Health Evidence Review Commission's Oral Health Advisory Panel

September 8, 2016

8:30 AM - 10:00 AM

Clackamas Community College
Wilsonville Training Center, Room 211
29373 SW Town Center Loop E, Wilsonville, Oregon, 97070

Section 1.0

Call to Order

AGENDA
ORAL HEALTH ADVISORY PANEL (BHAP)
September 8, 2016
8:30-10:00 AM
Wilsonville Training Center, Room 211
(All agenda items are subject to change and times listed are approximate)

#	Time	Item	Presenter
1	8:30	Call to Order	Gary Allen, Chair
2		Purpose of Meeting Overview of role of OHAP	Darren Coffman
3		1) 2017 CDT code placements 2) Dental guidelines - GN 17 PREVENTIVE DENTAL CARE - GN 43 ORAL SURGERY - GN XXX REMOVAL OF TORI AND EXCISION OF HYPERPLASTIC TISSUE 3) Implant removal and debridement	Ariel Smits
5		Other Business	
6		Public Comment	
7	10:00	Adjournment	Gary Allen, Chair

MINUTES

Health Evidence Review Commission's
Oral Health Advisory Panel (OHAP)

Clackamas Community College
Wilsonville Training Center, Room 210
September 22, 2015
8:00-10:00 AM

Members Present: Bruce Austin, DMD, Chair Pro Tempore; Deborah Loy; Mike Shirtcliff, DMD (via phone); Gary Allen, DMD; Lynn Ironside; Lori Lambright; Mike Plunkett, DDS, MPH (at 8:20); Patricia Parker, DMD; Karen Nolan.

Members Absent: Benjamin Hoffman, MD; Eli Schwarz, DDS, MPH, PhD.

Staff Present: Darren Coffman; Ariel Smits, MD, MPH.

Also Attending: Dee Weston, Sarah Wetherson, Brian Nieubuurt, and Lori Johnson, OHA; Cathleen Olesitse, Care Oregon; Laura McKeane, All Care Health; Paul Bullinger and Ashlen Strong, Healthshare of Oregon; Caroline Larsen, WVCM; Dayna Steringer, DK Strategies LLC and Advantage Dental.

Roll Call/Minutes Approval/Staff Report

The meeting was called to order at 8:05 am and roll was called. Minutes from the October 15, 2014 OHP meeting were reviewed and approved.

Smits reviewed the charge of OHAP and the organizational structure within HERC.

- **Topic: 2016 CDT Code Review**

  Discussion: The proposed placement for the new 2016 CDT codes included in the meeting materials, reflecting input from the DCO Contractors, were reviewed. The code placements were accepted as proposed with minimal discussion except for the following:

  1) D5221-D5224 were placed as recommended on a non-covered line. OHAP clarified that immediate partial dentures are not a covered item because it is very difficult to correctly fit dentures until the mouth is healed from the extraction process. The delayed partial denture CDT codes are on a covered line.

  2) D9223 and D9243 (dental anesthesia codes) were recommended to be placed on the Exempt List rather than the Ancillary List, as the dental providers do not used

diagnosis codes and the Ancillary List therefore is not applicable. The other dental anesthesia codes are on the Exempt List, and there are dental rules in place regarding their use.

3) D1354 (interim caries arresting medicament application) was extensively discussed. This CDT code is mainly used for the application of silver diamine fluoride. This treatment provides tertiary prevention, to arrest caries already present. Therefore, this procedure is not appropriate for a prevention line, which contains only primary and secondary preventive services. It is most appropriate for the dental caries line (line 358). Plunkett asked that a guideline be added to define what a "medicament" is, as this term is very vague. Currently, it refers to silver diamine fluoride, but other existing compounds and compounds under development could fall into this category. HERC reviewed silver compounds including silver diamine fluoride in January, 2013 and determined that these compounds should not be covered and added a guideline to the Prioritized List (GN91) specifically calling out non-coverage. At that time, silver diamine fluoride was not FDA approved (it has subsequently been approved), and the majority of the research into its effectiveness was done outside of the US. The previous HERC discussion had also included silver nitrate, which OHAP does not feel should be covered. There was additional concern about the black staining of teeth with silver treatments.

The majority of OHAP felt that this treatment is effective for arresting caries and for treating the dental infectious process. The group felt that newer compounds currently being studied will prove to be equally or more effective. The group was unanimous in feeling that D1354 should be covered, and recommended adding a guideline limiting this code to represent only the use of silver diamine fluoride, with further limitation to 2 applications a year. The group felt that this guideline would be an interim guideline for the next year or two, while OHAP could further investigate the research and standards for use, and create a more comprehensive guideline note.

A representative from Delta Dental testified that Delta Dental was not going to cover this CDT code for 2016 due to concerns about defining medicament and for concerns about the experimental nature of the therapy.

Shirtcliff forwarded an in-press review by Horst in the California Dental Association Journal on silver diamine fluoride to the group, which he felt was an excellent summary of the technology and its recommended uses.

The decision was made to recommend placement of D1354 on line 358 DENTAL CONDITIONS (EG. CARIES, FRACTURED TOOTH), with a new guideline. GN91 was recommended for deletion. HERC staff was directed to 1) research the CDT committee minutes for additional information on why this code was approved, 2) review the recently published MED report on this topic, and 3) review the identified

review article on this topic. HERC staff will compile this material for the October 1, 2015 VBBS meeting for further discussion.

Actions:

1) See recommended 2016 CDT code placements in Appendix A
2) Delete GN91

~~**GUIDELINE NOTE 91, SILVER COMPOUNDS FOR DENTAL CARIES**~~

~~*Lines 57,347,348,473,599*~~

~~Silver compounds for dental caries prevention and treatment are not included on these or any lines on the Prioritized List for coverage consideration~~

3) Add a new guideline for silver diamine fluoride as shown below

GUIDELINE XXX, CARIES ARRESTING MEDICAMENT APPLICATION

Line 358

D1354 is limited to silver diamine fluoride applications, with a maximum of two applications per year.

- **Topic: Placement of CDT Codes on the Prioritized List and on Another List**

Discussion: CDT codes which are currently located both on the Prioritized List and on another List (Diagnostic, Ancillary, etc.) were reviewed, along with the staff proposed placement. There was no discussion.

Actions:

1) The CDT codes appearing on two lists will all be removed from any other list other than the Prioritized List

- **Topic: Denture Coverage on the Prioritized List**

Discussion: Smits reviewed the current placement of CDT codes for dentures. There was no discussion.

Actions: This topic was informational only

- **Topic: Crowns**

  Discussion: Smits requested feedback from OHAP on whether the current OHA dental rules regarding crowns were sufficient or whether OHAP would like a guideline regarding crown coverage drafted for the Prioritized List. The group was in unanimous agreement that rules were preferable to a guideline.

  Actions: No action required

- **Topic: Dental Access Issues**

  Discussion: Austin reviewed an OHA survey on dental access. There was some discussion about dental metrics.

  Actions: This topic was informational/for discussion only

- **Topic: Restoration of Benefits for Adults**

  Discussion: The legislative decision to appropriate additional money to allow broader coverage of dentures, crowns, and scaling/planing was reviewed and information on possible additions to coverage was reviewed.

  Actions: This topic was informational only

- **Public Comment:**

  Caroline Larson testified about the importance of the work of OHAP and the importance of dental health for overall physical health and the ability of a person to function in society.

- **Issues for next meeting:**
  - Revisit caries arresting medicament guideline

- **Next meeting:**
  - TBD

Appendix A
2016 New CDT Codes

CDT Code	Code Description	Suggested Placement
D0251	extra-oral posterior dental radiographic image	Diagnostic List
D0422	collection and preparation of genetic sample material for laboratory analysis and report	Services Recommended for Non-Coverage Table
D0423	genetic test for susceptibility to diseases – specimen analysis	Services Recommended for Non-Coverage Table
D1354	interim caries arresting medicament application	**348** DENTAL CONDITIONS (EG. CARIES, FRACTURED TOOTH) *Note: With guideline limiting to silver diamine fluoride only, used up to twice per year*
D4283	autogenous connective tissue graft procedure (including donor and recipient surgical sites) – each additional contiguous tooth, implant or edentulous tooth position in same graft site	**496** DENTAL CONDITIONS (EG. PERIODONTAL DISEASE)
D4285	non-autogenous connective tissue graft procedure (including recipient surgical site and donor material) – each additional contiguous tooth, implant or edentulous tooth position in same graft site	**496** DENTAL CONDITIONS (EG. PERIODONTAL DISEASE)
D5221	immediate maxillary partial denture – resin base (including any conventional clasps, rests and teeth)	**594** DENTAL CONDITIONS (EG. CARIES, FRACTURED TOOTH)
D5222	immediate mandibular partial denture – resin base (including any conventional clasps, rests and teeth)	**594** DENTAL CONDITIONS (EG. CARIES, FRACTURED TOOTH)
D5223	immediate maxillary partial denture – cast metal framework with resin denture bases (including any conventional clasps, rests and teeth)	**594** DENTAL CONDITIONS (EG. CARIES, FRACTURED TOOTH)
D5224	immediate mandibular partial denture – cast metal framework with resin denture bases (including any conventional clasps, rests and teeth)	**594** DENTAL CONDITIONS (EG. CARIES, FRACTURED TOOTH)
D7881	occlusal orthotic device adjustment	**552** TMJ DISORDER
D8681	removable orthodontic retainer adjustment	**47** CLEFT PALATE WITH AIRWAY OBSTRUCTION **305** CLEFT PALATE AND/OR CLEFT LIP **621** DENTAL CONDITIONS (EG. MALOCCLUSION)
D9223	deep sedation/general anesthesia – each 15 minute increment	Exempt List
D9243	intravenous moderate (conscious) sedation/analgesia – each 15 minute increment	Exempt List
D9932	cleaning and inspection of removable complete denture, maxillary	Services Recommended for Non-Coverage Table
D9933	cleaning and inspection of removable complete denture, mandibular	Services Recommended for Non-Coverage Table

Appendix A
2016 New CDT Codes

CDT Code	Code Description	Suggested Placement
D9934	cleaning and inspection of removable partial denture, maxillary	Services Recommended for Non-Coverage Table
D9935	cleaning and inspection of removable partial denture, mandibular	Services Recommended for Non-Coverage Table
D9943	occlusal guard adjustment	**650** DENTAL CONDITIONS WHERE TREATMENT RESULTS IN MARGINAL IMPROVEMENT

2017 CDT Codes

CDT Code	Nomenclature	Suggested Code Placement	Comments
D0414	laboratory processing of microbial specimen to include culture and sensitivity studies, preparation and transmission of written report	Diagnostic	D0415 (COLLECTION OF MICROORGANISMS FOR CULTURE AND SENSITIVITY) is currently listed on the Diagnostic List, but HSD reports that this code is not open for payment. This appears to be a companion code. Typically paid under a medical billing code. Diagnostic List, and HSD will not open for payment
D0600	non-ionizing diagnostic procedure capable of quantifying, monitoring and recording changes in structure of enamel, dentin, and cementum	Services Recommended for Non-Coverage	This is a procedure for using non-xray based diagnostic tools. This is considered an emerging area. DCOs recommended non-coverage. This code represents the proprietary Canary system, which is still considered experimental by the DCO medical directors. Place on Services Recommended for Non-Coverage as experimental. Can readdress as new studies are published
D1575	distal shoe space maintainer - fixed - unilateral	57 PREVENTIVE DENTAL SERVICES	D1510 (SPACE MAINTAINER-FIXED UNILATERAL) is on line 57. HSD recommends making either/or with D0150 and use the same limitations as apply to D1510. Rules to be devised by HSD.
D4346	scaling in presence of generalized moderate or severe gingival inflammation – full mouth, after oral evaluation	57 PREVENTIVE DENTAL SERVICES	D4342 (PERIODONTAL SCALING AND ROOT PLANING - ONE TO THREE TEETH, PER QUADRANT) is on line 223. D4355 (FULL MOUTH DEBRIDEMENT TO ENABLE COMPREHENSIVE EVALUATION AND DIAGNOSIS) is on line 57. DCOs felt this was equivalet to debridement and recommended line 57. Make either/or with D4355 and use the same limitations as apply to D4355. Rules to be devised by HSD.
D6081	scaling and debridement in the presence of inflammation or mucositis of a single implant, including cleaning of the implant surfaces, without flap entry and closure	622 DENTAL CONDITIONS (EG. MISSING TEETH) Treatment IMPLANTS (I.E. IMPLANT PLACEMENT AND ASSOCIATED CROWN OR PROSTHESIS) vs ???	Implant related. Needs discussion.
D6085	provisional implant crown	622 DENTAL CONDITIONS (EG. MISSING TEETH) Treatment IMPLANTS (I.E. IMPLANT PLACEMENT AND ASSOCIATED CROWN OR PROSTHESIS)	Implant related. Do not cover
D9311	consultation with medical health care professional	Ancillary	Integration of dental and medical systems should be encouraged.
D9991	dental case management – addressing appointment compliance barriers.	Ancillary	Integration related. HSD recommends Ancillary.
D9992	dental case management – care coordination	Ancillary	Integration related. HSD recommends Ancillary.
D9993	dental case management – motivational interviewing	Ancillary	Integration related. HSD recommends Ancillary.
D9994	dental case management – patient education to improve oral health literacy	Ancillary	Integration related. HSD recommends Ancillary.

1) GN17 Preventive Dental Care

GN17 allows additional fluoride treatment for "a child at high risk for dental caries" and "high risk adults." Dr. Allen would like to better define what is meant by high risk.

CDT codes representing risk
D0601 Caries risk assessment and documentation with a finding of low risk
D0602 moderate risk
D0603 high risk

See materials from Gary Allen regarding the definition of "high risk" in the meeting packet.

HERC staff recommendation:

1) Discuss better definition of "high risk" in GN17

GUIDELINE NOTE 17, PREVENTIVE DENTAL CARE

Lines 3,57

Dental cleaning is limited to once per 12 months for adults and twice per 12 months for children up to age 19 (D1110, D1120). More frequent dental cleanings may be required for certain higher risk populations. Additionally, assessment (D0191) may be performed once per 12 months for adults and twice per 12 months for children up to age 19.

Fluoride varnish (D1206) is included on Line 3 for use with children 18 and younger during well child preventive care visits. Fluoride treatments (D1206 and D1208) are included on Line 57 PREVENTIVE DENTAL SERVICES for use with adults and children during dental visits. The total number of fluoride applications provided in all settings is not to exceed four per twelve months for a child at high risk for dental caries and two per twelve months for a child not at high risk. The number of fluoride treatments is limited to once per 12 months for average risk adults and up to four times per 12 months for high risk adults.

2) GN34 Oral Surgery

GN34 currently limits removal of impacted teeth (CDT D7220, D7230, D7240, D7241, D7250) to "symptomatic dental pain, infection, bleeding or swelling." This guideline applies to line 349 DENTAL CONDITIONS (EG. SEVERE CARIES, INFECTION) Treatment: ORAL SURGERY (I.E. EXTRACTIONS AND OTHER INTRAORAL SURGICAL PROCEDURES). Dr. Allen suggests substituting working from the 2000 NICE guideline on impacted wisdom teeth.

From Dr. Allen:

> My rationale is that "symptomatic" is a relative term and is common in all developing third molars and should not be considered as a reason for extraction when OTC pain meds can be recommended for the intermittent episodes of discomfort. In addition, our current guideline and rules do not say anything about dental caries, external resorption or associated pathology such as odontogenic cysts. I also like that the NICE guideline addresses pericoronitis and limits

extractions to recurrent cases of pericoronitis. There are non-invasive treatment options for pericoronitis that should be considered before extraction when patients first present.

From **NICE 2000** Guidance on the Extraction of Wisdom Teeth (study may be found here: https://www.nice.org.uk/guidance/ta1/resources/guidance-on-the-extraction-of-wisdom-teeth-63732983749)

1. Surgical removal of impacted third molars should be limited to patients with evidence of pathology. Such pathology includes unrestorable caries, non-treatable pulpal and/or periapical pathology, cellulitis, abcess and osteomyelitis, internal/external resorption of the tooth or adjacent teeth, fracture of tooth, disease of follicle including cyst/tumour, tooth/teeth impeding surgery or reconstructive jaw surgery, and when a tooth is involved in or within the field of tumour resection.
2. Specific attention is drawn to plaque formation and pericoronitis. Plaque formation is a risk factor but is not in itself an indication for surgery. The degree to which the severity or recurrence rate of pericoronitis should influence the decision for surgical removal of a third molar remains unclear. The evidence suggests that a first episode of pericoronitis, unless particularly severe, should not be considered an indication for surgery. Second or subsequent episodes should be considered the appropriate indication for surgery.

HERC staff recommendation:

1) Modify GN34 as shown below
    a. Includes NICE indications for extraction of impacted teeth
    b. D7970 addressed in issue #3 below

GUIDELINE NOTE 34, ~~ORAL SURGERY~~ EXTRACTION OF IMPACTED WISDOM TEETH

Line 349

~~Treatment only for symptomatic dental pain, infection, bleeding or swelling (D7220, D7230, D7240, D7241, D7250). To be used in conjunction with making a prosthesis (D7970).~~

Extraction of impacted wisdom teeth (D7220, D7230, D7240, D7241, D7250) are only included on this line when there is

1) evidence of pathology. Such pathology includes unrestorable caries, non-treatable pulpal and/or periapical pathology, cellulitis, abcess and osteomyelitis, internal/external resorption of the tooth or adjacent teeth, fracture of tooth, disease of follicle including cyst/tumour, tooth/teeth impeding surgery or reconstructive jaw surgery, and when a tooth is involved in or within the field of tumour resection OR
2) two or more episodes of pericoronitis

3) Removal of tori for dentures

Gary Allen has proposed adding coverage for D7472 (Removal of torus palatinus) and D7473 (Removal of torus mandibularis) when used for the creation of dentures. Currently, these CDT codes are on the Services Recommended for Non-Coverage Table.

If the above change is accepted, Dr. Allen recommends adding a guideline, and including D7970 restrictions (removed from GN 34 in the changes above) in this new guideline.

HERC staff recommendations:

1) Remove D7970 (EXCISION OF HYPERPLASTIC TISSUE-PER ARCH) from line 349 DENTAL CONDITIONS (EG. SEVERE CARIES, INFECTION) Treatment: ORAL SURGERY (I.E. EXTRACTIONS AND OTHER INTRAORAL SURGICAL PROCEDURES and add to line 457 DENTAL CONDITIONS (EG. MISSING TEETH, PROSTHESIS FAILURE) Treatment: REMOVABLE PROSTHODONTICS (E.G. FULL AND PARTIAL DENTURES, RELINES)
2) Add D7472 (Removal of torus palatinus) and D7473 (Removal of torus mandibularis) to line 457 and remove from the Services Recommended for Non-Coverage table
3) Adopt a new guideline regarding D7970, D7472 and D7473 as shown below

GUIDELINE NOTE XXX REMOVAL OF TORI AND EXCISION OF HYPERPLASTIC TISSUE

Line 457

D7472 and D7473, and D7970 are included on this line only when used in conjunction with making a prosthesis.

Guideline on Caries-risk Assessment and Management for Infants, Children, and Adolescents

Originating Council
Council on Clinical Affairs

Review Council
Council on Clinical Affairs

Adopted
2002

Revised*
2006, 2010, 2011, 2013, 2014

Purpose
The American Academy of Pediatric Dentistry (**AAPD**) recognizes that caries-risk assessment and management protocols can assist clinicians with decisions regarding treatment based upon caries risk and patient compliance and are essential elements of contemporary clinical care for infants, children, and adolescents. This guideline is intended to educate health care providers and other interested parties on the assessment of caries risk in contemporary pediatric dentistry and aid in clinical decision making regarding diagnostic, fluoride, dietary, and restorative protocols.

Methods
This guideline is an update of AAPD's Policy on Use of a Caries-risk Assessment Tool (CAT) for Infants, Children, and Adolescents, Revised 2006 that includes the additional concepts of dental caries management protocols. The update used electronic and hand searches of English written articles in the medical and dental literature within the last 10 years using the search terms caries risk assessment, caries management, and caries clinical protocols. From this search, 1,909 articles were evaluated by title or by abstract. Information from 75 articles was used to update this document. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background
Caries-risk assessment
Risk assessment procedures used in medical practice normally have sufficient data to accurately quantitate a person's disease susceptibility and allow for preventive measures.[1] Even though caries-risk data in dentistry still are not sufficient to quantitate the models, the process of determining risk should be a component in the clinical decision-making process.[2] Risk assessment:

1. Fosters the treatment of the disease process instead of treating the outcome of the disease.
2. Gives an understanding of the disease factors for a specific patient and aids in individualizing preventive discussions.
3. Individualizes, selects, and determines frequency of preventive and restorative treatment for a patient.
4. Anticipates caries progression or stabilization.

Caries-risk assessment models currently involve a combination of factors including diet, fluoride exposure, a susceptible host, and microflora that interplay with a variety of social, cultural, and behavioral factors.[3-6] Caries risk assessment is the determination of the likelihood of the incidence of caries (ie, the number of new cavitated or incipient lesions) during a certain time period[7] or the likelihood that there will be a change in the size or activity of lesions already present. With the ability to detect caries in its earliest stages (ie, white spot lesions), health care providers can help prevent cavitation.[8-10]

Caries risk indicators are variables that are thought to cause the disease directly (eg, microflora) or have been shown useful in predicting it (eg, socioeconomic status) and include those variables that may be considered protective factors. Currently, there are no caries-risk factors or combinations of factors that have achieved high levels of both positive and negative predictive values.[2] Although the best tool to predict future caries is past caries experience, it is not particularly useful in young children due to the importance of determining caries risk before the disease is manifest. Children with white spot lesions should be considered at high risk for caries since these are precavitated lesions that are indicative of caries activity.[11] Plaque accumulation also is strongly associated with caries development in young children.[12,13] As a corollary to the presence of plaque,[14] a child's Mutans Streptococci (**MS**) levels[3] and the age at which a child becomes colonized with cariogenic flora[15,16] are valuable in assessing risk, especially in preschool children.

** The 2013 revision was limited to modification of Table 1. Caries-risk Assessment Form for 0-3 Year Olds (For Physicians and Other Non-Dental Health Care Providers). The 2014 revision was limited to use of toothpaste in young children.*

While there is no question that fermentable carbohydrates are a necessary link in the causal chain for dental caries, a systematic study of sugar consumption and caries risk has concluded that the relationship between sugar consumption and caries is much weaker in the modern age of fluoride exposure than previously thought.[17] However, there is evidence that night-time use of the bottle, especially when it is prolonged, may be associated with early childhood caries.[18] Despite the fact that normal salivary flow is an extremely important intrinsic host factor providing protection against caries, there is little data about the prevalence of low salivary flow in children.[19,20]

Sociodemographic factors have been studied extensively to determine their effect on caries risk. Children with immigrant backgrounds have three times higher caries rates than non-immigrants.[21] Most consistently, an inverse relationship between socioeconomic status and caries prevalence is found in studies of children less than six years of age.[22] Perhaps another type of sociodemographic variable is the parents' history of cavities and abscessed teeth; this has been found to be a predictor of treatment for early childhood caries.[23,24]

The most studied factors that are protective of dental caries include systemic and topical fluoride, sugar substitutes, and tooth brushing with fluoridated toothpaste. Teeth of children who reside in a fluoridated community have been shown to have higher fluoride content than those of children who reside in suboptimal fluoridated communities.[25] Additionally, both pre- and post-eruption fluoride exposure maximize the caries-preventive effects.[26,27] For individuals residing in non-fluoridated communities, fluoride supplements have shown a significant caries reduction in primary and permanent teeth.[28] With regard to fluoridated toothpaste, studies have shown consistent reduction in caries experience.[29] Professional topical fluoride applications performed semiannually also reduce caries,[30] and fluoride varnishes generally are equal to that of other professional topical fluoride vehicles.[31]

The effect of sugar substitutes on caries rates have been evaluated in several populations with high caries prevalence.[32] Studies indicate that xylitol can decrease MS levels in plaque and saliva and can reduce dental caries in young children and adults, including children via their mothers.[33] With regard to toothbrushing, there only is a weak relationship between frequency of brushing and decreased dental caries, which is confounded because it is difficult to distinguish whether the effect is actually a measure of fluoride application or whether it is a result of mechanical removal of plaque.[34] The dental home or regular periodic care by the same practitioner is included in many caries-risk assessment models because of its known benefit for dental health.[35]

Risk assessment tools can aid in the identification of reliable predictors and allow dental practitioners, physicians, and other nondental health care providers to become more actively involved in identifying and referring high-risk children. Tables 1, 2, and 3 incorporate available evidence into practical tools to assist dental practitioners, physicians, and

Table 1. Caries-risk Assessment Form for 0-3 Year Olds[59,60]

(For Physicians and Other Non-Dental Health Care Providers)

Factors	High Risk	Low Risk
Biological		
Mother/primary caregiver has active cavities	Yes	
Parent/caregiver has low socioeconomic status	Yes	
Child has >3 between meal sugar-containing snacks or beverages per day	Yes	
Child is put to bed with a bottle containing natural or added sugar	Yes	
Child has special health care needs	Yes	
Child is a recent immigrant	Yes	
Protective		
Child receives optimally-fluoridated drinking water or fluoride supplements		Yes
Child has teeth brushed daily with fluoridated toothpaste		Yes
Child receives topical fluoride from health professional		Yes
Child has dental home/regular dental care		Yes
Clinical Findings		
Child has white spot lesions or enamel defects	Yes	
Child has visible cavities or fillings	Yes	
Child has plaque on teeth	Yes	

Circling those conditions that apply to a specific patient helps the health care worker and parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (eg, frequent exposure to sugar containing snacks or beverages, visible cavities) in determining overall risk.

Overall assessment of the child's dental caries risk: High ❒ Low ❒

Table 2. Caries-risk Assessment Form for 0-5 Year Olds [59,60]

(For Dental Providers)

Factors	High Risk	Moderate Risk	Low Risk
Biological			
Mother/primary caregiver has active caries	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >3 between meal sugar-containing snacks or beverages per day	Yes		
Child is put to bed with a bottle containing natural or added sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Protective			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has >1 decayed/missing/filled surfaces	Yes		
Child has active white spot lesions or enamel defects	Yes		
Child has elevated mutans streptococci levels	Yes		
Child has plaque on teeth		Yes	

Circling those conditions that apply to a specific patient helps the practitioner and parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low, moderate, or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (eg, frequent exposure to sugar-containing snacks or beverages, more than one dmfs) in determining overall risk.

Overall assessment of the child's dental caries risk: High ❒ Moderate ❒ Low ❒

Table 3. Caries-risk Assessment Form for ≥6 Years Olds [60-62]

(For Dental Providers)

Factors	High Risk	Moderate Risk	Low Risk
Biological			
Patient is of low socioeconomic status	Yes		
Patient has >3 between meal sugar-containing snacks or beverages per day	Yes		
Patient has special health care needs		Yes	
Patient is a recent immigrant		Yes	
Protective			
Patient receives optimally-fluoridated drinking water			Yes
Patient brushes teeth daily with fluoridated toothpaste			Yes
Patient receives topical fluoride from health professional			Yes
Additional home measures (eg, xylitol, MI paste, antimicrobial)			Yes
Patient has dental home/regular dental care			Yes
Clinical Findings			
Patient has ≥1 interproximal lesions	Yes		
Patient has active white spot lesions or enamel defects	Yes		
Patient has low salivary flow	Yes		
Patient has defective restorations		Yes	
Patient wearing an intraoral appliance		Yes	

Circling those conditions that apply to a specific patient helps the practitioner and patient/parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low, moderate, or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (eg, ≥1 interproximal lesions, low salivary flow) in determining overall risk.

Overall assessment of the dental caries risk: High ❒ Moderate ❒ Low ❒

other non-dental health care providers in assessing levels of risk for caries development in infants, children, and adoles cents. As new evidence emergences, these tools can be re-fined to provide greater predictably of caries in children prior to disease initiation. Furthermore, the evolution of caries-risk assessment tools and protocols can assist in providing evidence for and justifying periodicity of services, modification of third-party involvement in the delivery of dental services, and quality of care with outcomes assessment to address limited resources and work-force issues.

Table 4. Example of a Caries Management Protocol for 1-2 Year Olds

Risk Category	Diagnostics	Interventions		Restorative
		Fluoride	Diet	
Low risk	– Recall every six to12 months – Baseline MS[α]	– Twice daily brushing	Counseling	– Surveillance[χ]
Moderate risk parent engaged	– Recall every six months – Baseline MS[α]	– Twice daily brushing with fluoridated toothpaste[β] – Fluoride supplements[δ] – Professional topical treatment every six months	Counseling	– Active surveillance[ε] of incipient lesions
Moderate risk parent not engaged	– Recall every six months – Baseline MS[α]	– Twice daily brushing with fluoridated toothpaste[β] – Professional topical treatment every six months	Counseling, with limited expectations	– Active surveillance[ε] of incipient lesions
High risk parent engaged	– Recall every three months – Baseline and follow up MS[α]	– Twice daily brushing with fluoridated toothpaste[β] – Fluoride supplements[δ] – Professional topical treatment every three months	Counseling	– Active surveillance[ε] of incipient lesions – Restore cavitated lesions with ITR[ϕ] or definitive restorations
High risk parent not engaged	– Recall every three months – Baseline and follow up MS[α]	– Twice daily brushing with fluoridated toothpaste[β] – Professional topical treatment every three months	Counseling, with limited expectations	– Active surveillance[ε] of incipient lesions – Restore cavitated lesions with ITR[ϕ] or definitive restorations

Table 5. Example of a Caries Management Protocol for 3-5 Year Olds

Risk Category	Diagnostics	Interventions			Restorative
		Fluoride	Diet	Sealants[λ]	
Low risk	– Recall every six to 12 months – Radiographs every 12 to 24 months – Baseline MS[α]	– Twice daily brushing with fluoridated toothpaste[γ]	No	Yes	– Surveillance[χ]
Moderate risk parent engaged	– Recall every six months – Radiographs every six to 12 months – Baseline MS[α]	– Twice daily brushing with fluoridated toothpaste[γ] – Fluoride supplements[δ] – Professional topical treatment every six months	Counseling	Yes	– Active surveillance[ε] of incipient lesions – Restoration of cavitated or enlarging lesions
Moderate risk parent not engaged	– Recall every six months – Radiographs every six to 12 months – Baseline MS[α]	– Twice daily brushing with fluoridated toothpaste[γ] – Professional topical treatment every six months	Counseling, with limited expectations	Yes	– Active surveillance[ε] of incipient lesions – Restoration of cavitated or enlarging lesions
High risk parent engaged	– Recall every three months – Radiographs every six months – Baseline and follow up MS[α]	– Brushing with 0.5 percent fluoride (with caution) – Fluoride supplements[δ] – Professional topical treatment every three months	Counseling	Yes	– Active surveillance[ε] of incipient lesions – Restoration of cavitated or enlarging lesions
High risk parent not engaged	– Recall every three months – Radiographs every six months – Baseline and follow up MS[α]	– Brushing with 0.5 percent fluoride (with caution) – Professional topical treatment every three months	Counseling, with limited expectations	Yes	– Restore incipient, cavitated, or enlarging lesions

Table 6. Example of a Caries Management Protocol for ≥6 Year-Olds

Risk Category	Diagnostics	Interventions			Restorative
		Fluoride	Diet	Sealants [λ]	
Low risk	– Recall every six to12 months – Radiographs every 12 to 24 months	– Twice daily brushing with fluoridated toothpaste [μ]	No	Yes	– Surveillance [χ]
Moderate risk patient/parent engaged	– Recall every six months – Radiographs every six to 12 months	– Twice daily brushing with fluoridated toothpaste [μ] – Fluoride supplements [δ] – Professional topical treatment every six months	– Counseling	Yes	– Active surveillance [ε] of incipient lesions – Restoration of cavitated or enlarging lesions
Moderate risk patient/parent not engaged	– Recall every six months – Radiographs every six to 12 months	– Twice daily brushing with toothpaste [μ] – Professional topical treatment every six months	– Counseling, with limited expectations	Yes	– Active surveillance [ε] of incipient lesions – Restoration of cavitated or enlarging lesions
High risk patient/parent engaged	– Recall every three months – Radiographs every six months	– Brushing with 0.5 percent fluoride – Fluoride supplements [δ] – Professional topical treatment every three months	– Counseling – Xylitol	Yes	– Active surveillance [ε] of incipient lesions – Restoration of cavitated or enlarging lesions
High risk patient/parent not engaged	– Recall every three months – Radiographs every six months	– Brushing with 0.5 percent fluoride – Professional topical treatment every three months	– Counseling, with limited expectations – Xylitol	Yes	– Restore incipient, cavitated, or enlarging lesions

Legends for Tables 4-6

α Salivary mutans streptococci bacterial levels.

χ Periodic monitoring for signs of caries progression.

β Parental supervision of a "smear" amount of toothpaste.

δ Need to consider fluoride levels in drinking water.

ε Careful monitoring of caries progression and prevention program.

ϕ Interim therapeutic restoration.[63]

γ Parental supervision of a "pea sized" amount of toothpaste.

λ Indicated for teeth with deep fissure anatomy or developmental defects.

μ Less concern about the quantity of toothpaste.

Caries management protocols

Clinical management protocols are documents designed to assist in clinical decision-making; they provide criteria regarding diagnosis and treatment and lead to recommended courses of action. The protocols are based on evidence from current peer-reviewed literature and the considered judgment of expert panels, as well as clinical experience of practitioners. The protocols should be updated frequently as new technologies and evidence develop.

Historically, the management of dental caries was based on the notion that it was a progressive disease that eventually destroyed the tooth unless there was surgical/restorative intervention. Decisions for intervention often were learned from unstandardized dental school instruction, and then refined by clinicians over years of practice. Little is known about the criteria dentists use when making decisions involving restoration of carious lesions.[36]

It is now known that surgical intervention of dental caries alone does not stop the disease process. Additionally, many lesions do not progress, and tooth restorations have a finite longevity. Therefore, modern management of dental caries should be more conservative and includes early detection of noncavitated lesions, identification of an individual's risk for caries progression, understanding of the disease process for that individual, and active surveillance to apply preventive measures and monitor carefully for signs of arrestment or progression.

Caries management protocols for children further refine the decisions concerning individualized treatment and treatment thresholds based on a specific patient's risk levels, age, and compliance with preventive strategies (Tables 4, 5, 6). Such protocols should yield greater probability of success and better cost effectiveness of treatment than less standardized treatment. Additionally, caries management protocols free practitioners of the necessity for repetitive high level treatment decisions, standardize decision making and treatment strategies,[36-38] eliminate treatment uncertainties, and guarantee more correct strategies.[39]

Content of the present caries management protocol is based on results of clinical trials, systematic reviews, and expert panel recommendations that give better understanding of and recommendations for diagnostic, preventive, and restorative treatments. The radiographic diagnostic guidelines are based

on the latest guidelines from the American Dental Association (**ADA**).[40] Systemic fluoride protocols are based on the Centers for Disease Control and Prevention's (**CDC**) recommendations for using fluoride.[29] Guidelines for the use of topical fluoride treatment are based on the ADA's Council on Scientific Affairs' recommendations for use of fluoride toothpaste in young children[41] and professionally applied and prescription strength home-use topical fluoride,[42] and the CDC's fluoride guidelines.[29] Guidelines for pit and fissure sealants are based on the ADA's Council on Scientific Affairs recommendations for the use of pit-and-fissure sealants.[43] Guidelines on diet counseling to prevent caries are based on two review papers.[44,45] Guidelines for the use of xylitol are based on the AAPD's oral health policy on use of xylitol in caries prevention,[32] a well-executed clinical trial on high caries-risk infants and toddlers,[46] and two evidence-based reviews.[47,48] Active surveillance (prevention therapies and close monitoring) of enamel lesions is based on the concept that treatment of disease may only be necessary if there is disease progression,[49] that caries progression has diminished over recent decades,[50] and that the majority of proximal lesions, even in dentin, are not cavitated.[51]

Other approaches to the assessment and treatment of dental caries will emerge with time and, with evidence of effectiveness, may be included in future guidelines on caries-risk assessment and management protocols. For example, there are emerging trends to use calcium and phosphate remineralizing solution to reverse dental caries.[52] Other fluoride compounds, such as silver diamine fluoride[53] and stannous fluoride[54], may be more effective than sodium fluoride for topical applications. There has been interest in antimicrobials to affect the caries rates, but evidence from caries trials is still inconclusive.[55,56] However, some other proven methods, such as prescription fluoride drops and tablets, may be removed from this protocol in the future due to attitudes, risks, or compliance.[57,58]

Recommendations

1. Dental caries-risk assessment, based on a child's age, biological factors, protective factors, and clinical findings, should be a routine component of new and periodic examinations by oral health and medical providers.
2. While there is not enough information at present to have quantitative caries-risk assessment analyses, estimating children at low, moderate, and high caries risk by a preponderance of risk and protective factors will enable a more evidence-based approach to medical provider referrals, as well as establish periodicity and intensity of diagnostic, preventive, and restorative services.
3. Clinical management protocols, based on a child's age, caries risk, and level of patient/parent cooperation, provide health providers with criteria and protocols for determining the types and frequency of diagnostic, preventive, and restorative care for patient specific management of dental caries.

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Conference Paper

Evidence of Effectiveness of Current Therapies to Prevent and Treat Early Childhood Caries

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Abstract: ***Purpose:*** *The purpose of this paper was to systematically review the quality of evidence related to self-applied and professionally applied fluorides, antimicrobial agents, fissure sealants, temporary restorations, and restorative care for the prevention and management of early childhood caries (ECC).* ***Methods:*** *Relevant papers were selected after an electronic search for literature published in English between 2000 and April 2014. From 877 reports, 33 were included for full review. The quality of evidence was expressed according to the GRADE (Grading of Recommendations Assessment, Development and Evaluation) system.* ***Results:*** *There was moderate and limited quality of evidence in support of fluoride toothpaste and fluoride varnish for ECC prevention, while the evidence for fluoride tablets/drops was insufficient. The support for the use of silver diamine fluoride, xylitol, chlorhexidine varnish/gel, povidone iodine, probiotic bacteria, and remineralizing agents (casein phosphopeptide-amorphous calcium phosphate) was insufficient. There was also insufficient quality of evidence for the use of sealants, temporary restorations, and traditional restorative care to reduce incidence of ECC.* ***Conclusion:*** *The results reinforce the need for high quality clinical research and point out the knowledge gaps to be addressed in future studies.* *(Pediatr Dent 2015;37(3):246-53) Received January 26, 2015 / Last Revision March 20, 2015 / Accepted March 31, 2015*

KEYWORDS: DENTAL CARIES, FLUORIDE, INFANTS, RESTORATIVE CARE

Early childhood caries (**ECC**) is a complex condition associated with impaired oral health-related quality of life (**OHRQOL**) and high costs for families and society in general. It is commonly postulated that ECC is a preventable disease, but studies to support this are actually rare. In a previous update, Tinanoff and Reisine[1] concluded that preventive programs to combat ECC have been proven only partly successful, and the relapse after restorative treatment is commonly reported to be approximately 40 percent.[2,3] In addition, many ECC prevention guidelines have been released over the years, but their effectiveness has seldom been proved.[4] Systematic reviews on ECC prevention and management highlight early introduction and regular use of fluoride toothpaste as the best self-care method to prevent the disease.[5,6] Among the professional methods, the use of fluoride varnish has been a recommended procedure for children younger than six years old, albeit the evidence is not strong.[7] Consequently, there are still knowledge gaps and room for further clinical trials in infants.

The purpose of this conference paper was to systematically review the evidence with a focus on the following five clinical questions: (1) Do self-applied and professionally applied fluorides reduce the incidence of early childhood caries? (2) Do anticaries agents (e.g., antimicrobials, remineralizing agents) reduce the incidence of ECC? (3) Do sealants reduce the incidence of ECC? (4) Do temporary restorations provide disease management for ECC? (5) Does traditional restorative dentistry provide disease management for ECC?

Methods

A broad search for articles published in English was conducted in the PubMed database and Cochrane library. The main search terms, in various combinations, were: early childhood caries; nursing caries; infant caries; prevention; fluoride; fluoride varnish; antibacterial agents; caries control; caries management; and restorative treatment. Relevant papers published between 2007 and April 2014 (prevention of ECC) and 2000 through April 2014 (treatment/management of ECC) were identified after an independent review of the abstracts by the authors (Figure 1). Diverging opinions were resolved in consensus. For the prevention sections (questions one and two), only prospective, randomized, and non-randomized controlled trials describing a defined intervention implemented to children before three years of age were considered. Furthermore, an endpoint reporting caries prevalence and/or incidence over a study period of at least one year was required. Reference lists of accepted papers and systematic reviews were hand-searched for additional literature. Studies reporting surrogate endpoints or interventions directed

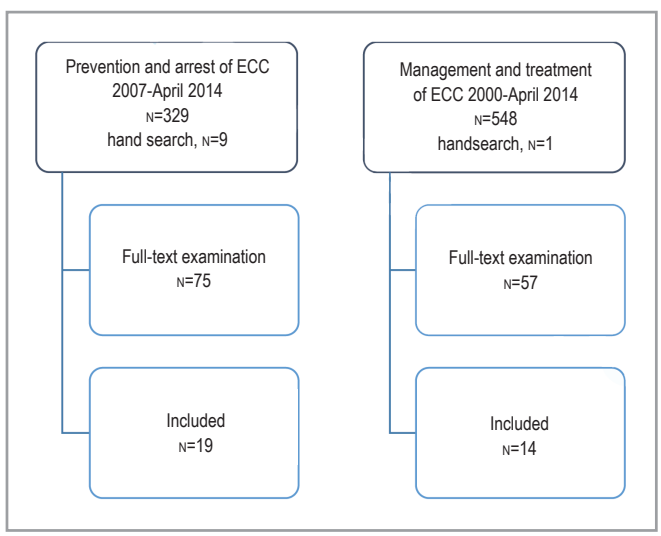

Figure 1. Flowchart of papers.

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Table 1. QUALITY OF EVIDENCE ACCORDING TO GRADE[9]

Grade	Legend	Quality of evidence
High	⊕⊕⊕⊕	Based on high or moderate quality studies containing no factors that weaken the overall judgment
Moderate	⊕⊕⊕O	Based on high or moderate quality studies containing isolated factors that weaken the overall judgment
Low	⊕⊕OO	Based on high or moderate quality studies containing factors that weaken the overall judgment
Very low	⊕OOO	The evidence base is insufficient when scientific evidence is lacking, quality of available studies is poor, or studies of similar quality are contradictory.

to mothers (primary-primary prevention) were excluded. For non-operative ECC management (questions three and four related to sodium diamine fluoride, atraumatic restorative treatment, temporary fillings, and sealants) and restorative treatment in children up to six years old (question five), controlled non-randomized clinical trials and observational studies were accepted, with endpoints related to the fate of treated teeth, new cavities (recurrent disease), caries arrestment, quality of life, and pain reduction. Case reports, case series, abstracts, textbooks, narrative reviews, and expert opinions were excluded. In the event of multiple publications from the same project, only the most recent contribution was included. Papers describing community fluorides (e.g., in water, milk, and salt) were not assessed.

Key data were extracted and compiled in tables. Both authors, according to predetermined criteria for methodology and performance, assessed the quality of the selected publications independently. The criteria of the Cochrane handbook for interventions[8] were used, and the risk of bias for each paper was graded as low, moderate, or high. Due to the diversity of the included studies, a narrative synthesis was carried out. The quality of evidence for each of the clinical questions was rated, using the GRADE profiler software version 3.6.1. The GRADE (Grading of Recommendations Assessment, Development and Evaluation) system,[9] allows rating the quality of evidence in four categories, as shown in Table 1.

Results

Question 1: Do self-applied and professionally applied fluorides reduce the incidence of ECC? Self-applied fluorides. Only two original papers from 2007 were included (Table 2), both supplying high-risk families with fluoride toothpaste and toothbrushes from early age as a part of oral health promotion activities for parents.[10,11] Both had a high risk of bias and displayed a mixed outcome. This illustrates the challenge to get compliance among those with the greatest needs. However, several previous systematic reviews, of which two were published in recent years,[12,13] have concluded that fluoride toothpaste reduces caries in the primary dentition. Thus, daily toothbrushing with fluoride toothpaste from the eruption of the first tooth must be regarded as best clinical practice today, based on moderate quality of evidence (⊕⊕⊕O). No recent papers on other self-applied fluoride supplements (tablets, drops) met the inclusion criteria, so the quality of evidence was based on systematic reviews of previously published literature.[5,6,14] Therefore, it may be concluded that evidence for ECC prevention with fluoride tablets and drops is insufficient (⊕OOO).

Professional fluorides: Fluoride varnish. Seven papers describing six studies with fluoride varnish (five percent sodium fluoride) applications, typically two to four times per year, in combination with oral health promotion were included (Table 2).[15-21] Only one study reported a double-blind placebo-controlled design,[21] and none were assessed with a low risk of bias. Common confounding factors were water fluoride, supervised toothbrushing with fluoride toothpaste, attrition bias, and inadequate controls. The mean prevented fraction, calculated

Table 2. SELF-APPLIED AND PROFESSIONAL FLUORIDES FOR EARLY CHILDHOOD CARIES (ECC) PREVENTION (2007-2014)*

Author, year	Design size/age	Intervention	Control	Follow-up age (yrs)	ECC outcome/ PF (%)	Risk of bias
Self-applied						
Davies, 2007[10]	Cohort 664/8 mos	FTP+OHP	NI	5	20 vs. 32%/38%	High
Livny, 2007[11]	Cohort 596/6 mos	FTP+OHP	NI	2.5	15 vs. 15%, NS	High
Professionally applied						
Lawrence, 2008[15]	CRCT 1146/6mos	FV, 2yrs+OHP	OHP	2.5-7	11.0 vs. 13.4 dmfs/18%	Moderate
Milgrom, 2009[16]	CCT 473/64 mos	V, 3yrs+FTP	FV, 3yrs	4	8.2 vs.10.3 deft 20%	Moderate
Minah, 2010[17]	CCT 219/6 mos	FV + OHP	Historical	2-3	0.1 vs. 1.3ds/93%	High
Slade, 2011[18]	CRCT 543/18 mos	FV, 2yrs+OHP	NI	3.5-6	6.9 vs. 9.9 dmfs/24%	Moderate
Ramos-Gomez, 2012[19]	CCT 361/4 mos	FV, 2yrs+OHP	OHP+(FV)	3	34 vs. 34%, NS	High
Divaris, 2013[20†]	CRCT 543/18 mos	FV, 2yrs+OHP	NI	3.5-6	RR: 0.75/25%, NS	Moderate
Oliviera, 2014[21]	RCT 200/12 mos	FV, 2yrs	Placebo, 2/yrs	3	36 vs. 47% d2d3/11%, NS	Moderate

* PF=prevented fraction; FTP=fluoride toothpaste; OHP=oral health promotion; NI=no intervention; CCT=controlled clinical trial; RCT=randomized controlled trial; CRCT=cluster randomized controlled trial; FV=fluoride varnish; NS=not significant; RR=relapse rates.

† Secondary analysis of Slade et al., 2011.[18]

from the three studies with moderate risk of bias, was 18 percent, and it seems reasonable that fluoride varnish to some extent can decrease caries incidence in early childhood. Yet, the quality of evidence was rated as low (⊕⊕OO).

Silver diamine fluoride (SDF). The literature search did not reveal any new articles other than those included in the reviews of Rosenblatt et al.[22] and Fung et al.[23] Both claimed single and multiple applications of 38 percent SDF to be effective in arresting dentin caries in primary teeth. The four trials that were published after 2000, however, were not considered in this review, since they were conducted on children over three years old. Thus, the quality of evidence for the prevention of ECC was rated as very low (⊕OOO).

Question 2: Do anticaries agents (e.g., antimicrobials, remineralizing agents) reduce the incidence of ECC? The 10 papers that met the inclusion criteria are listed in Table 3. The antibacterial agents studied were xylitol (four papers),[24,25,28,30] chlorhexidine varnish/gel (two papers),[31,33] povidone iodine (two papers),[26,27] and probiotic bacteria (one paper).[29] In addition, one paper evaluating the use of a remineralizing agent (casein phosphopeptide-amorphous calcium phosphate, or CPP-ACP) was identified.[31] The scientific quality was mixed; none displayed a low risk of bias, and six papers were assessed with a high risk of bias. Three papers with topical xylitol applications (lozenges, syrup, and wipes)[25,28,30] displayed significant reductions in caries prevalence at the one-year follow-up, with only one having a moderate risk of bias.[25] None of the other technologies displayed any beneficial effects on ECC incidence, in spite in some studies having significant reductions in salivary mutans streptococci levels. The quality of evidence for anticaries agents to prevent or control caries incidence in early childhood was graded as very low (⊕OOO).

Question 3: Do sealants reduce the incidence of ECC? No papers were identified on sealants specific to ECC, and there was scarce information on the use of sealants in primary teeth in very young children. Only one RCT on fissure sealants conducted in early childhood was identified (Table 3),[34] and this study found no evidence that glass ionomer sealants had an effect on caries incidence. Due to indirectness and risk of bias, the evidence on use of sealants to reduce incidence of ECC was graded as very low (⊕OOO).

Question 4: Do temporary restorations provide disease management for ECC? There were no papers identified that evaluated the use of temporary restorations like the atraumatic restorative technique (**ART**) or interim therapeutic restorations (**ITR**) without additional interventions in ECC.

Question 5: Does traditional restorative dentistry contribute to disease management for ECC? Three questions were formulated to address this query and facilitate a relevant literature search.

1. *In ECC children, does restorative care reduce relapse rates or reduce new caries?* A total of eight papers evaluating postoperative relapse rates or evidence of new caries in the follow-up visits were included (Table 4).[3,35-41] All of these were observational studies with restorative intervention done under general anesthesia.

Table 3. ANTICARIES AGENTS FOR EARLY CHILDHOOD CARIES (ECC) PREVENTION PUBLISHED BETWEEN 2007-2014 AND SEALANTS FOR REDUCTION OF INCIDENCE OF ECC PUBLISHED BETWEEN 2000-2014*

Author, year	Design	Size/age	Intervention	Control	Follow-up age	ECC outcomes/PF	Risk of bias
Anticaries agents							
Meurman, 2009[24]	Cohort	794/18 mos	Xyl+OHP	OHP	5 yrs	20 vs. 20%, NS	High
Milgrom, 2009[25]	RCT	94/9-15 mos	Xyl syrup	Placebo	2-3 yrs	24 vs. 52%/54%	Moderate
Simratvir, 2010[26]	RCT	30/3-4 yrs	PI	Water	4-5 yrs	Decreased relapse	High
Milgrom, 2011[27]	q-exp	172/12-30 mos	PI+FV	FV	2-4 yrs	41 vs. 54%/24%	High
Alamoudi, 2012[28]	RCT	60/10-36 mos	Xyl. tabl+OHPFV	2/yrs+OHP	1.5 yrs	0.8 vs. 4.4dmft/82%	High
Taipale, 2012[29]	RCT	106/1-2 mos	Probiotic tabl	Xyl tabl	4 yrs	NS	High
Zhan, 2012[30]	RCT	44/6-35 mos	Xyl wipes	Placebo	1.5-4 yrs	5 vs. 32%/85%	High
Plonka, 2013[31]	RCT	622/birth	CPP-ACP+FTP	FTP	2 yrs	1 vs. 2%, NS	Moderate
			CHX gel+FTP	FTP	2 yrs	1 vs. 2%, NS	Moderate
Pukallus, 2013[32]	RCT	191/birth	CPP-ACP	NI	2 yrs	2 vs. 7%, NS	Moderate
Pukallus, 2013[33]	RCT	189/birth	CHX-gel+FTP	FTP	2 yrs	5 vs. 7%, NS	Moderate
Sealants							
Chadwick, 2005[34]	RCT	508/18-30 mos	GI	Placebo	30-60 mos	76.5 vs. 75.9%, NS	High

* PF=prevented fraction; PI=povidone iodine; CHX=chlorhexidine; FTP=fluoride toothpaste; OHP=oral health promotion; Xyl=xylitol; FV=fluoride varnish; CPP-ACP=casein phosphopeptides-amorphous calcium phosphate; RCT=randomized controlled trial; CCT=controlled clinical trial; NS=not significant; GI=glass ionomer.

Table 4. POST-RESTORATIVE CARE RELAPSE RATES IN CHILDREN WITH EARLY CHILDHOOD CARIES (ECC) BETWEEN 2000-2014*

Author, year	Design	Size/age	Intervention¥	Control	Follow-up period	Relapse rate (RR)/PF (%)	Risk of bias
Almeida, 2000[35]	Observational	73/1.9-4.9 yrs	Restorative work	Caries-free group	2 yrs	79 vs. 29/63(s)	High
Primosch, 2001[36]	Observational	38/< 6 yrs	Restorative work	No control	6 mos	38	High
Chase, 2004[37]	Observational	79/2.3-7.3 yrs	Restorative work	No control	6 mos	37	High
Foster, 2006[39]	Observational	193/19-60 mos	Restorative work	No control	2 yrs	53	High
Zhan, 2006[38]	Observational	22/2-6 yrs	Restorative work+10% PI, 1.23% APF	Restorative work+saline, 1.23% APF	1 yr	67 vs. 60/10 (NS)	Moderate
Amin, 2010[40]	Observational	36/<6 yrs	Restorative work	No control	2 yrs	53	High
Berkowitz, 2011[3]	Observational	49/3.72 yrs	Restorative work+10% PI, 1.23% APF	No control	6 mos	39	High
Hughes, 2012[41]	Observational	117/2-6 yrs	Restorative work	Caries-free group	1 yr	22	High

* PF=prevented fraction; NS=not significant; S=significant; PI=povidine iodine; APF=acidulated phosphate fluoride.

Interestingly, evidence of new caries in the follow-up visits (at three months, two years) consistently indicated a relapse rate observed in the range of 22 to 79 percent (Figure 2). Since all the studies were observational in nature with moderate/high risk of bias, the quality of evidence was graded as very low (⊕OOO).

2. *In ECC children, does restoration of primary teeth influence the progression of disease and sequels like pain/abscess?* No papers were found that evaluated the effect of restorative care on progression/sequel of caries in ECC children.
3. *In ECC children, does restorative care improve OHRQOL, body weight, and performance in school settings?* Five papers that evaluated the impact of restorative care on quality of life were included (Table 5).[42-46] All of the included studies carried out a parental survey to assess the quality of life. Significant improvement was reported by parents in the child's overall health post-operatively at the six-month and one-year follow-ups[42,43,46] and in the child's oral health three to four weeks postoperatively.[44,45] Filstrup et al.[44] also surveyed children and found significant post-treatment improvement in the response to questions such as: "Do your teeth hurt you now?"; Do your teeth hurt when you eat something hot or cold?"; "Do your teeth hurt when you eat something sweet?"; and "Is it hard for you to chew and bite?" Thomas et al.[43] also observed changes in children's weight between pretreatment and post-treatment follow-ups but found no significant changes over one year. Cunnion et al.[46] reported significant improvement in parental ratings of their children's overall oral health and significant reductions

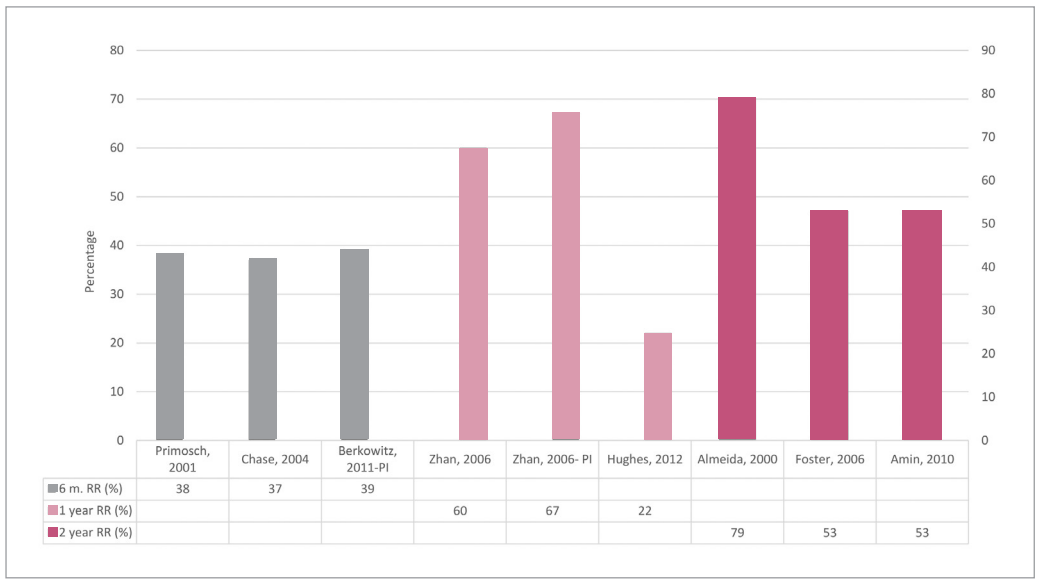

Figure 2. Postoperative relapse rates.

* RR=relapse rates; PI=intervention included application of 10% povidine iodine in addition to restorative care.

in problems associated with physical (pain related), mental, and social functioning for children who received dental treatment for ECC. These children maintained improvement at the one-year follow-up; however, the parent-reported health continued to be better for the caries-free control group. Since most of the studies were survey based and at high risk of bias, the quality of evidence was graded as very low (⊕OOO).

Discussion

This update was conducted mainly in accordance with methodology suggested by Siwek et al.[47] For prevention, the literature search was made to overlap the update by Twetman[5] while the interval was extended to the year 2000 for management and restorative treatment of ECC due to a lack of previous reviews. For studies to be included, an implementation before the age of three years was required. This was based on the European Academy of Pediatric Dentistry's definition of ECC, which regards the disease as a unique entity to be separated from the normal occlusal and proximal caries lesions appearing in later preschool ages. The main limitations with the present review were the restriction to the English language and the fact that the systematic reviews were not quality assessed. A positive finding was that the benefits clearly outweighed the adverse events; no significant complications were reported in any study. It should be noted, however, that the included studies were not designed specifically to unveil such outcomes.

It was disappointing to find few new trials with home care fluorides for the treatment of ECC. Considering the conflicting opinions and traditions over the globe, high-quality trials on toothpaste concentration, frequency of brushing, and age of toothpaste introduction would be extremely helpful.

Since the study by Weintraub et al.,[48] sodium fluoride varnish has emerged as the professional treatment of choice to prevent and control ECC in children at risk. Our present findings partly reinforced this concept, but it should be emphasized that the prevented fraction was low and the quality of evidence was weaker than that of studies of fluoride varnish in young permanent dentition.[49] A certain publication bias might also have occurred, as the findings from the three most recent trials in high-risk children[19-21] were generally less in favor of fluoride varnish and, in fact, statistically nonsignificant. In addition, it was concluded that biannual fluoride varnish applications were not effective as a supplement to daily supervised toothbrushing in preschoolers living in Athens.[50]

However, interesting site-specific observations were reported by Divaris et al.[20] in a secondary analysis of a previous trial.[18] They found that the fluoride varnish intervention had the greatest efficacy on surfaces that were sound at baseline; also, the facial surfaces of the upper incisors received the most caries-preventive benefit. Thus, these findings suggest starting early with fluoride varnish applications in order to maximize the outcome, especially in high caries populations. Nevertheless, further placebo-controlled studies of fluoride varnish in combination with supervised toothbrushing in infants are needed to elucidate its clinical use.

SDF is often used as a last option in uncooperative children and special needs children with an urgent treatment need. It is, however, not approved for clinical use in several countries due to the high content of fluoride (44,800 ppm) and the lack of understanding regarding the mechanisms of action. No trials conducted in early childhood were identified in this search; however, according to a narrative review of Fung et al.,[23] SDF can arrest dentin caries in primary teeth and prevent caries recurrence after treatment. Since the included studies in the aforementioned review[23] were not quality assessed, further studies on this concept in early childhood are warranted.

In accordance with previous reviews,[5,6] we found little evidence of efficacy for the use of xylitol, chlorhexidine varnish/gel, povidone iodine, probiotic bacteria, and remineralizing agents in ECC prevention. However, lack of evidence is not the same

Table 5. POST RESTORATIVE CARE OF EARLY CHILDHOOD CARIES: CHANGES IN QUALITY OF LIFE (2000-2014)*

Author, year	Design	Size/age	Intervention	Control	Follow-up period Follow-up age	Outcome	Risk of bias
Acs, 2001[42]	Survey	228/41±6 mos	Restorative care (GA)	None	— 43±10 mos	OHI†: 65%	High
Thomas, 2002[43]	Observational/ survey	50/2-7 yrs	Restorative care (GA)	None	13±1 mos —	Change in weight: NS OHI: 90%	High
Filstrup, 2003[44]	Survey	37/22-70 mos	Restorative care (GA or in-office treatment)	Caries-free group	4 wks —	OH: S; OH(C)‡	High
Klaassen, 2009[45]	RCT	104/2-7 yrs	Restorative work (GA)	Pre-treatment survey	Before treatment/ 3-4 wks —	OH: S; OHI: NS	Low
Cunnion, 2010[46]	Survey	501/2-8 yrs	Restorative work (GA)	Caries-free group	6 mos/1 yr —	OH: S; Improvement in mental, physical, social functioning: S	High

* OH=oral health-related quality of life (parental reporting); OHI=overall health improvement (parental reporting); OH(C)=oral health-related quality of life (child/self-reporting); PF=prevented fraction; RCT=randomized controlled trial; NS=not significant; S=significant; GA=done under general anesthesia.

† For patients with noncontributory medical histories.

‡ Significant improvement for questions like: Do your teeth hurt you now or when eating something sweet/hot/cold? Is it hard for you to chew and bite?

as lack of effect. In this context, the study of Milgrom et al.[25] was of particular interest, indicating a possible role of xylitol in ECC prevention that should be further studied in larger settings and other populations.

There is no literature pertaining to the use of pit and fissure sealants in children to prevent ECC. Based on clinical recommendations from the American Dental Association, there is weak evidence to support use of sealants in primary teeth and sealants should be placed when it is determined that the tooth, or the patient, is at risk of experiencing caries.[51] Interestingly, Borges et al. found sealants as effective as conventional composite restorations for management of noncavitated dentin occlusal lesions in primary teeth.[52] The studies utilized for the ADA review, however, were not graded for quality or risk of bias. Additionally, since most of the data of the ADA review were from older populations the evidence supporting use of sealants in ECC children is generally an extrapolation. Since the literature is not conclusive, the onus of the clinical decision to seal primary teeth in ECC children can be based on individual clinical expertise and patient preferences.

It was discouraging to see the lack of literature on effectiveness of techniques like ART/ITR in managing ECC, although some data is available for older children. Yassen[53] evaluated ART restorations in primary molars in six- to seven-year-olds and noted survival rates of 89 percent at six months and 74 percent at 12 months. Ng et al.[54] reported a reduction in new cavitation, pain, and referrals to the operating room among children undergoing a comprehensive disease management protocol versus historical controls. Some of these children received ITR as a part of the disease management; however, they received other interventions as well, so the effect of ITR as an intervention was not separately observed. There is certainly a need for further trials to evaluate effectiveness of temporary restorations in ECC.

Most of the studies evaluated in this paper to assess effectiveness of traditional restorative dentistry as a part of disease management were either surveys or observational in nature. Thus, the quality of evidence available to support restorative care was found to be insufficient. Even though graded as insufficient, the included studies provide some evidence highlighting high post-treatment relapse rates. Thus, there is lack of substantial evidence to suggest that restorative treatment leads to acceptable long-term clinical outcomes.

The evidence on influence of traditional restorative dentistry on overall or oral health-related quality of life is very limited and was assessed to be of weak quality. Most included papers noted evidence of improvement in OHRQOL, as reported by the parents. But conflicting results were also presented. For example, in a previous paper, Acs et al.[55] showed that the percentile weight categories for ECC children were significantly less than the caries-free patients. The authors also noted a significant improvement in weight following therapeutic dental treatment. However, these findings were inconsistent with those of Thomas et al.,[43] who were unable to confirm such a catch-up growth. Even though the current evidence supporting effectiveness of traditional restorative dentistry in ECC children is insufficient, it remains an integral part of the strategy to manage the disease. There is certainly a need to go beyond the drill-and-fill dentistry and integrate other concepts of disease management to ensure long-term success. One may also interpret the paucity of high-quality research as meaning the glass is half-full rather than half-empty. The mapping of knowledge gaps disclosed here and in other fields of pediatric dentistry[56] is a call for intensified clinical research and points out the most pertinent topics to be addressed in ECC prevention and management.

An appropriate question is: "What should be used to assist clinical decision-making when the quality of evidence is low or very low?" According to Sackett et al.,[57] evidence-based practice is a triad that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences. In pediatric dentistry, this means that the informed clinician must combine best available scientific evidence with his/her own expertise and parents' values and expectations. It further underpins the need and responsibility of the profession to understand and remain updated on the best available evidence for pediatric dental care.

Conclusions

Based on this updated review, the following conclusions can be made:

1. There is moderate and limited quality of evidence in support of fluoride toothpaste and fluoride varnish for early childhood caries prevention, while the evidence for fluoride tablets/drops is insufficient.
2. There is insufficient evidence to support the use of silver diamine fluoride, xylitol, chlorhexidine varnish/gel, povidone iodine, probiotic bacteria, and remineralizing agents (e.g., casein phosphopeptide-amorphous calcium phosphate) for ECC prevention.
3. There is insufficient evidence for the use of sealants to reduce incidence of ECC.
4. There is insufficient evidence to support the use of temporary restorations as a part of disease management of ECC.
5. There is insufficient evidence to evaluate the value of traditional restorative dentistry as a part of disease management of ECC.

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Is routine dental prophylaxis effective?

Abstracted from

Azarpazhooh A, Main PA.

Efficacy of dental prophylaxis (rubber cup) for the prevention of caries and gingivitis: a systematic review of literature. Br Dent J 2009; 207: E14; discussion 328–329

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Question: Does dental prophylaxis provided at recall appointments reduce caries increments, or improve gingival health?

Data sources Searches were made for relevant papers using Medline, CINHAL (Cumulative Index to Nursing and Allied Health Literature), Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic reviews, Database of Abstracts of Reviews of Effects, Embase, Health and Psychosocial Instruments, HealthSTAR, International Pharmaceutical Abstracts, and ACP (American College of Physicians) Journal Club. Further articles were identified by reviewing the references and bibliographies of the retrieved articles.

Study selection Articles were limited to original human studies assessing rubber cup dental prophylaxis. All other studies, including in vitro studies, reviews and case series, were excluded. Only studies in English with prophylaxis given at a recall appointment at intervals of 4 months were included.

Data extraction and synthesis The quality of articles was assessed independently and evidence levels rated. A qualitative synthesis is presented.

Results Four articles relating to dental prophylaxis and caries prevention and two articles relating to dental prophylaxis and gingivitis prevention were included. Four studies found that a dental prophylaxis was not warranted before professionally applied topical fluoride (PATF) for caries prevention in children. A generalisation about dental prophylaxis before PATF cannot be applied to adolescents and adults. Available evidence from two other studies fails to demonstrate any benefit in the prevention of gingivitis from further dental prophylaxis at the interval used here for recall examinations.

Conclusions To prevent caries in children, dental prophylaxis need not be provided either at a recall visit or before PATF. Dental prophylaxis at intervals of 4 months or more is not justified for the prevention of gingivitis in the general population.

Commentary

Dental prophylaxis generally consists of mechanical cleaning of the clinical crowns of the teeth, using an abrasive paste and a rubber cup rotating at low speed. This systematic review attempts to assess whether dental prophylaxis provided at recall appointments reduces caries increments, on its own or in combination with PATF, or improve gingival health.

Data for this review was obtained by searching Ovid Medline and several other well recognised databases. The authors made an attempt to include randomised control trials (RCT), although the number of suitable studies of this type was low, and non-RCT were therefore included. There was no personal contact with experts and only papers published in the English language were included, which may have limited the data somewhat.

The authors went into clear detail regarding methods for selecting appropriate studies from the literature search. Further articles were selected by performing a secondary search using the references from the original papers. Following initial exclusions, 12 articles were critically appraised by two separate readers using a checklist to assess evidence of efficacy of therapy or prevention.[1] Of the articles judged to be acceptable, four related to dental prophylaxis and caries prevention, and two related to dental prophylaxis and gingivitis prevention.

Although checklists are useful in such a review, they have several limitations which should be considered. The main issue involves the scoring system employed, in which equal weighting is given to aspects which carry different levels of importance. For example, the aforementioned checklist gives one point for sufficient duration of a study and the same score for the presence of randomisation. Such a system introduces a great deal of subjectivity to a literature review and should be used with caution. The Cochrane Collaboration explicitly discourages use of scales and checklists in reviews, as evidence shows them to be unreliable tools for assessment of validity.[2,3]

Because of wide variation in the design of the separate studies, no attempt was made to combine the data. Instead, qualitative summaries of each of the studies were provided, with a unanimous indication that there was no significant difference between groups of results in each study. The lack of comparable quantitative data meant there was no opportunity to carry out meta-analysis or sensitivity analysis.

All the papers investigating the relationship between prophylaxis and caries increments used acidulated phosphate fluoride as their PATF of choice. Although this form of fluoride delivery has been shown to be effective in the prevention of caries, it has largely fallen

out of favour in recent years. Instead, topical fluoride varnishes such as Duraphat (2.26% F) have become more widely used because they can adhere to tooth surfaces and are easier to apply.[4,5] With this in mind, the relevance of the papers to current clinical practice may be reduced.

An obvious theme running through the review is the lack of control of the subjects' dental care outside the study. This was acknowledged by the authors of this review, and points towards a potentially significant factor in influencing the results. The nature of the studies included means, however, that this would be an extremely difficult issue to resolve.

The overall recommendations made by the review are that:

- for the prevention of caries in children, dental prophylaxis need not be provided either at a recall visit or before the application of topical fluorides; and
- for the prevention of gingivitis in the general population, dental prophylaxis at recall appointments (of intervals of 4 or 6 months) is not effective for the prevention or treatment of gingivitis.

The authors state that in a setting such as Canada, to cease provision of prophylaxis prior to PATF would lead to considerable savings in oral health resources because of the nature of the fee structure. In general dental practice in the United Kingdom, no fee is paid for the provision of prophylaxis in the aforementioned situations and no financial gain would be made on the part of the National Health Service by excluding this treatment.

In general, most of the problems outlined here have been identified by the authors. It is fair to say that the evidence has been overstated, and the recommendations made are based on a limited amount of data. In any case, there appears to be little harm or benefit to the patient either way, whether prophylaxis is provided in these situations or not. Prophylaxis, does, however, have other uses not addressed by these authors: for example, prior to inspection for caries, or in the acclimatisation of an anxious or young patient. Given the limited number of high quality studies and reviews available, further research is clearly needed before any changes in clinical practice can be justified.

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Implant Removal and Debridement

Question: should implant removal and debridement be moved to a higher priority line?

Question source: Gary Allen, DMD

Issue: Currently D6100 (implant removal) and D6101 (implant debridement) are on line 622 DENTAL CONDITIONS (EG. MISSING TEETH) Treatment: MPLANTS (I.E. IMPLANT PLACEMENT AND ASSOCIATED CROWN OR PROSTHESIS). These procedures were placed on line 622 to be included with other implant procedures. However, when an implant is infected, it requires removal or debridement and therefore these procedures should be covered services. Dr. Allen suggested moving these codes to line 349 DENTAL CONDITIONS (EG. SEVERE CARIES, INFECTION) Treatment: ORAL SURGERY (I.E. EXTRACTIONS AND OTHER INTRAORAL SURGICAL PROCEDURES). He suggests creating a guideline note restricting these codes to use when the implant is infected.

HERC staff recommendations:

1) Add D6100 (implant removal) and D6101 (Debridement of a periimplant defect or defects surrounding a single implant, and surface cleaning of the exposed implant surfaces, including flap entry and closure) to line 349 DENTAL CONDITIONS (EG. SEVERE CARIES, INFECTION)
    a. Keep on line 622 DENTAL CONDITIONS (EG. MISSING TEETH)
2) Adopt the following new guideline note

GUIDELINE NOTE XXX DENTAL IMPLANT REMOVAL AND DEBRIDEMENT
Lines 349, 622
Removal and debridement of implants (D6100, D6101) are included on line 349 only when the implant is infected. Otherwise, these procedures are included on line 622.