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Title	Recall intervals for oral health in primary care patients
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Publication date	2020-10-14
Original Citation	Fee, P. A., Riley, P., Worthington, H. V., Clarkson, J. E., Boyers, D. and Beirne, P. V. (2020) 'Recall intervals for oral health in primary care patients', Cochrane Database of Systematic Reviews, 2020(10), CD004346 (24pp). doi: 10.1002/14651858.CD004346.pub5
Type of publication	Review
Link to publisher's version	10.1002/14651858.CD004346.pub5
Rights	© 2020, The Cochrane Collaboration. Published by John Wiley & Sons, Ltd. This review is published as a Cochrane Review in the Cochrane Database of Systematic Reviews 2020, Issue 10. Cochrane Reviews are regularly updated as new evidence emerges and in response to comments and criticisms, and the Cochrane Database of Systematic Reviews should be consulted for the most recent version of the Review.
Download date	2026-11-16 09:31:36
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Recall intervals for oral health in primary care patients (Review)

Beirne PV, Forgie A, Clarkson JE, Worthington HV

Beirne PV, Forgie A, Clarkson JE, Worthington HV.
Recall intervals for oral health in primary care patients.
Cochrane Database of Systematic Reviews 2005, Issue 2. Art. No.: CD004346.
DOI: 10.1002/14651858.CD004346.pub2.

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TABLE OF CONTENTS

HEADER 1
ABSTRACT 1
PLAIN LANGUAGE SUMMARY 2
BACKGROUND 3
OBJECTIVES 4
METHODS 5
RESULTS 8
DISCUSSION 9
AUTHORS' CONCLUSIONS 10
ACKNOWLEDGEMENTS 11
REFERENCES 12
CHARACTERISTICS OF STUDIES 16
DATA AND ANALYSES 23
Analysis 1.1. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 1 dmfs increment, 3-5 year olds. 25
Analysis 1.2. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 2 DMFS Increment, 16-18 year olds. 25
Analysis 1.3. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 3 DMFS Increment, 18-20 year olds. 25
Analysis 1.4. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 4 Examination time (min), 3-5 year olds. 25
Analysis 1.5. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 5 Treatment time (min), 3-5 year olds. 25
Analysis 1.6. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 6 Total time (min), 3-5 year olds. 26
Analysis 1.7. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 7 Examination time (min), 16-18 year olds. 26
Analysis 1.8. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 8 Treatment time (min), 16-18 year olds. 26
Analysis 1.9. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 9 Total time (min), 16-18 year olds. 26
Analysis 1.10. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 10 Examination time (min), 18-20 year olds. 27
Analysis 1.11. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 11 Treatment time (min), 18-20 year olds. 27
Analysis 1.12. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 12 Total time (min), 18-20 year olds. 27
ADDITIONAL TABLES 27
WHAT'S NEW 27
HISTORY 27
DECLARATIONS OF INTEREST 28
SOURCES OF SUPPORT 28
INDEX TERMS 28

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[Intervention Review]

Recall intervals for oral health in primary care patients

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Editorial group: Cochrane Oral Health Group.
Publication status and date: Unchanged, published in Issue 3, 2007.

Citation: Beirne PV, Forgie A, Clarkson JE, Worthington HV. Recall intervals for oral health in primary care patients. *Cochrane Database of Systematic Reviews* 2005, Issue 2. Art. No.: CD004346. DOI: 10.1002/14651858.CD004346.pub2.

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ABSTRACT

Background

The frequency with which patients should attend for a dental check-up and the potential effects on oral health of altering recall intervals between check-ups have been the subject of ongoing international debate for almost 3 decades. Although recommendations regarding optimal recall intervals vary between countries and dental healthcare systems, 6-monthly dental check-ups have traditionally been advocated by general dental practitioners in many developed countries.

Objectives

To determine the beneficial and harmful effects of different fixed recall intervals (for example 6 months versus 12 months) for the following different types of dental check-up: a) clinical examination only; b) clinical examination plus scale and polish; c) clinical examination plus preventive advice; d) clinical examination plus preventive advice plus scale and polish.
To determine the relative beneficial and harmful effects between any of these different types of dental check-up at the same fixed recall interval.
To compare the beneficial and harmful effects of recall intervals based on clinicians' assessment of patients' disease risk with fixed recall intervals.
To compare the beneficial and harmful effects of no recall interval/patient driven attendance (which may be symptomatic) with fixed recall intervals.

Search methods

We searched the Cochrane Oral Health Group Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE and EMBASE. Reference lists from relevant articles were scanned and the authors of some papers were contacted to identify further trials and obtain additional information.
Date of most recent searches: 9th April 2003.

Selection criteria

Trials were selected if they met the following criteria: design - random allocation of participants; participants - all children and adults receiving dental check-ups in primary care settings, irrespective of their level of risk for oral disease; interventions - recall intervals for the following different types of dental check-ups: a) clinical examination only; b) clinical examination plus scale and polish; c) clinical examination plus preventive advice; d) clinical examination plus scale and polish plus preventive advice; e) no recall interval/patient driven attendance (which may be symptomatic); f) clinician risk-based recall intervals; outcomes- clinical status outcomes for dental caries (including, but not limited to, mean dmft/DMFT, dmfs/DMFS scores, caries increment, filled teeth (including replacement restorations), early carious lesions arrested or reversed); periodontal disease(including, but not limited to, plaque, calculus, gingivitis, periodontitis,

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change in probing depth, attachment level); oral mucosa (presence or absence of mucosal lesions, potentially malignant lesions, cancerous lesions, size and stage of cancerous lesions at diagnosis). In addition the following outcomes were considered where reported: patient-centred outcomes, economic cost outcomes, other outcomes such as improvements in oral health knowledge and attitudes, harms, changes in dietary habits and any other oral health-related behavioural change.

Data collection and analysis

Information regarding methods, participants, interventions, outcome measures and results were independently extracted, in duplicate, by two authors. Authors were contacted, where deemed necessary and where possible, for further details regarding study design and for data clarification. A quality assessment of the included trial was carried out. The Cochrane Oral Health Group's statistical guidelines were followed.

Main results

Only one study (with 188 participants) was included in this review and was assessed as having a high risk of bias. This study provided limited data for dental caries outcomes (dmfs/DMFS increment) and economic cost outcomes (reported time taken to provide examinations and treatment).

Authors' conclusions

There is insufficient evidence from randomised controlled trials (RCTs) to draw any conclusions regarding the potential beneficial and harmful effects of altering the recall interval between dental check-ups. There is insufficient evidence to support or refute the practice of encouraging patients to attend for dental check-ups at 6-monthly intervals. It is important that high quality RCTs are conducted for the outcomes listed in this review in order to address the objectives of this review.

PLAIN LANGUAGE SUMMARY

The effects on oral health and the economic impact of altering the recall interval between dental check-ups (the time period between one dental check-up and the next) are unclear

Primary care dental practitioners in many countries have traditionally recommended dental check-ups at 6-monthly intervals for patients. Only one randomised controlled trial satisfied the eligibility criteria for this review. Due to the limited quantity and quality of the available evidence, no conclusions could be reached regarding the beneficial and harmful effects of varying recall intervals between dental check-ups. There is insufficient evidence to support or refute the practice of encouraging patients to attend for dental check-ups at 6-monthly intervals.

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BACKGROUND

Healthcare providers' decisions about when to recall patients for their next visit are common to many outpatient encounters in longitudinal care. Such decisions directly affect provider workloads and have a potentially great impact on healthcare costs and outcomes (Chapko 1999). There is evidence of significant variation in physicians' recommendations about recall intervals (variously called 'revisit intervals', 're-examination intervals' or 'return intervals') for patients with many common ambulatory care conditions including diabetes mellitus, hypertension, angina and musculoskeletal pain (DeSalvo 2000; Petitti 1993; Schwartz 1999; Tobacman 1992). It has been suggested that the existence of such widespread variation may be an indication that physicians are uncertain about what interval is most appropriate and, further, that "a rational, information-based approach to the choice of revisit interval for common conditions could yield substantial savings in medical care costs" (Petitti 1993).

Concerns about the clinical and cost-effectiveness of recall intervals have led to the emergence of research interest in understanding provider behaviour concerning appointment assignment and in the possible beneficial and harmful effects associated with varying recall intervals (Chapko 1999; DeSalvo 2000; Schwartz 1999). The outcomes associated with differing recall intervals are relevant to many patient populations in receipt of continuing care from primary care providers. In this context, there has been an ongoing international debate in relation to the clinical effectiveness and cost-effectiveness of recall intervals for specific types of care, in particular routine dental examinations. This review looks at the evidence pertaining to the effects on oral health and the resource implications of different recall intervals for 'dental check-ups'.
In the context of the provision of continuing dental care to patients, a 'recall' visit may be defined as "*t*he planned, unprecipitated return of a patient who, when last seen was in good oral health" (Royal College 1997). A 'recall examination' or 'routine dental check-up' is the examination performed at this planned return appointment. The 'recall interval' is the time period, usually specified in months or years, between recall examinations.

There appears to be no universally recognised definition of the term 'routine dental check-up.' A routine dental check-up has been defined in the United Kingdom (UK) National Health Service (NHS) dental remuneration statement as "clinical examination, advice, charting (including monitoring of periodontal status) and report" (NHS Executive 2002). The principal function of the 'clinical examination' component of the check-up is to detect the signs and symptoms of oral disease, in particular dental caries and periodontal disease. The primary dental health team is also regarded as having a role in the early detection of oral malignancy and potentially malignant lesions with a view to having a potential beneficial impact on the overall incidence, morbidity and mortality from oral cancer (Conway 2002). It has been argued that an examination for oral cancer, including a thorough medical and social history and a systematic examination of the oral mucosa, should form an integral part of all routine dental examinations (BDA 2000; Clovis 2002; Conway 2002; Field 1995).

The 'advice' component of the dental recall examination is amenable to wide interpretation, but may be presumed to allude to professional advice directed towards the prevention of oral disease. Such advice may incorporate instruction on appropriate oral hygiene practices for the prevention of dental caries and periodontal disease (e.g. the use of fluoride toothpaste, appropriate toothbrushing techniques and other adjunctive methods of plaque control such as flossing), dietary advice (e.g. reducing the amount and frequency of intake of sugar containing foods and drinks) and advice aimed at modifying other risk factors for oral disease (e.g. the delivery of smoking cessation advice and alcohol reduction counselling).
The recall examination may therefore be construed as having a purported dual function as a primary and secondary preventive measure. The 'advice' component of the recall examination may be regarded as a primary preventive measure that seeks to influence patient behaviour with a view to preventing oral diseases before they occur. As a secondary preventive measure, a further aim of the check-up is to limit the progression and effect of oral diseases at as early a stage as possible after onset. This is achieved through the early detection of the signs and symptoms of oral diseases with a view to instituting clinical procedures and interventions which may have a favourable effect upon the natural history and clinical course of disease (Deep 2000).

Other functions that can be ascribed to the recall examination include the regular monitoring and preventive management of early carious lesions, the regular monitoring of stages of dental development to ensure that interventions are appropriate and timely (e.g. orthodontic treatment for malocclusions), the detection of the oral manifestations of systemic disease and appropriate referral for further investigation, the maintenance of dentist/patient rapport and the regular repetition and reinforcement of professional advice with a view to improving patient motivation and enhancing compliance with preventive recommendations. Recall examinations in the public dental services in some countries also regularly include specific preventive care such as the application of a fluoride gel or varnish (Wang 1995a).

The provision of a scale and polish at a recall examination is also common practice in primary dental care settings (Elley 2001; Frame 2000). Scaling can be defined as the mechanical removal of plaque, calcified deposits and staining from the crown and root surfaces of the teeth using manual and/or power-driven instrumentation. Polishing can be defined as the mechanical removal of any residual extrinsic stains and deposits that remain following the scaling procedure, using a rubber cup or bristle brush loaded with an abrasive or non-abrasive prophylaxis paste. Half of all adult courses of treatment provided in the NHS General Dental Services in the UK consist of the patient receiving nothing more than an examination and a scale and polish (DoH 2000). In a survey of dentists' preventive recommendations in New York State it was reported that dentists uniformly recommended semi-annual dental check-ups for all age groups and, furthermore, the majority of dentists (86%) who responded to the survey recommended scaling and polishing every 6 months for 'low-risk patients of all ages' (Frame 2000).

The optimal length of the recall interval (how often to attend for a dental check-up) for the preventive maintenance of oral health in both children and adults has been the subject of debate in many countries (DTB 1985; Elderton 1985a; Elderton 1985b; Kay 1999; Lahti 2001; Lock 1986; Perlus 1994; Renson 1977; Renson 2000; Sheiham 1977; Sheiham 1980; Sheiham 2000). In North America it has been suggested that the issue has become controversial due to the reduced coverage adopted by some insurance carriers,

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many of which have reduced their coverage for recall examinations from 6 to 9 months, and some to a 12 month frequency (Perlus 1994). The recall interval debate has also been prompted by conflicting evidence on the beneficial and harmful effects of regular attendance and by diverging interpretations of that evidence.

On the one hand, it has been reported that regular dental attendance is associated with improved oral health and that regular attenders have less untreated disease, lower rates of tooth loss, higher numbers of functioning teeth, and are less likely to suffer acute symptoms and to require emergency treatment (Murray 1996; Sheiham 1985; Todd 1991). An association between regular dental attendance and perception of how oral health affects quality of life has also been reported (McGrath 2001). In addition, it has been recently reported that regular attenders suffer significantly less from the severity, prevalence, social and psychological impacts of dental health problems (Richards 2002).

On the other hand, however, it has also been argued that regular attenders do not experience any major advantage over irregular attenders in respect of their total disease experience and that regular visits do not help to prevent the onset of further disease (Sheiham 1985). Based on an analysis of the results of the 1998 Adult Dental Health Survey in the United Kingdom (Kelly 2000), Sheiham has argued that occasional attenders had less periodontal disease, more teeth present and fewer missing teeth than regular attenders (Sheiham 2000). Concerns have also been expressed about the financial implications for patients associated with regular attendance, including time foregone in attending for appointments, and the enhanced possibility for iatrogenic interventions (overtreatment) associated with regular attendance (Reekie 1997; Sheiham 1985).

Against this background of continuing debate a 6-monthly recall interval has remained customary practice in many countries and is a common recommendation made by dental practitioners engaged in primary care (Frame 2000; Kay 1999; Scott 2002). The clinical and cost-effectiveness of this six-monthly recall interval have increasingly been questioned in the light of recent changes in the epidemiology of dental diseases and in the interests of cost-containment and judicious use of scarce resources (Audit Commission2002; DoH 2000; DoH 2002; HDA 2001; Sheiham 2000). Over the last 2 decades the prevalence and severity of dental caries in many developed countries has decreased dramatically and the rate of progression of the disease has slowed (Brown 1995). Caries experience in many contemporary populations also exhibits a skewed distribution with a majority of children and adolescents having little or no disease, whilst for a minority the caries experience remains relatively high (Hausen 1997). In particular, it has been consistently observed that caries experience is generally more extensive and severe in lower socio-economic status groups (Burt 1999). These factors have led to suggestions in a number of countries that the notion of a 'fixed and universal' recall interval is inappropriate and that recall intervals should be patient specific (individualised) (Deep 2000; DoH 2000; HDA 2001; Lahti 2001; Perlus 1994; Riordan 1997). The School Dental Service in Western Australia has, for example, adopted a practice of choosing recall intervals based on the clinician's assessment of a patient's risk of acquiring new disease (Riordan 1997). Other systems for assigning recall intervals have been based on a classification of patients into 'low' and 'high' risk groups *e.g.,* guidelines on recall intervals in the School Dental Services in New Zealand state that 'high risk' children should be seen 6-monthly and 'low risk' children annually (NZ MoH 2001).

The rationale underpinning the risk-based recall approach is that it should be possible to extend recall intervals for those individuals classified as 'low risk' without incurring any undue detrimental effect on their oral health status and ultimately reducing resource consumption. Relatively shorter recall intervals can then be adopted for those individuals with the greatest need who are classified as 'high risk'. Studies carried out in the public dental services in Norway have suggested that appropriately individualised recall intervals (between 12 to 20 months) for low risk children and adolescents can reduce resource consumption without adversely affecting the outcome of care (Wang 1995a; Wang 1995b).

Similarly, for periodontal disease it has been argued that 6-monthly recall intervals are no more effective than longer intervals for preventing periodontitis or controlling gingivitis in healthy patients and that recall intervals should be individualised and based on an evaluation of the patient's oral hygiene, disease activity, individual susceptibility and disease history (Brothwell 1998). In the UK, the justification for regular 6-monthly screening of all patients for oral cancer has also been questioned on the grounds that the number of cases of oral malignancy is small and usually confined to patients at 'high risk' (due to tobacco use and excessive consumption of alcohol) over the age of 45 years (Sheiham 1977; Sheiham 1980).

Although the concepts of assigning patient risk profiles and the development of patient-specific recall intervals have gained increasing currency, there is significant variation in recommendations both within and between countries regarding the 'optimal recall interval' for dental check-ups. Sheiham has argued that for low risk children (< 18 years of age) and adults in the UK the recall intervals should be 18 months and 2 to 3 years respectively (Sheiham 2000). However, it has also been suggested that the maximum period between oral examinations for everyone in the UK, irrespective of age or dental condition, should be 1 year (HDA 2001). An expert group in Finland has recommended that recall intervals for low risk children and adolescents could be extended to 1.5 to 2 years without jeopardising their oral health (Lahti 2001). In Denmark, 35 to 45 per cent of the municipal dental services adopt an 8-month recall interval (Petersen 1999). In the United States a recall interval of no longer than 12 months has been advocated for low caries-risk patients (Benn 1999).

The contemporary debate over appropriate recall intervals in the UK resulted in the commissioning of a Health Technology Assessment (HTA) Project to review the clinical and cost-effectiveness of routine dental checks and to examine the influence of altering the recall interval on effectiveness and cost-effectiveness (Davenport 2003). The National Institute for Clinical Excellence (NICE) has also been asked by the Department of Health and the Welsh Assembly Government "to prepare guidance for the NHS in England and Wales on the clinical and cost-effectiveness of a dental recall examination for all patients at an interval based on the risk from oral disease" (DoH 2002). This guideline was published in October 2004. The HTA review and the NICE guideline are further discussed in the 'Discussion' section below.

OBJECTIVES

Primary objectives

The primary objectives of this review were:

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(1) To determine the beneficial and harmful effects of different fixed recall intervals (for example 6 versus 12 months) for any one of the following different types of dental check-up:

- clinical examination only
- clinical examination plus scale and polish
- clinical examination plus preventive advice
- clinical examination plus preventive advice plus scale and polish.

(2) To determine the relative beneficial and harmful effects between any of the different check-ups listed above at the same fixed recall interval (for example 12 months).

(3) To compare the beneficial and harmful effects of recall intervals based on clinicians' assessments of patients' disease risk with fixed recall intervals.
All methods used by clinicians to assess disease risk will be considered in relation to this objective (e.g. assessments based on patients' medical history, previous caries experience, dietary and oral hygiene practices etc).

(4) To compare the beneficial and harmful effects of no recall interval/patient driven attendance (which may be symptomatic) with fixed recall intervals.

- In relation to objective (1) the following null hypotheses were tested.

To test the null hypothesis of no difference in terms of clinical status, psychosocial and economic cost outcomes between each intervention mentioned in (1) at a fixed recall interval compared with itself at a different fixed recall interval.
For example, no difference in outcomes between clinical examination at a fixed recall interval (e.g. 6 months) versus clinical examination at any other fixed (longer or shorter) recall interval (e.g. 3 months or 9 months).

- In relation to objective (2) the following null hypotheses were tested:

To test the null hypothesis of no difference in terms of clinical status, psychosocial and economic cost outcomes between each intervention mentioned in (1) at a fixed recall interval compared with any other intervention at the same fixed recall interval.
For example, no difference in outcomes between clinical examination at one fixed recall interval (e.g. 6 months) versus clinical examination plus scale and polish at the same fixed recall interval (6 months).

- In relation to objective (3) the following null hypotheses were tested:

To test the null hypothesis of no difference in terms of clinical status, psychosocial and economic cost outcomes between each intervention mentioned in (1) at a fixed recall interval compared with a clinician risk-based recall interval.
For example, no difference in outcomes between clinical examination at a fixed recall interval (e.g. 6 months) versus clinical examination at a risk-based recall interval.

- In relation to objective (4) the following null hypotheses were tested:

To test the null hypothesis of no difference in terms of clinical status, psychosocial and economic cost outcomes between each intervention mentioned in (1) at a fixed recall interval and no recall interval/patient driven attendance (which may be symptomatic).

Secondary objective
The secondary objective of this review was to determine the beneficial and harmful effects of different recall intervals for each of the different types of interventions mentioned above for specific age groups and according to initial levels of caries severity (DMFS, DMFT, or other measure).

The following age groups were considered in the review:

- Children aged 6 years of age and younger (< 83 months) (deciduous dentition)
- Children aged 7 to 13 years of age (mixed dentition)
- Adolescents aged 14 to 17 years of age (permanent dentition)
- Young adults aged 18 to 25
- Adults aged 26 to 55
- Older adults aged 56 years and older.

(*Note*: the age groups outlined above were selected taking into consideration reported rates of progression of dental caries, the stage of development of the dentition and reported risk ages for dental caries. The rate of progression of dental caries may be faster in the deciduous dentition than in the permanent dentition as the enamel and dentine are thinner in deciduous teeth and they have broader proximal contacts leading to potentially increased caries activity and more rapid progression of caries. For occlusal surfaces of molar teeth, the first 1 to 2 years after eruption are considered as 'risk ages' for new caries. For approximal surfaces, the first 4 to 5 years after contact with the neighbouring surface appear to be the ages when most new carious lesions occur (Espelid 2001). Data on the rates of progression of dental caries in adults appear to be sparse. However, it has been suggested that the period between 26 to 55 years of age may be a time of 'potential stability' (Pitts 1992). For adults over the age of 55 years, the potential for root caries becomes particularly relevant.)

METHODS

Criteria for considering studies for this review

Types of studies

Only randomised controlled trials(RCTs) were included in this review.

Types of participants

All children and adults receiving dental check-ups in primary care settings were included in this review, irrespective of their level of risk for oral disease.

Types of interventions

The interventions considered in this review included recall intervals for:

- clinical examination only
- clinical examination plus scale and polish
- clinical examination plus preventive advice
- clinical examination plus scale and polish plus preventive advice

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- no recall interval/patient driven attendance (which may be symptomatic)
- recall intervals based on clinician assessment of patient risk.

Types of outcome measures

The outcomes considered in this review included clinical status outcomes, psychosocial (patient centred) outcomes and economic cost outcomes.

Clinical status outcomes

Dental caries

- Caries experience: mean dmft/DMFT, dmfs/DMFS scores
- Caries increment as measured by changes in the mean dmfs/DMFS and dmft/DMFT scores
- Untreated decayed teeth/surfaces (by site, if given, i.e. occlusal, approximal etc.)
- Missing teeth
- Filled teeth (including replacement restorations)
- Sound teeth/surfaces
- Teeth/surfaces affected by caries into dentine
- Number, size and severity of white spot lesions
- Early carious lesions arrested or reversed
- Root caries (adults only, any index).

Periodontal disease

- Plaque and calculus (any index)
- Gingivitis (any index)
- Periodontitis (any index)
- Change in pocket depth
- Change in attachment level
- Change in proportion of sites bleeding on probing.

Oral mucosa

- Presence or absence of mucosal lesions, potentially malignant lesions, cancerous lesions
- Size and stage of cancerous lesions at diagnosis

Developmental

- Dento-facial development.

Psychosocial outcomes

- Patient/parent satisfaction with provider of care (i.e. dentist, hygienist, therapist)
- Patient/parent satisfaction with actual care received
- Patient oral comfort
- Patient/parent satisfaction with appearance
- Any assessment of patients' oral health related quality of life, provided this was recorded in a reproducible and validated format.

Economic costs

Costs to patient

- Out of pocket payments for care received (patient charges) and insurance premiums
- Time and foregone wages or other opportunity costs
- Costs of transportation, child care expenses.

Costs to provider

- Real costs of producing care for provider
- Dentist, hygienist, therapist time and other personnel time
- Materials, overheads, equipment used
- Costs to the healthcare system or third party provider were considered where reported.

Other outcomes

- Improvements in oral health knowledge and attitudes, harms (such as fluorosis, overtreatment), changes in dietary habits and any other oral health related behavioural changes were recorded and considered where reported.

Search methods for identification of studies

This review was conducted at the same time as another Cochrane review entitled 'Routine scale and polish for periodontal health in adults' (Beirne 2004) and the same search strategy was used for both reviews.
For the identification of studies included or considered for this review, detailed search strategies were developed for each database searched. These were based on the search strategy developed for MEDLINE but revised appropriately for each database.
The search strategy combined the subject search with phases 1 and 2 of the Cochrane sensitive search strategy for RCTs (as published in Appendix 5b in the Cochrane Reviewers' Handbook 4.2.0 updated March 2003) and revised by the Cochrane Oral Health Group to include study designs specific to oral health research. The subject search used a combination of controlled vocabulary and free text terms based on the following search strategy for searching MEDLINE:

1 exp STOMATOGNATHIC DISEASES/
2 exp DENTISTRY/
3 ORAL HEALTH/
4 HEALTH EDUCATION DENTAL/
5 DENTIST'S PRACTICE PATTERNS/
6 oral health.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]
7 (tooth or teeth or dental$).mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]
8 (routine$ adj (check-up$ or inspect$ or examin$ or attend$ or recall$ or visit$))
9 (regular$ adj (check-up$ or inspect$ or examin$ or attend$ or recall$ or visit$))
10 (periodic$ adj (check-up$ or inspect$ or examin$ or attend$ or recall$ or visit$))
11 (recall$ adj3 interval$)
12 (six-month$ adj3 (check-up$ or inspect$ or examin$ or attend$ or recall$ or visit$))
13 (dental$ adj (check-up$ or recall$ or attend$ or inspect$))
14 or/1-7
15 or/8-13
16 14 and 15

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17 exp DENTAL SCALING/
18 ("dental scaling" or "scale and polish$" or "dental prophylaxis" or "oral prophylaxis" or periodont$ or ((dental or tooth) and scaling))
19 (periodic$ or routine$ or recall$ or six-month$ or three-month$)
20 or/17-18
21 20 and 19
22 RANDOMIZED CONTROLLED TRIAL.pt.
23 CONTROLLED CLINICAL TRIAL.pt.
24 RANDOMIZED CONTROLLED TRIAL.sh.
25 RANDOM ALLOCATION.sh.
26 DOUBLE BLIND METHOD.sh.
27 SINGLE BLIND METHOD.sh.
28 latin square.ti,ab.
29 crossover.ti,ab.
30 (split adj (mouth or plot)).ti,ab.
31 or/22-30
32 (ANIMAL not HUMAN).sh.
33 31 not 32
34 CLINICAL TRIAL.pt.
35 exp CLINICAL TRIALS/
36 (clin$ adj25 trial$).ti,ab.
37 ((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).ti,ab.
38 PLACEBOS.sh.
39 placebo$.ti,ab.
40 random$.ti,ab.
41 RESEARCH DESIGN.sh.
42 or/34-41
43 42 not 32
44 43 not 33
45 33 or 43
46 CROSS-OVER STUDIES/
47 MULTICENTER STUDY.pt.
48 or/45-47
49 (16 or 21) and 48

Electronic searching
Studies pre-dating 1966 were not searched for. The following databases were searched:

- Cochrane Oral Health Group Trials Register (to 9th April 2003)
- The Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* Issue 1, 2003)
- MEDLINE (1966 to 9th April 2003)
- EMBASE (1980 to 9th April 2003).

The most recent electronic search was carried out on the 9th April, 2003.

Handsearching
Only handsearching carried out by The Cochrane Collaboration was included in the search (*see* master list at www.cochrane.org). The reference lists of all potentially eligible trials were checked for more relevant studies. Reference lists from review articles identified in the searches were also scanned for further studies. The search strategy attempted to identify all relevant studies irrespective of language. Any non-English papers identified as potentially relevant to the review were translated.

Personal contact
The author(s) of eligible published studies and any researchers involved in the ongoing debate on recall intervals were contacted, where possible and when considered necessary, to obtain information on additional published or unpublished studies possibly eligible for inclusion.

Data collection and analysis

Study selection
Two authors (Paul Beirne (PB) and Andrew Forgie (AF)) independently and in duplicate assessed the titles, keywords and abstracts (when available) of all reports identified by the search strategy as being of potential relevance to the review. The authors remained unblinded regarding the author(s), their institutional affiliations and the site of publication of reports. The full report was obtained for all studies appearing to meet the inclusion criteria or in instances where there was insufficient information from the title, keywords and abstract to make a clear decision. All of the potentially relevant studies were assessed independently for eligibility by both authors. Instances of disagreement in the study selection process were referred to the other two members of the review team (Jan Clarkson (JC) and Helen Worthington (HW)) and ultimately resolved by mutual discussion among all review team members. Studies rejected at this or subsequent stages were recorded in a table of excluded studies, and reasons for exclusion noted. All of the studies meeting the inclusion criteria were subjected to quality assessment and data extraction.

Quality assessment
The quality assessment of included trials was undertaken independently and in duplicate by two authors (PB and HW) as part of the data extraction process and in accordance with the guidelines in the Cochrane Reviewers' Handbook (version 4.2.2, updated March 2004). Any disagreements were resolved by discussion.

Three main quality criteria were examined.

(1) Allocation concealment, recorded as:
(A) Adequate
(B) Unclear
(C) Inadequate as described in the Cochrane Reviewers' Handbook.

(2) Treatment blind to outcome assessors, recorded as:
(A) Yes
(B) No
(C) Unclear
(D) Not possible.

(3) Completeness of follow up (is there a clear explanation for withdrawals and drop outs in each treatment group?) assessed as:
(A) Yes
(B) No.

After taking into account any additional information provided by the authors of the trials, studies were grouped into the following categories.
A. Low risk of bias (plausible bias unlikely to seriously alter the results) if all criteria were met.
B. Moderate risk of bias (plausible bias that raises some doubt about the results) if one or more criteria were partly met (when authors responded that they had made some attempts to conceal the allocation of patients, to blind the assessors or to give an explanation for withdrawals, but these attempts were not judged to be ideal, these criteria were categorized as 'partly').

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C. High risk of bias (plausible bias that seriously weakens confidence in the results) if one or more criteria were not met.

Data extraction

Data were extracted independently and in duplicate by two authors (PB and HW) using specially designed and piloted data extraction forms. The characteristics of the trial participants (including demographic characteristics and criteria for inclusion, different baseline prevalence of disease), sample size, numbers of participants randomised to each group, provider characteristics (dentist, hygienist, dental therapist), differences in diagnostic criteria and diagnostic thresholds used, interventions and outcomes for the included studies, direct and indirect costs (where provided) were presented in study tables. Descriptive data extracted from each study included the year the study started, the date of publication, the country/place of origin and study duration. Disagreements on data extraction were resolved by discussion among all of the review team members.

Data synthesis

The Cochrane Oral Health Group's statistical guidelines were followed in determining the choice of summary statistic and estimates of overall effect. All of the outcome measures were continuous outcomes and means and standard deviations were used to summarise the data for each group.

It was intended to assess the significance of any heterogeneity by Cochran's test and to investigate any heterogeneity by examining whether differences in study results were related to the characteristics of the studies that had been identified (quality, year of study, place of study etc). However, there were insufficient studies to undertake this analysis. It was also intended to undertake a sensitivity analysis on the basis of methodological quality and to explore the effect of including unpublished literature on the review's findings. Again, there were insufficient studies for any one comparison to undertake this.

It was planned to conduct subgroup analyses, where possible, according to age and for patients at different levels of risk for oral disease. However, there were insufficient studies available to undertake such analyses.

RESULTS

Description of studies

Summary details are provided in the 'Characteristics of included studies' and 'Characteristics of excluded studies' tables.

Search results, excluded and included studies

Initial searches of all sources yielded a total of 496 titles and abstracts. Following scanning of the titles and abstracts (when available) for relevance the full texts of 47 papers considered potentially relevant to the review were obtained. Seven of these papers were either partially or fully translated in order to determine their eligibility for the review (five German (Fiebranz 1989; Katay 1990; Schulz 1989 (fully translated) Grimm 1986; Sandig 1981(partially translated)); one Finnish (Ketomaki 1993) (partially translated) and one Norwegian (Lunder 1994) (fully translated). Of the 47 potentially relevant papers considered, 46 were excluded (one excluded study (Listgarten 1986) was reported in three separate papers). Although many studies could be excluded for more than one reason, in general only the main reason for exclusion has been recorded in the 'Characteristics of excluded studies' table.

The majority of studies (27) were excluded on the grounds that the interventions were not relevant, either because the interventions were not provided as part of a dental check-up or were not provided in primary care settings and/or the clinical examination of the comparison groups was carried out at the same interval (Addy 1988; Axelsson 1987; Brown 2002; Feldman 1988; Fiebranz 1989; Glavind 1977; Greenwell 1985; Hill 1981; Kaldahl 1988; Katay 1990; Kinane 2000; Kowash 2000; Lembariti 1998; Lightner 1971; Listgarten 1985; Listgarten 1986; Loesche 2002; Nyman 1975; Pihlstrom 1987; Powell 1999; Rask 1988; Rosling 1976; Sigurdsson 1994; Suomi 1973; Zimmerman 1993). One of these studies (Listgarten 1986) was reported in three separate papers.

For further details on the reasons for rejection *see* the 'Characteristics of excluded studies' table.

Fifteen studies were excluded on the grounds that they were not randomised controlled trials (Ast 1970; Axelsson 1981; Axelsson 1991; Budtz-Jorgensen 2000; Cutress 1991; Grimm 1986; Gunay 1998; Hou 1989; Huber 1987; Ketomaki 1993; Klein 1985; Lunder 1994; Rosen 1999; Shaw 1991; Suomi 1971).

Three studies were excluded because the authors could not be contacted to determine/confirm if the studies were randomised controlled trials (Chawla 1975; Sandig 1981; Schulz 1989).

One study (Antczak-Bouckoms1994) was excluded because it was a narrative review of the natural history, prevention and treatment of periodontal disease.

Thus, following detailed assessment of all of the potentially relevant papers, only one study (Wang 1992) was judged to have satisfied the eligibility criteria for the review.

Characteristics of the trial settings and investigators

See 'Table of included studies' for further details.

The only study included in this review (Wang 1992) was conducted in a public dental clinic in Tromso, Norway.

One dentist and one dental hygienist provided all dental care over the 2 years of the trial. There were three different age groups included in this trial (3, 16 and 18 year olds). The hygienist examined 3-year-old participants in the trial at the initial, at the intermediate and at the last visits. The dentist examined 16 and 18 year olds and provided operative treatment for all the children. It was unclear who carried out the outcome assessment.

Characteristics of the participants

See 'Table of included studies' for further details.

The participants in this study (Wang 1992) were aged either 3, 16 or 18 years at entry into the trial (aged 5, 18 and 20 years at completion of the trial) and all had previously received regular dental care, including preventive services and health promotion, in one public dental clinic in Tromso, Norway. Children classified as 'risk' patients were not included in the study. The criteria used for the classification of risk patients were:

- 3 year olds (more than 0 dmft)
- 16 year olds (at least one decayed surface *and* four or more initial carious lesions *and* more than 10 DMFT)
- 18 year olds (at least one decayed surface *and* four or more initial carious lesions *and* more than 12 DMFT).

Characteristics of the interventions

See 'Table of included studies' for further details.

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Clinical examination compared with clinical examination at a different recall interval

The participating children in this study (Wang 1992) were randomly allocated to two groups. One group was recalled for examination after 12 and 24 months (12-month recall group) and the other group was recalled after 24 months (24-month recall group).

Characteristics of the outcome measures (and time points when measured)

In this study (Wang 1992) the incremental number of decayed, missing, filled and sound tooth surfaces were recorded from baseline examination to 24 months. Primary teeth were recorded in the 3 to 5 year age group and permanent teeth in the 16 to 18 and 18 to 20 year age groups. A tooth surface was recorded as decayed if the carious process extended into the dentine as assessed clinically and radiographically.

Time in minutes used for each patient was recorded in four categories: clinical examination, operative treatment, acute visits (unscheduled extra visits initiated by the patient) and minutes wasted when the patient did not show up. All time values were rounded up to the nearest 5 minutes. All of these categories were added together to give the 'total time.'

Secondary outcomes

No patient-centred outcomes were reported in the included study.

Risk of bias in included studies

Details of the quality assessment for the included study (Wang 1992) are presented in Additional Table 1 'Quality assessment for criteria measured'. The main author of the study was contacted to provide additional information for our quality assessment. Unfortunately, the required information was no longer available. Both authors agreed completely on all aspects of the quality assessment.

The method used to generate the random sequence, the concealment of allocation and the blinding of examiners to study group were unclear. The explanation for, and handling of, withdrawals/drop outs was judged to be inadequate. During the study period 56 patients left the area over the course of the 2-year trial - a 23% drop out. The drop outs in this study are presented for each age group below (group indicated in parentheses):

- 3 to 5 yr: (12) 23%, (24) 11%
- 16 to 18yr: (12) 14%, (24) 31%
- 18 to 20yr: (12) 34%, (24) 26%.

There was no intention-to-treat analysis and data analysis was confined to those participants who fully completed the trial.

Effects of interventions

Comparison 01: Clinical examination versus clinical examination at a different interval

Only one study (Wang 1992) provided data for this comparison for the outcomes dmfs/DMFS increment, examination time, treatment time and total time (examination plus treatment time).

dmfs/DMFS increment (outcomes 01 to 03)

- *Twelve months versus 24 months*

There were no statistically significant differences in dmfs/DMFS increment between 12-month recall and 24-month recall for all three age groups considered in the trial (3, 16, 18 year olds [ages 5, 18 and 20 respectively at completion of trial), although there was a trend towards a lower dmfs/DMFS increment associated with the shorter recall interval (12 months) in all age groups.

Examination time, treatment time and total time (outcomes 04 to 12)

- *Twelve months versus 24 months*

There were statistically significant differences in examination time between 12-month recall and 24-month recall for the three age groups considered in the trial, in favour of shorter examination time required in the 24-month recall groups. No statistically significant differences in treatment time between 12-month recall and 24-month recall groups were reported for all age groups.

A statistically significant difference in total clinical time (examination time plus treatment time) between 12-month recall and 24-month recall was reported in the 18 to 20 year old age group, in favour of shorter total time required in the 24 month group. For the other age groups considered in the trial, the differences between the recall interval groups were not statistically significant, although there was a trend towards less total time required in the 24-month recall group in both the 3 to 5 and 16 to 18 year old groups.

DISCUSSION

:

The debate over appropriate recall intervals between dental check-ups for primary care patients was first initiated almost 3 decades ago (Sheiham 1977). Given the longevity of this debate and the potential impact of altering recall intervals on healthcare costs and outcomes and provider workloads, it is disappointing that there is a paucity of good quality and reliable research evidence that can be used to inform clinical practice. Only one randomised trial satisfied the eligibility criteria for this review. This trial was judged to be of poor methodological quality and hence the results presented therein should be interpreted cautiously. In addition, the study was carried out on low risk patients in the public dental services in Norway who had previously received regular dental care, including health promotion and preventive services; hence the extent to which the results of this study can be extrapolated and applied to different populations (with different baseline risk) and in different settings is unclear. No statistically significant differences in oral health (measured using dmfs/DMFS increments) were reported between 12-month and 24-month recall groups for all age groups (3, 16, 18 year olds) in this single study, although there was a non-significant trend towards greater dmfs/DMFS increments associated with longer recall intervals. Examination times were significantly shorter in the 24-month recall groups compared with the 12 month groups and there were no statistically significant differences in treatment time between the recall interval groups. However, the limited quantity and quality of the evidence available from this one trial preclude drawing any conclusions regarding the effects on oral health and the economic impact of altering recall intervals between dental check-ups.

It has been argued that well designed and executed non-randomised studies can furnish valid information (Benson 2000) and, furthermore, that analyses of observational data can play an important role in medical effectiveness research (Egger 1998). However, our review only included randomised controlled trials

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because these studies, if well designed and executed, are most likely to produce the least biased evidence. Proper randomisation eliminates selection bias and reduces the risk of serious imbalance in unknown but potentially important factors that can influence the clinical course of the participants. We excluded all study designs lacking the experimental element of random allocation of participants to an intervention, due to the susceptibility of such studies to selection biases and confounding. Nevertheless, we have commented (below) on non-randomised studies (and systematic reviews of these studies) that have examined the effects of varying recall intervals between dental check-ups.

As mentioned in the 'Background' section of this Cochrane review (*see* above), a systematic review of the clinical effectiveness and cost-effectiveness of routine dental check-ups of different recall frequencies was carried out as part of the NHS Research and Dissemination Health Technology Assessment (HTA) Programme in the UK (Davenport 2003) (the date of the last search carried out for this HTA review was February 2001). This review of the evidence included non-randomised observational epidemiological studies. The authors identified 28 studies for inclusion in the review and were highly critical of the poor quality of these studies. Many of the studies were poorly reported and methodologically and clinically heterogenous with inadequate description of patient and intervention (dental check-up) characteristics, thus limiting comparison between studies. In addition, there was a preponderance of cross-sectional studies included in the review, which are particularly prone to selection biases and confounding. The review found no consistency across studies in the direction of effect of different dental check frequencies on measures of caries, periodontal disease or oral cancer. The authors concluded that there was no high quality evidence to support or refute the practice of encouraging 6-monthly dental checks in children and adults and that there was little evidence to suggest an optimal dental check frequency for any of the outcomes considered. The authors recommended that the quality of design and reporting of future research should be improved and that increased emphasis should be placed on patient-centred oral health outcomes.

As also mentioned in the 'Background' section of this Cochrane review, clinical practice guidelines on appropriate recall intervals between dental check-ups have been developed for the NHS in England and Wales under the auspices of the National Institute for Clinical Excellence (NICE). The guidelines were published in October 2004. As part of the guideline development process, an 'update' of the HTA review (*see* paragraph above) was carried out (date of last search for the 'updated' review - July 2003). Thirteen observational epidemiological studies were included in this update, all of which were judged during the quality assessment process as having some threat to validity. A major limitation of the included studies was the method used to measure the frequency of the intervention (dental check-up). The majority of studies used a subjective measure of dental check frequency and relied on participants' reported attendance, obtained from self administered questionnaires or structured interviews. This may have compromised the validity of the data collected as it is reasonable to assume that attendance frequency is 'over estimated' in questionnaire/interview type surveys and there is some empirical evidence to support this assumption (Elderton 1983). A further limitiation of the included studies related to the comparisons made. The most common comparison was between the oral health status of 'regular' and 'irregular' attenders. However, different studies used completely different definitions of what constituted 'regular' and 'irregular' attendance which imposed serious limitations on the inferences that could be drawn from this evidence. For example, in one study (Bullock 2001) a regular attender was defined as someone who attended for at least two dental examinations in the past 2 years. However, in another study (Richards 2002) a regular attender was defined as someone whose last attendance was within the last two years. Furthermore, in many of these non-randomised studies it was impossible to distinguish between prevention oriented/motivated visits (for asymptomatic check-up) and treatment oriented/motivated visits for a specific problem, infection etc.

The authors concluded that: a) the results of this 'updated' review had no impact on the conclusions of the original HTA review (*see* above); b) there was a paucity of evidence with which to inform clinical practice on assigning recall intervals; and c) further research was needed to examine the effects of varying dental recall intervals on oral health.
In developing their recommendations, the guideline developers used evidence pertaining to risk factors for oral diseases and formal consensus methods and recommended that the recall interval between dental check-ups should be based on the clinician's professional assessment of a patient's risk of or from oral disease. The guideline advocates that this assessment should take into account the patient's medical history, social history, behavioural risk factors for oral disease and past and current disease levels. The full text of the 'Dental recall' guideline can be accessed through the NICE website (http://www.nice.org.uk).

The conclusions of these additional reviews of the evidence-base, when considered in conjunction with this Cochrane review, all point towards the urgent need for high quality research to address the specific objectives of this review and the uncertainty over the effects of altering recall intervals between dental check-ups. We consider that observational studies will be of limited value in addressing the questions posed in this review and that priority should be given to conducting high quality randomised controlled trials in primary care settings. With non-randomised studies it is impossible to determine whether observed differences between comparison groups are due to differences in the frequency of provision of the intervention (dental check-up) or whether these differences can be attributed to the presence of other known or unknown potential confounding factors not controlled for in the analysis. This is particularly the case where non-randomised studies rely on observed differences in oral health status between 'regular' and 'irregular' attenders. Frequent attendance may simply be a marker for generally healthy behaviour and differences in general health behaviour may explain the different patterns in oral health between the comparison groups. Whilst statistical techniques can be used to adjust for known confounding factors in non-randomised studies, by definition, unknown confounders can only be balanced through randomisation.

AUTHORS' CONCLUSIONS

Implications for practice

There is insufficient evidence from randomised controlled trials to reach any conclusions regarding the potential beneficial and harmful effects of varying recall intervals between dental check-ups. There is insufficient evidence to support or refute the practice

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of encouraging patients to attend for dental check-ups at 6-monthly intervals.

Implications for research

There is a need for well conducted randomised controlled trials in this area which include a sufficient number of patients to detect a true difference, if any, and that are of sufficient duration. The types of outcome measures used in these studies should include the clinical measures we have identified in this review (*see* 'Types of outcome measures' above) as well as patient-centred factors and economic factors. The studies should also specify explicitly what the dental check-up actually entails i.e. a clinical examination only or a clinical examination plus preventive advice (*see* 'Types of interventions' above). Furthermore, the precise nature and content of the preventive advice delivered as part of the dental check-up should be clearly specified. All trials should be reported according to the Consolidated Standards of Reporting of Trials (CONSORT) guidelines (http://www.consort-statement.org/).

ACKNOWLEDGEMENTS

We wish to thank Sylvia Bickley (Cochrane Oral Health Group) for her assistance with literature searching; Emma Tavender (Cochrane Oral Health Group) and Luisa Fernandez (Cochrane Oral Health Group) for their help with the preparation of this review; Regina Mitezki for translating three German articles; Nina Wang, Lowell Smith, Ram Nanda and Jan Lindhe for responding to requests for information on specific trials. The authors are also grateful for the comments of members of the Guideline Development Group on recall intervals between routine dental examinations conducted under the auspices of the National Institute for Clinical Excellence (NICE) and co-ordinated by the National Collaborating Centre for Acute Care (NCC-AC). In particular the authors would like to thank Jacqueline Dutchak and Nigel Pitts.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Wang 1992

Methods	Parallel group randomised controlled trial. Method of randomisation not stated.

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Wang 1992 *(Continued)*

	It is unclear if the outcome assessors were blinded to the treatment groups to which participants belonged.
Participants	Children and adolescents who received regular dental care in one public dental clinic in Norway. Participants entering the trial were either 3, 16 or 18 years of age. Children classified as 'at risk' were excluded. Criteria for classification of 'risk patients': 3 years: more than 0 dmft. 16 years: at least one decayed surface and four or more initial carious lesions and more than 10 DMFT. 18 years: at least one decayed surface and four or more initial carious lesions and more than 12 DMFT. During the study period 56 patients dropped out of the study (23%). The drop out by treatment group in each age group was as follows: 3 year olds: 23% drop out from 12-month recall group. 11% drop out from 24-month recall group. 16 year olds: 14% dropped out of 12-month recall group and 31% from 24-month recall group. 18 year olds: 34% dropped out of 12-month recall group and 26% from the 24-month group.
Interventions	Treatment group: participants in this group were recalled for examination after 24 months. Control group: participants in this group were recalled for examination at 12 and 24 months. One dentist and one hygienist provided all dental care. The hygienist examined 3 year old patients at the initial, intermediate and final visits. The dentist examined the 16 and 18 year olds and provided operative treatment for all the children.
Outcomes	DMFS increment during the 2 year study period. Total time (the sum of clinical examination time, operative treatment, acute visits (unscheduled extra visits initiated by the patient) and minutes wasted when the patient did not show up).
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Addy 1988	Interventions not relevant. This study evaluated chlorhexidine, metronidazole, and tetracycline delivered into periodontal pockets in an acrylic resin vehicle and compared the results with root planed and untreated sites over a 3-month follow-up period.
Antczak-Bouckoms1994	This paper is a narrative review of the natural history, prevention and treatment of periodontal disease (the reference list of this paper was checked by the review team for potentially relevant studies).
Ast 1970	Not a randomised controlled trial. This paper describes a 6-year cohort study of 5 and 6--year old children in fluoridated and non-fluoridated areas in New York, USA. The study was designed to compare the time and cost factors involved in providing regular dental care to children in fluoridated and non-fluoridated areas.

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Study	Reason for exclusion
Axelsson 1981	Not a randomised controlled trial. In this paper the authors state that "375 subjects were assigned to a test group and 180 to a control group." The authors refer to an earlier paper (Axelsson 1978 (see 'Additional References' for full reference)) for further details of the study participants. This paper was retrieved by the review team. Participants were recruited using the recall list of three general private practitioners and the waiting list of three large public dental health clinics. Potential participants for the test group were informed by letter of the purpose of the study and asked to volunteer for the trial. Potential members for the control group were informed that if they agreed to receive a very detailed oral examination they would be recalled for dental treatment to the public dental health clinic once a year during the next 3 years. Only those volunteers who had sought and received dental treatment annually during the last 5 years were selected.
Axelsson 1987	Interventions not relevant. This study examined the effect of intensified preventive advice/treatment that was not delivered as part of a dental check-up. The study involved two treatment groups (Groups 1 and 2) and one control group (Group 3). Group 1 received oral hygiene instruction, professional mechanical tooth cleaning including tongue scraping and chlorhexidine mouthrinse followed by application of 1% chlorhexidine gel. The entire prophylactic regimen was performed on days 1, 3, 5 and 8 followed by one single treatment every 6 months throughout the experimental period. Group 2 received only oral hygiene instruction - given on days 1, 3, 5 and 8 for approximately 10 minutes on each occasion - this preventive advice was thus not delivered in the context of a dental check-up. These instructions were repeated every 6 months. The 'control' group (Group III) did not receive any treatment additional to the one based on individual needs given by the local dental health officers.
Axelsson 1991	Not a randomised controlled trial. Study population and study design as described in (Axelsson 1981) above.
Brown 2002	Interventions not relevant. This study evaluated the effects of 'routine' and 'intensified' dental care and disease prevention in persons with human immunodeficiency virus (HIV). The study involved one control group ('standard care group') and one treatment group ('enhanced care group'). The standard care group received free professional dental treatment 'as needed and desired', including semi-annual professional prophylaxes and check-ups (3 per subject, at baseline, 6 months and 1 year). The enhanced group received standard care plus additional free professional prophylaxes (every 2 months) and twice daily chlorhexidine antiseptic mouthrinses. This study was excluded from the review as the check-ups were provided for 'treatment' and 'control' groups at the same interval (baseline, 6 months and 1 year) i.e. the recall intervals were the same. In addition, in the treatment group the scale and polish was carried out at a different interval (every 2 months) to the clinical examination (baseline, 6 months and 1 year) - thus the scale and polish was provided as an isolated intervention and was not delivered in the context of a dental check-up.
Budtz-Jorgensen 2000	Not a randomised controlled trial. This study examined the effects of an oral healthcare program on the occurrence of oral candidosis in residents in a long-term care facility. Two groups of residents were formed in this study. The authors state that random allocation was 'ruled out' and all the residents of each ward were assigned to one of the two groups.
Chawla 1975	Unable to confirm with the authors of this paper if it was a randomised controlled trial. One of the authors of this paper was contacted by the review team but failed to respond to a second e-mail request for further information. The interventions provided in this study constituted another reason for excluding the study from the review. Clinical examinations for experimental and control groups were all provided at the same interval (baseline, 12 months and 24 months). In addition, the prophylaxes and oral hygiene instruction do not appear to have been delivered as part of a dental check-up. The participants in this study were divided into one control and five experimental groups as follows: Control group C: received no prophylaxis or instructions in toothbrushing. Experimental group: 1a: received prophylaxis and toothbrushing instructions once a year; 1b: received prophylaxis and toothbrushing instructions twice a year;

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Study	Reason for exclusion
	1c: received prophylaxis and toothbrushing instructions four times a year; 2: received prophylaxis only twice a year; 3: received toothbrushing instructions only twice a year.
Cutress 1991	Not a randomised controlled trial. This study was a field trial of a community-based periodontal disease prevention programme in a developing nation. The authors state that allocation of villages to periodontal disease programmes was on an 'arbitrary basis' and was also dependent on the facilities available.
Feldman 1988	Differences in recall intervals between treatment and control groups were not stated and we were unable to determine whether interventions were relevant to this review. In addition the randomisation process used in the study was compromised. This paper examined the long-term effect of two dental delivery systems established during the Rural Dental Health Program (RDHP) in 1975. The aim of this program was to measure the effects of a school-based health education program and two modes of delivering dental treatment on children's utilisation of dental services. Children were randomly assigned to two Dental Care Delivery Modes: School and Community. The School dental care delivery mode was a needs-based delivery system. Dental treatment was provided from a school-based mobile van and dentists were responsible for implementing treatment protocols 'designed to have the maximum impact upon dental disease in the population in the shortest period.' Dental care to children assigned to Community was provided by private dentists practicing in the area. Professional dental care was only given on demand. It was not possible to determine if the School group included a fixed recall interval and hence whether the paper might be relevant to objective (4) as outlined in our protocol (to compare the beneficial and harmful effects of no recall interval/patient driven attendance (which may be symptomatic) with fixed recall intervals). On reviewing an earlier paper (Bentley 1983) (see 'Additional references' for full reference) describing the procedure used to form the two study groups, it was evident that the randomisation process was compromised: after first siblings were randomly assigned, their brothers and/or sisters were removed from the subsequent assignment process and given the same assignment.
Fiebranz 1989	Interventions not relevant. This study compared the effectiveness of a behavioural therapy dental health education programme versus 'usual care' of motivation and instruction. These interventions were not delivered as part of a dental check-up.
Glavind 1977	Interventions not relevant. The intervention (scale and polish) in this study was not provided as part of a dental check-up. This study was a 'split-mouth' trial comparing treatment units (teeth in the experimental units were cleaned thoroughly every month for 1 year (with the exception of 2 months)) and control units (teeth in the control units were not treated in any way throughout the course of the study and no attempts were made to influence the oral hygiene habits of the participants).
Greenwell 1985	Interventions not relevant. In this study the interventions were not delivered as part of a dental check-up. This study compared the effectiveness of two oral hygiene regimens (Keyes' method versus 'conventional' oral hygiene instruction).
Grimm 1986	Not a randomised controlled trial. In this study treatment and control groups were formed according to the age of participants.
Gunay 1998	Not a randomised controlled trial. This study was a three phase prospective study examining the effects of a long-term preventive programme for mothers and children starting during pregnancy - there were no randomised comparison groups.
Hill 1981	Interventions not relevant. The interventions in this group were not delivered as part of a dental check-up. In this split-mouth trial four types of periodontal treatment were compared over 2 years. Each quadrant of a participating patient's dentition was randomly assigned to one of four treatment types: Quadrant 1 (surgical pocket elimination); Quadrant 2 (modified Widman flap surgery);

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Study	Reason for exclusion
	Quadrant 3 (subgingival curettage); Quadrant 4 (thorough scaling and root planing by the periodontist as a principally 'non-surgical' control area).
Hou 1989	Not a randomised controlled trial. In this study only one group of patients was formed and all received the same treatment (ultrasonic scaling and root planing) which was not provided as part of a dental check-up.
Huber 1987	Not a randomised controlled trial. Study used a split-mouth experimental design. However, allocation to 'test' and 'control' sides was not random.
Kaldahl 1988	Interventions not relevant. In this study the interventions were not provided as part of a dental check-up. In this study, coronal scaling was used as 'control' in one quadrant (Quadrant A) for three 'treatment' quadrants. Quadrant B: coronal and subgingival scaling and root planing; Quadrant C: coronal and subgingival scaling and root planing followed by modified Widman surgery; Quadrant D: coronal and subgingival scaling and root planing followed by flap with osseous resection surgery.
Katay 1990	Interventions not provided in primary care setting. Methods: participants were randomly allocated to two treatment groups, A (3-month recall) and B (6-month recall) and one control group C (1-year recall)). Participants: 75 patients who had been provided with removable partial dentures in a dental clinic at Koln University, Germany. The numbers of participants in each group (at the end of the study period), average ages, sex, of the participants in the three groups were as follows: A: n = 13; 5 male, 8 female; age = 56.8 years (11.6 SD). B: n = 8; 4 male, 4 female; age = 56.6 years (12.8 SD). C: n = 6; 4 male, 2 female; age = 55 years (14.8 SD). Interventions: Group A: 3-month recall examination with scale and polish and oral hygiene instruction and motivation. Group B: 6-month recall examination with scale and polish and oral hygiene instruction and motivation. Group C: recall examination once a year, scale and polish and oral hygiene instruction and motivation. Outcomes: probing depth; tooth mobility; sulcus bleeding; plaque; dental prosthesis hygiene. Outcome assessors changed over the course of the 4-year trial. In the second year of the study, examinations and treatments were carried out by dental students. In the third and fourth years of the study outcomes were assessed by dental nurses in the department of prosthodontics. At the end of the study period, 52% remained in group A with a 3-month recall interval. The corresponding figures for groups B and C were 32% and 24% respectively. Of the original 75 patients in the trial, 68 were assessed in the first year, 40 remained at the end of the second year and only 27 patients could be examined at the end of the fourth year.
Ketomaki 1993	Not a randomised controlled trial. In this study, participants were assigned (not a random assignment) either to 'individualised recall' or to 'annual recall' examinations. Two clinics were chosen (for individualised recall) for practical reasons (they had the necessary facilities). A mobile clinic was used to provide check-ups and treatment to children on 'annual recall.' The mobile clinic was more likely than the other two clinics to offer treatment at the time of check-up. Thus single treatment visits were more likely than courses of treatment for this group.
Kinane 2000	Interventions not relevant. In this study the interventions were not provided as part of a dental check-up. Participants were randomised to four treatment groups: 1) scaling and root planing alone; 2) scaling and root planing plus antimicrobial therapy (minocycline gel); 3) scaling and root planing plus antimicrobial therapy (tetracycline fibres); 4) scaling and root planing plus antimicrobial therapy (metronidazole gel).

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Study	Reason for exclusion
Klein 1985	Not a randomised controlled trial. This study examined the cost and effectiveness of various types and combinations of school-based preventive dental care procedures. Schools (rather than individual children) were assigned to regimens in a way that balanced baseline decay levels, numbers of children and racial mix across treatment regimens.
Kowash 2000	Interventions not relevant. In this study clinical examinations of participants were all carried out at the same interval. This study was designed to test the effectiveness of a long-term dental health education programme for mothers with young children. Four different groups received differing dental health education programmes that emphasised either diet over oral hygiene instruction; oral hygiene instruction over diet; or placed equal emphasis on diet and oral hygiene instruction. The oral examinations of children and their mothers in the four treatment groups were carried out at the same interval (once a year in the volunteers home). The group described as the 'control' group was not formed by the randomisation procedure used to form the 'treatment' groups.
Lembariti 1998	Interventions not relevant. In this split-mouth study, single scaling, with or without oral hygiene instruction) was not provided as part of a 'dental check-up'.
Lightner 1971	Interventions not relevant. Clinical examinations of participants were all carried out at the same interval. In addition the intervention was not provided as part of a dental check-up. Four groups were formed in this study who received scaling and polishing with or without oral hygiene instruction at different intervals. Group 1 received one scale and polish per year with no oral hygiene instruction. Group 2 received one scale and polish per year given in two 30 minute appointments, 5 to 11 days apart and 10 minutes of toothbrushing instruction at each of their two appointments. Group 3 received a scale and polish every 6 months. Group 4 received a scale and polish every 3 months. For further details of this study see 'Table of included studies' in (Beirne 2004).
Listgarten 1985	Interventions not relevant. In this study clinical examinations of participants were all carried out at the same intervals in both groups. In addition, the intervention in this study (scale and polish) was not provided as part of a dental check-up. In this study, the control group received clinical examination every 6 months and a scale and polish every 6 months. The treatment group was examined every 6 months, but prophylaxes were administered according to a variable schedule based on the outcome of differential darkfield microscopic (DDFM) tests.
Listgarten 1986	Interventions not relevant. Clinical examinations of participants were all carried out at the same interval in treatment and control groups. In addition, the intervention in this study (scale and polish) was not provided as part of a dental check-up. In this study the control group received scaling and polishing every 3 months. The treatment group was examined every 6 months, but prophylaxes were administered according to a variable schedule based on the outcome of differential darkfield microscopic (DDFM) tests.
Loesche 2002	Interventions not relevant. In this study patients were randomly assigned (following debridement) to receive antimicrobial therapy for the treatment of periodontal disease (patients assigned to receive either metronidazole or doxycycline or placebo). Four to 6 weeks later, the patients were re-examined. If they had no teeth needing surgery, the subjects went directly to the maintenance phase of treatment. Otherwise, they were re-treated with either systemic or locally delivered antimicrobial agents.
Lunder 1994	Not a randomised controlled trial. Participants were allocated to treatment (18-month recall) and control (12-month recall) groups alphabetically according to their surname. Authors also state that 'when allocating the children into the two groups, geography and caries-activity was taken into consideration'.
Nyman 1975	Interventions not relevant. Scale and polish treatments provided in this study were not delivered as part of a dental check-up.

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Study	Reason for exclusion
Pihlstrom 1987	Interventions not relevant. Clinical examinations of all participants were all carried out at the same interval. All the 'preventive advice' interventions in the study were delivered at the same interval (1, 2, 3, 6, 8, 12, 16, 18, 21 months) and were not delivered as part of a dental check-up. In this study, participants were given scaling, root planing and polishing following collection of baseline data. Participants were randomly assigned to four groups: Group I, conventional oral hygiene; Group II, conventional oral hygiene plus microscopic viewing of subgingival microbial flora; Group III, instruction in use of salt and peroxide mouthrinse; Group IV, salt and peroxide plus microscopic viewing of subgingival microbial flora.
Powell 1999	Interventions not relevant. In this study the clinical examinations of all participants were carried out at the same interval. In addition, the interventions were not provided as part of a dental check-up. In this study subjects were randomly assigned to one of four experimental groups or a control group. The control group received 'usual care' from a public health department or private practitioner. Group 2 received an educational programme of 2 hours duration implemented twice a year. Group 3 received the educational programme plus a chlorhexidine rinse weekly. Group 4 received the education and chlorhexidine interventions and a fluoride varnish application by a dental hygienist twice a year. Group 5 received all of the above interventions as well as scaling and root planing by a dental hygienist every 6 months throughout the 3-year study.
Rask 1988	Interventions not relevant. The interventions were not delivered as part of a dental check-up. This study was designed to test the effectiveness (in high caries risk patients) of an intensified preventive regimen involving topical fluoride application in the dental surgery, fluoride mouthrinsing or fluoride gel treatment at home, and use of chlorhexidine gel in vinyl applicators compared with 'usual care' provided by their dentists (consisting of oral hygiene instruction, topical fluoride application and dietary information).
Rosen 1999	Not a randomised controlled trial. This study was designed to examine the effect of different frequencies of preventive maintenance on periodontal conditions over 5 years. In this study, following the initial examination, 391 subjects were divided into four experimental groups. First, three age groups were formed and within each of these aged groups equal numbers of individuals were matched into the four experimental groups based on the number of remaining teeth, number of decayed and filled tooth surfaces, number of decayed surfaces, full mouth plaque scores and mean probing depth.
Rosling 1976	Interventions not relevant. Scale and polish treatments provided in this study were not delivered as part of a dental check-up.
Sandig 1981	Unable to contact authors to confirm if this study was a randomised controlled trial. This study was partially translated (materials and methods section) with a view to determining its eligibility. However, we were unable to ascertain from this partial translation if it was a randomised controlled trial. The authors state that "two comparable groups of 18 or 20 patients were studied.....one group (test group) received a periodontal hygienic dispensaire treatment by a dental nurse over a period of 6 months in regular intervals of 4 weeks; that means that hard and soft tartar (sic) were removed, patients were re-motivated and the oral hygiene techniques were supervised. The second group (control group) did not receive dispensaire treatment".
Schulz 1989	Unable to contact authors to determine if this study was a randomised controlled trial (paper in German). This study was fully translated with a view to determining its eligibility. However, we were unable to ascertain from this translation if it was a randomised trial. In addition the interventions and comparison groups were poorly described. The authors state that "55 test persons participated in this study. They had gingivitis caused by plaque at the age 15 and 25 years (17.7 years on average). Not included were pregnant women, patients with internal diseases, with prosthetic restorations and untreated caries. 15 test persons took part in three different programs, over a period of 3 months that had the following objectives: oral hygiene instructions and motivation (dental nurse) as well as professional tooth cleaning (dentist). One group made up of 10 test persons (group IV) served as the control group. The program of group III with one motivation session without teeth cleaning training was designed to check which results the frequent examination with an oral hy-

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Study	Reason for exclusion
	giene pass/check book produces. From the results of the test group we expected indications of the motivating effect of the professional teeth cleaning and of the importance for the reduction of gingivitis as such".
Shaw 1991	This study involved the random allocation of 'adult training centres' to different treatment regimens and not random allocation of individuals within those centres. In addition the interventions were not delivered as part of a 'dental check-up'. Group 1 received no specific treatment (control group). Group 2 received daily toothbrushing at the adult training centre, supervised by training centre staff and reinforcement of oral hygiene instructions at 6-monthly intervals by a dental hygienist. Group 3 received daily toothbrusing as for Group 2 and in addition a 3-monthly professional prophylaxis by a dental hygienist and reinforcement of oral hygiene instruction. Group 4 received daily toothbrushing as for Group 2 and in addition a monthly professional prophylaxis by the dental hygienist and reinforcement of oral hygiene instruction.
Sigurdsson 1994	Interventions not relevant. In this study the interventions were not provided as part of a dental check-up. This study was designed to evaluate surgical and non-surgical therapy in periodontal patients. Groups of selected lesions in individual patients were randomly assigned to three groups. Group 1 received 'open debridement' (surgery and root planing under local anaesthetic). Group 2 received root planing under local anaesthetic. Group 3 received supragingival prophylaxes.
Suomi 1971	Not a randomised controlled trial. This study was carried out "to test the hypothesis that the development and progression of gingival inflammation and destructive periodontal disease are retarded in an oral environment in which high levels of hygiene are maintained". Two groups (experimental and control) were matched on the basis of periodontal and oral hygiene status, past caries experience, age and sex. The experimental group was given a series of frequent oral prophylaxes combined with oral hygiene instruction and dental health education. Subjects in the control group received no attention from the study team except for annual examinations.
Suomi 1973	Interventions not relevant. Clinical examinations of participants were all carried out at the same interval. In addition the interventions were not provided as part of a dental check-up. Participants in this study were divided into three groups. Group 1 received a scale and polish 12 months and 24 months after an initial scaling provided at baseline. Group 2 received a scale and polish every 6 months after the initial scaling. Group 3 received a scale and polish every 4 months after the initial scaling.
Zimmerman 1993	Interventions not relevant. In this study clinical examinations in the two groups were carried out at the same interval. In addition the interventions were not delivered as part of a dental check-up. This study examined the effectiveness of one versus two preventive advice sessions. The control group received dental health education consisting of a 15 minute slide presentation, 15 minute group discussion; 15 minutes of individual information and instruction and 30 minute scaling and polishing. The treatment group received baseline examination and dental health program (as described earlier) but were recalled for further instructional session comprising group discussion for 15 minutes and 30 minutes of individual information and instruction.

DATA AND ANALYSES

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Comparison 1. Clinical examination at 12 months versus clinical examination at 24 months

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 dmfs increment, 3-5 year olds	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
1.1 24 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
2 DMFS Increment, 16-18 year olds	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
2.1 24 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
3 DMFS Increment, 18-20 year olds	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
3.1 24 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
4 Examination time (min), 3-5 year olds	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4.1 24 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Treatment time (min), 3-5 year olds	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5.1 24 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Total time (min), 3-5 year olds	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
6.1 24 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
7 Examination time (min), 16-18 year olds	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7.1 24 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 Treatment time (min), 16-18 year olds	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8.1 24 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
9 Total time (min), 16-18 year olds	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
9.1 24 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
10 Examination time (min), 18-20 year olds	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10.1 24 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
11 Treatment time (min), 18-20 year olds	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11.1 24 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
12 Total time (min), 18-20 year olds	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
12.1 24 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]

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Analysis 1.1. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 1 dmfs increment, 3-5 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Mean Difference Random, 95% CI
1.1.1 24 months						
Wang 1992	27	0.9 (2.1)	31	1.8 (2)		-0.9[-1.96,0.16]

Analysis 1.2. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 2 DMFS Increment, 16-18 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Mean Difference Random, 95% CI
1.2.1 24 months						
Wang 1992	43	1 (1.7)	35	2.2 (4)		-1.2[-2.62,0.22]

Analysis 1.3. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 3 DMFS Increment, 18-20 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Mean Difference Random, 95% CI
1.3.1 24 months						
Wang 1992	23	0.4 (0.8)	26	0.9 (1.7)		-0.5[-1.23,0.23]

Analysis 1.4. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 4 Examination time (min), 3-5 year olds.

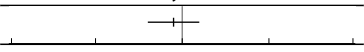
Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.4.1 24 months						
Wang 1992	27	39 (5.7)	31	23 (6.3)		16[12.91,19.09]

Analysis 1.5. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 5 Treatment time (min), 3-5 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.5.1 24 months						

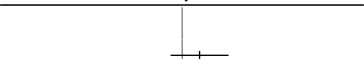
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Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Wang 1992	27	13 (28.1)	31	18 (29.5)		-5[-19.84,9.84]



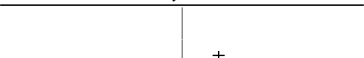
Analysis 1.6. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 6 Total time (min), 3-5 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Mean Difference Random, 95% CI
1.6.1 24 months						
Wang 1992	27	52 (30.2)	31	42 (34.7)		10[-6.7,26.7]



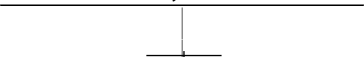
Analysis 1.7. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 7 Examination time (min), 16-18 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.7.1 24 months						
Wang 1992	43	49 (10.3)	35	28 (4.9)		21[17.52,24.48]



Analysis 1.8. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 8 Treatment time (min), 16-18 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.8.1 24 months						
Wang 1992	43	32 (53.2)	35	31 (44.5)		1[-20.68,22.68]



Analysis 1.9. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 9 Total time (min), 16-18 year olds.

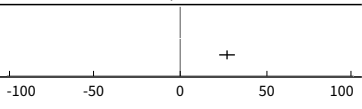
Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Mean Difference Random, 95% CI
1.9.1 24 months						
Wang 1992	43	89 (63.3)	35	71 (65.4)		18[-10.76,46.76]



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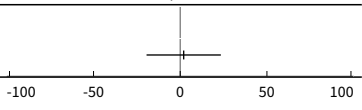
Analysis 1.10. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 10 Examination time (min), 18-20 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.10.1 24 months						
Wang 1992	23	57 (9.6)	26	30 (5.8)		27[22.49,31.51]



Analysis 1.11. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 11 Treatment time (min), 18-20 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.11.1 24 months						
Wang 1992	23	22 (44.7)	26	20 (29.1)		2[-19.42,23.42]



Analysis 1.12. Comparison 1 Clinical examination at 12 months versus clinical examination at 24 months, Outcome 12 Total time (min), 18-20 year olds.

Study or subgroup	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Mean Difference Random, 95% CI
1.12.1 24 months						
Wang 1992	23	81 (50.2)	26	51 (30)		30[6.47,53.53]



ADDITIONAL TABLES

Table 1. Quality assessment for criteria measured

Study	Allocat. concealment	Blind outcome assess	Complete follow up	Risk of bias
Wang 1992	Unclear	Unclear	No	High

WHAT'S NEW

Date	Event	Description
10 May 2017	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 3, 2003

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Review first published: Issue 2, 2005

Date	Event	Description
8 February 2005	New citation required and conclusions have changed	Substantive amendment

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- University of Manchester, UK.
- Scottish Executive, UK.
- University College Cork, Ireland.

External sources

- Cochrane Fellowship - Health Research Board, Ireland.

INDEX TERMS

Medical Subject Headings (MeSH)

*Appointments and Schedules; *Oral Health; Age Factors; Dental Care [*standards]; Dentition, Permanent; Randomized Controlled Trials as Topic; Time Factors; Tooth, Deciduous

MeSH check words

Adolescent; Child, Preschool; Humans; Young Adult

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