

# Staff-led interventions for improving oral hygiene in patients following stroke

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# Staff-led interventions for improving oral hygiene in patients following stroke (Review)

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[Intervention Review]

# Staff-led interventions for improving oral hygiene in patients following stroke

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## ABSTRACT

### Background

For people with limitations due to neurological conditions such as stroke, the routine practice of oral health care (OHC) may become a challenge. Evidence-based supported oral care intervention is essential for this patient group.

### Objectives

To compare the effectiveness of staff-led OHC interventions with standard care for ensuring oral hygiene for individuals after a stroke.

### Search methods

We searched the trials registers of the Cochrane Stroke Group (last searched April 2010) and Cochrane Oral Health Group (last searched May 2010), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* May 2010), MEDLINE (1966 to May 2010), CINAHL (1982 to May 2010), Research Findings Electronic Register (February 2006), National Research Register (Issue 1, 2006), ISI Science and Technology Proceedings (July 2010), Dissertation Abstracts and Conference Papers Index (August 2005), Zetoc (2000 to July 2010) and Proquest Dissertations and Theses (2000 to July 2010). We scanned reference lists from relevant papers and contacted authors and researchers in the field.

### Selection criteria

Randomised controlled trials that evaluated one or more interventions designed to improve oral hygiene. We included trials with a mixed population provided we could extract the stroke-specific data.

### Data collection and analysis

Two review authors independently classified trials according to the inclusion and exclusion criteria, assessed the trial quality and extracted data. We sought clarification from study authors when required.

**Main results**

We included three studies involving 470 participants. These trials were of limited comparability evaluating an OHC education training programme, a decontamination gel and a ventilator-associated pneumonia bundle of care augmented with an OHC component by comparing them to a deferred intervention, a placebo gel or standard care respectively. The OHC educational intervention demonstrated a significant reduction in denture plaque scores up to six months ($P < 0.00001$) after the intervention but not dental plaque. Staff knowledge ($P = 0.0008$) and attitudes ($P = 0.0001$) towards oral care also improved. The decontamination gel reduced the incidence of pneumonia amongst the intervention group ($P = 0.03$).

**Authors' conclusions**

Based on two trials involving a small number of stroke survivors, OHC interventions can improve staff knowledge and attitudes, the cleanliness of patients' dentures and reduce the incidence of pneumonia. Improvements in the cleanliness of patients teeth were not observed. Further evidence relating to staff-led oral care interventions is severely lacking.

## PLAIN LANGUAGE SUMMARY

**Staff-led interventions for improving oral hygiene in patients following stroke**

A clean mouth not only feels good but the practice of oral hygiene (removing dental plaque and traces of food) is a crucial factor in maintaining the health of the mouth, teeth and gums. A clean and healthy mouth will also prevent pain or discomfort and allow people to eat a range of nutritious foods. Maintaining good oral hygiene may be difficult after a stroke and healthcare staff may have to assist in providing such care. This review of three studies involving 470 participants found little evidence of how this care is best delivered. Information on a small number of nursing home residents who had a stroke (67 participants from a larger trial) showed that training nursing staff improved their knowledge of oral care and resulted in improved oral hygiene in their patients. Another trial demonstrated the beneficial impact of a decontamination gel on the incidence of pneumonia amongst patients in a stroke ward. However, there was no other information on how best to provide oral hygiene and more studies are urgently needed.

## BACKGROUND

For people with limitations due to disabilities caused by neurological conditions such as stroke, the routine practice of oral care presents a considerable challenge. Physical weakness, lack of co-ordination and the cognitive problems that can accompany a stroke may make it impossible for a person to maintain good oral hygiene on their own (Arai 2003). Medication prescribed for patients after stroke may further impact on oral health (Janket 2003) resulting in, for example, dry mouth, oral ulcers and stomatitis (ADA Report 2003; Ghezzi 2000). For those with swallowing difficulties, oral clearance may be compromised and medication or nutritional supplements may be administered in a syrup consistency (sugar-based) that further predisposes teeth to dental decay (Durward 1997). Stroke may change an individual's facial muscles and oral sensation resulting in poorly controlled dentures and altered chewing and oral clearance patterns. Together with swallowing impairment, all these factors impact on an individual's nutritional intake (Bailey 2004), which in turn has a negative impact on rehabilitation and other functional outcomes (Stroke Guidelines 2004).

A link between periodontitis and the incidence of stroke has been suggested, indicating that some individuals admitted to a stroke unit may have pre-existing oral health problems (Dörfer 2004; Scannapieco 2003). After a stroke, many patients are reliant on nursing staff to assist them with oral hygiene. Recent studies have highlighted the poor state of oral health of individuals within supported care (Hally 2003; Simons 1999). Despite indications that healthcare staff are interested in improving this aspect of care (Wårdh 1997), their knowledge has been found lacking (Adams 1996; Preston 2000). Oral care is not perceived as a care priority (Wårdh 1997; Wårdh 2000), is usually delegated to nursing care assistants (Boyle 1992; Wårdh 1997) and there are few training or care policies in place (Preston 2000; Talbot 2005; Wårdh 2000). Some nursing staff have even expressed a strong dislike for oral care (Boyle 1992; Wårdh 1997).

The complementary role that various members of the multidisciplinary stroke team could play in the provision of oral care has

been outlined, including dental health, dietetic and occupational therapy professionals (Bailey 2004; Bellomo 2005; Imm 1983; Sweeney 1998). As in other aspects of post-stroke care, rehabilitation goals that aim to maintain or regain independent oral care skills would be appropriate in the stroke care setting (Bellomo 2005). Current descriptions of oral care interventions incorporate staff knowledge, assessment, equipment, agents, planned intervention, monitored nutritional intake and specialist referral components (Freer 2000; Griffiths 2002; Milligan 2001; Roberts 2000). However, the dearth of evidence underpinning staff-led oral care practice in health care settings has been highlighted (Bailey 2005; Milligan 2001).

# OBJECTIVES

To compare the effectiveness of staff-led oral care interventions with standard care for ensuring oral hygiene for individuals after a stroke.

# METHODS

## Criteria for considering studies for this review

### Types of studies

We identified randomised controlled trials (RCTs) that evaluated one or more interventions designed to improve oral health. We included trials that recruited from a healthcare setting with a mixed population provided it was possible to extract the data specific to the individuals post-stroke.

### Types of participants

We included all patients with a diagnosis of stroke receiving assisted oral care within a healthcare facility.

### Types of interventions

We included trials that evaluated an intervention designed to improve routine assisted oral care in a healthcare setting. The interventions fell into the following broad categories.

- Assessment tool.
- Equipment (for example, toothbrush).
- Agent (for example, mouthwash).
- Staff training.
- Oral hygiene promotion.

### Types of outcome measures

A comprehensive, valid and reliable measurement tool for assessing oral hygiene is currently lacking. We recorded a range of outcomes that correspond to different aspects of oral hygiene and oral healthcare delivery.

#### Primary outcomes

1. Dental plaque: plaque scale
2. Denture plaque: denture cleanliness scale

#### Secondary outcomes

1. Patient satisfaction: care received, oral comfort and appearance
2. Presence of oral disease: gingivitis; denture-induced stomatitis; periodontal disease
3. Staff oral health knowledge and attitudes

In keeping with current Cochrane Stroke Group guidelines, it was necessary to reduce the number of primary outcomes identified within the protocol to two. We originally listed gingivitis as a primary outcome, but on reflection it was more appropriate to include it as an oral disease outcome, together with denture-induced stomatitis and periodontal disease. We acknowledge that making this post-hoc change following publication of the protocol may lead to bias. We recorded outcome measurements taken up to 12 months post-intervention. We took dental data of included studies at the patient level.

## Search methods for identification of studies

See the 'Specialized register' section in the Cochrane Stroke Group module.

We searched the trials registers of the Cochrane Stroke Group (last searched April 2010) and the Cochrane Oral Health Group (last searched May 2010). In addition, we searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* May 2010) (Appendix 1), MEDLINE (1966 to May 2010) (Appendix 2), and CINAHL (1982 to May 2010) (Appendix 3). For the previous version of this review we searched the Research Findings Electronic Register (to February 2006), and the National Research Register (Issue 1, 2006) These sources are no longer available and so our search update did not include these.

We developed the search strategy for CINAHL in consultation with the Trials Search Co-ordinators of the Cochrane Stroke Group and the Cochrane Oral Health Group and adapted it for the other databases.

In an effort to identify further published, unpublished and ongoing studies we searched ISI Science and Technology Proceedings (July 2010), Dissertation Abstracts and Conference Papers Index (searched August 2005), Zetoc (2000 to 2010) and Proquest Dissertations and Theses (2000 to July 2010). We scanned reference

lists from relevant papers and contacted authors and researchers in the field. We did not handsearch any journals or conference proceedings in addition to those already searched on behalf of The Cochrane Collaboration.

We searched for trials in all languages and planned to arrange translation of relevant papers published in languages other then English.

## Data collection and analysis

### Selection of studies

We considered investigative trials that addressed staff-led oral care interventions for inclusion on the basis of study design, interventions and outcome measures used. All RCTs that examined oral care interventions for elderly groups (which had the potential to have included individuals post stroke) were eligible for inclusion. Two review authors (DF, MB) screened references generated by the search strategy, with another review author screening a subset of references (up to a publication date of 2002) (VM). We did not identify any additional trials by this repeated screen. Two review authors independently evaluated relevant trials (based on the full texts). They confirmed the inclusion of the study within the review. In some cases we asked the trial authors to provide additional information before we could make a final decision. We resolved conflicting decisions through discussion.

### Data extraction and management

Two review authors independently extracted details including information on participants, study design, interventions and outcome measures used (MB and DF or RH). For trials based on a mixed population, we contacted the study authors to establish whether the details relating to participants post stroke were available. Stroke-specific data were available for one trial. All data provided was at participant rather than tooth level.

### Assessment of risk of bias in included studies

Two review authors independently coded the methodological quality of included trials by using items specified by the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2009). Details recorded included the method of generating the randomisation sequence, allocation concealment and blinding of the outcome assessors. Blinding of participants or staff may only be possible in specific types of oral health care interventions but was recorded where it occurred. We also noted incomplete outcome data, selective outcome reporting, sample size calculations, comparability of groups at baseline, reliability of measures used (inter-, intra-rater, test-retest) and evidence of intention-to-treat analysis (ITT).

We graded the method of generating the randomisation sequence, concealing allocation, blinding and the method of addressing incomplete outcome data within the Risk of Bias tables as 'low risk', 'high risk' and 'unclear risk' of bias. We also gathered information on whether power calculations and ITT analyses were conducted and presented this information within these tables. Where all participants were accounted for in the final results, we have not considered ITT analysis applicable.

We sought clarification from study authors if details were unavailable from the text.

### Measures of treatment effect

We grouped trials in terms of their interventions and outcomes and planned subgroup analyses when appropriate. If we included cluster RCTs we planned to identify the unit of randomisation, the unit of analysis and, wherever possible, the intra-class correlation coefficient in order to adjust results to account for cluster effect. We planned to use the Peto odds ratio (OR) for binary outcomes and mean differences (MD) for ordinal scales (10 or more categories) and for continuous data. If different scales were used in different trials, we planned to use standardised mean differences (SMD). For non-normal data and ordinal scales with fewer than 10 categories, we planned to use a defined cut off and to treat the data as a binary outcome. We planned sensitivity analyses based on the method of randomisation, extent of allocation concealment at randomisation and presence of assessor blinding.

### Assessment of heterogeneity

We intended to assess heterogeneity between trials using the $Chi^2$ calculations available in the Cochrane Review Manager software (RevMan 2008) (significance level = $P < 0.1$). If statistical heterogeneity existed (in the absence of co-existing clinical or methodological heterogeneity) then we planned to use a random-effects model to pool the trials. We would use a fixed-effect model if there was no evidence of clinical, methodological or statistical heterogeneity.

### Data synthesis

Where pooling of trials was not possible or appropriate, we planned to present a narrative description of the trials. With the introduction of the generic inverse variance option within RevMan we analysed the individual patient data for post-stroke participants using Proc Mixed in the statistical package SAS to take account of the clustering in the data, and used the generic inverse variance section of RevMan for presentation purposes (RevMan 2008).

# RESULTS

## Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Within the original review we identified eight trials eligible for inclusion within the review (Brailsford 2002; Craven 2005; Frenkel 2001; Mojon 1998; Redwood 2001; Schou 1989; Simons 1997; Simons 2002). With this update of the original search we identified three additional trials (Fields 2008; Gosney 2006; Quagliarello 2009). Additional information from the Craven 2005 trial described within the original review has now been supplemented by more comprehensive information presented within a PhD thesis (Hajizamani 2006). A synthesis of these findings are presented below.

### Results of the search

From a total of approximately 9000 references generated by the search strategies, we identified 11 trials that were eligible for inclusion within the review (Brailsford 2002; Fields 2008; Frenkel 2001; Gosney 2006, Hajizamani 2006; Mojon 1998; Quagliarello 2009; Redwood 2001; Schou 1989; Simons 1997; Simons 2002), of which two were unpublished (Hajizamani 2006; Redwood 2001).

### Included studies

We have included a total of three trials in this updated review: one from the original review (Frenkel 2001) and two identified in this update (Fields 2008; Gosney 2006). All evaluated the impact of OHC interventions on the oral health of individuals following a stroke. Two randomised a total of 548 individual patients (Fields 2008; Gosney 2006), while the third employed a cluster randomised design, randomising 22 nursing homes (Frenkel 2001).

One delivered an OHC intervention within a complex 'bundle' of care (Fields 2008), another an OHC educational intervention ((Frenkel 2001), while the third evaluated the impact of a decontamination gel following stroke (Gosney 2006). These interventions were compared with standard care (Fields 2008), a deferred intervention (Frenkel 2001) or a placebo intervention (Gosney 2006). Two were conducted in the UK (Frenkel 2001; Gosney 2006), while the third was based in the USA (Fields 2008).

Fields 2008 evaluated an intervention that aimed to reduce the incidence of pneumonia amongst individuals who were ventilated following stroke. The experimental intervention included an OHC extension to the standard ventilator-associated pneumonia (VAP) bundle of care. The OHC component of the VAP bundle of care included a training session for staff, a protocol for regular OHC every eight hours and an OHC assessment every 12 hours. The OHC intervention was compared to the standard VAP bundle of care based on the number of VAPs. Unfortunately, the trial was terminated early as the incidence of VAP dropped to nil over a period of six months. The study report did not include any suitable data which would permit inclusion of the trial within a meta-analysis and attempts to contact the author have thus far been unsuccessful.

Frenkel 2001 recruited 22 nursing homes (with 20 to 40 beds) into the cluster RCT to evaluate an oral health care (OHC) education training programme delivered to nursing home care assistants. The training included a description of the role of plaque in oral disease, and a demonstration of cleaning techniques for dentures and natural teeth (including a practical session). The care assistants that attended training received an oral care booklet and a course attendance certificate. The control group provided usual care and were provided with the training intervention after the trial was complete. A self-administered questionnaire was used to test the care givers' knowledge (26 true or false statements) and attitudes to oral care (response to 25 statements using a Likert 1 to 5 scale, from strongly agree to strongly disagree).

The residents' post-stroke oral health was measured in relation to

- dental plaque (Greene 1964);
- denture plaque (Augsburger 1982);
- gingivitis (Suomi 1968);
- denture induced stomatitis (Budtz-Jørgensen 1978).

Residents with significant cognitive impairment were excluded from the trial. All measures were taken at baseline (two months prior to training) and one and six months after training. Of the 412 individuals recruited, 337 completed the trial, of which 67 had a history of stroke.

Gosney 2006 evaluated the effectiveness of a 500 mg application of a decontamination gel applied to patients' oral mucous membranes four times daily when compared to a similar procedure using a placebo gel. The interventions were delivered to 203 participants who had experienced a stroke. Patients with dysphagia (swallowing impairment) were given the intervention over three weeks, while those who did not have dysphagia received the treatment over a two-week period. Outcome measures taken included infection (septicaemia and pneumonia) and colonisation by aerobic Gram-negative bacilli (AGNB).

### Excluded studies

We were unable to obtain information specific to participants who had experienced a stroke from eight potentially eligible trials (Brailsford 2002; Hajizamani 2006; Mojon 1998; Quagliarello 2009; Redwood 2001; Schou 1989; Simons 1997; Simons 2002) and so we excluded these from the review. We excluded two additional trials identified in our search because the interventions described - periodontal therapy (Jones 2007) and oral functional training (Kikutani 2006) - were not 'routine assisted oral health care'.

## Risk of bias in included studies

We considered the randomisation adequate in all three trials, and also considered concealment of allocation and blinding adequate for two trials (Frenkel 2001; Gosney 2006). Details of the randomisation process and blinding were unavailable for Fields 2008. ITT analysis was not conducted in Fields 2008 and it was not applicable in Gosney 2006, as all participants remained in the study throughout. Though Frenkel 2001 did not use ITT analysis for the patients' data, the carer data was analysed, including those carers employed after the intervention had been delivered, allowing an examination of the possible impact of new employees on the findings. Sample size calculations were conducted by two trials (Fields 2008; Frenkel 2001) but not by Gosney 2006.
We recorded details of the method of generating the randomisation sequence, allocation concealment, blinding of the outcome assessors, incomplete outcome data and selective outcome reporting. We also coded sample size calculations, comparability of groups at baseline, reliability of measures used (inter-, intra-rater, test-retest) and evidence of ITT analysis. We sought clarification from study authors if details were unavailable from the text.

## Effects of interventions

The results of three approaches to the delivery of an OHC intervention are presented below in the following comparison groups.

### Comparison 1: OHC training intervention versus standard care

The results for this comparison are presented in relation to nursing home residents' oral health (dental plaque, denture plaque, gingivitis, and denture-induced stomatitis) at one and six months following the training. Data relating to the care assistants outcomes is presented in the following section. Of 412 nursing home residents participating in the Frenkel 2001 trial, data from 67 individuals post stroke were available (training intervention: 40 individuals; control (that is, delayed training): 27 individuals). Availability of residents varied over the duration of the trial (baseline: 55 residents; one month after training: 57 residents; six months after training: 53 residents).

#### Outcome 1.1: Dental plaque

(1.1.1) There was no evidence of a difference between the percentage of dental plaque tooth coverage observed amongst the residents whose carers had been offered training and those whose carers had not yet received training (DMS -0.25, 95% CI -0.77 to 0.28).
(1.1.2) Six months after the carers' oral education intervention, dental plaque scores were similar for the two groups of residents (DMS -0.43, 95% CI -0.98 to 0.13).

#### Outcome 1.2: Denture plaque

(1.2.1) One month after training the residents in the homes that had received the intervention were found to have less plaque on their dentures than those residents that were receiving usual oral care (DMS -1.31, 95% CI -1.96 to -0.66, P < 0.0001).
(1.2.2) This difference could still be observed six months after the training intervention (DMS -1.57, 95% CI -2.23 to -0.92, P < 0.00001).

#### Outcome 1.3: Gingivitis

(1.3.1) The severity of gingivitis was measured one month after the training, but there was no evidence of a difference in gingivitis between the groups (DMS -0.05, 95% CI -0.50 to 0.39).
(1.3.2) Similarly, at six months after training there was no significant difference in gingivitis between the groups (DMS -0.25, 95% CI -0.61 to 0.10).

#### Outcome 1.4: Denture-induced stomatitis

(1.4.1) The severity of denture-induced stomatitis did not differ between the two groups of post-stroke residents one month after the intervention (DMS -0.33, 95% CI -0.92 to 0.26).
(1.4.2) Nor was there evidence of a difference between the groups' denture-induced stomatitis six months after training (DMS -0.10, 95% CI -0.61 to 0.40).
Data included in the review reflect the knowledge and attitude of all care assistants employed within the nursing homes at the data collection points including those that started their employment after the training intervention. Thus the impact of a training intervention delivered in a care setting with a characteristically high rate of staff turnover was reflected in the results. Not all available care assistants chose to participate in the training or to return a completed questionnaire (baseline = 80.5%; one month post training = 81.1%; six months post training = 77.2%). The number of care assistants employed varied (baseline: 369 assistants; one month after training: 322 assistants; six months after training: 289 assistants). For each outcome, data at one month and six months after training are presented.

#### Outcome 1.5: Knowledge

(1.5.1) One month after the oral care educational intervention the care assistants that received the training had higher knowledge scores than the group that had the delayed intervention (MD 1.31, 95% CI 0.47 to 2.15, P = 0.002).
(1.5.2) This difference could still be observed six months after training (MD 1.38, 95% CI 0.58 to 2.18, P = 0.0008).

#### Outcome 1.6: Attitude

(1.6.1) The nursing home care assistants that received the training had a significantly better attitude to oral care (as judged by rating

25 oral health statements on a Likert-scale) than the group that had training delayed (MD 4.45, 95% CI 1.79 to 7.11, P = 0.001). (1.6.2) This difference was still observed six months after training (MD 6.04, 95% CI 3.23 to 8.85, P = 0.0001).

### Comparison 2: OHC decontamination gel versus placebo gel

The results for this comparison are presented in relation to the trial participants' general and oral health (infection and aerobic Gram-negative bacilli (AGNB)). Data from all 203 randomised participants were available from the Gosney 2006 trial although full follow-up data was only available for 164 individuals.

#### Outcome 2.1: Infection

##### (2.1.1) Pneumonia

Those participants that received the decontamination gel (103 participants) had fewer incidences of pneumonia (one incident) over the course of the trial period than those that used the placebo gel (100 participants; seven incidents of pneumonia) (OR 0.20, CI 95% 0.05 to 0.84, P = 0.03).

##### (2.1.2) Septicaemia

There was no evidence of a difference in the incidence of septicaemia between the two groups (three incidences in both groups) (OR 0.97, CI 95% 0.19 to 4.91).

#### Outcome 2.2: Aerobic Gram-negative bacilli (AGNB)

##### (2.2.1) Acquired AGNB

A total of 37 individuals acquired AGNB following admission with stroke. There was no evidence of a difference between the group that were using the decontamination gel (14 participants) and those in the placebo group (23 participants) (OR 0.53, CI 95% 0.26 to 1.09).

##### (2.2.2) Carriage of AGNB

Similarly, there was no evidence of a difference between the groups in relation to carriage of AGNB (OR 0.90, CI 95% 0.42 to 1.92).

### Comparison 3: OHC complex intervention versus standard care

Fields 2008 compared two 'bundles' of care designed to reduce VAP amongst patients who were ventilated following a stroke. One approach included an OHC component within the bundle. The OHC intervention included an educational package, a protocol of OHC, an OHC assessment every 12 hours and an OHC kit. Outcome data were not reported and so the trial cannot be included within a meta-analysis. The trial was terminated after six months as the incidence of VAP was reduced to zero within the experimental group over the trial period.

### Sensitivity analysis

As such disparate trials were included in the review, we had no opportunity to conduct the sensitivity analyses planned at the protocol stage.

## DISCUSSION

Despite the conduct and (in some cases) publication of several new trials in this field since the original review, there remains a lack of high quality evidence to inform OHC practice in stroke care settings. From our original review we know that Frenkel 2001 demonstrated that an OHC educational training intervention targeted at healthcare staff had a positive impact not only on staff knowledge and attitudes but also had a beneficial effect on their patients' oral hygiene. One month after training, residents had less plaque on their dentures than those residents in the homes where training was delayed. Disappointingly, the training intervention was not seen to have made a difference to the residents' intra-oral health (in terms of dental plaque and gingivitis measures) at either assessment point. As improvements in the provision of oral care outside of the mouth, such as cleaning of removable dentures, was noted to improve but intra-oral care did not, it is likely that despite training, the healthcare staff continued to experience some barriers to the provision of oral care within the mouth (Wårdh 1997). The results of the study do give some encouragement however, as the benefits of the oral care training intervention (as measured by denture plaque) were still evident six months after the intervention, despite the characteristically high staff turnover rates in nursing home settings.

Gosney 2006 found that individuals using a gel for selective decontamination of the digestive tract had a lower incidence of pneumonia, while Fields 2008 similarly reports a drop in the incidence of pneumonia following a comprehensive and frequent OHC routine amongst a ventilated stroke population. The quality of the Fields 2008 trial is difficult to judge because the trial was terminated early and very little information is provided in the published report. Gosney 2006, in contrast, evaluated the effectiveness of a

highly specific OHC intervention across a wide stroke population, including those that were unable to consent. Some patients were excluded, including those with a prior stroke and those receiving antibiotic or steroid medication. Neither of these studies had conducted an ITT analysis and Gosney 2006 did not conduct an a-priori sample size calculation.

Of the trials eligible for inclusion in this review, eight trials were unable to provide stroke-specific data. Of these, five investigated oral healthcare programme interventions (Hajizamani 2006; Mojon 1998; Quagliarello 2009; Redwood 2001; Schou 1989), two examined the use of medicated gum (Simons 1997; Simons 2002) and one a varnish (Brailsford 2002). While Frenkel 2001 found the oral healthcare programme resulted in benefits to the patients, not all programme interventions had such positive effects. It appears likely that the differing results from these programmes may be related in part to their target populations, content, manner of delivery and support. Gum and varnish interventions were noted to have modest effects.

We also noted a large number of commentary or descriptive pieces in our systematic review of the literature, relating to the in-house development of an oral care tool conducted and reported by healthcare staff. Such enthusiasm and commitment to improving standards conflicts with the perception of staff apathy that might be inferred from descriptions of poor oral care procedures or reports of poor oral hygiene in care settings.

While the attitudes of nursing and healthcare staff to oral care appear to vary (Wårdh 1997), the provision of oral care for dependent patients is viewed as a core nursing responsibility (Fitzpatrick 2000; Wårdh 1997; Weeks 1994). Nursing staff, however, are frustrated by restricted training opportunities, access to equipment, assessment tools and professional dental support (Talbot 2005; Weeks 1994). What tools and protocols are available are based on limited evidence. With limited availability of support it is not surprising that oral care provision is not perceived as a priority. Good oral health is essential to optimise an individual's speech, nutritional intake, systemic health, rehabilitative outcomes and quality of life. It is therefore crucial that oral care is given greater priority in stroke care settings and that staff are supported in their delivery of this care.

In reviewing the literature, we were disappointed to find little mention of the specific rehabilitative nature oral care provision might take in the stroke care setting. Similarly, only passing reference was made to the possibility of involving the wider multidisciplinary team (such as occupational therapists, physiotherapists, dieticians, speech and language therapists) and informal carers in the planning or delivery of supported oral care (Bailey 2004; Bellomo 2005; Imm 1983; Sweeney 1998). One of the core strengths of specialist stroke care is the rehabilitative setting facilitated by the stroke specialist multidisciplinary team (Langhorne 2003). The proven benefits of this environment should be utilised in the provision of oral care post stroke. The maintenance of a patient's oral hygiene should be given higher priority (in research and clinical settings) given the wide reaching implications poor oral hygiene has on an individual's oral health and, in turn, recovery post stroke.

# AUTHORS' CONCLUSIONS

## Implications for practice

There is a paucity of high-quality evidence relating to oral care interventions for individuals after a stroke. What little evidence is available suggests that even an hour-long training session delivered by a dental health professional can change healthcare staff's knowledge of and attitude towards administering oral care and may have a positive impact on patients' oral hygiene as measured by denture cleanliness. There is some evidence that, despite an attendance rate of only two-thirds of the healthcare staff and a high staff turnover rate characteristic of such settings, the benefits of training were not only retained but appeared to be successfully transferred to new members of staff.

## Implications for research

The evidence presented within this review indicates the potential benefits of training on denture care and staff knowledge and the benefits of decontamination gel on the incidence of pneumonia, but further investigation is needed to identify the optimum OHC intervention that will benefit oral health. In addition, trials of high quality are needed to evaluate the effectiveness of other OHC interventions amongst the post-stroke population. These might be based in community, hospital or other residential settings. Specific goals within a rehabilitation setting might, for example, progress from oral care that is dependent on a carer, to supported oral care, to the eventual goal of independent oral care. While the evidence identified in this review relates to a training programme and a decontamination gel, trials that evaluate the effectiveness of the various oral care assessment tools, agents, equipment or oral hygiene promotion packages currently available within stroke care settings are urgently needed to fill the evidence gap that sadly exists in this area. Long-term follow-up should also be considered to capture information relating to the need for repeated training or other intervention updates.

We would urge anyone aiming to address the effectiveness of an oral care intervention to consider using a RCT design. Given the complexity of oral care provision, we acknowledge that evaluating oral care provision using a randomised or cluster randomised trial design is likely to be a complex undertaking. However, in a study that aims to successfully deliver and evaluate the effectiveness of a complex OHC intervention, it is vital to employ methods that ensure the exclusion of as much bias as possible.

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The views expressed here are those of the review authors and not necessarily those of the Chief Scientist Office or the Scottish Government.

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### References to studies included in this review

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* *Indicates the major publication for the study*

## CHARACTERISTICS OF STUDIES

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

**Fields 2008**

| | |
|---|---|
| Methods | RCT |
| Participants | 345 (but completed data only available on 200)<br>Included: admissions to ICU, mechanically ventilated, intubated in hospital for less than 24 hours, no previous diagnosis of pneumonia<br>Excluded: patients with prior tracheostomies, less than 18 years of age, patients with AIDS secondary to immunocompromised systems, patients that were edentulous<br>USA, 2005 to 2008 |
| Interventions | (1) OHC + timed toothbrushing in care bundle (nurse education; protocol; OHC assessment every 12 hours; OHC kit). Protocol: brushing of teeth, tongue and hard palate every 8 hours (3 times daily) for at least 1 minute, Toothette on teeth, tongue and hard palate for at least 1 minute; application of moisturiser as required; oral/pharyngeal suction as required<br>(2) Usual care 'could include daily toothbrushing along with Toothette mouth care as needed' |
| Outcomes | VAP |
| Notes | Very little detail reported in publication (for example information on baseline groups, numbers randomised to each intervention, other outcome measures collected). Unable to obtain additional unpublished information from authors. RCT terminated early when the intervention group had a VAP rate of 0% over 1000 ventilator days, which was sustained over a 6-month period (while there were 4 VAPs over 6 months in control group) |

***Risk of bias***

| **Bias** | **Authors' judgement** | **Support for judgement** |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Randomisation assisted by the Clinical Nursing Research Program of Summa Health Systems and the Biostatistics Department of North Eastern Ohio Universities Colleges of Medicine and Pharmacy |
| Allocation concealment (selection bias) | Unclear risk | Sequentially numbered envelopes (unclear whether they were opaque) containing the randomised worksheets. Envelopes were taken in sequence |
| Blinding (performance bias and detection bias)<br>All outcomes | High risk | VAP was collected by infection control nurse who may have been blinded. Nurses carrying out the OHC interventions were not blinded |

**Fields 2008** (*Continued*)

| | | |
|---|---|---|
| Incomplete outcome data (attrition bias) All outcomes | Unclear risk | 345 participants but completed data only available for 200 |
| Other bias | Unclear risk | Trial suspended prior to completion<br>No, ITT analysis not performed<br>Yes, sample size calculation was performed requiring a sample of 200 ventilator-dependent patients or 2000 ventilator days<br>Outcome measures reported prevent inclusion within a meta-analysis<br>No information given to judge comparability of groups |

**Frenkel 2001**

| | |
|---|---|
| Methods | Cluster RCT (block randomisation) |
| Participants | 20 nursing homes (with between 20 to 40 beds)<br>Included: residents who wore dentures, had one or more natural teeth or both, and whose general health permitted oral examination<br>Exclusions: clients with significant cognitive impairment<br>UK, ?1998 to 2001 |
| Interventions | (1) Control group (9 nursing homes; 27 residents)<br>(2) Oral health care education session (11 nursing homes; 40 residents) |
| Outcomes | Denture plaque (0 to 4 scale)<br>Denture-induced stomatitis (0 to 3 scale)<br>Dental plaque (0 to 3 scale)<br>Gingivitis (0 to 2 scale)<br>Carers' oral health knowledge (26 questions)<br>Carers' attitudes (25 statements rated on 0 to 5 point scale)<br>Calculus on buccal and lingual surfaces (present/absent)<br>Root caries (present/absent)<br>Tooth mobility (present/absent) |
| Notes | Blinding adequate<br>Primary outcome measurements differ from other studies that measure same outcomes. Carer knowledge and attitude measures not tested for reliability or validity out with this study. Baseline groups comparable (age, dental status, oral health status); some differences (gender, mobility, last seen by dentist). No intra-rater reliability conducted. Toothbrush was distributed |

***Risk of bias***

| **Bias** | **Authors' judgement** | **Support for judgement** |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | 1 of the researchers not involved in the intervention or data collection allocated the 22 nursing homes using block randomisation (block size |

**Frenkel 2001** (*Continued*)

| | | |
|---|---|---|
| | | four) to either a control or intervention group using a table of random numbers |
| Allocation concealment (selection bias) | Low risk | Allocation codes were passed directly to the health promoter delivering the training programme and the participating homes were asked to conceal their allocation from the data collector |
| Blinding (performance bias and detection bias)<br>All outcomes | Low risk | |
| Incomplete outcome data (attrition bias)<br>All outcomes | Low risk | There was some indication of completeness of follow-up except for the dental plaque measure where some teeth could not be scored |
| Other bias | Unclear risk | Partial, ITT analysis - analysis of carer measures was repeated on data from all carers working at each measurement time point. This allowed assessment of whether including carers that had not been present at the time of the initial intervention impacted upon the findings. Analysis of patient data was based only on individuals that were resident within the nursing homes at both baseline and follow-up time point<br>Yes, sample size calculations were conducted a-priori for both carers and patients<br>Yes, the baseline data on residents in the intervention and control groups looks reasonably balanced between the two groups. The care assistant groups were comparable for gender, age, experience and dental attendance patterns<br>Details of inter or intra-rater reliability were not reported |

**Gosney 2006**

| | |
|---|---|
| Methods | RCT |
| Participants | 203 patients admitted to hospital following a first stroke<br>Inclusions: within 24 hours of admission, first acute stroke<br>Exclusions: patients receiving antibiotic or steroid medication (including inhaled steroids), prior stroke |
| Interventions | (1) Control group: placebo gel 500 mg (100 participants)<br>(2) Selective decontamination of digestive tract (SDD) (103 participants): Orabase 500 mg gel (containing 2% (w/v) colistin, 2% (w/v) polymyxin E, 2% (w/v) amphotericin B<br>Gel was applied by a nurse (gloved finger or spatula) or by the patient (clean finger) to |

**Gosney 2006** (*Continued*)

| | |
|---|---|
| | the mucous membranes of the mouth four times daily. Treatment duration for patients with 'unsafe swallow' was 3 weeks; for patients with a 'safe swallow' was 2 weeks<br>UK, 2006 |
| Outcomes | Colonisation by AGNB<br>Carriage of AGNB on two or more consecutive samples<br>Septicaemia and/or respiratory tract infections during hospital stay<br>Pneumonia<br>Barthel Index (on days 8 and 15 of hospital stay)<br>Scandinavian Stroke Scale (on days 8 and 15 of hospital stay)<br>Administration of antibiotics |
| Notes | Patients too ill to consent were included in the study by obtaining assent from next of kin. Baseline groups comparable (age, admission source, swallowing ability, discharge destination) |

***Risk of bias***

| **Bias** | **Authors' judgement** | **Support for judgement** |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Computer generated random numbers |
| Allocation concealment (selection bias) | Low risk | Research pharmacist conducted randomisation remotely |
| Blinding (performance bias and detection bias)<br>All outcomes | Low risk | Double blind study |
| Incomplete outcome data (attrition bias)<br>All outcomes | Unclear risk | N/A |
| Other bias | High risk | ITT analysis, no - of 203 individuals included at baseline, data only on 164 remaining in study at follow-up<br>A priori sample size calculation, no<br>Groups comparable (gender, age, discharge destination)<br>Barthel Index (on days 8 and 15 of hospital stay) and Scandinavian Stroke Scale (on days 8 and 15 of hospital stay) unreported |

AGNB: aerobic Gram-negative bacilli
AIDS: Acquired Immunde Deficiency Syndrome
ICU: intensive care unit
ITT: intention-to-treat
N/A: not applicable
OHC: oral health care
RCT: randomised controlled trial
VAP: ventilator-associated pneumonia

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

| Study | Reason for exclusion |
|---|---|
| Brailsford 2002 | RCT<br>Fluoride-containing varnish + anti-microbial varnish (Cervitec) versus fluoride-containing varnish + placebo varnish. Stroke-specific data unavailable |
| Hajizamani 2006 | RCT<br>Stroke-specific data unavailable. Carer knowledge data only reported for intervention group before and after the intervention |
| Jones 2007 | RCT<br>Periodontal therapy versus usual care. Periodontal therapy typically requires specialist dental care and takes place in the presence of periodontal disease and so the intervention fell out with our inclusion criteria of 'routine assisted oral health care' |
| Kikutani 2006 | RCT<br>Nutritional supplementation plus oral functional training versus nutritional supplementation. Oral functional training does not relate to oral health care but instead movement of the oral articulators (lips, cheeks, tongue, soft palate) |
| Mojon 1998 | Cluster RCT<br>Oral health programme versus usual care. Stroke-specific data unavailable |
| Quagliarello 2009 | RCT<br>6 different OHC intervention programmes (3 specifically for those with dysphagia). Stroke-specific data unavailable |
| Redwood 2001 | Cluster RCT<br>Oral health programme versus oral healthcare worker. Stroke-specific data unavailable |
| Schou 1989 | Cluster RCT<br>Oral health programme for staff only versus oral health programme for residents only versus oral health programme for staff and residents versus usual care. Stroke-specific data unavailable |
| Simons 1997 | RCT<br>Chlorhexidine acetate/xylitol gum versus xylitol gum. Stroke-specific data unavailable |
| Simons 2002 | Cluster RCT<br>Chlorhexidine acetate/xylitol gum versus xylitol gum versus usual care (no gum). Stroke-specific data unavailable |

OHC: oral health care
RCT: randomised controlled trial

## DATA AND ANALYSES

### Comparison 1. OHC training intervention versus standard care

| Outcome or subgroup title | No. of studies | No. of participants | Statistical method | Effect size |
|---|---|---|---|---|
| 1 Dental plaque | 1 | | Diff in mean score (Fixed, 95% CI) | Totals not selected |
| 1.1 One month after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 1.2 Six months after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 2 Denture plaque | 1 | | Diff in mean score (Fixed, 95% CI) | Totals not selected |
| 2.1 One month after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 2.2 Six months after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 3 Gingivitis | 1 | | Diff in mean score (Fixed, 95% CI) | Totals not selected |
| 3.1 One month after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 3.2 Six month after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 4 Denture-induced stomatitis | 1 | | Diff in mean score (Fixed, 95% CI) | Totals not selected |
| 4.1 One month after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 4.2 Six months after oral care training versus usual care | 1 | | Diff in mean score (Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 5 Carers' oral health care knowledge | 1 | | Mean Difference (IV, Fixed, 95% CI) | Totals not selected |
| 5.1 One month after oral care training versus usual training | 1 | | Mean Difference (IV, Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 5.2 Six months after oral care training versus usual training | 1 | | Mean Difference (IV, Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 6 Carers' attitudes to oral care | 1 | | Mean Difference (IV, Fixed, 95% CI) | Totals not selected |
| 6.1 One month after oral care training versus usual training | 1 | | Mean Difference (IV, Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 6.2 Six months after oral care training versus usual training | 1 | | Mean Difference (IV, Fixed, 95% CI) | 0.0 [0.0, 0.0] |

## Comparison 2. OHC decontamination gel versus placebo gel

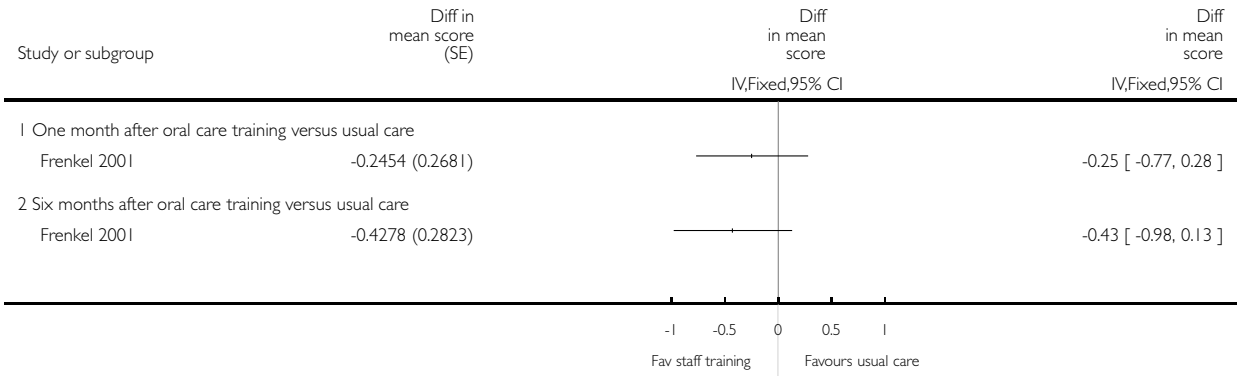
| Outcome or subgroup title | No. of studies | No. of participants | Statistical method | Effect size |
|---|---|---|---|---|
| 1 Infection | 1 | | Peto Odds Ratio (Peto, Fixed, 95% CI) | Totals not selected |
| 1.1 Pneumonia | 1 | | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 1.2 Septicaemia | 1 | | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 2 Aerobic Gram-negative bacilli (AGNB) | 1 | | Peto Odds Ratio (Peto, Fixed, 95% CI) | Totals not selected |
| 2.1 Acquired AGNB | 1 | | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.0 [0.0, 0.0] |
| 2.2 Carriage of AGNB | 1 | | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.0 [0.0, 0.0] |

### Analysis 1.1. Comparison 1 OHC training intervention versus standard care, Outcome 1 Dental plaque.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 1 OHC training intervention versus standard care

Outcome: 1 Dental plaque

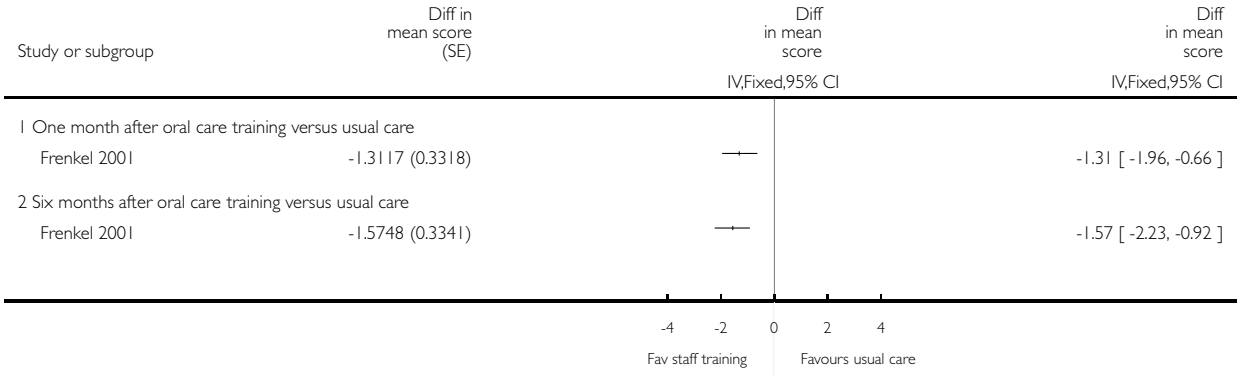


### Analysis 1.2. Comparison 1 OHC training intervention versus standard care, Outcome 2 Denture plaque.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 1 OHC training intervention versus standard care

Outcome: 2 Denture plaque

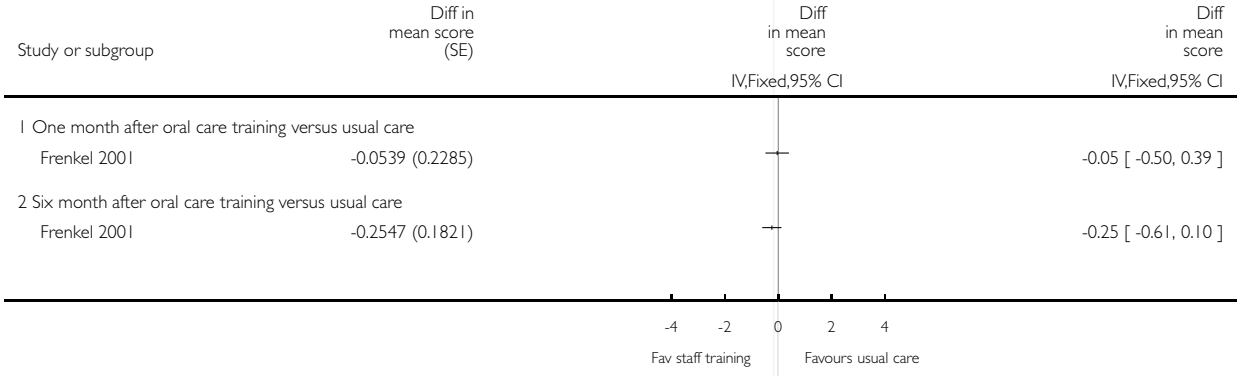



### Analysis 1.3. Comparison 1 OHC training intervention versus standard care, Outcome 3 Gingivitis.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 1 OHC training intervention versus standard care

Outcome: 3 Gingivitis

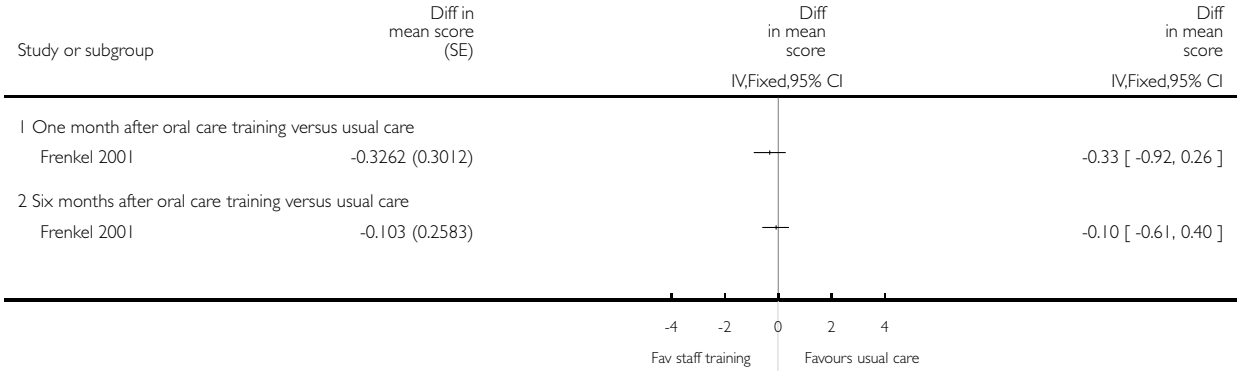


### Analysis 1.4. Comparison 1 OHC training intervention versus standard care, Outcome 4 Denture-induced stomatitis.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 1 OHC training intervention versus standard care

Outcome: 4 Denture-induced stomatitis

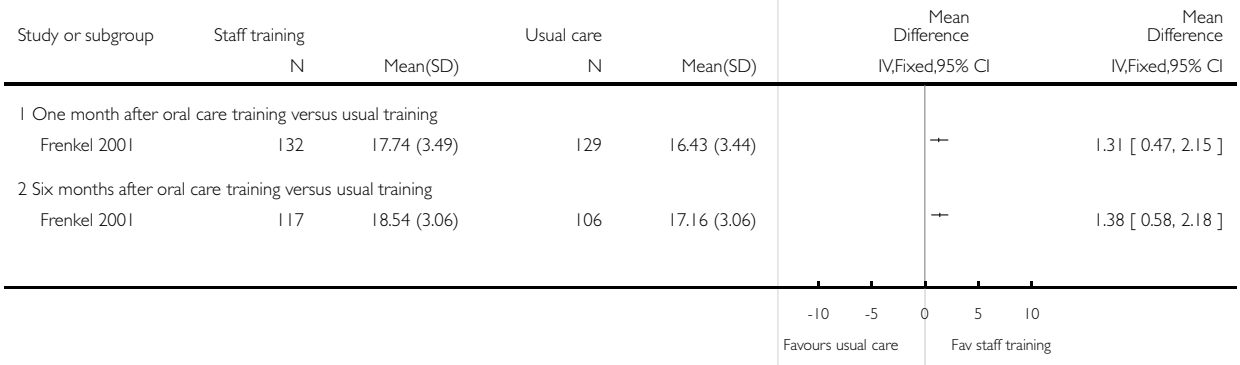



### Analysis 1.5. Comparison 1 OHC training intervention versus standard care, Outcome 5 Carers' oral health care knowledge.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 1 OHC training intervention versus standard care

Outcome: 5 Carers' oral health care knowledge



### Analysis 1.6. Comparison 1 OHC training intervention versus standard care, Outcome 6 Carers' attitudes to oral care.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 1 OHC training intervention versus standard care

Outcome: 6 Carers' attitudes to oral care

| Study or subgroup | Staff training N | Mean(SD) | Usual care N | Mean(SD) | Mean Difference IV,Fixed,95% CI | Mean Difference IV,Fixed,95% CI |
|---|---|---|---|---|---|---|
| 1 One month after oral care training versus usual training | | | | | | |
| Frenkel 2001 | 132 | 19.6 (10.46) | 129 | 15.15 (11.46) | | 4.45 [ 1.79, 7.11 ] |
| 2 Six months after oral care training versus usual training | | | | | | |
| Frenkel 2001 | 117 | 21.44 (10.11) | 106 | 15.4 (11.22) | | 6.04 [ 3.23, 8.85 ] |

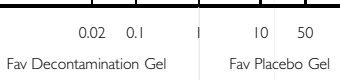

### Analysis 2.1. Comparison 2 OHC decontamination gel versus placebo gel, Outcome 1 Infection.

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 2 OHC decontamination gel versus placebo gel

Outcome: 1 Infection

| Study or subgroup | Decontamination gel n/N | Placebo gel n/N | Peto Odds Ratio Peto,Fixed,95% CI | Peto Odds Ratio Peto,Fixed,95% CI |
|---|---|---|---|---|
| 1 Pneumonia | | | | |
| Gosney 2006 | 1/103 | 7/100 | | 0.20 [ 0.05, 0.84 ] |
| 2 Septicaemia | | | | |
| Gosney 2006 | 3/103 | 3/100 | | 0.97 [ 0.19, 4.91 ] |

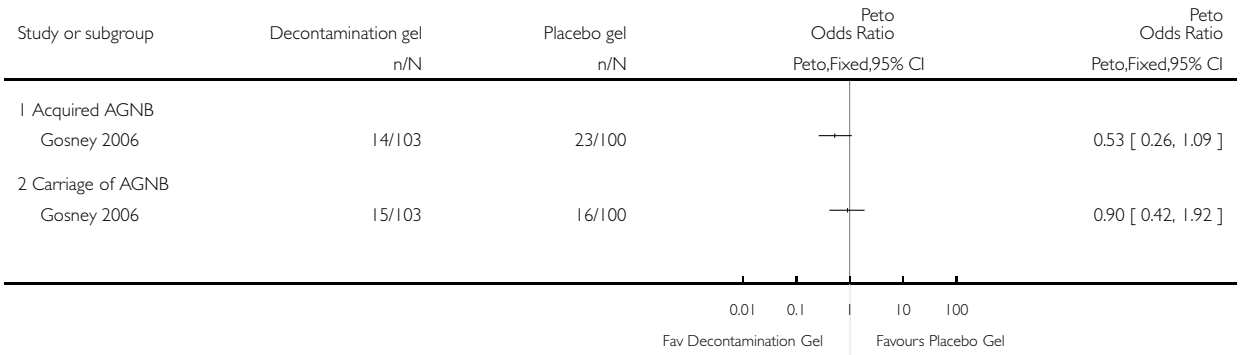


**Analysis 2.2. Comparison 2 OHC decontamination gel versus placebo gel, Outcome 2 Aerobic Gram-negative bacilli (AGNB).**

Review: Staff-led interventions for improving oral hygiene in patients following stroke

Comparison: 2 OHC decontamination gel versus placebo gel

Outcome: 2 Aerobic Gram-negative bacilli (AGNB)




# APPENDICES

## Appendix 1. CENTRAL search strategy

#1 MeSH descriptor Stomatognathic Diseases explode all trees
#2 MeSH descriptor Dentistry explode all trees
#3 MeSH descriptor Oral Health, this term only
#4 MeSH descriptor Oral Hygiene explode all trees
#5 MeSH descriptor Dental Auxiliaries explode all trees
#6 MeSH descriptor Mouth explode all trees
#7 MeSH descriptor Halitosis, this term only
#8 MeSH descriptor Facial Pain, this term only
#9 ((dental or oral or periodontal) and disease*)
#10 ((dental or tooth or teeth) and (caries or decay*))
#11 gingivitis
#12 xerostomia or "dry mouth"
#13 (oral and (stomatitis or candidiasis))
#14 ((mouth near/6 ulcer*) or (mouth near/6 aphthous) or (mouth near/6 aphthae) or (oral near/6 ulcer*) or (oral near/6 aphthous) or (oral near/6 aphthae))
#15 ((mouth or dental or oral) and hygiene)
#16 ((mouth near/4 odor) or (mouth near/4 odour))
#17 halitosis
#18 (dentist* or "dental nurse*" or dental therapist* or "dental hygienist*")
#19 "dental health educat*"
#20 (dental and (disabled or handicap*))
#21 ((dental near/3 scaling) or (oral near/3 scaling) or (teeth near/3 scaling) or (dental near/3 prophylaxis) or (oral near/3 prophylaxis) or (teeth near/3 prophylaxis))

#22 (mouth and ulcer*)
#23 (mouthwash* or mouthrinse*)
#24 (dental and (treatment* or care*))
#25 toothbrush*
#26 ((plaque next index) or (plaque next indices) or ("oral hygiene" next index) or ("oral hygiene" next indices) or (periodontal next index) or (periodontal next indices) or (DMF next index) or (DMF next indices))
#27 (#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 OR #25 OR #26)
#28 MeSH descriptor Cerebrovascular Disorders explode all trees
#29 (stroke* or cva* or cerebrovasc* or "cerebral vascular*" or poststroke or post-stroke)
#30 (cerebral or cerebellar or brain* or vertebrobasilar)
#31 (infarct* or ischemi* or ischaemi* or thrombo* or emboli* or apople*)
#32 (#30 AND #31)
#33 (cerebral or intracerebral or intracranial or brain* or subarachnoid)
#34 (haemorrhage or hemorrhage or bleed*)
#35 (#33 AND #34)
#36 MeSH descriptor Hemiplegia, this term only
#37 MeSH descriptor Brain Injuries, this term only
#38 MeSH descriptor Aphasia explode all trees
#39 MeSH descriptor Dysarthria, this term only
#40 MeSH descriptor Apraxias, this term only
#41 MeSH descriptor Deglutition Disorders, this term only
#42 (hemipleg* or hemipar*)
#43 (aphasi* or dysphasi* or dysarthri* or dysphag* or aprax* or dysprax*)
#44 (swallow* and (impair* or disorder* or problem* or difficult*))
#45 ("unilateral neglect" or "neglect syndrome*" or "visual neglect" or hemianop*)
#46 (#28 OR #29 OR #32 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45)
#47 (#27 AND #46)

## Appendix 2. MEDLINE search strategy

### MEDLINE via OVID search strategy

1. exp Stomatognathic diseases/
2. exp Dentistry/
3. oral health/
4. exp oral hygiene/
5. exp Dental Auxiliaries/
6. halitosis/
7. exp mouth/ph
8. exp digestive system/ph
9. Facial Pain/
10. ((dental or oral or periodontal) and disease$).tw.
11. ((dental or tooth or teeth) and (caries or decay$)).tw.
12. gingivitis.tw.
13. (xerostomia or "dry mouth").tw.
14. (oral and (stomatitis or candidiasis)).tw.
15. ((mouth or oral) adj6 (ulcer$ or aphthous or aphthae)).tw.
16. ((mouth or dental or oral) and hygiene).tw.
17. (mouth adj4 (odor or odour)).tw.
18. halitosis.tw.

19. (dentist$ or "dental nurse$" or "dental therapist$" or "dental hygienist$").tw.
20. "dental health educat$".tw.
21. (dental and (disabled or handicap$)).tw.
22. ((dental or oral or teeth) adj3 (scaling or prophylaxis)).tw.
23. (mouth and ulcer$).tw.
24. (mouthwash$ or mouthrinse$).tw.
25. (dental and (treatment$ or care$)).tw.
26. toothbrush$.tw.
27. ((plaque or "oral hygiene" or periodontal or DMF) adj (index or indices)).tw.
28. or/1-27
29. exp cerebrovascular disorders/
30. (stroke$ or cva$ or cerebrovasc$ or "cerebral vascular$" or poststroke or post-stroke).tw.
31. (cerebral or cerebellar or brain$ or vertebrobasilar).tw.
32. (infarct$ or isch?emi$ or thrombo$ or emboli$ or apople$).tw.
33. 31 and 32
34. (cerebral or intracerebral or intracranial or brain$ or subarachnoid).tw.
35. (haemorrhage or hemorrhage or bleed$).tw.
36. 34 and 35
37. Brain Injuries/
38. hemiplegia/
39. exp aphasia/ or dysarthria/ or apraxia/ or deglutition disorders/
40. (hemipleg$ or hemipar$).tw.
41. (aphasi$ or dysphasi$ or dysarthri$ or dysphag$ or aprax$ or dysprax$).tw.
42. (swallow$ and (impair$ or disorder$ or problem$ or difficult$)).tw.
43. ("unilateral neglect" or "neglect syndrome$" or "visual neglect$" or hemianop$).tw.
44. 29 or 30 or 33 or (or/36-43)
45. 28 and 44

### Cochrane Search filter for MEDLINE via OVID

Cochrane Highly Sensitive Search Strategy (CHSSS) for identifying randomised trials in MEDLINE: sensitivity maximising version (2009 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of *The Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.2 [updated September 2009].

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. randomized.ab.
4. placebo.ab.
5. drug therapy.fs.
6. randomly.ab.
7. trial.ab.
8. groups.ab.
9. or/1-8
10. exp animals/ not humans.sh.
11. 9 not 10

## Appendix 3. CINAHL search strategy

1. exp stomatognathic diseases/
2. exp dentistry/
3. oral health/
4. exp oral hygiene/
5. mouth care/
6. exp dental auxiliaries/
7. halitosis/
8. exp mouth physiology/
9. exp digestive system physiology/
10. dental hygiene assessment/
11. facial pain/
12. ((dental or oral or periodontal) and disease$).tw
13. ((dental or tooth or teeth) and (caries or decay$)).tw
14. gingivitis.tw
15. (xerostomia or dry mouth).tw
16. (oral and (stomatitis or candidiasis)).tw
17. ((mouth or oral) adj6 (ulcer$ or aphthous or aphthae)).tw
18. ((mouth or dental or oral) and hygiene).tw
19. (mouth adj4 (odor or odour)).tw
20. halitosis.tw
21. (dentist$ or dental nurse$ or dental therapist$ or dental hygienist$).tw
22. dental health educat$.tw
23. (dental and (disabled or handicap$)).tw
24. ((dental or oral or teeth) adj3 (scaling or prophylaxis)).tw
25. (mouth and ulcer$).tw
26. (mouthwash$ or mouthrinse$).tw
27. (dental and (treatment$ or care$)).tw
28. toothbrush$.tw
29. ((plaque or oral hygiene or periodontal or DMF) adj (index or indices)).tw
30. or/1-29
31. exp cerebrovascular disorders/
32. (stroke$ or cva$ or cerebrovasc$ or cerebral vascular$ or poststroke or post-stroke).tw
33. (cerebral or cerebellar or brain$ or vertebrobasilar).tw
34. (infarct$ or isch?emi$ or thrombo$ or emboli$ or apople$).tw
35. 33 and 34
36. (cerebral or intracerebral or intracranial or brain$ or subarachnoid).tw
37. (haemorrhage or hemorrhage or bleed$).tw
38. 36 & 37
39. hemiplegia/ or brain injury/
40. exp aphasia/ or dysarthria/ or apraxia/ or deglutition disorders/
41. (hemipleg$ or hemipar$).tw
42. (aphasi$ or dysphasi$ or dysarthri$ or dysphag$ or aprax$ or dysprax$).tw
43. (swallow$ and (impair$ or disorder$ or problem$ or difficult$)).tw
44. (unilateral neglect or neglect syndrome$ or visual neglect or hemianop$).tw
45. 31 or 32 or 35 or (or/38-44)
46. 30 and 45

### For the Review update 2010

#### CINAHL via EBSCO search strategy

S1 MH “Stomatognathic Diseases+”
S2 MH “Dentistry+”
S3 MH “Oral Health”
S4 MH “Oral Hygiene+”
S5 MH “Mouth care”
S6 MH “Dental Auxiliaries+”
S7 MH “Halitosis”
S8 MH “Mouth physiology+”
S9 MH “Digestive System Physiology+”
S10 MH “Dental Hygiene Assessment”
S11 MH “facial pain”
S12 ((dental or oral or periodontal) and disease*)
S13 ((dental or tooth or teeth) and (caries or decay*))
S14 gingivitis
S15 xerostomia or “dry mouth”
S16 (oral and (stomatitis or candidiasis))
S17 ((mouth N6 ulcer*) or (mouth N6 aphthous) or (mouth N6 aphthae)) or ((oral N6 ulcer*) or (oral N6 aphthous) or (oral N6 aphthae))
S18 ((mouth or dental or oral) and hygiene)
S19 (mouth N4 odor) or (mouth N4 odour)
S20 halitosis
S21 (dentist* or “dental nurse*” or “dental therapist*” or “dental hygienist*”)
S22 (“dental health educat*”)
S23 (dental and (disabled or handicap*))
S24 ((dental N3 scaling) or (dental N3 prophylaxis)) or ((oral N3 scaling) or (oral N3 prophylaxis)) or ((teeth N3 scaling) or (teeth N3 prophylaxis))
S25 ((mouth and ulcer*)) or ((oral N3 scaling) or (oral N3 prophylaxis)) or ((teeth N3 scaling) or (teeth N3 prophylaxis))
S26 (mouthwash* or mouthrinse*)
S27 (dental and (treatment* or care*))
S28 toothbrush*
S29 ((plaque N1 index) or (plaque N1 indices)) or ((“oral hygiene” N1 index) or (“oral hygiene” N1 indices)) or ((periodontal N1 index) or (periodontal N1 indices)) or ((DMF N1 index) or (DMF N1 indices))
S30 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 or S23 or S24 or S25 or S26 or S27 or S28 or S29
S31 MH “Cerebrovascular disorders+”
S32 (stroke* or cva* or cerebrovasc* or “cerebral vascular*” or poststroke or post-stroke)
S33 (cerebral or cerebellar or brain* or vertebrobasilar)
S34 (infarct* or isch?emi* or thrombo* or emboli* or apople*)
S35 S33 and S34
S36 (cerebral or intracerebral or intracranial or brain* or subarachnoid)
S37 (haemorrhage or hemorrhage or bleed*)
S38 S36 and S37
S39 MH “Hemiplegia” or MH “Brain Injury”
S40 MH “Aphasia+” or MH “dysarthria” or MH “apraxia” or MH “deglutition disorders”
S41 hemipleg* or hemipar*
S42 (aphasi* or dysphasi* or dysarthri* or dysphag* or aprax* or dysprax*)
S43 (swallow* and (impair* or disorder* or problem* or difficult*))
S44 (“unilateral neglect” or “neglect syndrome*” or “visual neglect” or hemianop*)
S45 S31 or S32 or S35 or S38 or S39 or S40 or S41 or S42 or S43 or S44
S46 S30 and S45

**The above subject search was linked to the following filter for CINAHL via EBSCO**

S1 MH Random Assignment or MH Single-blind Studies or MH Double-blind Studies or MH Triple-blind Studies or MH Crossover design or MH Factorial Design
S2 TI ("multicentre study" or "multicenter study" or "multi-centre study" or "multi-center study") or AB ("multicentre study" or "multicenter study" or "multi-centre study" or "multi-center study") or SU ("multicentre study" or "multicenter study" or "multi-centre study" or "multi-center study")
S3 TI random* or AB random*
S4 AB "latin square" or TI "latin square"
S5 TI (crossover or cross-over) or AB (crossover or cross-over) or SU (crossover or cross-over)
S6 MH Placebos
S7 AB (singl* or doubl* or trebl* or tripl*) or TI (singl* or doubl* or trebl* or tripl*)
S8 TI blind* or AB mask* or AB blind* or TI mask*
S9 S7 and S8
S10 TI Placebo* or AB Placebo* or SU Placebo*
S11 MH Clinical Trials
S12 TI (Clinical AND Trial) or AB (Clinical AND Trial) or SU (Clinical AND Trial)
S13 S1 or S2 or S3 or S4 or S5 or S6 or S9 or S10 or S11 or S12
Prepared by: Anne Littlewood, Trials Search Co-ordinator and Feedback Editor, Cochrane Oral Health Group

## WHAT'S NEW

Last assessed as up-to-date: 25 October 2010.

| Date | Event | Description |
|---|---|---|
| 7 June 2011 | Amended | Page number added to Frenkel reference and risk of bias terminology updated but no change to overall assessments |

## HISTORY

Protocol first published: Issue 4, 2002

Review first published: Issue 4, 2006

| Date | Event | Description |
|---|---|---|
| 26 October 2010 | New search has been performed | We updated the searches to May 2010. We have included two new studies, bringing the total of included studies to three, involving 470 participants. The conclusions of the review have not changed |
| 2 October 2008 | Amended | Converted to new review format. |

## CONTRIBUTIONS OF AUTHORS

MB updated the search, screened retrieved references for inclusion or exclusion, extracted the data from included trials, evaluated methodological quality, entered data, conducted data analysis, and drafted the review.

DF conducted the search, screened retrieved references for inclusion or exclusion, extracted the data from included trials, evaluated methodological quality, contacted trial authors, entered data, conducted data analysis, and drafted the review.

RH extracted the data from included trials, evaluated methodological quality, provided clinical expertise and commented on review drafts.

SL provided statistical support for data extraction and analysis and commented on review drafts.

VM developed the search strategy, conducted an initial search, screened retrieved references for inclusion or exclusion, extracted the data from included trials, evaluated methodological quality, contacted trial authors, entered data and drafted the review.

## DECLARATIONS OF INTEREST

None known

## SOURCES OF SUPPORT


### Internal sources

- Nursing, Midwifery and Allied Health Professions Research Unit, UK.

### External sources

- Chief Scientist Office, Scottish Government Health Directorate, UK.


## INDEX TERMS

### Medical Subject Headings (MeSH)

*Caregivers; *Health Education, Dental; Health Knowledge, Attitudes, Practice; Nursing Homes; Oral Hygiene [*methods]; Randomized Controlled Trials as Topic; Stroke [*nursing]

### MeSH check words

Humans