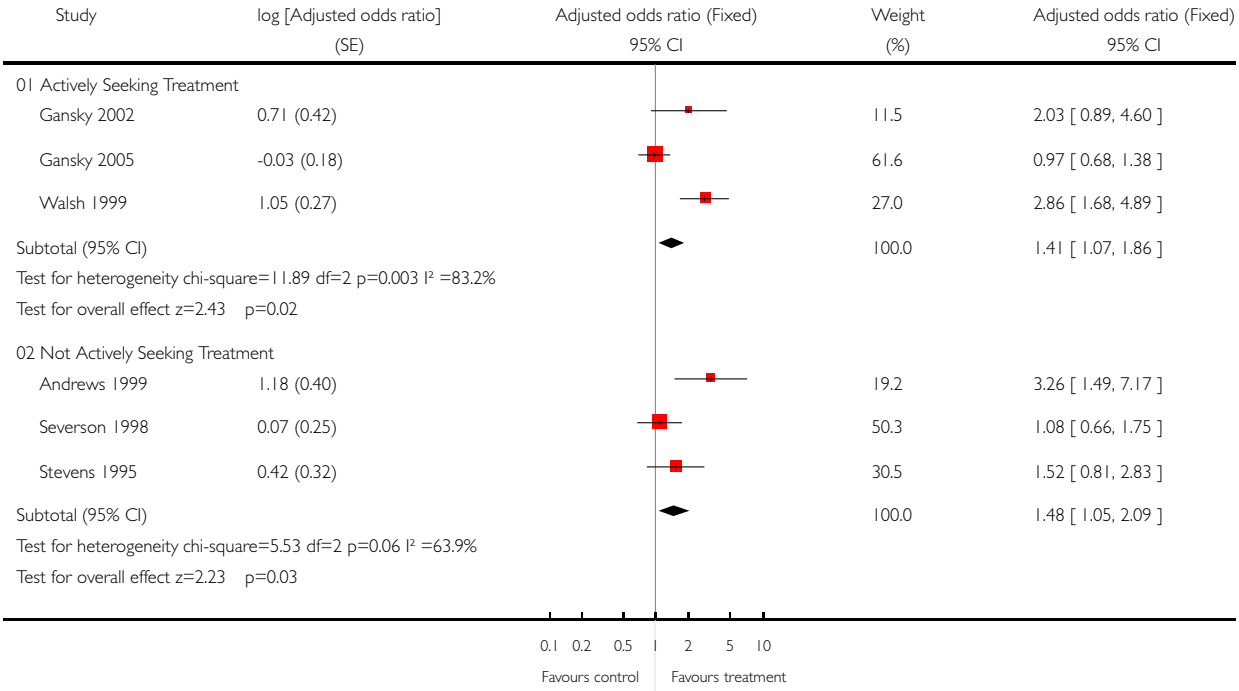


Analysis 01.02. Comparison 01 Behavioural Interventions vs. Usual Care (adjusted), Outcome 02 Tobacco Abstinence >= 12 months (adjusted)

Review: Interventions for tobacco cessation in the dental setting

Comparison: 01 Behavioural Interventions vs. Usual Care (adjusted)

Outcome: 02 Tobacco Abstinence >= 12 months (adjusted)



Analysis 01.03. Comparison 01 Behavioural Interventions vs. Usual Care (adjusted), Outcome 03 Method of Randomization (adjusted)

Review: Interventions for tobacco cessation in the dental setting

Comparison: 01 Behavioural Interventions vs. Usual Care (adjusted)

Outcome: 03 Method of Randomization (adjusted)