



**Cochrane**  
**Library**

Cochrane Database of Systematic Reviews

## Dental auxiliaries for dental care traditionally provided by dentists (Review)

Dyer TA, Brocklehurst P, Glenny AM, Davies L, Tickle M, Issac A, Robinson PG

Dyer TA, Brocklehurst P, Glenny AM, Davies L, Tickle M, Issac A, Robinson PG.

Dental auxiliaries for dental care traditionally provided by dentists.

*Cochrane Database of Systematic Reviews* 2014, Issue 8. Art. No.: CD010076.

DOI: 10.1002/14651858.CD010076.pub2.

[www.cochranelibrary.com](http://www.cochranelibrary.com)

## TABLE OF CONTENTS

HEADER . . . . .	1
ABSTRACT . . . . .	1
PLAIN LANGUAGE SUMMARY . . . . .	2
SUMMARY OF FINDINGS FOR THE MAIN COMPARISON . . . . .	4
BACKGROUND . . . . .	6
OBJECTIVES . . . . .	7
METHODS . . . . .	7
RESULTS . . . . .	9
Figure 1. . . . .	11
Figure 2. . . . .	14
DISCUSSION . . . . .	16
AUTHORS' CONCLUSIONS . . . . .	18
ACKNOWLEDGEMENTS . . . . .	18
REFERENCES . . . . .	18
CHARACTERISTICS OF STUDIES . . . . .	21
DATA AND ANALYSES . . . . .	32
APPENDICES . . . . .	32
CONTRIBUTIONS OF AUTHORS . . . . .	82
DECLARATIONS OF INTEREST . . . . .	82
SOURCES OF SUPPORT . . . . .	82
DIFFERENCES BETWEEN PROTOCOL AND REVIEW . . . . .	83
INDEX TERMS . . . . .	83

[Intervention Review]

# Dental auxiliaries for dental care traditionally provided by dentists

Tom A Dyer<sup>1</sup>, Paul Brocklehurst<sup>2</sup>, Anne-Marie Glenny<sup>3</sup>, Linda Davies<sup>4</sup>, Martin Tickle<sup>2</sup>, Ansy Issac<sup>5</sup>, Peter G Robinson<sup>6</sup>

<sup>1</sup>School of Clinical Dentistry, University of Sheffield, Sheffield, UK. <sup>2</sup>School of Dentistry, The University of Manchester, Manchester, UK. <sup>3</sup>Cochrane Oral Health Group, School of Dentistry, The University of Manchester, Manchester, UK. <sup>4</sup>Health Sciences Research Group: Health Economics, School of Community Based Medicine, University of Manchester, Manchester, UK. <sup>5</sup>General Dentistry, Preventive Dentistry, Smile Bright Dental Care, Madurai, Madurai, India. <sup>6</sup>School of Clinical Dentistry, University of Sheffield, Sheffield, UK

Contact address: Tom A Dyer, School of Clinical Dentistry, University of Sheffield, Claremont Crescent, Sheffield, S10 2TA, UK. [t.dyer@sheffield.ac.uk](mailto:t.dyer@sheffield.ac.uk).

**Editorial group:** Cochrane Effective Practice and Organisation of Care Group.

**Publication status and date:** New, published in Issue 8, 2014.

**Review content assessed as up-to-date:** 8 November 2013.

**Citation:** Dyer TA, Brocklehurst P, Glenny AM, Davies L, Tickle M, Issac A, Robinson PG. Dental auxiliaries for dental care traditionally provided by dentists. *Cochrane Database of Systematic Reviews* 2014, Issue 8. Art. No.: CD010076. DOI: 10.1002/14651858.CD010076.pub2.

Copyright © 2014 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

## ABSTRACT

### Background

Poor or inequitable access to oral health care is commonly reported in high-, middle- and low-income countries. Although the severity of these problems varies, a lack of supply of dentists and their uneven distribution are important factors. Delegating care to dental auxiliaries could ease this problem, extend services to where they are unavailable and liberate time for dentists to do more complex work. Before such an approach can be advocated, it is important to know the relative effectiveness of dental auxiliaries and dentists.

### Objectives

To assess the effectiveness, costs and cost effectiveness of dental auxiliaries in providing care traditionally provided by dentists.

### Search methods

We searched the following electronic databases from their inception dates up to November 2013: the Cochrane Effective Practice and Organisation of Care (EPOC) Group's Specialised Register; Cochrane Oral Health Group's Specialised Register; the Cochrane Central Register of Controlled Trials (Issue 11, 2013); MEDLINE; EMBASE; CINAHL; Cochrane Database of Systematic Reviews; Database of Abstracts of Reviews of Effectiveness; five other databases and two trial registries. We also undertook a grey literature search and searched the reference list of included studies and contacted authors of relevant papers.

### Selection criteria

We included randomised controlled trials (RCTs), non-randomised controlled clinical trials (NRCTs), interrupted time series (ITSs) and controlled before and after studies (CBAs) evaluating the effectiveness of dental auxiliaries compared with dentists in undertaking clinical tasks traditionally performed by a dentist.

## Data collection and analysis

Three review authors independently applied eligibility criteria, extracted data and assessed the risk of bias of each included study and two review authors assessed the quality of the evidence from the included studies, according to The Cochrane Collaboration's procedures. Since meta-analysis was not possible, we gave a narrative description of the results.

## Main results

We identified five studies (one cluster RCT, three RCTs and one NRCT), evaluating the effectiveness of dental auxiliaries compared with dentists in providing dental care traditionally provided by dentists, eligible for inclusion in this review. The included studies, which involved 13 dental auxiliaries, six dentists, and more than 1156 participants, evaluated two clinical tasks/techniques: placement of preventive resin fissure sealants and the atraumatic restorative technique (ART). Two studies were conducted in the US, and one each in Canada, Gambia and Singapore.

Of the four studies evaluating effectiveness in placing preventive resin fissure sealants, three found no evidence of a difference in retention rates of those placed by dental auxiliaries and dentists over a range of follow-up periods (six to 24 months). One study found that fissure sealants placed by a dental auxiliary had lower retention rates than one placed by a dentist after 48 months (9.0% with auxiliary versus 29.1% with dentist). The same study reported that the net reduction after 48 months in the number teeth exhibiting caries (dental decay) was lower for teeth treated by the dental auxiliary than the dentist (3 with auxiliary versus 60 with dentist, P value < 0.001).

One study showed no evidence of a difference in dental decay after treatment with fissure sealants between groups. The one study comparing the effectiveness of dental auxiliaries and dentists in performing ART reported no difference in survival rates of the restorations (fillings) after 12 months.

All studies were at high risk of bias and the overall quality of the evidence was very low, as assessed using the GRADE approach. In addition, four of the included studies were more than 20 years old; the materials used and the techniques assessed were out of date. We found no eligible studies comparing the effectiveness of dental auxiliaries and dentists in the diagnosis of oral diseases and conditions, in delivering oral health education and other aspects of health promotion, or studies assessing participants' perspectives including the acceptability of care received. None of the included studies reported adverse effects. In addition, we found no studies comparing the costs and cost-effectiveness of dental auxiliaries and dentists, their impact on access and equity of access to care that met the pre-specified inclusion criteria.

## Authors' conclusions

We only identified five studies for inclusion in this review, all of which were at high risk of bias and four were published more than 20 years ago, highlighting the paucity of high-quality evaluations of the relative effectiveness, cost-effectiveness and safety of dental auxiliaries compared with dentists in performing clinical tasks. No firm conclusions could be drawn from the present review about the relative effectiveness of dental auxiliaries and dentists.

## PLAIN LANGUAGE SUMMARY

### Effectiveness of dental auxiliaries performing clinical tasks traditionally provided by a dentist

#### Background

Some tasks undertaken by dentists could be delegated to appropriately trained dental auxiliaries, which might liberate time for dentists to undertake more complex procedures and could improve access to dental care and reduce costs. However, before such an approach can be advocated, it is important to know the relative effectiveness of dental auxiliaries and dentists in providing these tasks.

#### Review question

This review aims to assess the relative effectiveness, costs and cost effectiveness, and safety of dental auxiliaries in providing care traditionally provided by dentists.

#### Study characteristics

We searched the literature up to November 2013 and found five studies (involving 13 dental auxiliaries, six dentists, and more than 1156 participants) evaluating the effectiveness of dental auxiliaries compared with dentists in providing care traditionally delivered by

dentists for inclusion in this review. These studies evaluated only two clinical tasks/techniques: placement of preventive resin sealants, which are designed to prevent dental decay in the pits and grooves of back teeth; and the atraumatic restorative technique (ART), which is a method of filling teeth that does not require motorised instruments (e.g. dental drills). Two studies were conducted in the US, and one in each of Canada, Gambia and Singapore.

### **Key results**

Of the four studies comparing dental auxiliaries and dentists in placing preventive sealants, three found no differences between the two groups in the proportion of sealants that were still intact over different time periods (six to 24 months). One study found that fewer sealants placed by a dental auxiliary were still intact after 48 months than those placed by a dentist. The same study reported that dental decay was more likely to develop in teeth that had been sealed by the dental auxiliary than the dentist, whereas another study reported no evidence of a difference between the groups. The one study comparing the effectiveness of dental auxiliaries and dentists in performing ART reported no evidence of a difference in the proportion that needed replacing or that had developed new decay after 12 months. None of the studies reported adverse events. In addition, none of the studies compared the costs and cost effectiveness of dental auxiliaries and dentists, or considered any impacts on access to care.

### **Quality of the evidence**

Too few studies were included in this review to draw any firm conclusions about the relative effectiveness of dental auxiliaries and dentists. The included studies, of which four were more than 20 years old, were of low quality, had few participants and only considered two clinical tasks. This review highlights the lack of high-quality studies comparing the effectiveness, and cost-effectiveness, of dental auxiliaries and dentists in performing dental care traditionally delivered by dentists.

## SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Dental auxiliaries compared with dentists for dental care traditionally provided by dentists				
<p><b>Patient or population:</b> people requiring dental care (preventive resin fissure sealants)  <b>Settings:</b> dental practices and community settings in Canada, USA and Gambia  <b>Intervention:</b> treatment provided by dental auxiliaries  <b>Comparison:</b> treatment provided by dentists</p>				
Outcomes	Impact	No of studies (no of participants)	Quality of the evidence (GRADE)	Comments
Retention rates of preventive resin fissure sealants	<p>3 studies reported no difference in retention rates over varying time periods (median 12 months, range 9.3-24 months)</p> <p>1 study reported poorer retention rates for a dental auxiliary compared with a dentist over intervals up to 48 months. At 48 months: 9.0% (dental auxiliary) vs. 29.1% (dentist)</p>	<p>4 studies:                      dental auxiliaries (n = 6)                      dentists (n = 4)                      participants (n = 1023)</p>	<p>⊕○○○<sup>1,2</sup>  <b>very low</b></p>	<p>1 cluster RCT, 2 RCTs and 1 NRCT</p>
Survival rates of ART	<p>(Dental auxiliary vs. dentist)</p> <p><b>1 surface ART</b>                      Fracture/loss: 0.93 vs. 0.85 (P value &gt; 0.05)                      Marginal leakage/gap: 0.98 vs. 1.0 (P value &gt; 0.05)                      Secondary caries: 0.95 vs. 1.0 (P value &gt; 0.05)</p> <p><b>Multi-surface ART</b>                      Fracture/loss: 0.81 vs. 0.8 (P value &gt; 0.05)                      Marginal leakage/gap: 1.0 vs. 1.0 (P value &gt; 0.05)                      Secondary caries: 1.0 vs. 1.0 (P value &gt; 0.05)                      (Trainee dental auxiliary vs dentist):</p> <p><b>1 surface ART</b>                      Fracture/loss: 0.81 vs. 0.85 (P value &gt; 0.05)                      Marginal leakage/gap: 0.84 vs. 1.0 (P value &lt; 0.05)</p>	<p>1 study:                      dental auxiliaries (n = 7)                      trainee dental auxiliaries (n = 10)                      dentists (n = 2)                      participants (not provided)</p>	<p>⊕○○○<sup>3</sup>  <b>very low</b></p>	<p>No baseline assessment of participants was undertaken before random allocation; operators both assessed and provided treatment</p>

05)  
 Secondary caries: 1.0 vs.  
 1.0 (P value > 0.05)  
**Multi-surface ART**  
 Fracture/loss: 0.78 vs. 0.  
 8 (P value > 0.05)  
 Marginal leakage/gap: 1.  
 0 vs. 1.0 (P value > 0.  
 05)  
 Secondary caries: 1.0 vs.  
 1.0 (P value > 0.05)

GRADE Working Group grades of evidence

**High quality:** Further research is very unlikely to change our confidence in the estimate of effect.

**Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Very low quality:** We are very uncertain about the estimate.

ART: atraumatic restorative technique.

#### <sup>1</sup>Quality of the evidence

- **Risk of bias:** high
- **Inconsistency:** yes, there was inconsistency in retention rates among participants between studies
- **Indirectness:** no
- **Imprecision:** undetected (95% confidence intervals were not reported), but the small number dental auxiliary and dentist participants means imprecision will be high
- **Publication bias:** undetected
- **Other:** the difference in materials and methods of placement used severely limit the generalisability of the results
- **Large effect:** not relevant as the effect varied
- **Plausible confounding would change the effect:** not relevant
- **Dose response gradient:** not relevant

#### <sup>2</sup>Quality of the evidence

- The study that reported lower retention rates for dental auxiliaries compared one dental hygienist versus one dentist and did not report a statistical test ([Leake 1976](#))

#### <sup>3</sup>Quality of the evidence

- **Risk of bias:** high
- **Inconsistency:** no (single study)
- **Indirectness:** none detected
- **Imprecision:** undetected (95% confidence intervals were not reported), but the small number of dental auxiliary and dentist participants means imprecision will be high
- **Publication bias:** undetected
- **Other:** the pooling of outcome measure data for deciduous and permanent teeth was questionable. The failure rates for deciduous and permanent teeth were likely to be different given the fundamental differences in the structure and longevity of the teeth
- **Large effect:** not relevant as the effect varied
- **Plausible confounding would change the effect:** not relevant
- **Dose response gradient:** not relevant

## BACKGROUND

Millions of people across the globe, especially in poor areas, are not receiving the oral health care they need (Khan 2004; WHO 2005). Increasing the dentist-to-patient ratio has been suggested as one way to address this problem. Another suggestion is to 'task shift' (WHO 2008), where tasks traditionally performed by dentists are undertaken by dental auxiliaries. This change to a mix of skills may improve access, by releasing resources and increasing capacity. It may also decrease costs of episodes of dental care while maintaining its overall quality and is an approach that has been considered by over 50 countries worldwide (Nash 2012). In general health care, appropriately trained nurses can produce equally high-quality care as primary care doctors and achieve equally good health outcomes for patients (Laurant 2005).

### Description of the condition

Poor or inequitable access to oral health care is commonly reported in high-, middle- and low-income countries alike. Although the severity of these access problems varies, a lack of supply of dentists and their uneven distribution are important factors (Nash 2012). Task shifting care to dental auxiliaries is a possible solution to this problem.

### Description of the intervention

The concept of a team approach in dentistry, where dental care workers with a range of training and skills provide care, is now well established in many countries (Burt 2005; Department of Health 2002; Department of Health 2009; Khan 2004; Ministry of Health 2005; Nash 2012; Spencer 2004; WHO 1959). Dental teams are normally led by dentists but can include workers who are not. Although nomenclature varies from country to country, the term recognised internationally for team members that are not dentists is 'dental auxiliary', with those permitted to undertake work in people's mouths termed 'operating dental auxiliaries'. These terms will be adopted in this review. Their training, permitted duties and regulation also vary internationally, with dental auxiliaries being able to perform a limited range of procedures traditionally performed by dentists. These activities may include diagnosis and history taking, oral health education and promotion, scaling and polishing of teeth, preventive applications to teeth, simple fillings in children and adults, placement of orthodontic brackets, extractions and root treatment of primary teeth in children. The extent of training and clinical experience of dental auxiliaries is likely to impact on their ability to perform these tasks.

### How the intervention might work

Task shifting aspects of care to operating dental auxiliaries may liberate time for dentists to do more complex work, commensurate with their higher training. In addition, where there are workforce shortages, operating dental auxiliaries could deliver services that would otherwise be unavailable (Khan 2004). Consequently, the rationale for training and employing dental auxiliaries has been to maximise efficiency and access to dental care (Burt 2005; Department of Health 2002; Department of Health 2009; Khan 2004; Ministry of Health 2005; Spencer 2004; WHO 1959). The extent to which task shifting might improve efficiency and access to care may be influenced by the models of skill-mix adopted and the level of supervision dental auxiliaries require. Where dental auxiliaries substitute for dentists and are able to work independently, efficiency and access benefits are likely to be greater than if tasks are delegated to dental auxiliaries from a supervisory dentist within a dental team (Burt 2005; Nash 2012). Such potential efficiency and access benefits have been a driver to allow direct access to operating dental auxiliaries without the need for a dentist to diagnose and prescribe care (Office of Fair Trading 2012).

### Why it is important to do this review

Increasing the supply of dental auxiliaries could improve access to dental care for those populations who do not receive the oral health care they need. This may be due to an inability to pay for dental care or an insufficient supply of dental services (Khan 2004; WHO 2005). Therefore, it is important to assess if task shifting some care traditionally performed by dentists to dental auxiliaries may improve access to dental care and also at a lower cost.

However, in some countries increasing the skill-mix of dental teams is hotly debated (Bramson 2005; Nash 2005), with concerns centred on its impact on the quality of care (Bramson 2005).

Regardless of the type of dental system operating, employing a greater skill-mix has the potential to reduce the costs of training and increase the supply of some dental services. Moreover, there is the potential for a dental service employing dental auxiliaries to be more cost-effective, in that they are likely to be less costly to employ than dentists and no less effective. In the UK, the number of training places for operating dental auxiliaries has increased and the range of treatments they undertake has expanded (General Dental Council 2009), potentially providing more opportunities for access and efficiency improvements.

Before such an approach to the delivery of dental care can be advocated, it is important to know the relative effectiveness of dental auxiliaries and dentists. An earlier systematic review compared the effectiveness of dental auxiliaries with dentists in clinical and educational roles, and in terms of acceptability and productivity (Galloway 2002). It had broad inclusion criteria and most identified studies were of poor quality and often over 20 years old. Nonetheless, the authors concluded that existing data were consistent and suggested that dental auxiliaries can be as effective as dentists in: diagnosis, technical procedures (e.g. restorations and pe-



riodontal treatment) and delivery of oral health promotion. They reported weak evidence that dental auxiliaries were acceptable to participants and on the effectiveness of orthodontic auxiliaries and clinical dental technicians. The main recommendation from the review was that more high-quality research be undertaken. The systematic review was undertaken in 2002 and the findings are not sufficiently informative to allow firm conclusions to be made. An updated review with methodological rigour that includes new studies in this field would be beneficial.

## OBJECTIVES

To assess the effectiveness of dental auxiliaries in providing care traditionally provided by dentists by:

- comparing the effectiveness, costs and cost effectiveness of dental auxiliaries compared with dentists in:
  - the diagnosis of oral diseases and conditions;
  - their technical competence in the delivery of some aspects of dental care;
  - oral health education and other oral health promotion measures; and
  - delivering dental care that is acceptable to participants.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

We included studies comparing the effectiveness of dental auxiliaries with dentists. We considered the following study designs: randomised controlled trials (RCTs), non-randomised controlled trials (NRCTs), controlled before and after studies (CBAs) if there were at least two intervention and two control sites and study groups were comparable, and interrupted time series (ITSs) when the point in time when the intervention occurred was clearly defined and there were at least three data points before and three after the intervention.

#### Types of participants

We included people treated by dentists (controls) and people treated by dental auxiliaries (intervention), where the latter had been substituted for dentists in providing certain aspects of care, that is, they undertook work instead of the dentist.

Dentists included general dental practitioners or specialists working in any healthcare setting.

Dental auxiliaries included any healthcare worker who had received training to carry out aspects of oral health care. As nomenclature varies internationally, operating dental auxiliaries included dental therapists, dental hygienists, extended-duty dental nurses, oral health therapists, orthodontic auxiliaries, clinical dental technicians, maxillofacial technicians and denturists. As non-operating dental auxiliaries (e.g. dental nurses) undertake some clinical roles in certain countries (e.g. impression (moulds of teeth) and radiograph taking, education and health promotion), they were also included. We also included general healthcare workers who had received training to deliver specific aspects of oral health care.

#### Types of interventions

The intervention was a dental auxiliary providing care instead of a dentist. We included the introduction of dental auxiliaries to perform a range of activities traditionally performed by dentists: the comparator intervention was dentists performing the same activities. These activities included: diagnosis and history taking, oral health education and promotion, scaling and polishing of teeth, preventive applications to teeth, simple fillings, root fillings and extractions of primary teeth in children.

#### Types of outcome measures

We included studies that reported one or more of the following objective three primary outcome measures.

##### Primary outcomes

- Performance in history taking, diagnosis and treatment planning.
- Performance in technical procedures.
- Performance in oral health education and other health promotion measures.

##### Secondary outcomes

We also considered four other areas of outcome:

- participant perspectives of care, including: patient satisfaction, other participant-rated outcome measures and receipt of complaints;
- unanticipated or adverse events;
- adherence to evidence-based guidelines;
- costs and cost-effectiveness;
- impact on access and equity of access.

## Search methods for identification of studies

We searched for studies comparing the effectiveness of dental auxiliaries with dentists in care traditionally provided by dentists. A search strategy for MEDLINE was developed by the Cochrane Effective Practice and Organisation of Care (EPOC) Group's Trials Search Co-ordinator in consultation with the review authors (see [Appendix 1](#)). Strategies for other databases were based on the MEDLINE strategy and translated appropriately for each database (see full search strategies in [Appendix 2](#)). We applied no language or date limits. We included studies regardless of publication status. We searched databases from date of inception up to 8 November 2013.

## Electronic searches

We searched the following electronic databases:

- The Cochrane EPOC Group's Specialised Register;
- The Cochrane Oral Health Group's Specialised Register;
- The Cochrane Central Register of Controlled Trials (CENTRAL, Issue 11, 2013);
- Cochrane Database of Systematic Reviews (CDSR);
- MEDLINE, Ovid;
- EMBASE, Ovid;
- Cumulative Index to Nursing and Allied Health Literature (CINAHL), EBSCOHost;
- Database of Abstracts of Reviews of Effectiveness (DARE);
- PubMed;
- Dissertations and Theses, ProQuest;
- Latin American and Caribbean Health Sciences database (LILACS), Virtual Health Library (VHL);
- Pan American Health Organization database (PAHO), Virtual Health Library (VHL);
- World Health Organization Library Information System (WHOLIS);
- Web of Science;
- Health Management Information Consortium (HMIC), Ovid;
- NHS Economic Evaluations Database (NHS EED); and
- Health Economics Electronic Database (HEED).

## Searching other resources

We searched two trials registries: World Health Organization (WHO) International Clinical Trials Registry Platform Search Portal (ICTRP) ([apps.who.int/trialsearch/](http://apps.who.int/trialsearch/)), and ClinicalTrials.gov ([clinicaltrials.gov/](http://clinicaltrials.gov/)) ([Appendix 3](#)).

We conducted a grey literature search on sites concerned with the effective organisation of health care such as: Agency for Healthcare Research and Quality (AHRQ) ([www.ahrq.gov/](http://www.ahrq.gov/)); National Institute for Health and Care Excellence (NICE) ([www.nice.org.uk/](http://www.nice.org.uk/)); Pan American Health Organization (PAHO) ([new.paho.org/](http://new.paho.org/)); World Bank ([www.worldbank.org/](http://www.worldbank.org/)); WHO ([www.who.int/en/](http://www.who.int/en/)); Healthcare Information For All (HIFA) 2015 ([www.hifa2015.org/](http://www.hifa2015.org/))

[knowledge-base/](http://knowledge-base/)); and Open Grey ([www.opengrey.eu](http://www.opengrey.eu)). We undertook the latest search of the grey literature in July 2014.

In addition, we screened individual high-yield journals from January 2000 to December 2013 (*Community Dentistry and Oral Epidemiology*; *Community Dental Health*; *Journal of Public Health Dentistry*; *British Dental Journal*; *International Dental Journal*; *Journal of Dental Education*) and conference proceedings (e.g. handsearching) and reviewed the reference lists of relevant systematic reviews, included studies and other relevant publications. Where possible, we contacted the authors of relevant studies to clarify reported published information and seek unpublished data. We also contacted researchers with expertise relevant to the review and conducted cited reference searches on studies selected for inclusion, studies cited in related reviews and other relevant citations in ISI Web of Science/Web of Knowledge.

## Data collection and analysis

We managed the review process using Review Manager 5 ([RevMan 2012](#)).

## Selection of studies

We downloaded all identified citations and abstracts into a reference management software (EndNote®) and removed duplicates. Two review authors (from TD, PGR and AI) independently screened all titles and abstracts (where available), excluded studies that clearly did not meet the inclusion criteria and obtained full texts of potentially relevant references. The same three review authors independently assessed the eligibility of retrieved papers. We resolved disagreements by discussion between review authors and an arbitrator (GF: Managing Editor of UK EPOC Satellite).

## Data extraction and management

Two review authors (from TD, PGR and AI) independently extracted data from each included study into a modified EPOC data extraction form ([Appendix 4](#)). We resolved disagreements by discussion, or arbitration by the third person.

## Assessment of risk of bias in included studies

Two review authors (from TD, PGR and AI) independently assessed the risk of bias of each included study. We resolved disagreements by discussion and arbitration by the third person. For RCTs and NRCTs, we used The Cochrane Collaboration's 'Risk of bias' tool on six standard criteria ([Higgins 2011](#)):

- adequate sequence generation;
- concealment of allocation;
- blinded or objective assessment of primary outcome(s);
- adequately addressed incomplete outcome data;
- free from selective outcome reporting;
- free of other risk of bias.

We used three additional criteria specified by the EPOC group (EPOC 2011):

- similar baseline characteristics;
- similar baseline outcome measures;
- adequate protection against contamination.

We scored risk of bias for these criteria as Yes 'adequate', No 'inadequate', or unclear. Studies achieved a 'low' risk of bias score if all key domains were judged as 'adequate'. We assigned a score of 'unclear' risk of bias to studies that scored 'unclear' on one or more key domains and 'high' risk to studies that scored 'inadequate' on one key domain (Ivers 2012). We have summarised the risk of bias of included studies in the text and presented it in the risk of bias section in the [Characteristics of included studies](#) table.

### Measures of treatment effect

We reported outcomes for each included study in natural units.

In future updates, if we find more eligible studies for inclusion, and if the data allow it, for RCTs, NRCTs and CBAs, we will calculate unadjusted and adjusted (for any baseline imbalance) absolute change from baseline with 95% confidence intervals (CIs) for all pre-specified outcome measures ([Appendix 5](#)). We will report mean differences with 95% CIs for continuous variables and risk ratios with 95% CIs for dichotomous variables. In the future, if we identify any diagnostic studies for inclusion, we will report sensitivity, specificity, positive predictive values and negative predictive values in recognising diseases/abnormalities, and report degrees of agreement summaries using kappa scores, correlation coefficients and percentage correct diagnosis and treatment planning. If not calculated by the study authors, we will calculate these outcome statistics if the primary data allow.

If we identify in the future eligible ITS studies, we will extract the difference in slope and the difference in pre- to post-intervention levels and analyse the post- versus pre-intervention (adjusted for trends) at specific time points (three months, six months and 12 months and annually thereafter). If the differences were not in the primary reports, we will analyse the data using data from graphs or tables.

In future updates, if we identify eligible studies for inclusion with economic measures, we will undertake an economic evaluation ([Appendix 6](#)).

We have presented the results in [Summary of findings for the main comparison](#) for the main comparisons in the review to interpret the results and draw conclusions about the effects of different interventions on the main outcomes including the size of effects and quality of the evidence.

### Unit of analysis issues

The one study using a clustered design did not analyse results in a manner that took clustering effects into account, so there are likely to be unit of analysis errors (Leake 1976). As we assessed

the study at high risk of bias, we did not re-analyse the data and, therefore, do not report P values.

### Assessment of heterogeneity

We could not explore heterogeneity, due to too few studies being included.

### Assessment of reporting biases

As we found too few studies for inclusion in this review, we did not assess reporting bias.

### Data synthesis

We could not carry out a meta-analysis or present effect sizes in a forest plot as we included too few studies and due to the heterogeneity in study designs and clinical techniques. Instead, we produced a narrative summary of the results. We had planned to summarise and organise the studies into groups (e.g. by clinical activity, type of dental auxiliary, degree of training, study design) to help identify patterns in the results, but there were too few studies to enable this. We used Review Manager 5 to present the data (RevMan 2012). The results of the review are summarised in the [Summary of findings for the main comparison](#).

### Subgroup analysis and investigation of heterogeneity

As too few studies were eligible for inclusion in this review, we did not perform any subgroup analysis or investigate heterogeneity.

### Sensitivity analysis

We planned to perform a sensitivity analysis, excluding studies of high risk of bias. However, as so few studies were included, we performed no analysis.

## RESULTS

### Description of studies

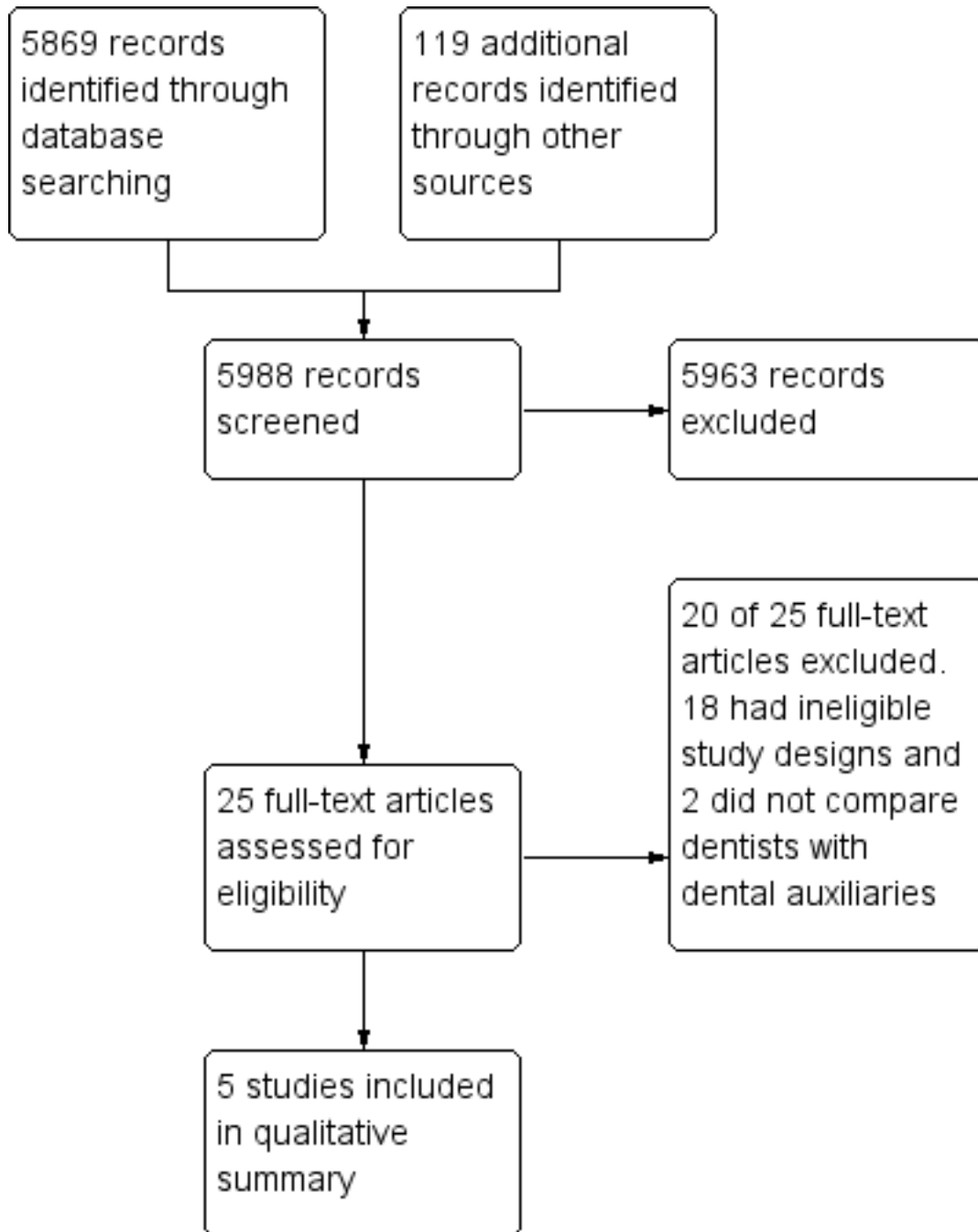
Characteristics of the included studies are presented and summarised in the [Characteristics of included studies](#) tables.

### Results of the search

[Figure 1](#) shows the PRISMA study flow chart (Moher 2009). We identified 5869 non-duplicate citations from the electronic database searches and a further 119 studies from: handsearching of high yield journals (12 citations), searches of references included in a systematic review (98 citations), searches of the lists of references of the full-text articles retrieved for eligibility assessment

(eight citations) and from contacts with experts in the field (one citation). After screening titles and abstracts, we obtained the full texts of 25 papers. Of these, we excluded 20 for reasons presented in the [Characteristics of excluded studies](#) table. The remaining five studies, which met the inclusion criteria, are reported in detail in the [Characteristics of included studies](#) table.

Figure 1. Study flow diagram.



## Included studies

### Study design

Five studies met the inclusion criteria: three RCTs (Jordan 2010; Stiles 1976; Wood 1989), one cluster RCT (Leake 1976), and one NRCT (Ooi 1986), and were subsequently included in this review.

### Participants

#### Providers

In total, 13 dental auxiliaries and six dentists were recruited in the five included studies. The numbers of dental auxiliaries and dentists included in the respective studies are provided in the [Characteristics of included studies](#) table. One study described the dental auxiliaries as “experienced” or “trainee” community oral health workers (COHWs). COHWs described as “experienced” were registered general nurses who had received three months training and were within one year of its completion and “trainees” were COHWs that had received three months training but had no clinical subsequent clinical experience. The dentist participants had supervised the training of the dental auxiliaries (Jordan 2010). One study described two of the dental auxiliaries participating as “dental corpsmen” and the third as a “dental assistant”, but no details were provided on their training or skill sets (Stiles 1976). Descriptions of participants (including their training or experience) were not provided in the other three included studies (Leake 1976; Ooi 1986; Wood 1989).

#### Patients

The studies provided few details of the participants recruited. One study described the number of restorations provided by participants (131 participants), but not the number of participants (Jordan 2010). The other four studies recruited 1156 participants with an age range from five to 21 years (Leake 1976; Ooi 1986; Stiles 1976; Wood 1989).

#### Settings

The studies were undertaken in a range of settings including primary care-based clinics (Jordan 2010; Stiles 1976; Wood 1989), a secondary care-based dental health institute (Ooi 1986), and in primary schools (Leake 1976). Four studies were conducted in high-income countries: two studies in the USA (Stiles 1976; Wood 1989), one in Canada (Leake 1976), and one in Singapore

(Ooi 1986). One study was conducted in the Republic of Gambia (Jordan 2010), a low-income country.

### Description of the interventions

The included studies compared the effectiveness of dental auxiliaries with the effectiveness of dentists in two technical procedures: placement of preventive resin fissure sealants (Leake 1976; Ooi 1986; Stiles 1976; Wood 1989), and the atraumatic restorative technique (ART) (Jordan 2010). Neither clinical intervention is technically complex. The placement of preventive resin fissure sealants involves: the cleaning of the biting surface of back teeth, usually with a motorised brush and paste; drying the tooth surface and preventing the surface from becoming wet during the procedure; conditioning or etching the area of the fissures (grooves) and pits on the biting surface of the tooth; applying a resin sealant to the fissures and pits (sealants vary and can set chemically or by using a light curing unit). ART is a filling technique that was developed for settings where there may not be access to motorised dental instruments. The procedure involves: removal of caries (decay) with hand instruments called excavators; drying the tooth surface and preventing the surface from becoming wet during the procedure; conditioning of the cavity with a fluid that prepares the tooth surface before filling; placement of a filling material (glass ionomer cement) with hand instruments and finger pressure is used to shape and compress the filling.

Two studies ran for 12 months (Jordan 2010; Stiles 1976), one for 24 months (Ooi 1986), and one for 48 months (Leake 1976). One study did not report its duration, but reported a mean follow-up period of 9.3 months (Wood 1989). Further details of interventions and follow-up periods are provided in the [Characteristics of included studies](#) table.

### Outcomes

Four studies reported the retention or partial retention of preventive resin fissure sealants (Leake 1976; Ooi 1986; Stiles 1976; Wood 1989). One study also reported the number of teeth exhibiting caries (dental decay) having placed fissure sealants at 48 months (Leake 1976). Another study reported the proportion of both permanent and deciduous teeth sealed and that developed caries after 12 months, which the authors described as the “caries attack rate” (Stiles 1976).

The study relating to ART reported two outcomes: failure criteria (fracture/loss; marginal leakage/gap; secondary caries) for one-surface and multi-surface ART restorations, and the proportion of success (representing the ratio of successful (nominator) versus failure ratings (denominator) of each failure criterion per group of clinicians) (Jordan 2010).

None of the studies evaluated performance in history taking, diagnosis and treatment planning, other technical procedures (scaling and polishing of teeth, placement of standard restorations and extractions), oral health education and oral health promotion. Neither did they assess participant perspectives of care, adverse events, adherence to evidence-based guidelines, the impact on access to care or economic aspects.

### **Excluded studies**

We excluded 20 studies after full copies of the papers were scruti-

nised. The main reason for exclusion was ineligible study design (15 studies). We excluded a further five studies that had characteristics of ITS, but had too few data points before, after or both before and after the intervention to be included. See the [Characteristics of excluded studies](#) table.

### **Risk of bias in included studies**

We have described the risk of bias of included studies in the 'Risk of bias' table within the [Characteristics of included studies](#) table with a summary in [Figure 2](#). All five studies were at high risk of bias as all scored 'inadequate' in more than two criteria ([Ivers 2012](#)).

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)
Jordan 2010	?	?	?	?	-	+	?
Leake 1976	?	?	?	?	-	+	?
Ooi 1986	-	?	?	?	-	+	-
Stiles 1976	?	+	?	?	?	+	?
Wood 1989	+	?	?	?	-	+	?



## Allocation

Of the four included RCTs, only one described the method for random sequence generation (Wood 1989). They used a two-stage process, first randomly assigning operator and assistant teams to four different dental surgeries, then participants were randomly allocated to the four surgeries. Both allocations were performed by drawing numbers. Leake 1976 Leake and co-workers attempted to balance test groups by ranking and grouping schools by dental health (which had been established from an earlier survey) from which participants were to be sampled. Equal numbers of schools from each ranked group were randomly assigned to each clinician (Leake 1976). The NRCT did not report the method of allocation (Ooi 1986). None of the included studies described a method of allocation concealment. However, Stiles and co-workers used a split mouth design, which minimises risk of bias introduced by lack of concealment; half of the mouth was randomly allocated for treatment by a dental auxiliary and the other for treatment by a dentist (Stiles 1976).

Three studies reported undertaking baseline assessments but provided few details (Leake 1976; Stiles 1976; Wood 1989). Stiles and co-workers followed pre-determined criteria but provided few details of how it was undertaken or by whom (Stiles 1976). Leake and co-workers used a dentist and a hygienist (who then participated in the trial) at baseline; no detail of calibration or tests of agreement or consistency were reported (Leake 1976). Wood and colleagues used a licensed paediatric dentist, assisted by dental students, but the role of the students was unclear (Wood 1989). The other studies did not report undertaking a baseline assessment (Jordan 2010; Ooi 1986).

None of the included studies presented baseline characteristics of the test and control groups and so any baseline imbalances are unknown.

## Blinding

It is unlikely that any of the included studies will have considered performance bias in their study designs. It is likely that all personnel will have been aware that they were involved in a study and that their work was being evaluated. It is unlikely that this lack of blinding of participants will have biased the outcomes as none were self assessed. Thus, we judged the risk of performance bias to be low in all included studies.

Measures to minimise detection bias varied. Blinded examiners were used in three studies (Jordan 2010; Leake 1976; Stiles 1976). However, as no details were provided on training or calibration for detection, we judged all three studies to be at unclear risk. One study used independent dental examiners, but did not describe whether they were blind to whether treatment was provided by a dentist or a dental auxiliary (Wood 1989), and, therefore, we

judged the risk of bias for this item to be unclear. Ooi and co-workers used the operators involved in the trial to perform the outcome assessment (Ooi 1986). Although they reported the operators being blind to who had provided treatment, the participants were regular patients at the clinic and the study was relatively small, increasing the risk of detection bias. Consequently, we judged the risk of bias to be high.

## Incomplete outcome data

Two studies did not report loss to follow-up and there were insufficient data presented for it to be calculated (Wood 1989; Stiles 1976). We judged the risk of bias for these studies as unclear. After four years of their trial, Leake and colleagues reported 16.0% loss to follow-up in the hygienist group and 12.0% loss to follow up in the dentist group. The authors regarded the proportions as similar (Leake 1976). After two years, Ooi and co-workers reported 7.1% loss to follow-up in the dental nurse group and 9.4% loss to follow-up in the dentist group without possible explanations (Ooi 1986), and Jordan and co-workers reported 2.9% drop-out overall, but did not report rates for dentists and dental auxiliaries (Jordan 2010). As none of these studies reported undertaking intention-to-treat analyses, we judged all three studies to be at unclear risk of bias (Jordan 2010; Leake 1976; Ooi 1986).

## Selective reporting

No trial research protocols were available for the included studies, but the outcomes reported were consistent with the stated aim of the study. However, there are insufficient details to conclude that all pre-specified outcomes were reported and hence the risk of selective reporting bias is unclear.

## Other potential sources of bias

The training received by dental auxiliaries and their clinical experience is likely to impact on the outcomes. Only two studies provided limited details of training (Jordan 2010; Leake 1976), and one described the experience of participating dental auxiliaries (Jordan 2010).

## Effects of interventions

See: [Summary of findings for the main comparison Dental auxiliaries compared with dentists for dental care traditionally provided by dentists](#)

The included studies compared the performance of dental auxiliaries and dentists in providing two aspects of care: ART (Jordan 2010), and preventive resin fissure sealants (Leake 1976; Ooi 1986;

Stiles 1976; Wood 1989. The effects of the interventions are described for each.

One study reported no difference between dental auxiliaries and dentists in performing ART after 12 months in the proportion of success (nominator) versus failure (denominator) in the following criteria: one surface ART (smaller restorations): fracture/loss: 0.93 with dental auxiliaries versus 0.85 with dentists (P value > 0.05); marginal leakage/gap: 0.98 with dental auxiliaries versus 1.0 with dentists (P value > 0.05); secondary caries: 0.95 with dental auxiliaries versus 1.0 with dentists (P value > 0.05); multi-surface ART (larger restorations): fracture/loss: 0.81 with dental auxiliaries versus 0.80 with dentists (P value > 0.05); marginal leakage/gap: 1.0 with dental auxiliaries versus 1.0 with dentists (P value > 0.05); secondary caries: 1.0 with dental auxiliaries versus 1.0 with dentists (P value > 0.05) (Jordan 2010). There were no differences between experienced and trainee COHWs. Trainee COHWs were less likely to provide leakage/gap-free restorations in small restorations than dentists: 0.84 with trainee COHW versus 1.0 with experienced COHWs (P value < 0.05), but this was not found in other criteria for one-surface restorations or in any criteria for multi-surface restorations (Jordan 2010).

Four included studies reported the effectiveness of dentists and dental auxiliaries in placing preventive resin fissure sealants (Leake 1976; Ooi 1986; Stiles 1976; Wood 1989). One study reported lower retention rates (partial and complete loss of resin sealants) for a dental hygienist compared with a dentist: 76.8% with dental hygienist versus 90.9% with dentist at six months; 52.0% dental hygienist versus 76.5% with dentist at 12 months; 39.6% dental hygienist versus 77.0% with dentist at 18 months; 30.5% dental hygienist versus 54.4% with dentist at 24 months; 17.4% dental hygienist versus 39.7% with dentist at 36 months; 9.0% dental hygienist versus 29.1% with dentist at 48 months (Leake 1976). No statistical comparisons were reported. The same study reported a greater net reduction in the number of teeth developing caries after being treated by a dentist (60 teeth) as compared with those treated by a dental hygienist (three teeth) at 48 months (P value < 0.001).

One study reported no difference in retention rates of preventive resin fissure sealants in permanent and deciduous teeth placed by a dentist and two dental corpsman at 12 months, but reported a difference between a dental assistant and the other three operators (P value < 0.001): permanent teeth: 52.7% with dentist versus 52.9% with dental corpsman; 51.1% with dental corpsman versus 38.7% with dental assistant; deciduous teeth: 44.8% with dentist versus 60.6% with dental corpsman; 57.4% with dental corpsman versus 25.0% with dental assistant (Stiles 1976). The same study also reported the “caries attack rates” for permanent teeth (4.5% with dentist versus 7.4% with dental corpsman versus 6.3% with dental corpsman versus 4.7% with dental assistant) and for deciduous teeth (3% with dentist versus 0% with dental corpsman versus 0% with dental corpsman versus 1% with dental assistant), but did not undertake further analysis due to reported

concerns about the data collection processes (Stiles 1976). Wood and colleagues reported no difference in retention rates of preventive resin fissure sealants between three operators (dental auxiliary, dentist and a student) but no numerical data were presented for individual operators (Wood 1989).

One study reported no differences in retention rates between operators (dentist versus dental nurse) in two different preventive resin fissure sealant materials (Concise®: 95.9% with dentist versus 94.9% with dental nurse at six months; 91.9% with dentist versus 93.3% with dental nurse at 12 months; 80.6% with dentist versus 86.7% with dental nurse at 18 months; 73.7% with dentist versus 80.5% with dental nurse at 24 months or Delton®: 97.6% with dentist versus 96.0% with dental nurse at six months; 97.4% with dentist versus 95.8% with dental nurse at 12 months; 96.7% with dentist versus 94.7% with dental nurse at 18 months; 95.4% with dentist versus 94.7% with dental nurse at 24 months) (Ooi 1986).

Overall, for performance in providing preventive resin fissure sealants, one study reported lower retention rates for a dental auxiliary compared with a dentist (Leake 1976), and three studies reported no difference between groups over varying time periods (Ooi 1986; Stiles 1976; Wood 1989). The one study comparing performance in ART reported no difference between dental auxiliaries and dentists at one year (Jordan 2010).

## DISCUSSION

### Summary of main results

Five studies (three RCTs, one cluster RCT and one NRCT) involving 13 dental auxiliaries and six dentists, and more than 1156 participants, met our inclusion criteria and were included in the review (Jordan 2010; Leake 1976; Ooi 1986; Stiles 1976; Wood 1989). Although dental auxiliaries undertake a wide range of procedures, these studies only compared their effectiveness with dentists in performing ART restorations and in placing preventive resin fissure sealants.

In the studies evaluating performance in placing preventive resin fissures sealants, one study reported the retention rates of a dental auxiliary at time intervals up to four years as being lower than that of a dentist (Leake 1976). The other three studies reported no difference in performance between dentists and dental auxiliaries over a range of time periods up to two years (Ooi 1986; Stiles 1976; Wood 1989). In the two studies comparing the rate of development of secondary caries in teeth treated with fissure sealants, one study reported that caries were more likely to develop in teeth treated by the dental hygienist compared with teeth treated by the dentist (Leake 1976); in the other study, the rates of caries development were similar for the three dental auxiliaries and the dentist (Stiles 1976).

The RCT comparing the performance of dental auxiliaries and dentists in ART reported no difference in failure rates in three different criteria for restorations after one year (Jordan 2010).

### Overall completeness and applicability of evidence

The evidence for the effectiveness of dental auxiliaries compared with dentists is limited in scale, content, quality and generalisability, which prevents firm conclusions being drawn from the data. Only two types of technical procedures were considered in the included studies; none evaluated the performance of dental auxiliaries compared with dentists in diagnosis, screening, epidemiological examination, treatment planning, oral health education and prevention, scaling and polishing, or the placement of standard restorations, all of which can be included in their training and permitted duties. Although studies exist considering these activities, none met our inclusion criteria. In addition, none of the included studies considered adverse events, impact on access and equity of access to services, or cost-effectiveness.

A particular difficulty in the applicability of the evidence comparing the performance of dental auxiliaries in placing preventive resin fissure sealants is the technology gap between studies. All the included studies were undertaken in the 1970s and 1980s, during which there were significant technological advances so that different techniques and materials would have been used in each. Consequently, retention rates in the studies are not comparable. Further technological advances since the 1990s also hamper inference to the present day. An additional problem is defining what constitutes a dental auxiliary. None of the studies provided a detailed description of the training, permitted duties and level of experience of those participating. One study provided a brief description of training in ART and a subjective assessment of experience. Consequently, it is difficult to generalise any of the findings to other settings and countries.

One potential benefit of using dental auxiliaries instead of dentists to deliver care is that the associated training and service costs should be lower and increasing the supply of dental auxiliaries could improve access to dental care for those populations who do not receive the oral health care they need, particularly in lower-income countries. Only one of the included studies was undertaken in a low-income country and none included a health economic analysis that met the inclusion criteria.

### Quality of the evidence

The data that we identified must be regarded as sparse and highly susceptible to bias. We judged all five included studies as being at high risk of bias (see *Assessment of risk of bias in included studies*). The older studies provided very few details of the methods used. The newer studies, although more detailed, had methodological

flaws. All the included studies had very few participating clinicians; some compared the performance of a single dentist with that of a single dental auxiliary. None included more than two dentists. The heterogeneity of the methods and techniques and the risk of bias meant that re-analyses or meta-analyses were either undesirable or impossible. Overall, the quality of the evidence from the five included studies was judged to be very low for all outcomes, as assessed by GRADE.

### Potential biases in the review process

All references identified in the electronic searches were independently sifted by at least two review authors. The same review authors independently extracted data and assessed the risk of bias of the included studies. Although the search strategy was carefully developed by all review authors and an experienced information technologist, and reviewed by another information technologist at the editorial base, a number of relevant studies did not have abstracts and did not include a term for a “dental auxiliary” in the title. Consequently, we extensively handsearched high-yield journals and reference lists of included studies and an earlier systematic (Galloway 2002) and a non-systematic (Nash 2012) reviews. In addition, we searched the reference lists of recently published systematic reviews identified in the search process (Freeman 2013; Phillips 2013; Turner 2013; Wright 2013). However, we cannot exclude the possibility that references have been missed.

There is also a risk of publication bias, that is, where studies reporting dental auxiliaries as more or less effective than dentists are less likely to be published. Unfortunately, as we identified too few studies to be included, we could not assess publication bias. However, as four of the five studies reported no difference between the performance of dental auxiliaries and dentists, the risk of publication bias is likely to be low.

### Agreements and disagreements with other studies or reviews

Within the limits of the two techniques included, our findings broadly concur with the findings of three previous systematic reviews (two of which were published in 2013) (Galloway 2002; Phillips 2013; Turner 2013), and one non-systematic narrative review (Nash 2012). However, as these studies included a broad range of study designs, their conclusions went beyond those of our review and concluded that dental auxiliaries can be at least as effective as dentists in a wide range of clinical tasks and participant outcomes (Galloway 2002; Nash 2012; Phillips 2013), and direct access to dental auxiliaries should not compromise patient safety and can increase access to care (Turner 2013). Although all four reviews reported that the quality of the evidence was generally poor, they recommended that the use of dental auxiliaries in

care traditionally provided by dentists should be increased as this should reduce the cost of care and potentially increase access. We identified two other relevant systematic reviews with broad inclusion criteria (Freeman 2013; Wright 2013). The first systematic review sought the impact of dental therapists working in remote-rural primary care in terms of services' effectiveness, efficiency, sustainability, acceptability and affordability. The authors concurred with our findings that there were no comparative studies undertaken and that there was a lack of high-quality evidence about the use of dental auxiliaries in remote-rural areas (Freeman 2013). The second systematic review considered the impact of services on a range of oral health outcomes employing "midlevel providers" compared with services that only used dentists to perform irreversible procedures (e.g. restorations). The authors reported that the quality of the evidence was very poor, but the evidence that exists suggests that services employing "midlevel providers" can provide health outcomes at least as good as those solely provided by dentists. They concurred with our findings that the generalisability of the results is very limited due to the age of many of the studies, clinical and methodological heterogeneity, and any conclusions should be drawn with extreme caution (Wright 2013).

## AUTHORS' CONCLUSIONS

### Implications for practice

The limitations in the quality and extent of the data mean that no substantive implications for practice can be drawn.

## Implications for research

This review only identified five eligible studies, four of which were published in the 1970s and 1980s and all were at high risk of bias. For policy makers to understand the potential for dental auxiliaries to increase the quality of dental services, including their effectiveness and cost-effectiveness, impact on equity, accessibility and acceptability, better designed and executed studies across a range of settings and contexts and with more participants are needed. There do not seem to be any reasons why randomised controlled trials could not be undertaken for most interventions that dental auxiliaries undertake. Where services are re-organised to increase the use of dental auxiliaries and an experimental design is not possible, then other robust non-randomised designs (such as interrupted time series) could be used. It is also essential that an appropriate follow-up period should be provided to assess the efficacy and long-term effects of any intervention provided by dental auxiliaries over a clinically relevant time period. Studies should also assess the cost-effectiveness of any intervention to help determine the resources that could be released to increase the capacity of care.

## ACKNOWLEDGEMENTS

The review authors would like to acknowledge the support of the Cochrane Effective Practice and Organisation of Care (EPOC) Group's UK Satellite, especially its Managing Editor, Gerd Flodgren. The Group is supported by a National Institute for Health Research (NIHR) Cochrane Programme Grant. They would also like to acknowledge Nia Roberts for her help to design and run the search of the electronic databases.

## REFERENCES

### References to studies included in this review

#### Jordan 2010 *{published data only}*

Jordan RA, Gaengler P, Markovic L, Zimmer S. Performance of atraumatic restorative treatment (ART) depending on operator-experience. *Journal of Public Health Dentistry* 2010;**70**:176–80.

#### Leake 1976 *{published data only}*

Leake JL, Martinello BP. A four year evaluation of a fissure sealant in a public health setting. *Journal of the Canadian Dental Association* 1976;**8**:409–15.

#### Ooi 1986 *{published data only}*

Ooi CL, Tan GC. A two-year study on the retention of pit and fissure sealants applied by different dental operators. *Singapore Dental Journal* 1986;**11**(1):15–7.

#### Stiles 1976 *{published data only}*

Stiles HM, Ward GT, Woolridge ED, Meyers R. Adhesive sealant clinical trial: comparative results of application by a dentist or dental auxiliaries. *Journal of Preventive Dentistry* 1976;**3**(3):8–11.

#### Wood 1989 *{published data only}*

Wood AJ, Saravia ME, Farrington FH. Cotton roll isolation versus Vac-Ejector isolation. *Journal of Dentistry for Children* 1989;**56**(6):438–41.

### References to studies excluded from this review

#### Abramovitz 1966 *{published data only}*

Abramovitz J. Expanded functions for dental assistants: a preliminary study. *Journal of the American Dental Association* 1966;**72**:386–91.

**Abramovitz 1973** {published data only}

Abramovitz J, Berg LE. A four-year study of the utilization of dental assistants with expanded functions. *Journal of the American Dental Association* 1973;**87**:623–35.

**Bader 1983** {published data only}

Bader JD, Mullins R, Lange K. Technical performance of amalgam restorations by dentists and auxiliaries in private practice. *Journal of the American Dental Association* 1983; **106**:338–41.

**Douglass 1976** {published data only}

Douglass CW, Lindahl RL, Moore S, Gillings DB. Expanded duty dental assistants in solo private practice. *Journal of the American College of Dentists* 1976;**43**(3): 145–63.

**Folke 2004** {published data only}

Folke BD, Walton JL, Fiegall RJ. Occlusal sealant success over ten years in a private practice: comparing longevity of sealants placed by dentists, hygienists, and assistants. *Pediatric Dentistry* 2004;**26**(5):426–32.

**Frencken 1998a** {published data only (unpublished sought but not used)}

Frencken JE, Makoni F, Sithole WD, Hackenitz E. Three-year survival of one-surface ART restorations and glass-ionomer sealants in a school oral health programme. *Caries Research* 1998;**32**:119–26.

**Frencken 1998b** {published data only (unpublished sought but not used)}

Frencken JE, Kakoni F, Sithole WD. ART restorations and glass ionomer sealants in Zimbabwe: survival at 3 years. *Community Dentistry and Oral Epidemiology* 1998; **26**:372–81.

**Gabre 2006** {published data only}

Gabre P, Birring E, Gahnberg L. A 20-year study of dentists' assessment of dental caries lesions in bite-wing radiographs. *Swedish Dental Journal* 2006;**30**(1):35–42.

**Hannerz 1996** {published data only}

Hannerz H, Westerberg I. Economic assessment of a six-year project with extensive use of hygienists in the dental care of children: a pilot study. *Community Dental Health* 1996;**13**:40–3.

**Heid 1973** {published data only}

Heid TH, Bair JH. Dental Therapy Assistant: Quality of Restorations Placed and Finished. Brooke Army Medical Center, Fort Sam Houston, TX 1973.

**Kemoli 2009** {published data only}

Kemoli AM, van Amerongen WE, Opinya G. Influence of the experience of operator and assistant on the survival rate of proximal ART restorations: two-year results. *European Archives of Paediatric Dentistry* 2009;**10**(4):227–32.

**Lobene 1979** {published data only}

Lobene RR. *The Forsyth Experiment. An Alternative System for Dental Care*. Cambridge, MA: Harvard University Press, 1979.

**Lotzkar 1971a** {published data only}

Lotzkar S, Johnson DW, Thompson MB. Experimental program in expanded functions for dental assistants: phase 1 base line and phase 2 training. *Journal of the American Dental Association* 1971;**82**:101–22.

**Lotzkar 1971b** {published data only}

Lotzkar S, Johnson DW, Thompson MB. Experimental program in expanded functions for dental assistants: phase 3 experiment with dental teams. *Journal of the American Dental Association* 1971;**82**:1067–81.

**Milgrom 1983** {published data only}

Milgrom P, Bergner M, Chapko MK, Conrad D, Skalabrin N. The Washington State dental auxiliary project: delegating expanded functions in general practice. *Journal of the American Dental Association* 1983;**107**:776–86.

**Morin 1998** {published data only}

Morin C, Lund JP, Sioufi C, Feine JS. Patient satisfaction with dentures made by dentists and denturologists. *Journal of the Canadian Dental Association* 1998;**64**(3):205–12.

**Mullins 1979** {published data only}

Mullins MR, Kaplan AL, Mistry DJ, Armstrong SR, Lange KW, Steuer RE, et al. Production-economic effects of delegation and practice size in a private dental office. *Journal of the American Dental Association* 1979;**98**:572–7.

**Mullins 1983** {published data only}

Mullins MR, Kaplan AL, Bader JD, Lange KW, Murray BP, Armstrong SR, et al. Summary results of the Kentucky dental practice demonstration: a cooperative project with practicing general dentists. *Journal of the American Dental Association* 1983;**106**:817–25.

**Phantumvanit 1996** {published data only}

Phantumvanit P, Songpaisan Y, Pilot T, Frencken JE. Atraumatic restorative treatment (ART): a three-year community field trial in Thailand - survival of one-surface restorations in the permanent dentition. *Journal of Public Health Dentistry* 1996;**56**(3 Spec No):141–5.

**Romcke 1973** {published data only}

Romcke RG, Lewis DW. Use of expanded function dental hygienists in the Prince Edward Island dental manpower study. *Journal of the Canadian Dental Association* 1973;**4**: 247–62.

## Additional references

**Bramson 2005**

Bramson JB, Guay AH. Comments on the proposed pediatric oral health therapist. *Journal of Public Health Dentistry* 2005;**65**:123–7.

**Burt 2005**

Burt BA, Eklund SA. *Dentistry, Dental Practice, and the Community*. St. Louis: Elsevier Saunders, 2005.

**Department of Health 2002**

Department of Health. *NHS Dentistry: Options for Change*. London: Department of Health, 2002.

**Department of Health 2009**

Department of Health. *NHS Dental Services in England: An Independent Review Led by Professor Jimmy Steele*. London: Department of Health, 2009.

**EPOC 2011**

Cochrane Effective Practice and Organisation of Care Group. Suggested risk of bias criteria for EPOC reviews. [epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/Suggested%20risk%20of%20bias%20criteria%20for%20EPOC%20reviews.pdf](http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/Suggested%20risk%20of%20bias%20criteria%20for%20EPOC%20reviews.pdf) (accessed 29 July 2014).

**Freeman 2013**

Freeman R, Lush C, MacGilliveray S, Themessl-Huber M, Richards D. Dental therapists/hygienists working in remote-rural primary care: a structured review of effectiveness, efficiency, sustainability, acceptability and affordability. *International Dental Journal* 2013;**63**:103–12.

**Galloway 2002**

Galloway J, Gorham J, Lambert M, Richards D, Russell D, Russell I, et al. *The Professionals Complementary to Dentistry: A Systematic Review and Synthesis*. London: University College London, Eastman Dental Hospital, Dental Team Studies Unit, 2002.

**General Dental Council 2009**

General Dental Council. *Scope of Practice*. London: General Dental Council, 2009.

**Higgins 2011**

Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0* [updated March 2011]. The Cochrane Collaboration, 2011. Available from [www.cochrane-handbook.org](http://www.cochrane-handbook.org).

**Ivers 2012**

Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews* 2012, Issue 6. [DOI: 10.1002/14651858.CD000259.pub3]

**Khan 2004**

Khan AA. Oral health services in developing countries: a case for the primary health care approach. *Developing Dentistry* 2004;**5**(2):1–2.

**Laurant 2005**

Laurant M, Reeves D, Hermens R, Braspenning J, Grol R, Sibbald B. Substitution of doctors by nurses in primary care. *Cochrane Database of Systematic Reviews* 2005, Issue 2. [DOI: 10.1002/14651858.CD001271.pub2]

**Ministry of Health 2005**

Ministry of Health. *Implementing the New Zealand Health Strategy 2005: The Minister of Health's fifth report on progress on the New Zealand Health Strategy, and the second report on actions to improve quality*. [www.moh.govt.nz/notebook/nbbooks.nsf/0/bf3a074fa325b442cc25739c00021787/\\$FILE/ImplementingNZHS2005.pdf](http://www.moh.govt.nz/notebook/nbbooks.nsf/0/bf3a074fa325b442cc25739c00021787/$FILE/ImplementingNZHS2005.pdf) (accessed 29 July 2014).

**Moher 2009**

Moher D, Liberati A, Tetzlaff J, Altman DG. The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Medicine* 2009; Vol. 6, issue 6:e1000097. [10.1371/journal.pmed.1000097]

**Nash 2005**

Nash DA. Developing and deploying a new member of the dental team: a pediatric oral health therapist. *Journal of Public Health Dentistry* 2005;**65**:48–55.

**Nash 2012**

Nash DA, Friedman JW, Mathu-Muju KR, Robinson PG, Satur J, Moffat S, et al. A review of the global literature on dental therapists, 2012. [www.wkcf.org/knowledge-center/resources/2012/04/Nash-Dental-Therapist-Literature-Review.aspx](http://www.wkcf.org/knowledge-center/resources/2012/04/Nash-Dental-Therapist-Literature-Review.aspx) (accessed 29 July 2014).

**Office of Fair Trading 2012**

Office of Fair Trading. *Dentistry: An OFT Market Study*. London: Office of Fair Trading, 2012.

**Phillips 2013**

Phillips E, Shaefer HL. Dental therapists: evidence of technical competence. *Journal of Dental Research* 2013;**92**(7 Suppl):11S–5S.

**RevMan 2012 [Computer program]**

The Cochrane Collaboration. Review Manager (RevMan). Version 5.2. Copenhagen: The Cochrane Collaboration, 2012.

**Spencer 2004**

Spencer J. *Narrowing the Inequality Gap in Oral Health and Dental Care in Australia*. Sydney, Australia: Australian Health Policy Institute, University of Sydney, 2004.

**Turner 2013**

Turner S, Tripathi S, MacGillivray S. Direct access to DCPs: what are the potential risks and benefits?. *British Dental Journal* 2013;**215**(11):577–82.

**WHO 1959**

World Health Organization. *Report of an Expert Committee on Auxiliary Dental Personnel. Technical Report Series No. 163*. Geneva: World Health Organization, 1959.

**WHO 2005**

World Health Organization. More oral health care needed for ageing populations. *Bulletin of the World Health Organization* 2005;**83**(9):646–7.

**WHO 2008**

World Health Organization. *Task shifting: global recommendations and guidelines*. Geneva: World Health Organization, 2008.

**Wright 2013**

Wright JT, Graham F, Hayes C, Ismail AI, Noraian KW, Weyant RJ, et al. A systematic review of oral health outcomes produced by dental teams incorporating midlevel providers. *Journal of the American Dental Association* 2013; **144**(1):75–91.

\* Indicates the major publication for the study

## CHARACTERISTICS OF STUDIES

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

#### Jordan 2010

Methods	<p><b>Study design:</b> RCT</p> <p><b>Data collection:</b> data were collected by a blinded, independent examiner as part of the evaluation of a training programme for COHWs</p> <p><b>Assessment of restoration outcomes:</b> ART was assessed after 12 months using an index of restoration quality (Ryge/United States Public Health Service criteria), but modified by the authors for ART. Restorations were rated as 'failure' if there was fracture or loss of restoration, marginal leakage or gap, secondary caries (decay), or a combination of these; otherwise they were labelled as 'success'</p> <p>A restoration was classified as 'small' when it involved 1 or 2 surfaces and 'large' when more than 2 surfaces</p> <p><b>Statistical analysis:</b> ANOVA</p>
Participants	<p><b>Participants:</b></p> <p><b>Providers:</b> 3 groups: 10 trainees COHWs; 7 experienced COHWs; 2 dentists</p> <p><b>Patients:</b> patients (number not reported) attending a health centre. No participant characteristics were reported</p> <p><b>Setting:</b> rural health centre (Jahali Health Centre)</p> <p><b>Country:</b> Republic of Gambia</p>
Interventions	<p><b>Description of the intervention:</b> 10 trainee COHWs; 7 experienced COHWs or 2 dentists. COHWs were state enrolled and state registered nurses who had received 3 months of training to perform the ART. The trainee COHWs entered the trial immediately after completing training and the experienced COHWs were in their first year following completion of training</p> <p>The operators clinically assessed the need for treatment and then provided ART restorations where appropriate. ART is a method of restoring carious (decayed) teeth that does not require advanced technological equipment and materials or the administration of local anaesthetic. Consequently, it is regarded as appropriate for treatment of carious teeth in developing and low-income countries where access to modern dental facilities may be limited. The carious tooth structure is removed with hand instruments and the tooth is restored with a chemically curing tooth coloured material, glass ionomer cement</p> <p><b>Auxiliaries:</b> 10 trainee COHWs; 7 experienced COHWs</p> <p><b>Training:</b> all COHWs received 3 months of training to perform ART</p> <p><b>Loss to follow-up:</b> 2.9% for the study as a whole. The individual loss to follow-up rates of the 3 groups were not reported</p>
Outcomes	<p><b>Small restorations:</b></p> <ul style="list-style-type: none"> <li>● fracture/loss</li> <li>● marginal leakage/gap</li> <li>● secondary caries</li> </ul> <p><b>Large restorations:</b></p> <ul style="list-style-type: none"> <li>● fracture/loss</li> <li>● marginal leakage/gap</li> </ul>

	<ul style="list-style-type: none"> <li>• secondary caries</li> </ul> <p><b>Follow-up:</b> 12 months after performing ART</p>	
Notes		
<b>Risk of bias</b>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The method of randomisation was not described. p177, col 2, para 1 QUOTE: "the patients were randomly assigned to an operator"
Allocation concealment (selection bias)	Unclear risk	The method of concealment was not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	128 of the 131 restorations were evaluated at 12 months (2.9%) drop-out. The authors describe the reasons for this loss to be related to migration from rural areas to the city and was, therefore, very unlikely to be related to the treatment provided
Selective reporting (reporting bias)	Unclear risk	The findings reported were consistent with the stated aim of the study. However, there was insufficient detail to conclude that all pre-specified outcomes have been reported
Other bias	High risk	No baseline assessment of participants was undertaken before random allocation to operator groups; it appears that the operators both assessed and provided treatment. In addition, no information is provided about the baseline characteristics of each of the test groups, or whether permanent or deciduous teeth were treated. Any imbalances in these factors would introduce bias
Blinding of participants and personnel (performance bias) All outcomes	Low risk	It is unclear whether the personnel were aware the treatment they provided was being assessed. It is also unclear whether the participants were blinded, but this is unlikely to impact on the outcome
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	p177, col 2, para 1 QUOTE: "To avoid information bias, a blinded examiner who was not part of



		the COHW training course conducted the evaluation” However, no details were provided on training or calibration in using the restoration quality clinical index
--	--	--

**Leake 1976**

Methods	<p><b>Study design:</b> cluster RCT</p> <p><b>Data collection:</b> data were collected by a blinded, independent examiner and the participating operators by as part of an evaluation of a public health prevention programme in schools</p> <p><b>Statistical analyses:</b> no statistical test was described for the comparison of retention rates of fissure sealants. The Chi<sup>2</sup> test was used to compare the effectiveness of dental auxiliaries and dentists in reducing the number of teeth exhibiting caries (dental decay) having placed fissure sealants</p>
Participants	<p><b>Participants:</b></p> <p><b>Providers:</b> 2 groups: 1 dental hygienist and 1 dentist</p> <p><b>Patients:</b> 518 school children in Grades 1 and 2 (aged 5-7 years)</p> <p><b>Setting:</b> schools</p> <p><b>Country:</b> Ontario, Canada</p>
Interventions	<p><b>Description of the intervention:</b> children with 2 caries-free permanent molar teeth were treated with preventive resin fissure sealants by either a dental hygienist or a dentist. The hygienist treated 448 teeth and the dentist treated 528 teeth. 1 of the teeth was sealed by the operator and the other left unsealed</p> <p><b>Dental auxiliary:</b> 1 dental hygienist</p> <p><b>Training:</b> both operators had received a 2-day course on the use of the preventive resin fissure sealant material</p> <p><b>Loss to follow-up:</b> 13.9% for the study as a whole; 16% in the hygienist group and 12% in the dentist group</p>
Outcomes	<p><b>Primary outcome:</b></p> <ul style="list-style-type: none"> <li>● partial loss of sealant</li> <li>● complete loss of sealant</li> </ul> <p><b>Follow-up:</b> at 6, 12, 18, 24, 36 and 48 months after application of preventive resin sealant</p> <p><b>Secondary outcome:</b></p> <ul style="list-style-type: none"> <li>● net reduction in the number of children who had occlusal (biting surface) caries (dental decay) in their first permanent molars. The number of teeth developing caries only on the treated side of the mouth was subtracted from the number of teeth only developing caries on the control side to produce a net reduction in sites with caries</li> </ul> <p><b>Follow up:</b> at 48 months after application of preventive resin sealant</p>
Notes	
<i>Risk of bias</i>	

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Schools and not participants were randomly allocated to either the hygienist or the dentist. No method of randomisation was described, but an attempt to balance the groups in terms of their dental health was made: p409, col 2, para 4 QUOTE: "To obtain the sample, the schools were ranked in order of the children's dental health according to health unit examination records of the previous year. The schools were then grouped by rank and equal numbers of schools from each group were randomly assigned to each clinician in order to balance the prevalence of caries in the sample assigned to each clinician"
Allocation concealment (selection bias)	Unclear risk	The method of concealment was not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Over the 4 years, 136 of the 976 teeth treated were lost to follow-up (13.9%). 72 of these were in the hygienist test group (16% loss) and 64 were in the dentist group (12% loss). The authors did not describe possible explanations for the loss
Selective reporting (reporting bias)	Unclear risk	The findings reported were consistent with the stated aim of the study. However, there was insufficient detail to conclude that all pre-specified outcomes have been reported
Other bias	High risk	The baseline assessment was undertaken by the dentist and hygienist participating in the trial. No details of any calibration process were described. In addition, no information was provided about the baseline characteristics of each of the test groups
Blinding of participants and personnel (performance bias) All outcomes	Low risk	It is assumed that the dentist and the hygienist were aware that they were participating in a study. It is unclear whether the participants were blinded, but this is unlikely to have impacted on the outcome

**Leake 1976** (Continued)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	An independent dentist familiar with the technique, examined the teeth at 6-month intervals, blind to which teeth had been treated and by whom. In addition, each operator examined the teeth that they had treated at 12 and 24 months. No details were provided on how or if any disagreements were resolved
---	--------------	--

**Ooi 1986**

Methods	<b>Study design:</b> non-RCT <b>Data collection:</b> data were collected by the participating operators <b>Statistical analyses:</b> Z statistics test	
Participants	<b>Participants:</b> <b>Providers:</b> 2 groups: 1 dental nurse and 1 dentist <b>Patients:</b> 196 school children between 6 and 7 years of age who were receiving routine dental treatment from student dental nurses <b>Setting:</b> Institute of Dental Health <b>Country:</b> Singapore	
Interventions	<b>Description of the intervention:</b> any first permanent molar that was not carious and with the occlusal surface visible was sealed with preventive resin fissure sealant by either a dentist (340 teeth) or a dental nurse (367 teeth). As part of the study, 2 different materials were used: Concise® (394 teeth) and Delton® (313 teeth) <b>Auxiliary:</b> 1 dental nurse <b>Training:</b> no information <b>Loss to follow-up:</b> 8.2% for study as a whole; 7.1% in the dental nurse group and 9.4% in the dentist group	
Outcomes	<b>Primary outcome:</b> <ul style="list-style-type: none"> <li>retention rates of the 2 different preventive resin materials</li> </ul> <b>Follow-up:</b> at 6, 12, 18 and 24 months after application of preventive resin sealant	
Notes		

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	This was a non-RCT. The method of allocation was not provided
Allocation concealment (selection bias)	Unclear risk	Any method of concealment was not described

Ooi 1986 (Continued)

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Over the 2 years, 58 out of the 707 teeth were lost to follow up (8.2%). 26 of these were in the dental nurse group (7.1% of 367 teeth) and 32 were in the dentist group (9.4% of 340 teeth). The authors did not describe possible explanations for the loss
Selective reporting (reporting bias)	Unclear risk	The findings reported were consistent with the stated aim of the study. However, there were insufficient details to conclude that all pre-specified outcomes have been reported
Other bias	High risk	There was no description of a baseline assessment of the teeth. In addition, there were no data on the baseline characteristics of the 2 groups
Blinding of participants and personnel (performance bias) All outcomes	Low risk	It is assumed that the dentist and the hygienist were aware that they were participating in a study. It is unclear whether the participants were blinded, but this is unlikely to have impacted on the outcome
Blinding of outcome assessment (detection bias) All outcomes	High risk	The 2 operators involved in the trial also performed the outcome assessment. It is unclear how participants were allocated for assessment. Given the relatively low numbers of participants and that they were regular patients at the clinic, it is unlikely that the operators would be sufficiently blinded to avoid risk of detection bias. p15, col 2, para 2: QUOTE: "The children were recalled at intervals of 6, 12, 18 and 24 months and at each recall the examination was done by either operator without prior knowledge of who had applied the sealant"

Stiles 1976

Methods	<b>Study design:</b> RCT <b>Data collection:</b> data were collected by a blinded, independent examiner <b>Statistical analyses:</b> Chi <sup>2</sup> test was used
Participants	<b>Participants:</b> <b>Providers:</b> 1 dental auxiliary, 2 dental corpsmen; 1 dentist <b>Patients:</b> 166 people aged 5-21 years of age of Coast Guard workers with caries-free pairs of contralateral matched posterior teeth (both deciduous and permanent)

	<b>Setting:</b> Coast Guard Base <b>Country:</b> New York, USA	
Interventions	<p><b>Description of the intervention:</b> half on the people's mouths were randomly allocated for treatment with preventive resin fissure sealants by 1 dentist and the other half by 1 of 3 dental auxiliaries. 1373 sites were treated by the 4 operators (dentist: 674 sites; dental corpsman: 310 sites; dental corpsman: 239 sites; dental auxiliary: 150 sites). The number of teeth treated was not provided</p> <p><b>Auxiliaries:</b> 2 dental corpsmen and 1 dental assistant</p> <p><b>Training:</b> the length and scope of auxiliaries' training is unclear</p> <p><b>Loss to follow-up:</b> not reported</p>	
Outcomes	<p><b>Primary outcome:</b></p> <ul style="list-style-type: none"> <li>retention rates (complete and partial) of the sealants for permanent and deciduous teeth</li> </ul> <p><b>Follow-up:</b> 12 months after application of preventive resin sealant</p> <p><b>Secondary outcome:</b></p> <ul style="list-style-type: none"> <li>"caries attack rates" for treated sites where the sealant had been lost or partially lost</li> </ul> <p><b>Follow-up:</b> 12 months after application of preventive resin sealant</p>	
Notes		
<b>Risk of bias</b>		
<b>Bias</b>	<b>Authors' judgement</b>	<b>Support for judgement</b>
Random sequence generation (selection bias)	Unclear risk	The method of randomisation was not described. p8 para 3 QUOTE: "One half of the mouth was randomly assigned for treatment by a dentist and the other half by one of three dental auxiliaries"
Allocation concealment (selection bias)	Low risk	As this was a split-mouth design, allocation concealment is not an issue
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	The total number of children included at baseline was provided (n = 166), the number of treated sites was not. As the number of treated sites in teeth was provided at 6 and 12 months, loss to follow-up cannot be calculated
Selective reporting (reporting bias)	Unclear risk	The findings reported are consistent with the stated aim of the study. However, there are insufficient details to conclude that all pre-specified outcomes have been reported

Stiles 1976 (Continued)

Other bias	Unclear risk	Although a baseline assessment was undertaken, very few details were provided
Blinding of participants and personnel (performance bias) All outcomes	Low risk	It is assumed that the dentist and the 3 dental auxiliaries were aware that they were participating in a study. It is unclear whether the participants were blinded, but this is unlikely to have impacted on the outcome
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	p8, col 2, para 3: QUOTE: "An examining dentist who had no previous knowledge of which tooth sites had received the material, scored the sealant as completely or partially missing at each examination"

Wood 1989

Methods	<p><b>Study design:</b> RCT</p> <p><b>Data collection:</b> data were collected as part of the evaluation of 2 different tooth isolation techniques</p> <p><b>Statistical analyses:</b> 2-way ANOVA</p>
Participants	<p><b>Participants:</b></p> <p><b>Providers:</b> 1 paediatric dentist, 1 dental auxiliary, 20 dental students</p> <p><b>Patients:</b> most participants (proportion not provided) were children (145 children) attending 2nd grade in the City of Richmond Public School System and qualified for a federally funded free-lunch programme. A small number of participants (proportion not provided) were regular patients at a health clinic. Age of participants ranged from 5 years 3 months to 10 years 4 months (mean 7 years 8 months)</p> <p><b>Setting:</b> health clinic (Richmond City Health Department Dental Clinic)</p> <p><b>Country:</b> New York, USA</p>
Interventions	<p><b>Description of the intervention:</b> any child with at least 1 adequately erupted non-carious (without decay) first permanent molar was randomly assigned to 1 of 3 different operator/assistant teams: a licensed paediatric dentist and assistant; a dental auxiliary and assistant; 1 of approximately 20 senior dental students and assistant. Operators and assistant teams were randomly assigned to 4 different surgeries by drawing numbers. Procedures used in the 4 surgeries were identical, except the isolation technique used; 2 cotton roll isolation set-ups and 2 Vac-Ejector set-ups were randomly distributed among the 4 surgeries. 523 teeth were sealed with a preventive resin fissure sealant (dentist 202 teeth; dental auxiliary 28 teeth; student 172 teeth)</p> <p><b>Dental auxiliary:</b> 1 dental hygienist</p> <p><b>Training:</b> length and scope of training was unclear</p> <p><b>Loss to follow-up:</b> not reported</p>

Outcomes	<p><b>Primary outcomes:</b></p> <ul style="list-style-type: none"> <li>● total number of teeth sealed</li> <li>● retention rates by isolation method</li> <li>● retention by tooth</li> <li>● comparison of retention rates by operator and assistant teams</li> </ul> <p><b>Follow-up:</b> recall periods for evaluation varied, with the mean being 9.3 months, but not less than 6 months after application of preventive resin sealant</p>	
Notes		
<b>Risk of bias</b>		
<b>Bias</b>	<b>Authors' judgement</b>	<b>Support for judgement</b>
Random sequence generation (selection bias)	Low risk	p439, col, 1 paras 3 and 4: QUOTE: "Operators and assistants were randomly assigned to operatories by drawing of numbers corresponding to operator numbers When the children participating in the study arrived at the clinic, they were asked to draw numbers corresponding to operator numbers, and thus randomly assigned to both the operator/assistant team and the isolation method to be employed"
Allocation concealment (selection bias)	Unclear risk	Any method of concealment was not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Loss to follow-up was not reported
Selective reporting (reporting bias)	Unclear risk	The findings reported were consistent with the stated aim of the study. However, there were insufficient details to conclude that all pre-specified outcomes have been reported
Other bias	High risk	A baseline assessment was undertaken by a paediatric dentist and assisted by dental students. The role of the dental students was not described. No information was provided on the baseline characteristics of the groups
Blinding of participants and personnel (performance bias) All outcomes	Low risk	It is assumed that the operator and assistant teams were aware that they were participating in a study. It is unclear whether the participants were blinded, but this is unlikely

		to have impacted on the outcome
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	p440, col 1, para 1: QUOTE: “Two examiners, who were unaware of the isolation method used, rated the sealants independently, utilizing a dental explorer and an intraoral mirror [...] When discrepancies in ratings occurred, the teeth in question were re-evaluated by both examiners and appropriate rating agreed upon” It is unclear whether the examiners were blinded to the operator providing treatment

ANOVA: analysis of variance; ART: atraumatic restorative technique; COHW: community oral health worker; RCT: randomised controlled trial.

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

Study	Reason for exclusion
Abramovitz 1966	Ineligible study design (retrospective evaluation)
Abramovitz 1973	Although the study design resembled an interrupted time series, there were only 2 data points in total
Bader 1983	Ineligible study design (retrospective evaluation)
Douglass 1976	Although the study design resembled an interrupted time series, there were only 2 data points in total. The study did not directly compare dentists and dental auxiliaries, but impact of delegation on various outcomes
Folke 2004	Although the study compared the retention rates of fissure sealants placed by dentists, hygienists and assistants, the study design was ineligible (retrospective evaluation)
Frencken 1998a	Although the study compared the performance of dentists and dental auxiliaries in ART, the study design was ineligible (retrospective evaluation)
Frencken 1998b	Although the study compared the performance of dentists and dental auxiliaries in ART, the study design was ineligible (retrospective evaluation)
Gabre 2006	Ineligible study design (repeated cross-sectional design)
Hannerz 1996	Did not compare dentists with dental auxiliaries. The test group was principally, but not exclusively, dental hygienists



(Continued)

Heid 1973	Ineligible study design. Involved students
Kemoli 2009	Although dentists and dental auxiliaries participated in the study, their effectiveness was not compared. The study assessed the influence of experience of operators and assistants on the survival rates of ART restorations
Lobene 1979	Ineligible study design (retrospective evaluation)
Lotzkar 1971a	Ineligible study design (retrospective evaluation) and included dental auxiliary students
Lotzkar 1971b	Ineligible study design (retrospective evaluation)
Milgrom 1983	Ineligible study design (retrospective evaluation)
Morin 1998	Ineligible design (retrospective questionnaire survey)
Mullins 1979	Although the study design resembled an interrupted time series, there were only 2 data points in total. The study did not directly compare dentists and dental auxiliaries, but degrees of delegation
Mullins 1983	Although the study design resembled an interrupted time series, there were only 2 data points in total. The study did not directly compare dentists and dental auxiliaries, but degrees of delegation
Phantumvanit 1996	Ineligible design (retrospective evaluation)
Romcke 1973	Although the study design resembles an interrupted time series, there were only 2 data points in total. The study did not directly compare dentists and dental auxiliaries

ART: atraumatic restorative technique.

## DATA AND ANALYSES

This review has no analyses.

## APPENDICES

### Appendix I. MEDLINE search strategy

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1948 to Present>

ML= MEDLINE Term; EM = EMBASE Term

1 exp Dental Auxiliaries/ [ML] (11,509)

2 exp dental staff/ [ML] (2071)

3 or/1-2 [Dental Auxiliaries ML] (13,447)

4 exp \*Dental Auxiliaries/ or exp \*Dental Staff/ [Dental Auxiliaries Focussed ML] (7839)

5 (((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ti. (575)

6 (denturist? or clinical dent\$ technician? or maxillofacial technician?).ti. (66)

7 (orthodonti\$ adj2 (auxiliary or auxiliaries or therapist?)).ti. (19)

8 ((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ti. (2667)

9 ((oral health\$ or oral surger\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$)).ti. (28)

10 oral hygienist?.ti. (20)

11 ((“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ti. (31)

12 ((dentist? or dental) adj2 ((skill? or service?) adj2 mix\$)).ti,ab. (6)

13 ((chairside or “chair side” or chair-side) adj3 (hygienist? or technician? or nurse? or dentist? or dental? or dentistry or assistant? or assistance or assisting or auxiliar\$ or personnel? or professional? or employee? or staff? or worker?)).ti,ab. (132)

14 (“four hand\$ dent\$” or “six hand\$ dent\$” or “four-hand\$ dent\$” or “six-hand\$ dent\$”).ti,ab. (42)

15 (dentist? adj3 (standin or “stand-in” or “stand in” or “stands in” or “standing in” or “stood in” or substitute? or delegat\$)).ti,ab. (28)

16 ((allied dental or dental assistant? or dent\$ auxiliar\$ or dental nurs\$ or dental staff or dental technician? or dental technologist? or dental worker? or hygienist?) adj4 (advanc\$ or expand\$ or extend\$ or increase\$ or role?)).ti,ab. (529)

17 (complementary adj4 dentistry).ti,ab. (30)

18 or/5-17 [Dental Auxilliary KW] (3706)

19 (((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ab. (316)

20 (denturist? or clinical dent\$ technician? or maxillofacial technician?).ab. (51)

21 ((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ab. (1972)

22 (oral hygienist? or ((oral health\$ or oral surger\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$))).ab. (75)

23 ((“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ab. (37)

24 denturist?.ti,ab. (90)

25 or/19-24 [Dental Aux Terms in Abstract] (2322)

26 exp Dentists/ or exp Dentistry/ or exp Specialties, Dental/ (317,696)

27 Dental Health Services/ or Dentist’s Practice Patterns/ (4561)

28 exp Dental Care/ or exp Tooth Diseases/ (150,299)

29 exp Dental Facilities/ or Partnership Practice, Dental/ or General Practice, Dental/ or Group Practice, Dental/ or Practice management, dental/ (21,016)

30 Economics, Dental/ (1829)

31 exp Personnel Management/ or “Personnel Staffing and Scheduling”/ (112,999)

32 Personnel Delegation/ or Delegation, Professional/ or Professional autonomy/ or Professional role/ (14,109)

33 (dentist? or dentistry or oral health\$ or oral hygiene or diagnos\$ or therapeut\$ or endodonti\$ or maxillofacial or orthodont\$ or periodonti\$ or prosthodonti\$).ti. (571,372)

34 exp Health Services/ or Capacity building/ or exp “Organization and Administration”/ or Health Services Administration/ or Decision Making, Organizational/ or Health Facility Administration/ or Models, Organizational/ or Organizational Culture/ or Organizational Innovation/ or Organizational Objectives/ or Staff Development/ or Career Mobility/ or Efficiency, Organizational/ (2,023,751)

35 exp Diagnosis/ or exp Patient care/ or “Patient Education as Topic”/ (5,871,905)

36 ((dental adj2 (diagnos? or exam\$ or treatment? or history)) or history taking).ti,ab. or (patient adj2 care).ti. (19,824)

37 practice pattern?.ti,ab. (3714)

38 ((service? or service level?) adj3 (mix\$ or combine? or combination?)).ti,ab. (798)

39 (skill? adj2 (mix\$ or combine? or combination?)).ti,ab. (716)

40 ((advanc\$ or develop\$) adj2 skill?).ti,ab. (4320)

41 ((chang\$ or exchange\$ or expand\$ or extend\$ or increase? or reduc\$ or replac\$ or limit? or focus\$ or redistribut\$) adj3 (task? or job? or work? or responsib\$ or role? or duty or duties or job function?)).ti,ab. (66,911)

42 (upskill\$ or “up-skill\$”).ti,ab. (63)

43 ((independent\$ or solo or individual\$) adj3 (decision or decision-making)).ti,ab. (1527)

44 (delegate? or delegation or delegating).ti,ab. (3895)

45 (interprofession\$ or interinstitution\$ or cooperat\$ or co-operat\$ or collaborat\$).ti,ab,hw. (235,501)

46 og.fs. [Org Admin Subheading] (328,493)

47 ma.fs. [Manpower subheading] (50,199)

48 (chang\$ or collaborat\$ or effectiv\$ or impact or improv\$ or team\$).ti. (665,790)

49 or/26-48 [Org Admin/Health Services Terms] (8,013,115)

50 (randomized controlled trial or controlled clinical trial).pt. or randomized.ab. or clinical trials as topic.sh. or randomly.ab. or trial.ti. (727,577)

51 exp animals/ not humans.sh. (3,651,958)

52 “comment on”.cm. or systematic review.ti. or literature review.ti. or editorial.pt. or meta-analysis.pt. or news.pt. or review.pt. [This line is not found in Cochrane Handbook; added by TSC to exclude irrelevant publication types] (2,471,999)

53 50 not (or/51-52) [Cochrane RCT Filter 6.4.d Sens/Precision Maximizing] (570,921)

54 intervention?.ti. or (intervention? adj6 (clinician? or collaborat\$ or community or complex or DESIGN\$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv\$ or individuali?e? or individuali?ing or interdisciplin\$ or multicomponent or multi-component or multidisciplin\$ or multi-disciplin\$ or multifacet\$ or multi-facet\$ or multimodal\$ or multi-modal\$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib\$ or prescription? or primary care or professional\$ or provider? or regulatory or regulatory or tailor\$ or target\$ or team\$ or usual care)).ab. (118,775)

55 (pre-intervention? or preintervention? or “pre intervention?” or post-intervention? or postintervention? or “post intervention?”).ti,ab. [added 2.4] (6618)

56 (hospital\$ or patient?).hw. and (study or studies or care or health\$ or practitioner? or provider? or physician? or nurse? or nursing or doctor?).ti,hw. (623,759)

57 demonstration project?.ti,ab. (1729)

58 (pre-post or “pre test\$” or pretest\$ or posttest\$ or “post test\$” or (pre adj5 post)).ti,ab. (49,249)

59 (pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab. (445)

60 trial.ti. or ((study adj3 aim?) or “our study”).ab. (460,120)

61 (before adj10 (after or during)).ti,ab. (304,860)

62 (“quasi-experiment\$” or quasiexperiment\$ or “quasi random\$” or quasirandom\$ or “quasi control\$” or quasicontrol\$ or ((quasi\$ or experimental) adj3 (method\$ or study or trial or design\$))).ti,ab,hw. [ML] (85,453)

63 (“time series” adj2 interrupt\$).ti,ab,hw. [ML] (637)

64 (time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month\$ or hour? or day? or “more than?)).ab. (6405)

65 pilot.ti. (30,024)

66 Pilot projects/ [ML] (67,278)

67 (clinical trial or controlled clinical trial or multicenter study).pt. [ML] (567,079)

68 (multicentre or multicenter or multi-centre or multi-center).ti. (22,540)

69 random\$.ti,ab. or controlled.ti. (604,155)

70 (control adj3 (area or cohort? or compare? or condition or design or group? or intervention? or participant? or study)).ab. not (controlled clinical trial or randomized controlled trial).pt. [ML] (329,763)

71 “comment on”.cm. or review.ti,pt. or randomized controlled trial.pt. [ML] (2,523,925)

72 review.ti. [EM] (205,430)  
73 (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti. (1,232,730)  
74 exp animals/ not humans.sh. [ML] (3,651,958)  
75 (animal\$ not human\$.sh,hw. [EM] (3,567,660)  
76 \*experimental design/ or \*pilot study/ or quasi experimental study/ [EM] (17,066)  
77 (“quasi-experiment\$” or quasiexperiment\$ or “quasi random\$” or quasirandom\$ or “quasi control\$” or quasicontrol\$ or ((quasi\$ or experimental) adj3 (method\$ or study or trial or design\$))).ti,ab. [EM] (85,453)  
78 (“time series” adj2 interrupt\$).ti,ab. [EM] (637)  
79 (or/54-70) not (or/71,73-74) [EPOC Methods Filter ML 2.4] (1,749,064)  
80 (or/54-61,64-65,68-69,76-78) not (or/72,75) [EPOC Methods Filter EM 1.9-2.4] (1,763,822)  
81 3 and 53 [Dental Aux MeSH & RCT] (139)  
82 (18 and 53) not 81 [Dental Aux Title KW & RCT] (13)  
83 (25 and 49 and 53) not (or/81-82) [Dent Aux Abstract & Dentistry & RCT] (93)  
84 ((exp \*Dental Auxiliaries/ or exp \*Dental Staff/ or 18) and 79) not (or/81-83) [Focussed MeSH for DentAux & EPOC Filter] (1027)  
85 (and/25,49,79) not (or/81-84) [Dent Aux Abstract & Dentistry & EPOC Filter] (298)  
86 or/81-85 (1570)  
87 or/81-83 [RCT results] (245)  
88 or/84-85 [EPOC results] (1325)

## Appendix 2. Other search strategies

Database	Interface	Coverage	Dates	Hits
CINAHL	EBSCOHost	1982-present	8 November 2013	300
Cochrane Central Register of Controlled Trial (CENTRAL)	<i>The Cochrane Library</i> via Wiley	Issue 10, 2013	8 November 2013	9
Database of Reviews of Effects	<i>The Cochrane Library</i> via Wiley	Issue 10, 2013	8 November 2013	3
Dissertations & Theses	ProQuest		8 November 2013	25
EMBASE	Ovid SP	1974-present	8 November 2013	287
EPOC Register			8 November 2013	
Health Management Information Consortium	Ovid SP		8 November 2013	5
LILACS	Virtual Health Library		8 November 2013	9
EDLINE	Ovid SP	1946-present	8 November 2013	195
NHS Economic Evaluation Database	Cochrane Library via Wiley	Issue 10, 2013	8 November 2013	2

(Continued)

PAHO	Virtual Health Library		8 November 2013	0
Web of Science		1945-present	8 November 2013	118
WHOLIS	Virtual Health Library		8 November 2013	0
Total				953
Duplicates				594
Final total:				359

Update searches were run on 8 November 2013. The results were de-duplicated against the results of update and previous searches.  
**CINAHL** [EBSCOHost] (1980 -)

S116  
S113 or S114 Limiters - Published Date: 20120101-20131231  
231  
S115  
S111 or S112 Limiters - Published Date: 20120101-20131231  
69  
S114  
S34 and S78 and S110  
1,739  
S113  
S23 and S110  
392  
S112  
S34 and S78 and S85  
537  
S111  
S23 and S85  
148  
S110  
S86 or S87 or S88 or S89 or S90 or S91 or S92 or S93 or S94 or S95 or S96 or S97 or S98 or S99 or S100 or S101 or S102 or S103  
or S104 or S105 or S106 or S107 or S108 or S109  
380,478  
S109  
TI ( (time points n3 over) or (time points n3 multiple) or (time points n3 three) or (time points n3 four) or (time points n3 five)  
or (time points n3 six) or (time points n3 seven) or (time points n3 eight) or (time points n3 nine) or (time points n3 ten) or (time  
points n3 eleven) or (time points n3 twelve) or (time points n3 month\*) or (time points n3 hour\*) or (time points n3 day\*) or (time  
points n3 “more than”) ) or AB ( (time points n3 over) or (time points n3 multiple) or (time points n3 three) or (time points n3 four)  
or (time points n3 five) or (time points n3 six) or (time points n3 seven) or (time points n3 eight) or (time points n3 nine) or (time  
points n3 ten) or (time points n3 eleven) or (time points n3 twelve) or (time points n3 month\*) or (time points n3 hour\*) or (time  
points n3 day\*) or (time points n3 “more than”) )  
1309  
S108  
TI ( (control w3 area) or (control w3 cohort\*) or (control w3 compar\*) or (control w3 condition) or (control w3 group\*) or (control  
w3 intervention\*) or (control w3 participant\*) or (control w3 study) ) or AB ( (control w3 area) or (control w3 cohort\*) or (control  
w3 compar\*) or (control w3 condition) or (control w3 group\*) or (control w3 intervention\*) or (control w3 participant\*) or (control  
w3 study) )  
37,394  
S107  
TI ( multicentre or multicenter or multi-centre or multi-center ) or AB random\*  
87,002  
S106  
TI random\* OR controlled  
71,557  
S105  
TI ( trial or (study n3 aim) or “our study” ) or AB ( (study n3 aim) or “our study” )  
65,030  
S104  
TI ( pre-workshop or preworkshop or post-workshop or postworkshop or (before n3 workshop) or (after n3 workshop) ) or AB ( pre-  
workshop or preworkshop or post-workshop or postworkshop or (before n3 workshop) or (after n3 workshop) )  
240

S103

TI ( demonstration project OR demonstration projects OR preimplement\* or pre-implement\* or post-implement\* or postimple-  
ment\* ) or AB ( demonstration project OR demonstration projects OR preimplement\* or pre-implement\* or post-implement\* or  
postimplement\* )

1171

S102

(intervention n6 clinician\*) or (intervention n6 community) or (intervention n6 complex) or (intervention n6 design\*) or (intervention  
n6 doctor\*) or (intervention n6 educational) or (intervention n6 family doctor\*) or (intervention n6 family physician\*) or (intervention  
n6 family practitioner\*) or (intervention n6 financial) or (intervention n6 GP) or (intervention n6 general practice\*) Or (intervention  
n6 hospital\*) or (intervention n6 impact\*) Or (intervention n6 improv\*) or (intervention n6 individualize\*) Or (intervention  
n6 individualise\*) or (intervention n6 individualizing) or (intervention n6 individualising) or (intervention n6 interdisciplin\*) or  
(intervention n6 multicomponent) or (intervention n6 multi-component) or (intervention n6 multidisciplin\*) or (intervention n6  
multi-disciplin\*) or (intervention n6 multifacet\*) or (intervention n6 multi-facet\*) or (intervention n6 multimodal\*) or (intervention  
n6 multi-modal\*) or (intervention n6 personalize\*) or (intervention n6 personalise\*) or (intervention n6 personalizing) or (intervention  
n6 personalising) or (intervention n6 pharmaci\*) or (intervention n6 pharmacist\*) or (intervention n6 pharmacy) or (intervention  
n6 physician\*) or (intervention n6 practitioner\*) Or (intervention n6 prescrib\*) or (intervention n6 prescription\*) or (intervention  
n6 primary care) or (intervention n6 professional\*) or (intervention\* n6 provider\*) or (intervention\* n6 regulatory) or (intervention  
n6 regulatory) or (intervention n6 tailor\*) or (intervention n6 target\*) or (intervention n6 team\*) or (intervention n6 usual care)

20,059

S101

TI ( collaborativ\* or collaboration\* or tailored or personalised or personalized ) or AB ( collaborativ\* or collaboration\* or tailored or  
personalised or personalized )

33,218

S100

TI pilot

10,143

S99

(MH "Pilot Studies")

26,128

S98

AB "before-and-after"

15,103

S97

AB time series

1494

S96

TI time series

216

S95

AB ( before\* n10 during or before n10 after ) or AU ( before\* n10 during or before n10 after )

28,637

S94

TI ( (time point\*) or (period\* n4 interrupted) or (period\* n4 multiple) or (period\* n4 time) or (period\* n4 various) or (period\* n4  
varying) or (period\* n4 week\*) or (period\* n4 month\*) or (period\* n4 year\*) ) or AB ( (time point\*) or (period\* n4 interrupted)  
or (period\* n4 multiple) or (period\* n4 time) or (period\* n4 various) or (period\* n4 varying) or (period\* n4 week\*) or (period\* n4  
month\*) or (period\* n4 year\*) )

43,408

S93

TI ( ( quasi-experiment\* or quasixperiment\* or quasi-random\* or quasirandom\* or quasi control\* or quasicontrol\* or quasi\* W3

method\* or quasi\* W3 study or quasi\* W3 studies or quasi\* W3 trial or quasi\* W3 design\* or experimental W3 method\* or experimental W3 study or experimental W3 studies or experimental W3 trial or experimental W3 design\* ) or AB ( ( quasi-experiment\* or quasiexperiment\* or quasi-random\* or quasirandom\* or quasi control\* or quasicontrol\* or quasi\* W3 method\* or quasi\* W3 study or quasi\* W3 studies or quasi\* W3 trial or quasi\* W3 design\* or experimental W3 method\* or experimental W3 study or experimental W3 studies or experimental W3 trial or experimental W3 design\* ) )

10,596

S92

TI pre w7 post or AB pre w7 post

7897

S91

MH "Multiple Time Series" or MH "Time Series"

1176

S90

TI ( (comparative N2 study) or (comparative N2 studies) or evaluation study or evaluation studies ) or AB ( (comparative N2 study) or (comparative N2 studies) or evaluation study or evaluation studies )

8884

S89

MH Experimental Studies or Community Trials or Community Trials or Pretest-Posttest Design + or Quasi-Experimental Studies + Pilot Studies or Policy Studies + Multicenter Studies

30,224

S88

TI ( pre-test\* or pretest\* or posttest\* or post-test\* ) or AB ( pre-test\* or pretest\* or posttest\* or "post test\*" ) OR TI ( preimplement\* or pre-implement\* ) or AB ( pre-implement\* or preimplement\* )

6120

S87

TI ( intervention\* or multiintervention\* or multi-intervention\* or postintervention\* or post-intervention\* or preintervention\* or pre-intervention\* ) or AB ( intervention\* or multiintervention\* or multi-intervention\* or postintervention\* or post-intervention\* or preintervention\* or pre-intervention\* )

129,772

S86

(MH "Quasi-Experimental Studies")

5155

S85

S79 or S80 or S81 or S82 or S83 or S84

127,922

S84

TI ( "control\* N1 clinical" or "control\* N1 group\*" or "control\* N1 trial\*" or "control\* N1 study" or "control\* N1 studies" or "control\* N1 design\*" or "control\* N1 method\*" ) or AB ( "control\* N1 clinical" or "control\* N1 group\*" or "control\* N1 trial\*" or "control\* N1 study" or "control\* N1 studies" or "control\* N1 design\*" or "control\* N1 method\*" )

1

S83

TI controlled or AB controlled

55,268

S82

TI random\* or AB random\*

95,977

S81

TI ( "clinical study" or "clinical studies" ) or AB ( "clinical study" or "clinical studies" )

6180



S80  
(MM “Clinical Trials+”)  
7408  
S79  
TI ( (multicent\* n2 design\*) or (multicent\* n2 study) or (multicent\* n2 studies) or (multicent\* n2 trial\*) ) or AB ( (multicent\* n2 design\*) or (multicent\* n2 study) or (multicent\* n2 studies) or (multicent\* n2 trial\*) )  
6914  
S78  
S35 or S36 or S37 or S38 or S39 or S40 or S41 or S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65 or S66 or S67 or S68 or S69 or S70 or S71 or S72 or S73 or S74 or S75 or S76 or S77  
1,607,235  
S77  
TI chang\* or collaborat\* or effectiv\* or impact or improv\* or team\*  
443,354  
S76  
TI ( interprofession\* or interinstitution\* or cooperat\* or co-operat\* or collaborat\* ) OR AB ( interprofession\* or interinstitution\* or cooperat\* or co-operat\* or collaborat\* ) OR MW ( interprofession\* or interinstitution\* or cooperat\* or co-operat\* or collaborat\* )  
61,037  
S75  
TI ( delegate or delegating or delegation ) OR AB ( delegate or delegating or delegation )  
1325  
S74  
TI ( (independent\* N3 decision) or (independent\* N3 decision-making) or (solo N3 decision) or (solo N3 decision-making) or (individual\* N3 decision) or (individual\* N3 decision-making) ) OR AB ( (independent\* N3 decision) or (independent\* N3 decision-making) or (solo N3 decision) or (solo N3 decision-making) or (individual\* N3 decision) or (individual\* N3 decision-making) )  
578  
S73  
TI ( upskill\* or up-skill\* ) OR AB ( upskill\* or up-skill\* )  
42  
S72  
TI ( (redistribut\* N3 task) or (redistribut\* N3 job) or (redistribut\* N3 work) or (redistribut\* N3 responsib\*) or (redistribut\* N3 role) or (redistribut\* N3 duty) or (redistribut\* N3 duties) or (redistribut\* N3 job function) ) OR AB ( (redistribut\* N3 task) or (redistribut\* N3 job) or (redistribut\* N3 work) or (redistribut\* N3 responsib\*) or (redistribut\* N3 role) or (redistribut\* N3 duty) or (redistribut\* N3 duties) or (redistribut\* N3 job function) )  
20  
S71  
TI ( (focus\* N3 task) or (focus\* N3 job) or (focus\* N3 work) or (focus\* N3 responsib\*) or (focus\* N3 role) or (focus\* N3 duty) or (focus\* N3 duties) or (focus\* N3 job function) ) OR AB ( (focus\* N3 task) or (focus\* N3 job) or (focus\* N3 work) or (focus\* N3 responsib\*) or (focus\* N3 role) or (focus\* N3 duty) or (focus\* N3 duties) or (focus\* N3 job function) )  
2652  
S70  
TI ( (limit N3 task) or (limit N3 job) or (limit N3 work) or (limit N3 responsib\*) or (limit N3 role) or (limit N3 duty) or (limit N3 duties) or (limit N3 job function) ) OR AB ( (limit N3 task) or (limit N3 job) or (limit N3 work) or (limit N3 responsib\*) or (limit N3 role) or (limit N3 duty) or (limit N3 duties) or (limit N3 job function) )  
89  
S69  
TI ( (replac\* N3 task) or (replac\* N3 job) or (replac\* N3 work) or (replac\* N3 responsib\*) or (replac\* N3 role) or (replac\* N3 duty) or (replac\* N3 duties) or (replac\* N3 job function) ) OR AB ( (replac\* N3 task) or (replac\* N3 job) or (replac\* N3 work) or (replac\*

N3 responsib\*) or (replac\* N3 role) or (replac\* N3 duty) or (replac\* N3 duties) or (replac\* N3 job function) )

167

S68

TI ( (reduc\* N3 task) or (reduc\* N3 job) or (reduc\* N3 work) or (reduc\* N3 responsib\*) or (reduc\* N3 role) or (reduc\* N3 duty) or (reduc\* N3 duties) or (reduc\* N3 job function) ) OR AB ( (reduc\* N3 task) or (reduc\* N3 job) or (reduc\* N3 work) or (reduc\* N3 responsib\*) or (reduc\* N3 role) or (reduc\* N3 duty) or (reduc\* N3 duties) or (reduc\* N3 job function) )

2171

S67

TI ( (increase# N3 task) or (increase# N3 job) or (increase# N3 work) or (increase# N3 responsib\*) or (increase# N3 role) or (increase# N3 duty) or (increase# N3 duties) or (increase# N3 job function) ) OR AB ( (increase# N3 task) or (increase# N3 job) or (increase# N3 work) or (increase# N3 responsib\*) or (increase# N3 role) or (increase# N3 duty) or (increase# N3 duties) or (increase# N3 job function) )

2972

S66

TI ( (extend\* N3 task) or (extend\* N3 job) or (extend\* N3 work) or (extend\* N3 responsib\*) or (extend\* N3 role) or (extend\* N3 duty) or (extend\* N3 duties) or (extend\* N3 job function) ) OR AB ( (extend\* N3 task) or (extend\* N3 job) or (extend\* N3 work) or (extend\* N3 responsib\*) or (extend\* N3 role) or (extend\* N3 duty) or (extend\* N3 duties) or (extend\* N3 job function) )

816

S65

TI ( (expand\* N3 task) or (expand\* N3 job) or (expand\* N3 work) or (expand\* N3 responsib\*) or (expand\* N3 role) or (expand\* N3 duty) or (expand\* N3 duties) or (expand\* N3 job function) ) OR AB ( (expand\* N3 task) or (expand\* N3 job) or (expand\* N3 work) or (expand\* N3 responsib\*) or (expand\* N3 role) or (expand\* N3 duty) or (expand\* N3 duties) or (expand\* N3 job function) )

1402

S64

TI ( (exchang\* N3 task) or (exchang\* N3 job) or (exchang\* N3 work) or (exchang\* N3 responsib\*) or (exchang\* N3 role) or (exchang\* N3 duty) or (exchang\* N3 duties) or (exchang\* N3 job function) ) OR AB ( (exchang\* N3 task) or (exchang\* N3 job) or (exchang\* N3 work) or (exchang\* N3 responsib\*) or (exchang\* N3 role) or (exchang\* N3 duty) or (exchang\* N3 duties) or (exchang\* N3 job function) )

112

S63

TI ( (chang\* N3 task) or (chang\* N3 job) or (chang\* N3 work) or (chang\* N3 responsib\*) or (chang\* N3 role) or (chang\* N3 duty) or (chang\* N3 duties) or (chang\* N3 job function) ) OR AB ( (chang\* N3 task) or (chang\* N3 job) or (chang\* N3 work) or (chang\* N3 responsib\*) or (chang\* N3 role) or (chang\* N3 duty) or (chang\* N3 duties) or (chang\* N3 job function) )

3864

S62

TI ( (advanc\* N2 skill) or (develop\* N2 skill) ) OR AB ( (advanc\* N2 skill) or (develop\* N2 skill) )

797

S61

TI ( (skill N2 mix\*) or (skill N2 combine) or (skill N2 combination) ) OR AB ( (skill N2 mix\*) or (skill N2 combine) or (skill N2 combination) )

625

S60

TI ( (service N3 mix\*) or (service N3 combine) or (service N3 combination) or (service level N3 mix\*) or (service level N3 combine) or (service level N3 combination) ) OR AB ( (service N3 mix\*) or (service N3 combine) or (service N3 combination) or (service level N3 mix\*) or (service level N3 combine) or (service level N3 combination) )

118

S59

TI practice pattern OR AB practice pattern

147  
S58  
TI patient N2 care  
6347  
S57  
TI ( (dental N2 diagnos\*) or (dental N2 exam\*) or (dental N2 treatment) or (dental N2 history) or history taking ) OR AB ( (dental N2 diagnos\*) or (dental N2 exam\*) or (dental N2 treatment) or (dental N2 history) or history taking )  
2762  
S56  
(MH "Patient Education")  
36,166  
S55  
(MH "Patient Care+")  
347,097  
S54  
(MH "Diagnosis+")  
597,325  
S53  
(MH "Staff Development")  
16,624  
S52  
(MH "Organizational Efficiency") OR (MH "Organizational Objectives")  
14,128  
S51  
(MH "Organizational Culture")  
8876  
S50  
(MH "Health Facility Administration")  
5782  
S49  
(MH "Decision Making, Organizational")  
2029  
S48  
(MH "Health Services Administration")  
830  
S47  
(MH "Health Services+")  
495,989  
S46  
TI dentist or dentistry or oral health\* or oral hygiene or diagnos\* or therapeut\* or endodonti\* or maxillofacial or orthodont\* or periodonti\* or prosthodonti\*  
515,218  
S45  
(MH "Professional Role")  
15,283  
S44  
(MH "Professional Autonomy")  
2782  
S43

(MH "Personnel Management+")  
147,197  
S42  
(MH "Economics, Dental")  
18  
S41  
(MH "Dental Facilities+")  
1061  
S40  
(MH "Tooth Diseases+")  
11,613  
S39  
(MH "Dental Care+")  
6166  
S38  
(MH "Dental Health Services")  
276  
S37  
(MH "Specialties, Dental+")  
4651  
S36  
(MH "Dentistry+")  
31,522  
S35  
(MH "Dentists")  
3683  
S34  
S24 or S25 or S26 or S27 or S28 or S31 or S32  
7339  
S33  
0  
S32  
AB ((oral surg\* N2 assistant) or (oral surg\* N2 hygienist) or (dental surg\* N2 assistant) or (dental surg\* N2 hygienist) or oral hygienist or dental health coordinator\* or dental health co-ordinator\* or oral health educator\* or oral hygiene educator\*)  
29  
S31  
AB oral hygienist or (oral health\* N2 hygienist) or (oral surger\* N2 hygienist) or (oral care N2 hygienist) or (oral health\* N2 assistant) or (oral surger\* N2 assistant) or (oral care N2 assistant) or (oral health\* N2 technician) or (oral surger\* N2 technician) or (oral care N2 technician) or (oral health\* N2 nurse) or (oral surger\* N2 nurse) or (oral care N2 nurse) or (oral health\* N2 therapist) or (oral surger\* N2 therapise) or (oral care N2 therapist) or (oral health\* N2 auxiliar\*) or (oral surger\* N2 auxiliar\*) or (oral care N2 auxiliar\*)  
35  
S30  
0  
S29  
0  
S28  
AB (dental N2 technician) or (dentist\* N2 technician) or (denturist N2 technician) or (endodonti\* N2 technician) or (maxillofacial N2 technician) or (orthodont\* N2 technician)  
25

S27

AB (dental N2 hygienist) or (dentist\* N2 hygienist) or (denturist N2 hygienist) or (endodonti\* N2 hygienist) or (maxillofacial N2 hygienist) or (orthodont\* N2 hygienist)

210

S26

AB (dental N2 assistant) or (dentist\* N2 assistant) or (denturist N2 assistant) or (endodonti\* N2 assistant) or (maxillofacial N2 assistant) or (orthodont\* N2 assistant)

28

S25

AB denturist or clinical dent\* technician or maxillofacial or orthodont\*

6472

S24

AB (dental N2 auxiliar\*) or (dentist\* N2 auxiliar\*) or dental therapist or oral health therapist

46

S23

S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22

5193

S22

TI complementary N4 dentistry OR AB complementary N4 dentistry

6

S21

TI ( (hygienist N4 advanc\*) or (hygienist N4 expand\*) or (hygienist N4 extend\*) or (hygienist N4 increase\*) or (hygienist N4 role) ) OR AB ( (hygienist N4 advanc\*) or (hygienist N4 expand\*) or (hygienist N4 extend\*) or (hygienist N4 increase\*) or (hygienist N4 role) )

64

S20

TI ( (dental worker N4 advanc\*) or (dental worker N4 expand\*) or (dental worker N4 extend\*) or (dental worker N4 increase\*) or (dental worker N4 role) ) OR AB ( (dental worker N4 advanc\*) or (dental worker N4 expand\*) or (dental worker N4 extend\*) or (dental worker N4 increase\*) or (dental worker N4 role) )

1

S19

TI ( (dental staff N4 advanc\*) or (dental staff N4 expand\*) or (dental staff N4 extend\*) or (dental staff N4 increase\*) or (dental staff N4 role) ) OR AB ( (dental staff N4 advanc\*) or (dental staff N4 expand\*) or (dental staff N4 extend\*) or (dental staff N4 increase\*) or (dental staff N4 role) )

3

S18

TI ( (dental nurs\* N4 advanc\*) or (dental nurs\* N4 expand\*) or (dental nurs\* N4 extend\*) or (dental nurs\* N4 increase\*) or (dental nurs\* N4 role) ) OR AB ( (dental nurs\* N4 advanc\*) or (dental nurs\* N4 expand\*) or (dental nurs\* N4 extend\*) or (dental nurs\* N4 increase\*) or (dental nurs\* N4 role) )

13

S17

TI ( (dent\* auxiliar\* N4 advanc\*) or (dent\* auxiliar\* N4 expand\*) or (dent\* auxiliar\* N4 extend\*) or (dent\* auxiliar\* N4 increase\*) or (dent\* auxiliar\* N4 role) ) OR AB ( (dent\* auxiliar\* N4 advanc\*) or (dent\* auxiliar\* N4 expand\*) or (dent\* auxiliar\* N4 extend\*) or (dent\* auxiliar\* N4 increase\*) or (dent\* auxiliar\* N4 role) )

1

S16

TI ( (dental assistant N4 advanc\*) or (dental assistant N4 expand\*) or (dental assistant N4 extend\*) or (dental assistant N4 increase\*) or (dental assistant N4 role) ) OR AB ( (dental assistant N4 advanc\*) or (dental assistant N4 expand\*) or (dental assistant N4 extend\*)

or (dental assistant N4 increase\*) or (dental assistant N4 role )

3

S15

TI ( (allied dental N4 advanc\*) or (allied dental N4 expand\*) or (allied dental N4 extend\*) or (allied dental N4 increase\*) or (allied dental N4 role ) OR AB ( (allied dental N4 advanc\*) or (allied dental N4 expand\*) or (allied dental N4 extend\*) or (allied dental N4 increase\*) or (allied dental N4 role )

1

S14

TI ( four hand\* dent\* or four-hand\* dent\* ) OR AB ( four hand\* dent\* or four-hand\* dent\* )

3

S13

AB (chairside N3 hygienist) or (“chair side” N3 hygienist) or (chair-side N3 hygienist) or (chairside N3 technician) or (“chair side” N3 technician) or (chair-side N3 technician) or (chairside N3 nurse) or (“chair side” N3 nurse) or (chair-side N3 nurse) or (chairside N3 assistance) or (“chair side” N3 assistance) or (chair-side N3 assistance) or (chairside N3 auxiliar\*) or (“chair side” N3 auxiliar\*) or (chair-side N3 auxiliar\*) or (chairside N3 personnel) or (“chair side” N3 personnel) or (chair-side N3 personnel) or (chairside N3 professional) or (“chair side” N3 professional) or (chair-side N3 professional) or (chairside N3 employee) or (“chair side” N3 employee) or (chair-side N3 employee) or (chairside N3 staff) or (“chair side” N3 staff) or (chair-side N3 staff) or (chairside N3 worker) or (“chair side” N3 worker) or (chair-side N3 worker)

3

S12

AB (chairside and dental) or (“chair side” and dental) or (chair-side and dental) or (chairside and assistant\*) or (“chair side” and assistant\*) or (chair-side and assistant\*) or (chairside and dentist) or (“chair side” and dentist) or (chair-side and dentist) or (chairside and dentistry) or (“chair side” and dentistry) or (chair-side and dentistry)

61

S11

TI (chairside and dental) or (“chair side” and dental) or (chair-side and dental) or (chairside and assistant\*) or (“chair side” and assistant\*) or (chair-side and assistant\*) or (chairside and dentist) or (“chair side” and dentist) or (chair-side and dentist) or (chairside and dentistry) or (“chair side” and dentistry) or (chair-side and dentistry)

45

S10

TI (oral hygienist or dental health coordinator\* or dental health co-ordinator\* or oral health educator\* or oral hygiene educator\*)

20

S9

TI (oral health\* N2 therapist) or (oral surger\* N2 therapist) or (oral care N2 therapist)

1

S8

TI (oral health\* N2 nurse) or (oral surger\* N2 nurse) or (oral care N2 nurse)

10

S7

TI (oral health\* N2 hygienist) or (oral surger\* N2 hygienist) or (oral care N2 hygienist)

3

S6

TI (dental N2 technician) or (dentist\* N2 technician) or (endodonti\* N2 technician) or (maxillofacial N2 technician) or (orthodont\* N2 technician)

12

S5

TI (dental N2 hygienist) or (dentist\* N2 hygienist) or (endodonti\* N2 hygienist) or (maxillofacial N2 hygienist) or (orthodont\* N2 hygienist)

195

S4  
 TI (dental N2 assistant) or (dentist\* N2 assistant) or (endodonti\* N2 assistant) or (maxillofacial N2 assistant) or (orthodont\* N2 assistant)  
 44  
 S3  
 TI (orthodonti\* N2 auxiliary) or (orthodonti\* N2 auxiliaries) or (orthodonti\* N2 therapist)  
 1  
 S2  
 TI (dental N2 auxiliar\*) or (dentist\* N2 auxiliar\*) or dental therapist or oral health therapist  
 40  
 S1  
 (MH "Dental Auxiliaries+")  
 4986

**Cochrane Register of Controlled Trials (CENTRAL)** [*The Cochrane Library*, Issue 9, Wiley]

- #1 MeSH descriptor: [Dental Auxiliaries] explode all trees
  - #2 MeSH descriptor: [Dental Staff] explode all trees
  - #3 (((dental or dentist\*) near/2 auxiliar\*) or dental therapist\* or oral health therapist\*):ti,ab,kw (Word variations have been searched)
  - #4 (denturist or clinical dent\* technician or maxillofacial technician\*)
  - #5 (orthodonti\* near/2 (auxiliary or auxiliaries or therapist\*))
  - #6 ((dental or dentist\* or denturist or endodonti\* or maxillofacial or orthodont\*) near/2 (assistant\* or hygienist\* or technician\* or technologist\*))
  - #7 ((oral health\* or oral surger\* or oral care) near/2 (hygienist\* or assistant\* or technician\* or nurse\* or therapist\* or auxiliar\*))
  - #8 oral hygienist\*
  - #9 ((oral surg\* or dental surg\*) near/2 (assistant\* or hygienist\*))
  - #10 ((chairside or "chair side" or chair-side) near/3 (hygienist\* or technician\* or nurse\* or dentist\* or dental or dentistry or assistant\* or assistance or assisting or auxiliar\* or personnel or professional\* or employee\* or staff or worker\*))
  - #11 (dentist near/3 (standin or "stand-in" or "stand in" or "stands in" or "standing in" or "stood in" or substitute or delegat\*))
  - #12 (allied dental or dental assistant\* or dent\* auxiliar\* or dental nurs\* or dental staff or dental technician\* or dental technologist\* or dental worker\* or hygienist\*)
  - #13 (complementary near/4 dentistry)
  - #14 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13
- Dissertations & Theses A&I** [ProQuest] 25/09/12

S11	S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10
S10	ab("orthodontic auxiliar*" OR "orthodontic assistant*" OR "orthodontic hygienist*" OR "orthodontic therapist*" OR "orthodontic nurse*" OR "orthodontic worker*" OR "orthodontic technician*" OR "orthodontic technologist*")
S9	ab("oral auxiliar*" OR "oral assistant*" OR "oral hygienist*" OR "oral therapist*" OR "oral nurse*" OR "oral worker*" OR "oral technician*" OR "oral technologist*")
S8	ab("oral health auxiliar*" OR "oral health assistant*" OR "oral health hygienist*" OR "oral health therapist*" OR "oral health nurse*" OR "oral health worker*" OR "oral health technician*" OR "oral health technologist*")

(Continued)

S7	ab("Dentists auxiliar*" OR "Dentists assistant*" OR "Dentists hygienist*" OR "Dentists therapist*" OR "Dentists nurse*" OR "Dentists technician*" OR "Dentists technologist*")
S6	ab("Dental auxiliar*" OR "Dental assistant*" OR "Dental hygienist*" OR "Dental therapist*" OR "Dental nurse*" OR "Dental worker*" OR "Dental technician*" OR "Dental technologist*")
S5	ti("Dental auxiliar*" OR "Dental assistant*" OR "Dental hygienist*" OR "Dental therapist*" OR "Dental nurse*" OR "Dental worker*" OR "Dental technician*" OR "Dental technologist*")
S4	ti(((dentist OR dentists OR dental OR moral OR orthodontic OR orthodontics) AND (auxiliary OR auxiliaries OR assistants OR assistant OR hygienist OR hygienists OR therapists OR hygienist OR nurse OR nurses OR technician OR technicians OR technologists OR technologist))

**EPOC Register (Reference Manager database)** Search run 26 September 2012

All Non-Indexed Fields: {dental} or {dentist} or {orthodont} or {denture} or {oral health}

AND

All Non-Indexed Fields: {assistant} or {auxiliar} or {hygienist} or {therapist} or {nurse} or {staff} or {worker} or {technician} or {technologist} or {personnel}

**EMBASE** [OvidSP] (1974-)

1	dental assistant/ 11,748
2	(((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ti 604
3	(denturist? or clinical dent\$ technician? or maxillofacial technician?).ti 65
4	(orthodonti\$ adj2 (auxiliary or auxiliaries or therapist?)).ti 20
5	((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ti 2737
6	((oral health\$ or oral surg\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$)).ti 30
7	oral hygienist?.ti. 20
8	((“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ti 32



(Continued)

9

((dentist? or dental) adj2 ((skill? or service?) adj2 mix\$)).ti,ab

6

10

((chairside or “chair side” or chair-side) adj3 (hygienist? or technician? or nurse? or dentist? or dental? or dentistry or assistant? or assistance or assisting or auxiliar\$ or personnel? or professional? or employee? or staff? or worker?)).ti,ab

152

11

(“four hand\$ dent\$” or “six hand\$ dent\$” or “four-hand\$ dent\$” or “six-hand\$ dent\$”).ti,ab

49

12

(dentist? adj3 (standin or “stand-in” or “stand in” or “stands in” or “standing in” or “stood in” or substitute? or delegat\$)).ti,ab

32

13

((allied dental or dental assistant? or dent\$ auxiliar\$ or dental nurs\$ or dental staff or dental technician? or dental technologist? or dental worker? or hygienist?) adj4 (advanc\$ or expand\$ or extend\$ or increase\$ or role?)).ti,ab

575

14

(complementary adj4 dentistry).ti,ab.

28

15

(dental health adj (cordinator? or co-ordinator?)).ti.

0

16

((oral health or oral hygiene) adj educator?).ti.

4

17

1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16

12,307

18

((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ab

385

19

(denturist? or clinical dent\$ technician? or maxillofacial technician?).ab

54

20

((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ab

2349

21

(oral hygienist? or ((oral health\$ or oral surger\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$))).ab

107

22

(“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ab

51

23

denturist?.ti,ab.

91

(Continued)

24  
(dental health adj (cordinator? or co-ordinator?)).ab.  
0  
25  
((oral health or oral hygiene) adj educator?).ab.  
17  
26  
18 or 19 or 20 or 21 or 22 or 23 or 24 or 25  
2784  
27  
dentist/  
19,494  
28  
exp dentistry/  
94,528  
29  
exp dental care/  
203,174  
30  
dental health/  
2367  
31  
exp tooth disease/  
178,456  
32  
exp dental facility/  
3381  
33  
group practice/ and dent\$.ti,ab.  
294  
34  
general practice/ and dent\$.ti,ab.  
3116  
35  
health economics/ and dent\$.ti,ab.  
899  
36  
exp personnel management/  
68,303  
37  
professional delegation/  
978  
38  
(dentist? or dentistry or oral health\$ or oral hygiene or diagnos\$ or therapeut\$ or endodonti\$ or maxillofacial or orthodont\$ or  
periodonti\$ or prosthodonti\$).ti  
779,031  
39  
exp health service/ or capacity building/ or “organization and management”/ or career mobility/  
3,566,846

(Continued)

40

exp diagnosis/ or exp patient care/ or patient education/

5,148,648

41

((dental adj2 (diagnos? or exam\$ or treatment? or history)) or history taking).ti,ab. or (patient adj2 care).ti

26,484

42

practice pattern?.ti,ab.

5945

43

((service? or service level?) adj3 (mix\$ or combine? or combination?)).ti,ab

1143

44

(skill? adj2 (mix\$ or combine? or combination?)).ti,ab.

1049

45

((advanc\$ or develop\$) adj2 skill?).ti,ab.

6855

46

((chang\$ or exchang\$ or expand\$ or extend\$ or increase? or reduc\$ or replac\$ or limit? or focus\$ or redistribut\$) adj3 (task? or job? or work? or responsib\$ or role? or duty or duties or job function?)).ti,ab

97,253

47

(upskill\$ or "up-skill\$").ti,ab.

137

48

((independent\$ or solo or individual\$) adj3 (decision or decision-making)).ti,ab

2407

49

(delegate? or delegation or delegating).ti,ab.

5350

50

(interprofession\$ or interinstitution\$ or cooperat\$ or co-operat\$ or collaborat\$).ti,ab,hw

290,160

51

(chang\$ or collaborat\$ or effectiv\$ or impact or improv\$ or team\$).ti

957,796

52

27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51

8,911,125

53

controlled clinical trial/ or controlled study/ or randomized controlled trial/

4,252,981

54

(book or conference paper or editorial or letter or review).pt. not randomized controlled trial/

4,041,388

55

(random sampl\$ or random digit\$ or random effect\$ or random survey or random regression).ti,ab. not randomized controlled trial/

(Continued)

53,525

56

(animal\$ not human\$.sh,hw.

3,903,735

57

53 not (54 or 55 or 56)

2,807,173

58

intervention?.ti. or (intervention? adj6 (clinician? or collaborat\$ or community or complex or DESIGN\$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv\$ or individuali?e? or individuali?ing or interdisciplin\$ or multicomponent or multi-component or multidisciplin\$ or multi-disciplin\$ or multifacet\$ or multi-facet\$ or multimodal\$ or multi-modal\$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib\$ or prescription? or primary care or professional\$ or provider? or regulatory or regulatory or tailor\$ or target\$ or team\$ or usual care)).ab

201,442

59

(pre-intervention? or preintervention? or “pre intervention?” or post-intervention? or postintervention? or “post intervention?”).ti,ab

12,713

60

(hospital\$ or patient?).hw. and (study or studies or care or health\$ or practitioner? or provider? or physician? or nurse? or nursing or doctor?).ti,hw

1,545,588

61

demonstration project?.ti,ab.

2285

62

(pre-post or “pre test\$” or pretest\$ or posttest\$ or “post test\$” or (pre adj5 post)).ti,ab

92,071

63

(pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab

804

64

trial.ti. or ((study adj3 aim?) or “our study”).ab.

839,592

65

(before adj10 (after or during)).ti,ab.

446,471

66

(time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month\$ or hour? or day? or “more than”)).ab

11,819

67

pilot.ti.

49,360

68

(multicentre or multicenter or multi-centre or multi-center).ti

39,360

69

random\$.ti,ab. or controlled.ti.

(Continued)

923,379

70

\*experimental design/ or \*pilot study/ or quasi experimental study/

6722

71

("quasi-experiment\$" or quasiexperiment\$ or "quasi random\$" or quasirandom\$ or "quasi control\$" or quasicontrol\$ or ((quasi\$ or experimental) adj3 (method\$ or study or trial or design\$))).ti,ab

118,874

72

("time series" adj2 interrupt\$).ti,ab.

1139

73

or/58-72

3,541,569

74

review.ti.

299,966

75

(animal\$ not human\$).sh,hw.

3,903,735

76

(rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti

1,546,481

77

or/74-76

4,557,977

78

73 not 77

3,174,210

79

17 and 57

182

80

26 and 52 and 57

203

81

17 and 78

1726

82

26 and 52 and 78

871

83

79 or 80 or 81 or 82

2214

84

(2012\* or 2013\*).em,dp,yr.

2,680,005

85

83 and 84

*(Continued)*

260

**Health Management Information Consortium (HMIC) [OvidSP] (1979-July 2012)**

1  
dental assistants/  
30  
2  
(((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ti  
36  
3  
(denturist? or clinical dent\$ technician? or maxillofacial technician?).ti  
0  
4  
(orthodonti\$ adj2 (auxiliary or auxiliaries or therapist?)).ti  
1  
5  
((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ti  
62  
6  
((oral health\$ or oral surg\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$)).ti  
0  
7  
oral hygienist?.ti.  
0  
8  
(("oral surg\$" or "dental surg\$") adj2 (assistant? or hygienist?)).ti  
6  
9  
((dentist? or dental) adj2 ((skill? or service?) adj2 mix\$)).ti,ab  
1  
10  
((chairside or "chair side" or chair-side) adj3 (hygienist? or technician? or nurse? or dentist? or dental? or dentistry or assistant? or assistance or assisting or auxiliar\$ or personnel? or professional? or employee? or staff? or worker?)).ti,ab  
2  
11  
("four hand\$ dent\$" or "six hand\$ dent\$" or "four-hand\$ dent\$" or "six-hand\$ dent\$").ti,ab  
0  
12  
(dentist? adj3 (standin or "stand-in" or "stand in" or "stands in" or "standing in" or "stood in" or substitute? or delegat\$)).ti,ab  
1  
13  
((allied dental or dental assistant? or dent\$ auxiliar\$ or dental nurs\$ or dental staff or dental technician? or dental technologist? or dental worker? or hygienist?) adj4 (advanc\$ or expand\$ or extend\$ or increase\$ or role?)).ti,ab  
11  
14  
(complementary adj4 dentistry).ti,ab.  
10  
15  
(dental health adj (cordinator? or co-ordinator?)).ti.  
0  
16  
((oral health or oral hygiene) adj educator?).ti.

0  
 17  
 (((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ab  
 27  
 18  
 (denturist? or clinical dent\$ technician? or maxillofacial technician?).ab  
 1  
 19  
 ((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ab  
 84  
 20  
 (oral hygienist? or ((oral health\$ or oral surger\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$))).ab  
 4  
 21  
 ((“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ab  
 9  
 22  
 denturist?.ti,ab.  
 0  
 23  
 (dental health adj (cordinator? or co-ordinator?)).ab.  
 0  
 24  
 ((oral health or oral hygiene) adj educator?).ab.  
 1  
 25  
 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24  
 173  
 26  
 limit 25 to yr=“2012 -Current”  
 5

**Latin American and Caribbean Health Sciences database** LILACS [Virtual Health Library] 25 September 2012

(TW:dentist OR TW:dentists OR TW:dental OR TW:oral OR TW: orthodontic OR TW:orthodontics) AND (TW:auxiliary OR TW: auxiliaries OR TW:assistants OR TW:assistant OR TW:hygienist OR TW:hygienists OR TW:therapists OR TW:hygienist OR TW: nurse OR TW:nurses OR TW:technician OR TW:technicians OR TW:technologists OR TW:technologist) AND ((PT:“randomized controlled trial” OR PT:“controlled clinical trial” OR PT:“multicenter study” OR MH:“randomized controlled trials as topic” OR MH:“controlled clinical trials as topic” OR MH:“multicenter study as topic” OR MH:“random allocation” OR MH:“double-blind method” OR MH:“single-blind method”) OR ((ensayo\$ OR ensayo\$ OR trial\$) AND (azar OR acaso OR placebo OR control\$ OR aleat\$ OR random\$ OR enmascarado\$ OR simpleciego OR ((simple\$ OR single OR duplo\$ OR doble\$ OR double\$) AND (cego OR ciego OR blind OR mask))) AND clinic\$)) AND NOT (MH:animals OR MH:rabbits OR MH:rats OR MH:primates OR MH: dogs OR MH:cats OR MH:swine OR PT:“in vitro”)

(TI:dentist OR TI:dentists OR TI:dental OR TI:oral OR TI: orthodontic OR TI:orthodontics) AND (TI:auxiliary OR TI:auxiliaries OR TI:assistants OR TI:assistant OR TI:hygienist OR TI:hygienists OR TI:therapists OR TI:hygienist OR TI:nurse OR TI:nurses OR TI:technician OR TI:technicians OR TI:technologists OR TI:technologist) AND NOT (MH:animals OR MH:rabbits OR MH: rats OR MH:primates OR MH:dogs OR MH:cats OR MH:swine OR PT:“in vitro”)

**MEDLINE** [OvidSP] (1946-, In process)

Top of Form



Bottom of Form  
Top of Form

1  
 exp Dental Auxiliaries/  
 12,062  
 2  
 exp dental staff/  
 2226  
 3  
 1 or 2  
 14,144  
 4  
 exp \*Dental Auxiliaries/ or exp \*Dental Staff/  
 8307  
 5  
 (((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ti  
 614  
 6  
 (denturist? or clinical dent\$ technician? or maxillofacial technician?).ti  
 68  
 7  
 (orthodonti\$ adj2 (auxiliary or auxiliaries or therapist?)).ti  
 19  
 8  
 ((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ti  
 2793  
 9  
 ((oral health\$ or oral surger\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$)).ti  
 34  
 10  
 oral hygienist?.ti.  
 21  
 11  
 ((“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ti  
 31  
 12  
 ((dentist? or dental) adj2 ((skill? or service?) adj2 mix\$)).ti,ab  
 7  
 13  
 ((chairside or “chair side” or chair-side) adj3 (hygienist? or technician? or nurse? or dentist? or dental? or dentistry or assistant? or assistance or assisting or auxiliar\$ or personnel? or professional? or employee? or staff? or worker?)).ti,ab  
 150  
 14  
 (“four hand\$ dent\$” or “six hand\$ dent\$” or “four-hand\$ dent\$” or “six-hand\$ dent\$”).ti,ab  
 44  
 15  
 (dentist? adj3 (standin or “stand-in” or “stand in” or “stands in” or “standing in” or “stood in” or substitute? or delegat\$)).ti,ab  
 33  
 16  
 ((allied dental or dental assistant? or dent\$ auxiliar\$ or dental nurs\$ or dental staff or dental technician? or dental technologist? or dental worker? or hygienist?) adj4 (advanc\$ or expand\$ or extend\$ or increase\$ or role?)).ti,ab

565  
 17  
 (complementary adj4 dentistry).ti,ab.  
 32  
 18  
 (dental health adj (cordinator? or co-ordinator?)).ti.  
 0  
 19  
 ((oral health or oral hygiene) adj educator?).ti.  
 4  
 20  
 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19  
 3929  
 21  
 (((dental or dentist\$) adj2 auxiliar\$) or dental therapist? or oral health therapist?).ab  
 381  
 22  
 (denturist? or clinical dent\$ technician? or maxillofacial technician?).ab  
 57  
 23  
 ((dental or dentist\$ or denturist? or endodonti\$ or maxillofacial or orthodont\$) adj2 (assistant? or hygienist? or technician? or technologist?)).ab  
 2289  
 24  
 (oral hygienist? or ((oral health\$ or oral surger\$ or oral care) adj2 (hygienist? or assistant? or technician? or nurse? or therapist? or auxiliar\$))).ab  
 101  
 25  
 ((“oral surg\$” or “dental surg\$”) adj2 (assistant? or hygienist?)).ab  
 39  
 26  
 denturist?.ti,ab.  
 92  
 27  
 (dental health adj (cordinator? or co-ordinator?)).ab.  
 0  
 28  
 ((oral health or oral hygiene) adj educator?).ab.  
 17  
 29  
 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28  
 2718  
 30  
 exp Dentists/ or exp Dentistry/ or exp Specialties, Dental/  
 342,518  
 31  
 Dental Health Services/ or Dentist’s Practice Patterns/  
 5193  
 32

exp Dental Care/ or exp Tooth Diseases/  
162,909  
33  
exp Dental Facilities/ or Partnership Practice, Dental/ or General Practice, Dental/ or Group Practice, Dental/ or Practice management,  
dental/  
22,149  
34  
Economics, Dental/  
1866  
35  
exp Personnel Management/ or “Personnel Staffing and Scheduling”/  
126,387  
36  
Personnel Delegation/ or Delegation, Professional/ or Professional autonomy/ or Professional role/  
16,882  
37  
(dentist? or dentistry or oral health\$ or oral hygiene or diagnos\$ or therapeut\$ or endodonti\$ or maxillofacial or orthodont\$ or  
periodonti\$ or prosthodonti\$).ti  
642,871  
38  
exp Health Services/ or Capacity building/ or exp “Organization and Administration”/ or Health Services Administration/ or Decision  
Making, Organizational/ or Health Facility Administration/ or Models, Organizational/ or Organizational Culture/ or Organizational  
Innovation/ or Organizational Objectives/ or Staff Development/ or Career Mobility/ or Efficiency, Organizational/  
2,323,613  
39  
exp Diagnosis/ or exp Patient care/ or “Patient Education as Topic”/  
7,030,054  
40  
((dental adj2 (diagnos? or exam\$ or treatment? or history)) or history taking).ti,ab. or (patient adj2 care).ti  
23,365  
41  
practice pattern?.ti,ab.  
4758  
42  
((service? or service level?) adj3 (mix\$ or combine? or combination?)).ti,ab  
986  
43  
(skill? adj2 (mix\$ or combine? or combination?)).ti,ab.  
913  
44  
((advanc\$ or develop\$) adj2 skill?).ti,ab.  
5607  
45  
((chang\$ or exchang\$ or expand\$ or extend\$ or increase? or reduc\$ or replac\$ or limit? or focus\$ or redistribut\$) adj3 (task? or job?  
or work? or responsib\$ or role? or duty or duties or job function?)).ti,ab  
84,643  
46  
(upskill\$ or “up-skill\$”).ti,ab.  
91

47  
((independent\$ or solo or individual\$) adj3 (decision or decision-making)).ti,ab  
2060  
48  
(delegate? or delegation or delegating).ti,ab.  
4498  
49  
(interprofession\$ or interinstitution\$ or cooperat\$ or co-operat\$ or collaborat\$).ti,ab,hw  
286,486  
50  
og.fs.  
375,592  
51  
ma.fs.  
56,093  
52  
(chang\$ or collaborat\$ or effectiv\$ or impact or improv\$ or team\$).ti  
800,923  
53  
30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52  
9,461,698  
54  
(randomized controlled trial or controlled clinical trial).pt. or randomized.ab. or clinical trials as topic.sh. or randomly.ab. or trial.ti  
898,352  
55  
exp animals/ not humans.sh.  
4,058,483  
56  
“comment on”.cm. or systematic review.ti. or literature review.ti. or editorial.pt. or meta-analysis.pt. or news.pt. or review.pt  
2,893,187  
57  
54 not (55 or 56)  
699,901  
58  
intervention?.ti. or (intervention? adj6 (clinician? or collaborat\$ or community or complex or DESIGN\$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv\$ or individuali?e? or individuali?ing or interdisciplin\$ or multicomponent or multi-component or multidisciplin\$ or multi-disciplin\$ or multifacet\$ or multi-facet\$ or multimodal\$ or multi-modal\$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib\$ or prescription? or primary care or professional\$ or provider? or regulatory or regulatory or tailor\$ or target\$ or team\$ or usual care)).ab  
166,871  
59  
(pre-intervention? or preintervention? or “pre intervention?” or post-intervention? or postintervention? or “post intervention?”).ti,ab  
10,339  
60  
(hospital\$ or patient?).hw. and (study or studies or care or health\$ or practitioner? or provider? or physician? or nurse? or nursing or doctor?).ti,hw  
722,791  
61

demonstration project\*.ti,ab.  
1994  
62  
(pre-post or “pre test\*” or pretest\* or posttest\* or “post test\*” or (pre adj5 post)).ti,ab  
66,017  
63  
(pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab  
612  
64  
trial.ti. or ((study adj3 aim?) or “our study”).ab.  
636,008  
65  
(before adj10 (after or during)).ti,ab.  
363,896  
66  
(“quasi-experiment\$” or quasiexperiment\$ or “quasi random\$” or quasirandom\$ or “quasi control\$” or quasicontrol\$ or ((quasi\$ or experimental) adj3 (method\$ or study or trial or design\$))).ti,ab,hw  
104,776  
67  
(“time series” adj2 interrupt\*).ti,ab,hw.  
1188  
68  
(time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month\* or hour? or day? or “more than”)).ab  
9452  
69  
pilot.ti.  
40,070  
70  
Pilot projects/  
84,339  
71  
(clinical trial or controlled clinical trial or multicenter study).pt  
651,202  
72  
(multicentre or multicenter or multi-centre or multi-center).ti  
29,945  
73  
random\*.ti,ab. or controlled.ti.  
782,391  
74  
(control adj3 (area or cohort? or compare? or condition or design or group? or intervention? or participant? or study)).ab. not  
(controlled clinical trial or randomized controlled trial).pt  
413,785  
75  
or/58-74  
3,139,679  
76  
“comment on”.cm. or review.ti,pt. or randomized controlled trial.pt

2,968,767  
77  
exp animals/ not humans.sh.  
4,058,483  
78  
(rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti  
1,370,937  
79  
76 or 77 or 78  
7,068,743  
80  
75 not 79  
2,159,218  
81  
3 and 57  
167  
82  
20 and 57  
72  
83  
29 and 53 and 57  
202  
84  
(4 or 20) and 80  
1249  
85  
29 and 53 and 80  
767  
86  
81 or 82 or 83 or 84 or 85  
1823  
87  
(2012\* or 2013\*).ed,dp,yr.  
2,465,614  
88  
86 and 87  
180

**Pan American Health Organization PAHO**[Virtual Health Library] 25 September 2012

(TW:dentist OR TW:dentists OR TW:dental OR TW:oral OR TW: orthodontic OR TW:orthodontics) AND (TW:auxiliary OR TW: auxiliaries OR TW:assistants OR TW:assistant OR TW:hygienist OR TW:hygienists OR TW:therapists OR TW:hygienist OR TW: nurse OR TW:nurses OR TW:technician OR TW:technicians OR TW:technologists OR TW:technologist) AND ((PT:"randomized controlled trial" OR PT:"controlled clinical trial" OR PT:"multicenter study" OR MH:"randomized controlled trials as topic" OR MH:"controlled clinical trials as topic" OR MH:"multicenter study as topic" OR MH:"random allocation" OR MH:"double-blind method" OR MH:"single-blind method") OR ((ensayo\$ OR ensayo\$ OR trial\$) AND (azar OR acaso OR placebo OR control\$ OR aleat\$ OR random\$ OR enmascarado\$ OR simpleciego OR ((simple\$ OR single OR duplo\$ OR doble\$ OR double\$) AND (cego OR ciego OR blind OR mask))) AND clinic\$)) AND NOT (MH:animals OR MH:rabbits OR MH:rats OR MH:primates OR MH: dogs OR MH:cats OR MH:swine OR PT:"in vitro")

(TI:dentist OR TI:dentists OR TI:dental OR TI:oral OR TI: orthodontic OR TI:orthodontics) AND (TI:auxiliary OR TI:auxiliaries OR TI:assistants OR TI:assistant OR TI:hygienist OR TI:hygienists OR TI:therapists OR TI:hygienist OR TI:nurse OR TI:nurses

OR TI:technician OR TI:technicians OR TI:technologists OR TI:technologist) AND NOT (MH:animals OR MH:rabbits OR MH:rats OR MH:primates OR MH:dogs OR MH:cats OR MH:swine OR PT:"in vitro")

**Science Citation Index, Social Science Citation Index, Conference Proceedings Citation Index - Science & Conference Proceedings Citation Index - Social Science & Humanities** [Web of Science] (1945 - )



# 61  
83  
#59  
# 60  
35  
#58  
# 59  
419  
#57 AND #41  
# 58  
245  
#42 AND #41  
# 57  
2,233,095  
#56 OR #55 OR #54 OR #53 OR #52 OR #51 OR #50 OR #  
49 OR #48 OR #47 OR #46 OR #45 OR #44 OR #43  
# 56  
745,025  
TS=((((control NEAR/3 (area or cohort\* or compar\* or condition  
or group\* or intervention\* or participant\* or study))))))  
# 55  
122,724  
TS=(((multicentre or multicenter or multi-centre or multi-cen-  
ter))))  
# 54  
8928  
TS=((((“time points” NEAR/3 (over or multiple or three or four  
or five or six or seven or eight or nine or ten or eleven or twelve  
or month\* or hour\* or day\* or “more than”))))))  
# 53  
1012  
TS=((((“time series” NEAR/2 interrupt\*))))  
# 52  
333,525  
TS=((((“quasi-experiment\*” or quasiexperiment\* or “quasi ran-  
dom\*” or quasirandom\* or “quasi control\*” or quasicontrol\* or (  
(quasi\* or experimental) NEAR/3 (method\* or study or trial or  
design\*))))))  
# 51  
675,919  
TS=((((study NEAR/3 aim\*) or “our study”))))  
# 50  
765  
TS=((((pre-workshop or post-workshop or (before NEAR/3  
workshop) or (after NEAR/3 workshop))))))  
# 49  
72,656  
TS=((((pre-post or “pre test\*” or pretest\* or posttest\* or “post  
test\*” or (pre NEAR/5 post))))))  
# 48

61,636  
 TI=(pilot)  
 # 47  
 630  
 TS=((((demonstration OR pilot) NEXT project\*))))  
 # 46  
 240,992  
 TS=(collaborativ\* OR collaboration\* OR tailored OR personal-  
 ised OR personalized)  
 # 45  
 5573  
 TS=(((intervention\* NEAR/6 (“family doctor\*” or “family physi-  
 cian\*” or “family practitioner\*” or “general practice\*” or “primary  
 care” or “usual care”))))  
 # 44  
 116,561  
 TS=(((intervention\* NEAR/6 (clinician\* or collaborat\* or com-  
 munity or complex or DESIGN\* or doctor\* or educational or fi-  
 nancial or GP or hospital\* or impact\* or improve\* or individuali\*  
 or individualizing or individualising or interdisciplin\* or multi-  
 component or multi-component or multidisciplin\* or multi-dis-  
 disciplin\* or multifacet\* or multi-facet\* or multimodal\* or multi-  
 modal\* or personalize\* or personalise\* or personalizing or person-  
 alising or pharmacies or pharmacist\* or pharmacy or physician\*  
 or practitioner\* or prescrib\* or prescription\* or professional\* or  
 provider\* or regulatory or tailor\* or target\* or team\*))))  
 # 43  
 101,939  
 TI=(intervention\*)  
 # 42  
 2,239,446  
 TS=(((random\* or blind\* or allocat\* or assign\* or trial\* or placebo\*  
 or crossover\* or cross-over\*))))  
 # 41  
 1720  
 #16 OR #39  
 Refined by: [excluding] Document Types=( LETTER OR BOOK  
 REVIEW OR NEWS ITEM OR EDITORIAL MATERIAL OR  
 REVIEW )  
 # 40  
 2007  
 #16 OR #39  
 # 39  
 1429  
 #38 AND #25  
 # 38  
 4,191,426  
 #37 OR #36 OR #35 OR #34 OR #33 OR #32 OR #31 OR #  
 30 OR #29 OR #28 OR #27 OR #26

# 37  
1,651,213  
Title=(chang\* or collaborat\* or effectiv\* or impact or improv\* or team\*)

# 36  
385,407  
Topic=(interprofession\* or interinstitution\* or cooperat\* or co-operat\* or collaborat\*)

# 35  
9089  
Topic=((delegate\* or delegation or delegating))

# 34  
8591  
Topic((((independent\* or solo or individual\*) NEAR/3 decision\*) ) )

# 33  
134  
Topic=((upskill\* or "up-skill\*"))

# 32  
229,008  
Topic((((chang\* or exchang\* or expand\* or extend\* or increase\* or reduc\* or replac\* or limit\* or focus\* or redistribut\*) NEAR/3 (task\* or job\* or work\* or responsib\* or role\* or duty or duties)))

# 31  
13,236  
Topic((((advanc\* or develop\*) NEAR/2 skill\*))

# 30  
1137  
Topic(((skill\* NEAR/2 (mix\* or combine\* or combination\*)))

# 29  
4382  
Topic=(service\* NEAR/4 (mix\* or combine\* or combination\*))

# 28  
5851  
Topic=("practice pattern\*")

# 27  
149,832  
Topic((((dental NEAR/2 (diagnos\* or exam\* or treatment\* or history)) or history taking) or (patient NEAR/2 care))

# 26  
1,994,427  
Topic=((dentist\* or dentistry or oral health\* or oral hygiene or diagnos\* or therapeut\* or endodonti\* or maxillofacial or orthodont\* or periodonti\* or prosthodonti\*))

# 25  
2212  
#24 OR #23 OR #22 OR #21 OR #20 OR #19 OR #18 OR #17

# 24

7  
 Topic=(“oral health educator\*” or “oral hygiene educator\*”)  
 # 23  
 3  
 Topic=(“dental health coordinator\*” OR “dental health co-ordinator\*”)  
 # 22  
 28  
 Topic=(denturist\*)  
 # 21  
 45  
 Topic=( (“oral surg\*” or “dental surg\*”) NEAR/2 (assistant\* or hygienist\*))  
 # 20  
 288  
 Topic=(oral NEAR/3 (hygienist\* or assistant\* or technician\* or nurse\* or therapist\* or auxiliar\*))  
 # 19  
 1526  
 Topic=( (“dental or dentist\* or denturist\* or endodonti\* or maxillofacial or orthodont\*”) NEAR/2 (assistant\* or hygienist\* or technician\* or technologist\*))  
 # 18  
 188  
 Topic=( (denturist\* or clinical dent\* technician\* or maxillofacial technician\*))  
 # 17  
 504  
 Topic=( (“dental or dentist\*”) NEAR/2 auxiliar\*) or dental therapist\* or oral health therapist\*)  
 # 16  
 973  
 #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1  
 # 15  
 1  
 Title=(“oral health educator\*” or “oral hygiene educator\*”)  
 # 14  
 1  
 Title=( (“dental health coordinator\*” OR “dental health co-ordinator\*”))  
 # 13  
 17  
 Topic=( (complementary NEAR/4 dentistry))  
 # 12  
 178  
 Topic=( (“allied dental” or “dental assistant\*” or “dental auxiliar\*” or “dental nurs\*” or “dental staff” or “dental technician\*” or “dental technologist\*” or “dental worker\*” or hygienist\*) NEAR/4 (ad-

vanc\* or expand\* or extend\* or increase\* or role\*))

# 11  
38  
Topic=((dentist\* NEAR/3 (standin or “stand-in” or “stand in” or “stands in” or “standing in” or “stood in” or substitute\* or delegat\*)  
))

# 10  
5  
Topic=((“four hand\* dent\*” or “six hand\* dent\*” or “four-hand\* dent\*” or “six-hand\* dent\*”))

# 9  
60  
Topic=(((chairside or “chair side” or chair-side) NEAR/3 (hygienist\* or technician\* or nurse\* or dentist\* or dental\* or dentistry or assistant\* or assistance or assisting or auxiliar\* or personnel\* or professional\* or employee\* or staff\* or worker\*)))

# 8  
21  
Topic=(((dentist\* or dental) NEAR/2 ((skill\* or service\*) NEAR/2 mix\*)))

# 7  
23  
Title=(((“oral surg\*” or “dental surg\*”) NEAR/2 (assistant\* or hygienist\*)))

# 6  
8  
Title=(“oral hygienist\*”)

# 5  
95  
Title=((oral NEAR/3 (hygienist\* or assistant\* or technician\* or nurse\* or therapist\* or auxiliar\*)))

# 4  
629  
Title=(((dental or dentist\* or denturist\* or endodonti\* or maxillofacial or orthodont\*) NEAR/2 (assistant\* or hygienist\* or technician\* or technologist\*)))

# 3  
10  
Title=((orthodonti\* NEAR/2 (auxiliary or auxiliaries or therapist\*)))

# 2  
23  
Title=((denturist\* or clinical dent\* technician\* or maxillofacial technician\*))

# 1  
6  
Title=(((dentist\* or dental) NEAR/2 ((skill\* or service\*) NEAR/2 mix\*)))

(TW:dentist OR TW:dentists OR TW:dental OR TW:oral OR TW: orthodontic OR TW:orthodontics) AND (TW:auxiliary OR TW: auxiliaries OR TW:assistants OR TW:assistant OR TW:hygienist OR TW:hygienists OR TW:therapists OR TW:hygienist OR TW: nurse OR TW:nurses OR TW:technician OR TW:technicians OR TW:technologists OR TW:technologist)

### Appendix 3. Trial register searches

Trial registers: Searched 12 November 2013

**ClinicalTrials.gov** - [clinicaltrials.gov](http://clinicaltrials.gov) - added since 25 September 2012

“dental auxiliary” OR “dental auxiliaries” - 0  
“dental assistant” OR “dental assistants” - 8  
“dental hygienists” OR “dental hygienist” - 0  
“dental therapist” OR “dental therapists” - 0  
“dental technician” OR “dental technicians” - 0  
“dental technologist” OR “dental technologists” - 0  
“oral auxiliary” OR “oral auxiliaries” - 0  
“oral assistant” OR “oral assistants” - 3  
“oral hygienist” OR “oral hygienists” - 0  
“oral therapist” OR “oral therapists” - 1  
“oral health nurse” OR “oral health nurses” - 0  
“oral health technician” OR “oral health technicians” - 0  
“oral health technologist” OR “oral health technologists” - 0  
“oral health auxiliary” OR “oral health auxiliaries” - 0  
“oral health assistant” OR “oral health assistants” - 1  
Duplicates removed = 3

**WHO International Clinical Trials Registry Platform** [apps.who.int/trialsearch/](http://apps.who.int/trialsearch/) added since 25 September 2012

In title: “dental auxiliary” OR “dental auxiliaries” OR “dental assistant” OR “dental assistants” OR “dental hygienist” OR “dental hygienists” OR “dental therapist” OR “dental therapists” OR “dental nurse” OR “dental nurses” OR “dental worker” OR “dental workers” OR “dental technician” OR “dental technicians” OR “dental technologist” OR “dental technologists” - 0

In title: “oral auxiliary” OR “oral auxiliaries” OR “oral assistant” OR “oral assistants” OR “oral hygienist” OR “oral hygienists” OR “oral therapist” OR “oral therapists” OR “oral nurse” OR “oral nurses” OR “oral worker” OR “oral workers” OR “oral technician” OR “oral technicians” OR “oral technologist” OR “oral technologists” - 0

In title: “oral health auxiliary” OR “oral health auxiliaries” OR “oral health assistant” OR “oral health assistants” OR “oral health hygienist” OR “oral health hygienists” OR “oral health therapist” OR “oral health therapists” OR “oral health nurse” OR “oral health nurses” OR “oral health worker” OR “oral health workers” OR “oral health technician” OR “oral health technicians” OR “oral health technologist” OR “oral health technologists” - 0

In title: “orthodontic auxiliary” OR “orthodontic auxiliaries” OR “orthodontic assistant” OR “orthodontic assistants” OR “orthodontic hygienist” OR “orthodontic hygienists” OR “orthodontic therapist” OR “orthodontic therapists” OR “orthodontic nurse” OR “orthodontic nurses” OR “orthodontic worker” OR “orthodontic workers” OR “orthodontic technician” OR “orthodontic technicians” OR “orthodontic technologist” OR “orthodontic technologists” - 0

### Appendix 4. Data extraction form

#### Data collection form

Intervention review - RCTs and non-RCTs

**DCPs for dental care traditionally provided by dentists**

---

**Review title or ID**

---

---

---

**Study ID** (*surname of first author and year first full report of study was published e.g. Smith 2001*)

---

---

---

**Report IDs of other reports of this study** (*e.g. duplicate publications, follow-up studies*)

---

---

---

**Notes:**

---

## **1. General Information**

---

<b>Date form completed</b>	
<b>Name/ID of person extracting data</b>	
<b>Report title</b>	
<b>Report ID</b>	
<b>Reference details</b>	
<b>Report author contact details</b>	
<b>Publication type</b>	
<b>Study funding source</b>	
<b>Possible conflicts of interest</b>	
<b>Notes:</b>	

---

## **2. Eligibility**

Study Characteristics	Review Inclusion Criteria	Yes	No	Unclear	Location in text
Type of study	Randomised Controlled Trial				
	Controlled Clinical Trial				
	Controlled Before and After Study <ul style="list-style-type: none"> <li>• Contemporaneous data collection</li> <li>• Comparable control site</li> <li>• At least 2 x intervention and 2 x control clusters</li> </ul>				
	Interrupted Time Series <ul style="list-style-type: none"> <li>• At least 3 time points before and 3 after the intervention</li> <li>• Clearly defined intervention point</li> </ul>				
	Other design (specify):				
Participants					
Types of intervention					
Types of outcome measures					
INCLUDE	EXCLUDE				
Reason for exclusion					
Notes:					

**DO NOT PROCEED IF STUDY EXCLUDED FROM REVIEW**

### 3. Population and setting



	Description	Location in text)
Population description		
Setting		
Inclusion criteria		
Exclusion criteria		
Method/s of recruitment of participants		
Informed consent obtained	Yes/No/Unclear	
Notes:		

#### 4. Methods

	Descriptions as stated in report/ paper	Location in text
Aim of study		
Design		
Unit of allocation		
Start date		
End date		
Duration of participation		
Ethical approval needed/ obtained for study	Yes No Unclear	
Notes:		

#### 5. Risk of Bias assessment

Domain	Risk of bias			Support for judgement	Location in text
	Low risk	High risk	Unclear		
Random sequence generation					
Allocation concealment					
Blinding of participants and personnel				Outcome group: All/	
				Outcome group:	
Blinding of outcome assessment				Outcome group: All/	
				Outcome group:	
Incomplete outcome data					
Selective outcome reporting?					
Other bias					
Notes:					

## 6. Participants

	Description as stated in report/paper	Location in text
Total no. randomised		
Clusters		
Baseline imbalances		
Withdrawals and exclusions		
Age		
Sex		

(Continued)

Race/Ethnicity		
Severity of illness		
Co-morbidities		
Other treatment received		
Other relevant sociodemographics		
Subgroups measured		
Subgroups reported		
Notes:		

## 7. Intervention groups

### Intervention Group 1

	Description as stated in report/paper	Location in text
Group name		
No. randomised to group		
Theoretical basis		
Description		
Duration of treatment period		
Timing		
Delivery		
Providers		
Co-interventions		
Economic variables		
Resource requirements to replicate intervention		

(Continued)

Notes:

## 8. Outcomes

### Outcome 1

	Description as stated in report/ paper	Location in text
Outcome name	ART survival rates	
Time points measured		
Time points reported		
Outcome definition		
Person measuring/ reporting		
Unit of measurement		
Scales: upper and lower limits		
Is outcome/tool validated?	Yes No Unclear	
Imputation of missing data		
Assumed risk estimate		
Power		
Notes:		

### Outcome 2

	Description as stated in report/ paper	Location in text
Outcome name	Fissure sealant retention rates	
Time points measured		

(Continued)

<b>Time points reported</b>		
<b>Outcome definition</b>		
<b>Person measuring/ reporting</b>		
<b>Unit of measurement</b>		
<b>Scales: upper and lower limits</b>		
<b>Is outcome/tool validated?</b>	Yes No Unclear	
<b>Imputation of missing data</b>		
<b>Assumed risk estimate</b>		
<b>Power</b>		
<b>Notes:</b>		

### Outcome 3

	Description as stated in report/ paper	Location in text
<b>Outcome name</b>	Fissure sealant recurrent caries	
<b>Time points measured</b>		
<b>Time points reported</b>		
<b>Outcome definition</b>		
<b>Person measuring/ reporting</b>		
<b>Unit of measurement</b>		
<b>Scales: upper and lower limits</b>		
<b>Is outcome/tool validated?</b>	Yes No Unclear	
<b>Imputation of missing data</b>		
<b>Assumed risk estimate</b>		

(Continued)

<b>Power</b>			
<b>Notes:</b>			

**9. Results**

*Dichotomous outcome - ART survival rates*

	Description as stated in report/paper									Location in text	
<b>Com- parison</b>											
<b>Out- come</b>											
<b>Sub- group</b>											
<b>Time point</b>											
One- surface Baseline	Loss	Gap	caries	Loss	Gap	Caries		Loss	Gap	Caries	
12 months											
Multi- surface Baseline											
12 months											
<b>No. missing partici- pants and rea- sons</b>											
<b>No. par- tici- pants moved</b>											

(Continued)

<b>from other group and reasons</b>		
<b>Any other results reported</b>		
<b>Unit of analysis</b>		
<b>Statistical methods used and appropriateness of these methods</b>		
<b>Reanalysis required?</b>	Yes No Unclear	
<b>Reanalysis possible?</b>	Yes No Unclear	
<b>Reanalysed results</b>		
<b>Notes:</b>		

	Description as stated in report/paper								Location in text
<b>Comparison</b>									
<b>Outcome</b>									
<b>Subgroup</b>									
<b>Time point</b>									
<b>Results</b>	<b>DCP</b>				<b>Dentist</b>				
Baseline	No. of sites	Complete retention/loss	Partial retention	Total	No. of sites	Complete retention/loss	Partial retention	Total	
6 months									
12 months									
18 months									
24 months									
36 months									
48 months									
<b>No. missing participants and reasons</b>									
<b>No. participants moved from other group and reasons</b>									
<b>Any other results reported</b>									



(Continued)

Unit of analysis		
Statistical methods used and appropriateness of these methods		
Reanalysis required?	Yes No Unclear	
Reanalysis possible?	Yes No Unclear	
Reanalysed results		
Notes:		

Dichotomous outcomes - preventive resin sealant retention rates

## 9. Applicability

Have important populations been excluded from the study?	Yes No Unclear	
Is the intervention likely to be aimed at disadvantaged groups?	Yes No Unclear	
Does the study directly address the review question?	Yes No Unclear	
Notes:		

## 10. Other information

	Description as stated in report/paper	Location in text
Key conclusions of study authors		
References to other relevant studies		
Correspondence required for further study information		
Notes:		

## Appendix 5. Outcomes defined in the protocol

We planned to consider the following primary and secondary outcomes.

### Primary outcomes

We planned to include performance of three types of activities as the main outcomes:

#### 1. Performance in history taking, diagnosis and treatment planning

We planned to assess performance against a pre-determined 'gold standard'. Examples of such activities include:

- history taking, including medical, dental and social histories;
- diagnosis of dental diseases and conditions:
  - presence of caries. Clinical indices to include dmft/DMFT and dmfs/DMFS, Katz index and radiographic diagnosis;
  - plaque scores and bleeding index (indices to include Silness-Loe and Orton Jones);
  - periodontal disease status. Clinical indices to include: pocket charting, bleeding indices, CPITN, BPE and radiographic diagnosis);
  - tooth surface loss (to include Smith and Knight and Eccles indices);
  - oral cancer and pre-malignant disease;
- treatment planning.

#### 2. Performance in technical procedures

Examples of such activities include:

- radiograph taking. Assessment of performance will be against a pre-determined acceptability thresholds (e.g. 70% excellent, 20% diagnostically acceptable, 10% unacceptable);
- provision of fissure sealants and preventive resin restorations. Measurements of performance to include:
  - survival rates in time units;
- provision of dental restorations. Measurements of performance to include:
  - cavity preparation comparisons of marginal adaptation, smoothness, contact points, anatomical form of restorations, where ratings will be categorised (e.g. excellent, acceptable, unacceptable);
  - survival rates in time units;
- treatments of periodontal disease. Measurements of performance to include:
  - proportion free of calculus, percentage reduction in bleeding on probing, attachment gain and reduction in pocket depth;
- prosthodontic treatment. Measurements to include:
  - assessment of technical aspects such as fit and occlusal contact. Participant self assessment of comfort and aesthetics;
- orthodontic treatment. Measures to include:
  - assessment of the alignment of bracket, bracket retention rates;

- impression taking. Measures to include:
  - assessment of the accuracy of impressions, where ratings will be categorised (e.g. excellent, acceptable, unacceptable);
- placement of rubber dam. Measures to include:
  - extent of moisture isolation, dam retention, where ratings will be categorised (e.g. excellent, acceptable, unacceptable);
- tooth whitening
  - assessment of the effectiveness of tooth whitening, the degree of whitening achieved measured by the standard VITA shade guide.

### **3. Performance in oral health education and other health promotion measures**

Examples of such activities include:

- delivering oral health education and other oral health promotion measures such as smoking cessation. Measurement of performance to include:
  - increase in awareness/knowledge of participants over different time scales;
  - change in behaviour (e.g. change in diet, toothbrushing frequency and technique, use of oral hygiene adjuncts, reduction in plaque scores and bleeding indices, tobacco use quit rates).

### **Secondary outcomes**

We planned to consider five other areas of outcome:

#### **1. Participant perspectives of care**

- Participant satisfaction with care and other participant-rated outcome measures. Performance measurement will include validated patient satisfaction measures (e.g. Dental Visit Satisfaction Scale and Dental Satisfaction Questionnaire).
- Receipt of complaints.

#### **2. Adverse events**

We will extract data on adverse events when reported.

#### **3. Evidence-based practice**

- Adherence to evidence-based guidelines.

#### **4. Measures of resource use**

- Number of participants examined or treated per clinical session.
- Frequency and length of appointments.
- Number and type of treatment undertaken per appointment and frequency of review appointments following treatment.

#### **5. Measures of cost and cost effectiveness**

- Total cost per person of treatment in the control and intervention arms.
- Net cost of the intervention.
- Net savings of the intervention or the net cost per unit outcome gained (incremental cost effectiveness ratio).

The gold standard analytical perspective for costs is that of a societal viewpoint, taking into account all resource use, costs and outcomes to the practice, health service funders, other health and social care providers, patients and families. However, we anticipate that the majority of studies will use a more focused perspective of the practice. We will report resource use, costs, outcomes and incremental cost effectiveness ratios for the following perspectives: practice, dental health care funders, patient and family. We anticipate that these will be the key components of the societal perspective.

### **Impact on access and equity of access**

Measures of access could be at a practice or service level. At a practice level, we anticipated this could include comparisons of capacity before and after the introduction of skill-mix, for example, the number of patients receiving care before and after the introduction of greater skill-mix and distinguish between the numbers receiving care by dental auxiliaries and the number receiving care by the team as a whole. At a service level, we anticipated this could include any impact on access and inequities in access across a population, before and after greater skill-mix has been introduced. We planned to perform subgroup analyses of the impact on access and equity of access in high-, medium- and low-income countries if the data had allowed.

### **Appendix 6. Economic evaluation defined in the protocol**

We planned to present the results of the economic measures included in an intervention study in tables to summarise the characteristics of any economic component included (e.g. setting, analytic perspective and time horizon) (Higgins 2011). We planned to report costs in US dollars. Where costs are reported in other currencies, we would have converted them to US dollars using purchasing power parities for the relevant time period. We would have inflated all costs to a common index year. We would have presented mean service use and costs at baseline and follow up in a narrative summary, along with authors' estimates of variance. We would have also presented mean total costs in the narrative summary, with estimates of net costs of savings or incremental cost effectiveness ratios. The narrative summary would have also included information about the study design and quality of the study and reliability and robustness of the results. This would have used the critical appraisal criteria developed for the production of the National health service Economic Evaluation Database structured abstracts of full economic evaluation studies. We anticipated that there would be few studies reporting economic measures and that for the included studies, there would be significant heterogeneity in setting, timing and data collected. For this reason, we did not expect the results of the economic measures to be pooled or subject to meta-analysis.

## **CONTRIBUTIONS OF AUTHORS**

Development of protocol based on the latest Cochrane guidance: Tom Dyer (TD), Paul Brocklehurst (PB), Anne-Marie Glenny (AMG), Linda Davies (LD), Martin Tickle (MT) Peter G Robinson (PGR).

Identification of studies: TD, PGR, Ansy Isaac (AI).

Data extraction: TD, PGR, AI.

Assessment of risk of bias: TD, PGR, AI.

Data input/synthesis: TD, PGR, AI.

Quality assessment of included studies: TD, PGR.

Writing of conclusions: TD, PGR, PB.

## **DECLARATIONS OF INTEREST**

Peter Robinson was the Director of the programme in Hygiene and Therapy, Sheffield. Both he and Tom Dyer have taught both dental and hygiene and therapy students.

## SOURCES OF SUPPORT

### Internal sources

- EPOC UK Satellite/NIHR, UK.

### External sources

- NIHR Cochrane Programme Grant, UK.

This supports EPOC reviews relevant to the NHS.

## DIFFERENCES BETWEEN PROTOCOL AND REVIEW

There were a number of changes in the review team; Jenny Godson, Derek Richards, Tim Newton and Zoe Marshman left and Ansy Isaac joined.

For reasons of readability, we have abridged the outcomes considered in the review. We have produced a full list of outcomes that we planned to consider in [Appendix 5](#).

As there were only five studies, all at high risk of bias, included in the review, we did not undertake an assessment of heterogeneity or reporting bias. In addition, given the heterogeneity in methods and results, lack of information on training of participants and technological gaps in the studies, we did not undertake quantitative data syntheses (including meta-analysis or forest plot of effect sizes), subgroup analyses or qualitative narrative synthesis. Instead, we provided a summary of the individual studies.

We had planned to undertake an economic evaluation ([Appendix 6](#)), but none of the included studies included economic measures.

## INDEX TERMS

### Medical Subject Headings (MeSH)

\*Dental Atraumatic Restorative Treatment; \*Dental Auxiliaries; \*Dentists; Dental Care [\*standards]; Dental Caries [\*prevention & control]; Dental Restoration Failure [statistics & numerical data]; Pit and Fissure Sealants [\*therapeutic use]; Randomized Controlled Trials as Topic; Time Factors; Treatment Outcome

### MeSH check words

Humans