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CADTH RAPID RESPONSE REPORT:
SUMMARY WITH CRITICAL APPRAISAL

Soft Toothbrushes versus Foam Swabs for Oral Care: A Review of the Comparative Clinical Effectiveness, Cost-Effectiveness, and Guidelines

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About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Context and Policy Issues

Oral sponges or foam swabs are used to maintain oral hygiene in hospital and long-term care patients who cannot tolerate brushing with a regular toothbrush.[1] This includes patients undergoing cancer treatment, patients who are intubated, the elderly, and people at risk for bleeding in the mouth.[1-3] Concerns about the effectiveness of foam swabs in these patient populations have been expressed.[1-3] Additionally, safety concerns pertaining to the use of oral sponges have been noted in the literature[1,4,5] and contributed to the rationale for a Canadian study on patients in long-term care.[4] Members of the research group had made note of two critical incidents that demonstrated the choking hazard risk associated with the use of sponge swabs. In these incidents, the sponge end of the swab had separated from the stick and dropped to the back of the patient's throat. The choking hazard presented with foam swabs was also described in a medical device alert from the UK government.[5] It was stated that the alert was to take effect in May 2012 after a patient died from choking after the foam head of an oral swab detached from the stick.

The purpose of this report is to evaluate the clinical effectiveness, cost-effectiveness, and guidelines for the use of soft toothbrushes compared to foam swabs for oral care in hospitals, residential care, or group home populations.

Research Question

1. What is the comparative clinical effectiveness of soft toothbrushes versus foam swabs for oral care?
2. What is the cost-effectiveness of soft toothbrushes versus foam swabs for oral care?
3. What are the evidence-based guidelines on the use of soft toothbrushes for oral care?

Key Findings

One moderate-quality randomized control trial (RCT), one low-quality RCT and one low-quality non-RCT provided mixed findings for the efficacy of soft toothbrushes compared to oral swabs for oral care in patients at hospitals or long-term care facilities.

One moderate-quality guideline for the oral care of adult patients with head and neck cancer recommends the use of twice daily brushing with a soft toothbrush and only recommends the use of oral sponges if the use of a toothbrush is painful.

Methods

Literature Search Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD), Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to research question 1 whereas methodological filters were applied to limit retrieval to economic studies and guidelines for research questions 2 and 3.

Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2012 and August 4, 2017.

Rapid Response reports are organized so that the evidence for each research question is presented separately.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Adults and pediatric patients in hospitals, residential care facilities, or group homes
Intervention	Q1-3: Soft toothbrushes
Comparator	Q1-2: Foam swabs Q3: N/A
Outcomes	Clinical effectiveness (benefit/harm), safety, cost-effectiveness, guidelines
Study Designs	Heath technology assessments (HTA), systematic reviews (SR), meta-analyses (MA), randomized control trials (RCT), non-RCTs, economic evaluations and evidence-based guidelines

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2012.Guidelines were excluded if there was no clear evidence of a systematic approach to collecting evidence or if unclear methodology was used.

Critical Appraisal of Individual Studies

The included RCTs and non-RCTs were critically appraised using the Downs and Black Checklist[6] and the guideline was assessed with the AGREE II instrument[7]. Summary scores were not calculated for the included studies; rather, a review of the strengths and limitations of each included study were described narratively.

Summary of Evidence

Quantity of Research Available

A total of 241 citations were identified in the literature search. Following screening of titles and abstracts, 230 citations were excluded and 11 potentially relevant reports from the electronic search were retrieved for full-text review. 15 potentially relevant publications were retrieved from the grey literature search. Of these potentially relevant articles, 22 publications were excluded for various reasons, while 4 publications met the inclusion criteria and were included in this report. Appendix 1 describes the PRISMA flowchart of the study selection.

Summary of Study Characteristics

Two RCTs,[8,9] one non-RCT,[4] and one guideline[3] published between January 1, 2012 and August 4, 2017 were included in this report. Detailed characteristics of the individual studies included in this report are provided in Appendix 2.

Study Design, Country of Origin, and Patient Population

Chacko et al. published a double-blind, single-site, RCT in 2017.[8] This study aimed to assess ventilator-associated pneumonia (VAP) and oral decontamination techniques in 206 patients. Adult patients aged 16 and older with an oro-tracheal tube receiving VAP bundle care were recruited from the intensive care unit (ICU) of a tertiary care centre in South India. Patients had to be recruited within four to six hours of intubation. The toothbrush intervention group and oral sponge comparator group consisted of 55.9% and 32.7% female patients, respectively. The mean age of patients in the intervention group was 41.0 years, and 45.9 years in the comparator group.

Marino et al. conducted a single-blind, split-mouth RCT conducted in the United Kingdom[9] (UK). This study included 21 mechanically ventilated ICU patients over the age of 18. The study sample was composed of 55% female patients, and the mean age of the patients was 49 years.

The Canadian non-randomized study used a pre/post-intervention design.[4] This study included 42 patients from a long-term nursing facility. Patients ranged in age from 21 to 82, and all patients had dysphagia.

In 2017, Alberta Health Services released a clinical practice guideline applicable to adults over the age of 18 years with head and neck cancer being managed by surgery, radiation therapy, chemotherapy alone or in combination.[3] The guidelines aim to help prevent cancer treatment interruption due to oral complications resulting from treatment and are specific to patients before, during, and after cancer treatment. The guidelines were developed by the guideline working group (GWG) and were based on a literature search in multiple databases for evidence published after 1990, which was supplemented by hand searching the literature.[3] The GWG created specific guidelines for patients at various stages of cancer treatment. Among these guidelines were recommendations pertaining to the use of toothbrushes and oral swabs. Generally, the CPG assessed oral and dental morbidity as the main outcomes while taking function, comfort, dignity, and quality of life into consideration.[3]

Interventions and Comparators

The RCT by Chacko et al. assigned patients to receive treatment with toothbrushes or oral swabs.[8] The toothbrush intervention group involved chlorhexidine gluconate 0.2% instilled into the oral cavity via syringe through a port at the side of the toothbrush followed by brushing of the tongue and teeth, ensuring all four quadrants were cleaned. The oral cavity was simultaneously suctioned with the Yankauer suction catheter. The comparative treatment involved swabbing of the oral cavity with sponges soaked in chlorhexidine gluconate 0.2%.

The UK split-mouth study involved half of each patient's mouth being treated with a small-headed toothbrush with sterile water using the modified Bass technique for brushing.[9] The other half of the mouth was treated using a foam swab with sterile water using the same

modified Bass technique. The side of the mouth to be treated with the toothbrush was randomly assigned.

The Canadian non-RCT examined patients prior to the study intervention when they were undergoing typical care.[4] Typical care for patients included the use of sponge swabs moistened with alcohol-free mouth rinse (n = 35) or the use of toothbrushes (n = 7). All patients underwent treatment with the following oral intervention. The oral intervention required the discontinued use of sponge swabs and the implementation of a new oral protocol that utilized twice-daily brushing with soft, small-headed toothbrushes and thickened antibacterial gel (cetylpyridinium chloride 0.05% in glycerine). The new protocol was performed by staff.

Outcomes

Chacko et al.'s RCT assessed the incidence of VAP.[8] VAP was determined based on microbiology reports and the criteria from the United States Centers for Disease Control and Prevention. Diagnosis of VAP was confirmed after agreement between the medical ICU consultant and the hospital infection control committee officer.

The remaining studies assessed various outcomes that pertained to general oral health. The UK study assessed dental plaque removal and gingival inflammation using the Silness-Löe scoring indices.[9] The Silness-Löe plaque index assigns a score of zero to three, where a score of zero indicates no plaque, and a score of three indicates an abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin. The Silness-Löe gingival index assigns a score of zero to three, where a score of zero indicates a normal assessment, and a score of three indicates severe inflammation, marked redness and edema, ulceration, spontaneous bleeding. The Canadian study used general oral health status as the primary outcome.[4] The oral health status of lips, tongue, gums, tissues, saliva, and oral cleanliness was assessed by an oral health promotion specialist. Details of the assessment were limited. Other aspects of oral health including tartar, swollen or bleeding gums, ulcerations, debris and severe halitosis were recorded. The CPG developed by Alberta Health Services assessed general oral and dental morbidity as the main outcomes while taking function, comfort, dignity, and quality of life into consideration.[3]

Summary of Critical Appraisal

The details of the critical appraisal for the included publications are provided in Appendix 3.

The objectives of the RCT were clearly described.[8] The study outcomes to be measured were clearly described in the methodology section. The source, relevant characteristics, and inclusion and exclusion criteria for patients were provided. The length of follow-up and the characteristics of patients lost to follow-up were not provided. The interventions for both toothbrush-intervention and oral swab control group are clearly described. A list of confounders was provided. The main findings of the study were clearly described and the authors included the actual probability values. The characteristics of patients lost to follow-up were not provided. The primary investigator was blinded, but it was unclear if patients or data analysts were blinded. Blinding analysts acts as another method to preserve the integrity of the data and prevent ascertainment bias. This study considered all mechanically-ventilated patients, however potential issues with external validity arose as this study contained an extensive inclusion criteria that may have resulted in limited generalizability. This study required patients to be recruited within four to six hours of intubation. In addition, patients had to be receiving VAP bundle care that included the

following: head-end elevation, antibiotics, H2 receptor blocker, oral care, hand hygiene, cleaning of equipment and universal precautions. This intervention made it impossible to blind the staff members that were administrating the treatments; this introduces the possibility of the Hawthorne effect. A power calculation was not provided; therefore it is unclear if the study was adequately powered to detect a clinically important effect.

The overall aim of the UK study by Marino et al. was clearly described. This study utilized split-mouth methodology.[9] There are pros and cons associated with this method as it introduces the possibility of cross-over effects where the outcome measured (plaque and gingival inflammation) may be affected by the other treatment leading to misclassification. In contrast, there are benefits associated with split-mouth methodology including the control of individual differences in patients' mouths. The study outcomes to be assessed were provided in the methodology section. The source, relevant characteristics, and inclusion and exclusion criteria for patients were provided. The two oral hygiene methods used in the split-mouth design were identified. The main findings of the study are clearly described. The actual probability values were reported. The assessors, laboratory staff, and statistician were blinded. The outcomes were assessed using visual inspection according to the Silness-Löe scoring indices for dental plaque and gingival inflammation. These measures are subjective and potentially vulnerable to assessor-related heterogeneity. The study was sufficiently powered to detect a 0.63 shift in plaque scores; although, it is unclear if this value is indicative of a clinically important effect.

The aims of the Canadian study by Dyck et al. were clearly stated.[4] The main outcomes are listed prior to the results section and little detail is provided. This study included a sample size of 42 patients and used a pre/post intervention methodology where all patients' oral health was assessed prior to and after the intervention by an oral health promotion specialist. The pre/post methodology makes it possible for the pre-intervention method to influence the post-intervention results. In this patient population, the pre-intervention method varied between people, where 35 patients used sponge swabs and seven patients used toothbrushes. The characteristics of the patients included in the study were not provided in detail. Some aspects of the intervention were not clearly described (i.e. length of intervention). The main outcomes of oral health were provided in little detail and it is unclear how assessments were made, or if any validated scales or measures were used. Confounders were not considered in this study. The final outcomes were not stratified by pre-intervention method and did not use any statistical measures to control for this potential difference. The main findings of the study were provided in a bar chart and probability values were not provided. The study does not provide estimates of random variability for the main outcomes and does not indicate the use of any statistical tests. Adverse events were not reported. The characteristics of patients lost to follow-up were not provided. It is unclear if the study participants were representative of the general long-term care population as characteristics of the subjects were not provided.

The overall objectives and health questions covered by the guideline were described.[3] The guideline is clearly indicated for adult patients with head and neck cancer who are managed by surgery, radiation therapy, or chemotherapy alone or in combination. The working group that developed the guideline included individuals from relevant professional groups including content experts, external experts, and significantly impacted groups. The guideline was developed using systematic methods to search for evidence, a specific criteria to select the material, and specific methods to formulate the recommendations.The health benefits, side effects, and risks have been considered in the formulation of the recommendations. The explicit links between the recommendations and the supporting

evidence were provided. A procedure for updating the guideline was provided. The recommendations are specific and unambiguous and address different stages during treatment for head and neck cancer. The key recommendations are clearly indicated. Conflicts of interest within the developing group are addressed. The guideline does not describe the associated strengths and limitations and fails to describe facilitators and barriers to its application.

Summary of Findings

What is the comparative clinical effectiveness of soft toothbrushes versus foam swabs for oral care?

In a RCT utilizing a hospital population of ventilated patients, tooth-brushing was not superior to mouth-swabbing in preventing ventilator-associated pneumonia.[8] In a split-mouth trial of ventilated patients, brushing with a toothbrush or a foam swab were equally effective at removing plaque and reducing gingival inflammation.[9] In a Canadian trial of long-term care patients who had originally received oral care with either foam swabs (n = 35) or toothbrushes (n = 7), the use of a toothbrush intervention applied to all patients showed improved oral health ratings for the lips, gums and tissues, saliva, and oral cleanliness.[4] Use of sponge swabs were shown to be ineffective at removing plaque.

What is the cost-effectiveness of soft toothbrushes versus foam swabs for oral care?

No studies specific to cost-effectiveness of soft toothbrushes versus foam swabs for oral care were identified.

What are the evidence-based guidelines on the use of soft toothbrushes for oral care?

Alberta Health Services guidelines for patients with head and neck cancer provided 43 oral care recommendations for various stages in cancer treatment.[3] These recommendations were described but not rated. For general management during cancer treatment it was recommended that brushing with a soft toothbrush should be carried out twice daily. If brushing teeth was painful, then it was recommended that the teeth and oral tissues be cleaned with an oral sponge or gauze moistened with alcohol-free chlorhexidine mouthwash. The CPG recommends that after cancer treatment, patients brush their teeth two to three times per day with high fluoride content (5000ppm) toothpaste. It was also recommended that brushing and flossing be delayed by 20 to 60 minutes after eating or drinking.

Limitations

Overall, the quality of the RCT by Chacko et al., was somewhat limited by methodological issues and failure to describe specific aspects of the study.[8] Issues with external validity of the study were evident by the use of extensive inclusion criteria that limited the generalizability of the results. The study failed to include a power calculation, making it unclear if the study was adequately powered to detect a clinically important effect.

The split-mouth RCT by Marino et al.[9] was limited as it allowed for possible cross-over effects of the treatments. This study was limited by not explicitly stating the number of assessors per patient. Multiple assessors would be beneficial as the outcomes are based on visual inspection which may vary from assessor to assessor. If there were multiple assessors per patient there was no inter-rater reliability tests included in the analysis.

The non-RCT Canadian study by Dyck et al.[4] used pre/post methodology. Generally, this study contained a number of limitations pertaining to methodology and ambiguity in reporting. The pre/post methodology makes it possible for the pre-intervention method to influence the post-intervention results. In this patient population, the pre-intervention method varied between people, where the majority of patients (n = 35) used sponge swabs and seven patients used toothbrushes. Ambiguity in reporting was noted for patient characteristics, duration of intervention, and details of the outcome assessments. The results of the study were not presented in detail or with statistics.

The quality of the guideline[3] was somewhat limited by failing to describe the associated strengths and limitations of the CPG, and failure to describe facilitators and barriers to its application.

No relevant economic evaluations were identified; therefore, the cost-effectiveness of soft toothbrushes versus foam swabs for oral care remains unclear.

Conclusions and Implications for Decision or Policy Making

The hospital-based RCT of ventilated patients determined that tooth-brushing was not superior to mouth-swabbing in preventing ventilator-associated pneumonia.[8] The split-mouth non-RCT of ventilated patients determined that brushing with a toothbrush or a foam swab were equally effective at removing plaque and reducing gingival inflammation.[9] The non-RCT on a long-term care population favoured the use of toothbrushes over foam swabs for general oral health.[4]

Guidelines for patients with head and neck cancer undergoing surgery, radiation therapy, chemotherapy or any combination of these provided 43 oral care recommendations specific to the various stages in cancer treatment.[3] Two of these recommendations pertained to the use of toothbrushes and foam swabs. For general management during cancer treatment it was recommended that brushing with a soft toothbrush be carried out twice daily. Use of oral sponges or gauze moistened with alcohol-free chlorhexidine mouthwash was recommended only if brushing with the soft toothbrush was painful. The CPG recommends that after cancer treatment, patients brush their teeth two to three times per day with high fluoride content (5000ppm) toothpaste. The use of oral sponges was not mentioned for oral care after treatment.

A gap in the literature exists for recent economic studies specific to soft toothbrushes compared to foam swabs as our literature search yielded zero results. Overall, the finding for efficacy of soft toothbrushes compared to foam swabs is mixed and based on low to moderate quality studies; thus, further study is warranted.

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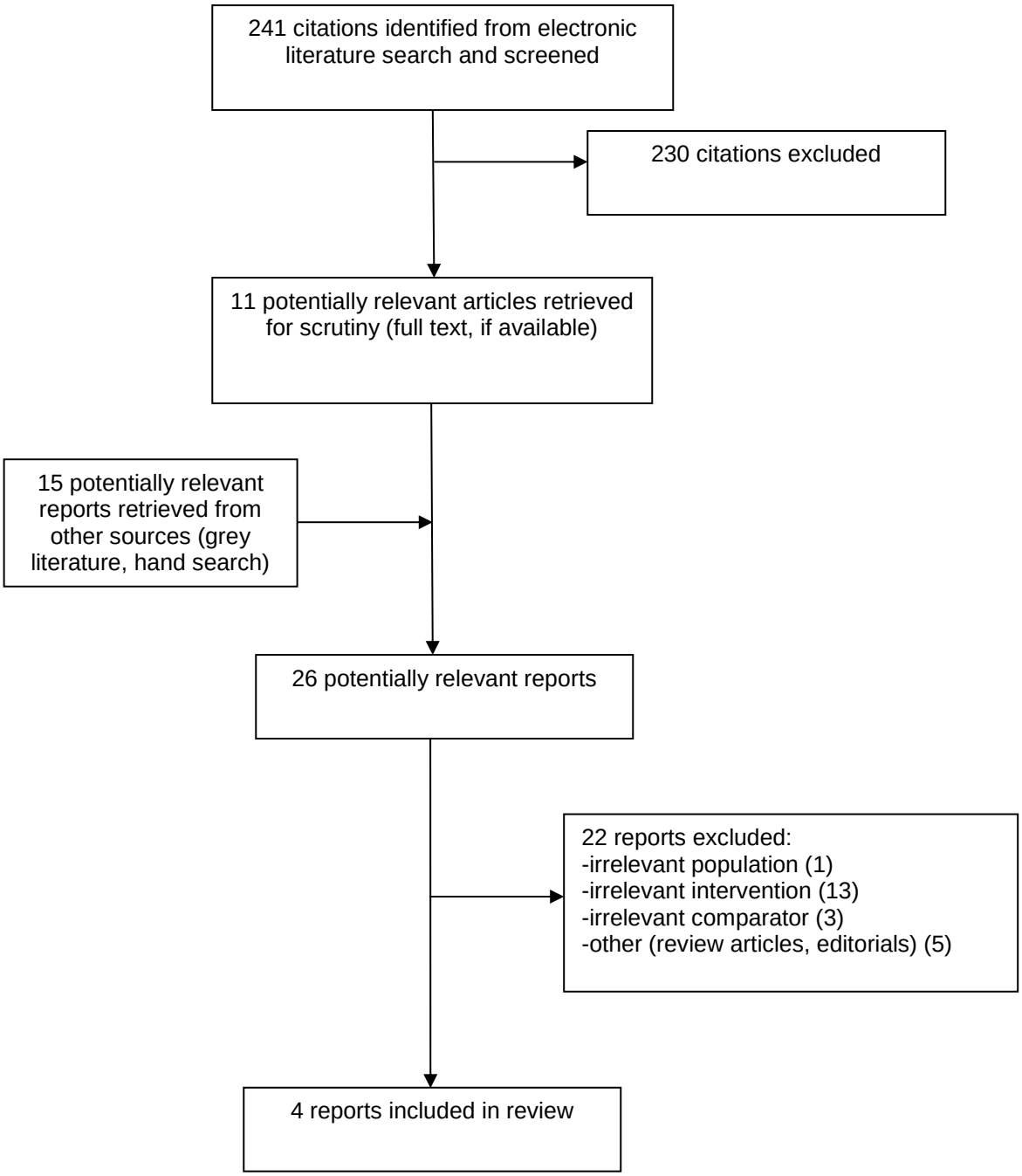
Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Publications

Table 2: Characteristics of Included Clinical Studies

First Author, Publication Year, Country	Study Design, Length of Follow-up	Patient Characteristics, Sample Size (n)	Intervention	Comparator(s)	Clinical Outcomes
Randomized Control Trial					
Chacko, 2017, South India[8]	Double-blind, RCT	Patients (n=206) aged 16 and above in the ICU of a tertiary care centre ventilated with an oro-tracheal tube receiving VAP bundle care. Sex (%) Intervention – 55.9% female Oral sponges – 32.7% female Age (mean, SD) Intervention – 41.0 (17.8) Oral sponges – 45.9 (18.4)	Chlorhexidine gluconate 0.2% was instilled into the oral cavity via syringe through a port at the side of the tooth brush. Tongue and teeth were brushed, ensuring all four quadrants were cleaned. The oral cavity was concurrently suctioned with the Yankauer suction catheter.	Oral cavity was swabbed with sponges soaked in chlorhexidine gluconate 0.2%.	Incidence of VAP was determined based on microbiology reports and the US CDC criteria available at the time of the study.
Marino, 2016, United Kingdom[9]	Single-blind RCT, split-mouth design, follow-up once daily until extubation or for 7 days.	Patients (n=21) above the age of 18 in an intensive care unit who were mechanically ventilated. Sex (%) 55% female Age (mean) – 49	Small-headed toothbrush with sterile water using the modified Bass technique for brushing	Foam swab with sterile water using the modified Bass technique for brushing	Dental plaque removal and gingival inflammation were assessed using the Silness-Löe scoring indices.
Non-randomized Controlled Trial					
Dyck, 2012, Canada[4]	Pre/post design, follow-up at 3 weeks	Patients (n=42) aged 21 to 82 in a long-term care facility with dysphagia.	Applicable to all participants: Discontinued use of	Typical care (prior to intervention) for all participants:	Oral health status of lips, tongue, gums, tissues, saliva, and oral cleanliness was

Table 2: Characteristics of Included Clinical Studies

First Author, Publication Year, Country	Study Design, Length of Follow-up	Patient Characteristics, Sample Size (n)	Intervention	Comparator(s)	Clinical Outcomes
			sponge swabs. Use of a twice-daily oral-hygiene protocol utilizing thickened antibacterial gel (cetylpyridinium chloride 0.05% in glycerine) and soft, small-headed toothbrushes to be performed by staff.	Use of sponge swabs moistened with alcohol-free mouth rinse (n=35). Use of toothbrushes (n=7)	assessed by an oral health promotion specialist.

CDC = centers for disease control and prevention; ICU = intensive care unit; RCT = randomized control trial; US = united states VAP = ventilator associated pneumonia.

Table 3: Characteristics of Included Guidelines

First Author, Publication Year, Country	Intended users/ Target population	Intervention and Practice Considered	Major Outcomes Considered	Evidence collection, Selection and Synthesis	Guideline Validation
Alberta Health Services, 2017, Canada[3]	The recommendations are for adults over the age of 18 years with head and neck cancer being managed by surgery, radiation therapy, or chemotherapy or any combination of these.	A pathway for oral and dental care for patients with head and neck cancer to help prevent cancer treatment interruption due to oral complications resulting from treatment. Guidelines are specific to patients before, during, and after cancer treatment.	Oral and dental morbidity. Function, comfort, dignity, and quality of life.	The CPG is developed by the GWG, which may be composed of PTT leads (content experts), external experts, and significantly impacted groups. PTT members can be oncologists, surgeons, pathologists, nurses, pharmacists, allied health professionals, and researchers from across Alberta. The guideline is reviewed by members of the working group, PTT, external experts and is approved by consensus. The CPG is developed using clearly defined steps. The literature search is conducted using search parameters defined by the PTT leads. Several databases including Medline, EMBASE, and Cochrane are systematically searched. A formal rating system is not used, however the guideline describes the strength of recommendation based on benefits, harms, evidence summary, and the clinical role.	The CPG is used by CancerControl Alberta. The CPG was adapted from the Royal College of Surgeons of England and the British Society for Disability and Oral Health clinical practice guideline.

CPG = clinical practice guideline; GWG = guideline working group; PTT = provincial tumour team.

Appendix 3: Critical Appraisal of Included Publications

Table 4: Strengths and Limitations of Randomized Controlled Trials using the Downs & Black Checklist[6]

Strengths	Limitations
Randomized Control Trial	
Chacko, 2017[8]	
• Objectives of the study were clearly described • Study outcomes were clearly described in the methodology section • Source, relevant characteristics, and inclusion and exclusion criteria for patients were provided • Interventions for both intervention and control group were clearly described • A list of confounders was provided • Main findings of the study were clearly described • Actual probability values were reported • Primary investigator was blinded	• Length of follow-up was not provided • Characteristics of patients lost to follow-up were not provided • All mechanically-ventilated patients were assessed for eligibility, but an extensive inclusion criteria resulted in limited generalizability • Unclear if patients or data analysts were blinded • Not possible for staff administering intervention to be blinded. Increased potential for the Hawthorne effect. • Unclear if the study was adequately powered to detect a clinically important effect
Marino, 2016[9]	
• Overall aim of the study was clearly described • Study outcomes to be assessed were provided in the methodology section • Source, relevant characteristics, and inclusion and exclusion criteria for patients were provided • The two oral hygiene methods used in the 'split-mouth' design were identified • Main findings of the study are clearly described • Actual probability values were reported • The assessors, laboratory staff and statistician were blinded • Study was sufficiently powered to detect a 0.63 shift in plaque scores • 'Split-mouth' methodology used allowing for control of characteristics at the level of the individual	• 'Split-mouth' methodology used leading to potential cross over effect • Not possible for staff administering intervention to be blinded. Increased potential for the Hawthorne effect. • Unclear if patients were assessed by more than one assessor. • Major measures are qualitative and potentially vulnerable to assessor-related heterogeneity • Unclear if the study was sufficiently powered to detect a clinically important effect
Non-randomized Control Trials	
Dyck, 2012[4]	
• Overall aims of the study were clearly described • Main outcomes are mentioned prior to the results section	• Small sample size (N = 42) • Pre/post methodology used – possible for "pre" method to influence "post" method • Main outcomes were provided in little detail • Characteristics of the patients included in the study were not provided in detail • Some aspects of the intervention were not clearly described (i.e. length of intervention) • Confounders were not considered in this study • Main findings of the study were provided in a bar chart

Table 4: Strengths and Limitations of Randomized Controlled Trials using the Downs & Black Checklist[6]

Strengths	Limitations
	• The study does not provide estimates of random variability for the main outcomes • Characteristics of patients lost to follow-up were not provided • Adverse events were not reported • Probability values were not provided • Unclear if the study participants were representative of the general long-term care population • Blinding was not possible for this study • Statistical tests were not conducted

Table 5: Strengths and Limitations of Guidelines using AGREE II[7]

Strengths	Limitations
Alberta Health Services, 2017[3]	
• Overall objectives of the guideline are specifically described • Health questions covered by the guideline are specifically provided • Population to whom the guideline is meant to apply to is specifically described • Guideline development group includes individuals from relevant professional groups • Views and preferences of the target population have been sought • Target users of the guideline are stated • Systematic methods were used to search for evidence • Criteria for selecting evidence was provided • Methods for formulating the recommendation were clearly described • Health benefits, side effects, and risks have been considered in formulating the recommendations • Explicit links between the recommendations and the supporting evidence were provided • Procedure for updating the guideline is provided • Recommendations are specific and unambiguous • Key recommendations are clearly indicated • Conflicts of interest within the developing group are addressed	• Strengths and limitations of the body of evidence were not provided • Guideline does not describe facilitators and barriers to its application

Appendix 4: Main Study Findings and Author's Conclusions

Table 6: Summary of Findings of Included Studies

Main Study Findings	Author's Conclusion
Randomized Control Trial	
Chacko, 2017[8]	
There was no difference in the incidence of patients with VAP. The incidence of VAP in the mouth-swabbing group was 8.6 per 1000 ventilator days while the incidence of VAP in the tooth-brushing group was 11.6 per 1000 ventilator days (P = 0.82). An increase in odds of 1.3 was associated with each day of ventilation (P = 0.03).	*"Tooth-brushing with concurrent suctioning technique was not proved to be superior to mouth-swabbing."* p.594 *"The greatest risk factor for developing VAP was the length of time on a ventilator"* p.594
Non-Randomized Control Trial	
Marino, 2016[9]	
High initial plaque (mean=2.1 (SD 0.45)) and gingival (mean=2.0 (SD 0.54)) scores were recorded for 21 patients. The reduction in plaque index from pre-intervention to post-intervention was similar for the use of toothbrushes (mean change= −1.26; 95% CI −1.57 to −0.95; P < 0.001) and foam swabs (mean change=−1.28; 95% CI −1.54 to −1.01; P < 0.001). The reduction in gingival index from pre-intervention to post-intervention was similar for the use of toothbrushes (mean change=−0.92; 95% CI −1.19 to −0.64; P < 0.001) and foam swabs (mean change=−0.85; 95% CI −1.10 to −0.61; P < 0.001). There was no difference in reduction of plaque index (p = 0.24), or gingival index (P = 0.12) between the use of the toothbrushes and foam swabs. No significant change in bacterial counts from pre-intervention to post-intervention was found for either toothbrushes (P > 0.001) or foam swabs (P > 0.001).	*"Both interventions [brushing with a toothbrush or foam swab] were equally effective at removing plaque and reducing gingival inflammation."* p.1
Dyck, 2012[4]	
The percentage of patients with healthy rating improved after the intervention (tooth brushing) for the lips, gums and tissues, saliva, and oral cleanliness. The percentage of patients with healthy ratings for the tongue was higher before the intervention. (Findings reported in bar graph format; raw numerical data and probability values not provided)	*"This intervention confirmed that tooth brushing is appropriate as the gold standard of good oral care and showed that sponge swabs are ineffective for removing plaque."* p.21
Guidelines	
Alberta Health Services, 2017[3]	
Relevant recommendations: • **During cancer treatment:** Twice daily brushing should be carried out with a soft toothbrush along with	The CPG for oral and dental care management for adult patients with head and neck cancer included 43 recommendations specific to patients before, during, and after treatment.

Table 6: Summary of Findings of Included Studies

Main Study Findings	Author's Conclusion
interdental cleaning. If brushing is painful, then teeth and supporting soft tissues can be cleaned with an oral sponge or gauze moistened with alcohol free chlorhexidine mouthwash. • **After cancer treatment:** Brushing and flossing should be delayed for at least 20 minutes and possibly up to 60 minutes after eating/drinking. Oral hygiene measures should include brushing two to three times/day with high fluoride content (5000ppm) toothpaste for adults. Formal rating schemes for describing the strength of the recommendations not used during guideline development.	Recommendations for general management during and after cancer treatment referred to the use of soft toothbrushes or oral sponges under certain conditions.

CPG = clinical practice guideline; VAP = ventilator-associated pneumonia.