

Effective Use of Pit and Fissure Sealants to Prevent Pit and Fissure Caries on the Permanent Posterior Teeth of Children and Youth

Nadine Khan, MHSc RD, Public Health Nutritionist
Paul Sharma, BSc RDH MSc, Manager

Chronic Disease and Injury Prevention Division (CDIP)
Region of Peel Public Health

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Key Messages

The following key messages are based on the findings from this Rapid Review:

1. To prevent pit and fissure caries, the permanent molar teeth of children and youth, who are identified at risk for caries, should have sealants applied.
2. Sealants should be placed on the permanent molar teeth of children and youth as soon as possible after the tooth has fully erupted. However, the occlusal surface of teeth remains at risk for caries throughout childhood, youth and early adulthood; therefore, the length of time after a tooth's eruption should not be a barrier from sealant application.
3. Resin-based pit and fissure sealants are shown to have better retention rates than other sealants, thus resin-based sealants are the material of choice for the molar teeth of children and youth.

Executive Summary

Research Question

When and with what material should pit and fissure sealants (PFS) be applied to the posterior permanent teeth of children and youth for the prevention of pit and fissure caries?

Issue and Context

Dental caries is one of the most common, yet preventable childhood chronic diseases. Despite the benefits of community water fluoridation¹ and increases in Public Health programming, the prevalence of dental caries among Peel's children and youth, especially in vulnerable populations, is cause for concern. While there are limited oral health status data for both Peel and Ontario, the 2010 Canadian Health Measures Survey identified that 57 per cent of six to 11 year olds and 59 per cent of 12-19 year olds have or have had dental caries.¹⁰ In addition, Peel Public Health's (PPH) Student Health Survey (2011) found that 52 per cent of students in grade 10 and 12 have experienced dental caries.² PFS are an effective strategy for the prevention of pit and fissure caries.⁵

Methods and Results

A search of both the academic and grey literature yielded 48 relevant papers, including guidelines and systematic reviews. An additional six articles were obtained through expert consultations. The reviewers decided to assess only the guidelines as they are the most synthesized evidence currently available. Of 15 guidelines, 11 were eliminated based on primary and secondary relevance assessments. The remaining four guidelines were appraised; two of the guidelines rated weak and were excluded from further analysis. The Scottish

Intercollegiate Guideline Network (SIGN) 138 guideline and the Irish Oral Health Services Pit and Fissure Sealant guideline both rated strong and were included in this rapid review.

Synthesis of Findings

- Sealants should be applied to the permanent molar teeth of children and youth, specifically the first and second molars.
- Resin-based sealants, over other sealants materials, should be used for the prevention of pit and fissure caries in children and youth as they have better retention rates.
- Dental sealants should be applied as early after tooth eruption as possible. However, there is no post-eruptive time limit on the placement of sealants.
- All children including those at high risk for dental caries should have their permanent molar teeth sealed.

Recommendations

- Apply sealants to the permanent molar teeth of children and youth who are identified at risk by a caries risk assessment in PPH Oral Health clinics.
- Place sealants on teeth as soon as possible after eruption; however, the length of time after eruption should not be a barrier to the placement of sealants.
- Use resin-based sealant materials to seal teeth, for increased retention of dental sealants.
- Disseminate the review findings to Peel dentists, dental hygienists, level II dental assistants and other health care providers to promote the use of PFS.

- Share relevant evidence with parents of children and youth in the community in order to promote discussions about and request for PFS from their practitioners.
- Collect and analyze the cost of PFS application for various providers in different settings throughout Peel, to aid in assessing cost effectiveness of PFS application throughout the region.

1 Issue

Dental caries is one of the most common yet preventable childhood chronic diseases. Despite the benefits of community water fluoridation¹ and increases in Public Health programming, such as screening and preventive programs, the prevalence of dental caries among Peel's children and youth, especially in vulnerable populations, is cause for concern. Peel Public Health's (PPH) Student Health Survey (2011) found that 52 per cent of students in grades 10 and 12 have experienced dental caries²; approximately 90 per cent of these caries are found in molar teeth.^A

Many factors affect the development of dental caries; from tooth-level issues (e.g. plaque, tooth, diet) to societal determinants (e.g., income and education).³ Dental caries can occur on a tooth's smooth surfaces or on premolar/molar fissures. Water fluoridation and fluoride treatments are effective in preventing caries on the tooth's smooth surfaces.⁴ Pit and fissure sealants (PFS) when applied to the fissures of permanent posterior teeth, are effective at preventing pit and fissure caries.⁵

In children and youth, teeth generally erupt at specific time intervals. Prospective European studies have shown consistent mean/median ages of appearance for first permanent molars (6.0–6.3 years for girls and 6.3–6.5 years for boys) and second permanent molars (11.5–12.3 years for girls and 11.8–12.4 for boys).¹⁴ However, molar teeth may erupt earlier or later than

specified. The timing of a tooth's eruption cannot be determined by inspection. Historically, practice guidelines have recommended placing sealants on teeth within two to four years after eruption,⁶ but they have not addressed whether applying sealants after this time also reduces the prevalence of dental caries.

This review addresses the question, when and with what material should PFS be applied to the posterior permanent teeth of children and youth for the prevention of pit and fissure caries?

Anecdote

In creating the PPH 2013-2018 Oral Health Program Business Plan,⁷ the Oral Health management team looked at strategies that would help reduce dental caries in Peel. Management observed that staff was applying a limited number of PFS on permanent teeth. Discussions with staff revealed that they were not applying sealants because they did not have sufficient time during the appointment, did not understand the science behind dental sealants, felt they needed a dentist to make sure there was no presence of decay, thought radiographs were needed, and were not comfortable applying PFS on children and youth. Management discussed prevention as a cornerstone of public health and encouraged staff to use PFS interventions to prevent dental caries on permanent posterior teeth.

2 Context

One program objective for PPH Oral Health teams is to reduce tooth decay in Peel children and youth under 18 years of age.⁷ PPH Oral Health staff conduct screenings of untreated dental conditions in schools and community clinics. In 2013, 63,940 children and youth were screened using this assessment. PPH staff identified 13,985 children and youth (22%) with dental conditions requiring treatment. Of those, 10,391 children and youth (74%) had urgent conditions (e.g. visible caries or infections) and the remainder had minor conditions (e.g. small caries). If the children with urgent dental conditions are left untreated, they would be deemed to be in a state of dental neglect and eligible for referral to a Children's Aid Society under the Child and Family Services Act.⁹

The 2010 Canadian Health Measures Survey identified that decay affects 2.5 teeth on average in Canadian children between ages six and 19, and that 57 per cent of children aged six to 11 and 59 per cent of children aged 12 to 19 have or have had dental caries.¹⁰ While there is limited oral health status data for Peel and Ontario, the 2011 Peel School Health Survey results showed 52 per cent of students in grades 10 and 12 have experienced dental caries.²

Peel has a diverse population with high oral health needs. Peel data shows that Canadian-born children from birth to 13 years have better oral health, including fewer untreated dental caries, than foreign-born children.¹¹ The Canadian Community Health Survey specifies that between 2009-2010, recent immigrants made up 50 per cent of Peel's population and only half (49 per cent) of this population has dental coverage.⁷

PPH administers three programs for children under the age of 18 who meet program eligibility (refer to appendix F for further details):

- Children in Need of Treatment program (CINOT) which provides access to basic dental treatments for those in need of urgent dental care
- Healthy Smiles Ontario program (HSO) which provides ongoing preventive and early treatment for children from low income families
- Preventive Dental Services which provides preventive treatments (e.g., fluoride, sealants and scaling)

Over 900 dental practitioners in the community provide treatment services through CINOT and HSO. PPH staff, which includes 14.5 registered dental hygienists and 10 certified dental assistants, provides Preventive Dental Services to Peel children and youth who do not meet the eligibility criteria for CINOT or HSO. PPH also provides dental screening in schools and community clinics; each year, PPH staff screen approximately 60,000 children and youth.

Between September 1, 2013 and August 31, 2014, using Ministry guidelines¹³, PPH staff scanned 63,940¹ children and youth, identifying 7,986 (12%) who would benefit from dental sealants. Some of the children identified have families with the means to self-pay or pay through their dental insurance provider for dental care. Families who do not have the means to fund dental care are assessed using financial criteria outlined in the Preventive Oral Health Services Protocol.¹³ If they meet the criteria, they are allowed to access our community clinics.

¹ 63,940 children includes those without permanent molars and those who have existing molar restoration

PPH clinic staff sealed 1,781 individual teeth in 2012-2013^{II}, and 3,588 individual teeth in 2013-2014^{III}.^B

3 Conceptual Frameworks

Oral health contributes to overall health and quality of life.⁷ The conceptual model (Appendix A) emphasizes this relationship, highlighting the strategies that contribute to healthy dentition, such as prevention of tooth decay. PFS are a key component of these strategies. This model was developed in consultation with PPH Oral Health Teams, who play an important role in providing dental services throughout Peel.

4 Literature Review Question

The question addressed in this literature review is: when and with what material should PFS be applied to the posterior permanent teeth of children and youth for the prevention of pit and fissure caries? The research question in the PICOT format is as follows:

Population (P)=	children and youth with posterior permanent teeth
Intervention (I)=	pit and fissure sealants
Control/Comparison (C)=	no pit and fissure sealants applied
Outcome (O)=	pit and fissure caries
Time (T)=	time of sealant application

^{II} Year runs September 1, 2012 to August 31, 2013

^{III} Year runs September 1, 2013 to August 31, 2014

5 Literature Search & Relevance Assessment

A search for both published and grey literature was conducted in August 2014 by PPH librarians. The search for summaries and guidelines included, but was not limited to, the following sources: National Guidelines Clearinghouse, Centre for Disease Control – The Community Guide and Center for Reviews and Dissemination. In addition, PPH librarians searched Medline and the Cochrane databases, limiting the search date (i.e., 2005 onwards) and type of papers (i.e., guidelines, systematic reviews and meta-analyses). Refer to Appendix B for the detailed search strategy.

Two reviewers assessed the search results for relevance and mutually agreed upon the most relevant articles. Fifty-four results were assessed, including guidelines and systematic reviews, using the following criteria:

- *Inclusion criteria:* Written in English; synthesized evidence (i.e., guidelines, systematic reviews, meta-analyses); included children and youth population; focused on investigating dental sealants as a prevention method for dental caries regardless of when the PFS was applied.
- *Exclusion criteria:* Focused only on the adult population; focused only on the cost effectiveness of dental sealants.

6 Results of the Search

The academic and grey literature searches retrieved 48 results. Six additional articles, consisting of guidelines and systematic reviews, were provided through expert consultations. A

total of 15 guidelines were included in the results; once duplicates and older versions of guidelines were removed, 11 remained. To include the most synthesized evidence available, reviewers agreed to assess only the guidelines for relevance.

During primary relevance assessment, three guidelines were eliminated: one because the overall outcomes did not match and two because they were not in English. Four additional guidelines were removed during the full document relevance assessment; two due to out-of-date references, one due to a lack of methodology and one because it was published prior to 2010^{IV}. The remaining four guidelines underwent quality assessment. The search results flowchart is provided in Appendix C.

7 Critical Appraisal

Two independent reviewers used the AGREE II tool to critically appraise four guidelines; two of the guidelines rated as strong quality (6/7). The two other appraised guidelines rated as weak due to several factors including a lack of detailed information on the methodological rigor; these guidelines were therefore excluded from this review.

8 Description of Included Studies

Two guidelines included in this review:

- Irish Oral Health Services Guideline Initiative (2010) - *Pit and Fissure Sealants: Evidence-based guidance on the use of sealants for the prevention and management of pit and pit and fissure caries.*¹⁴

^{IV} Reviewers decided to further narrowed the publication date to reflect the most recent research

- Scottish Intercollegiate Guideline Network (2014) - *Dental Interventions to Prevent Caries in Children: A National Clinical Guideline*. SIGN Publication no. 138 (SIGN)¹⁵

Each guideline provides slightly different, yet complementary, perspectives. Please refer to Appendix D for the related data extraction tables.

8.1 Irish Oral Health Services Guideline

This guideline outlines how PFS are used to prevent and manage caries in the pits and fissures of primary and permanent teeth in children, adolescents and adults. The ADAPTE process^V was used to develop the guideline, providing a structured framework for adapting clinical practice guidelines from one organization or context to another. The evidence used to inform the guideline development included guidelines, systematic reviews, clinical trials and economic evaluations. Four sections were relevant this rapid review: *How effective are fissure sealants at preventing caries? Who should get sealants?, Which Teeth should be sealed?, and When should sealants be applied?*

The applicable sections of the guideline included both synthesized and primary research. The guideline group combined four systematic reviews (published between 2000 and 2009), 12 single studies (published between 2004 and 2010), and used the results from an unpublished survey to inform the recommendations. The guideline group used the parameters set out by SIGN to grade the evidence that informs the recommendations (see appendix D).

^V The ADAPTE Collaboration is an international collaboration of researchers, guideline developers and implementers whose goals are to promote the development and use of clinical practice guidelines through the adaptation of existing guidelines. The group's main vision is to develop and validate a process that will foster valid and high-quality adapted guidelines.

8.2 Scottish Intercollegiate Guideline Network (SIGN) Guideline 138

This guideline outlines SIGN's guidance on the use of dental interventions to prevent caries in children and young people aged 0–18 years. It is an update to SIGN guideline 47 on preventing dental caries in children at high caries risk and SIGN guideline 83 on prevention and management of dental decay in pre-school children. The guideline was developed using SIGN 50: A guideline developer's handbook.¹⁶

To find relevant evidence to inform the guideline, the guideline development group searched databases for systematic reviews between 2000-2011; RCTs and observational studies were also searched for, with variations in the dates covered for specific topics, ranging from 2002-2012. For the purposes of this review, the reviewers focused on the sealants section of this guideline.

The evidence used to inform this section of the guideline included one Cochrane systematic review,¹⁷ published in 2013, which was an update from the 2008 version.⁵ A total of 34 trials were included in the systematic review, with 6,529 participants ages five to 16 years. The systematic review was rated high quality using SIGN's rating of Levels of Evidence.

Refer to Appendix D for further information on the guidelines.

9 Synthesis of Findings

The Irish Oral Health Services and the SIGN guidelines contain complementary findings related to the use of sealants in children and youth; the relevant findings from the guidelines are summarized in Table 1.

Table 1: Summary of Findings

Question	Recommendations and Effect	Supporting Literature
What type of PFS should be used?	<p>Resin-based sealants are recommended for use over other sealant materials (e.g. glass ionomers)</p> <ul style="list-style-type: none"> • 16 trials found that molars with resin-based sealants had less caries on their occlusal surfaces after 2 years (78%) and 4-4.5 years (60%) compared to unsealed molars • At 36-48 months follow-up, 5 studies showed that retention figures favoured resin sealants (mean 76%) over glass ionomers (mean 8%) • 3 of 5 studies included in a review found retention rates of resin-based sealants to be around 70% at 48-54 months 	<ul style="list-style-type: none"> • 2 Guidelines <ul style="list-style-type: none"> ○ 2 Systematic Reviews
When should PFS be applied?	<p>PFS should be applied as soon as the tooth has fully erupted</p> <ul style="list-style-type: none"> • A prospective study found that after 3 years, 54% of teeth sealed when the operculum covered the marginal ridge required retreatment compared to 26% of teeth sealed when the gingival tissue was level with the marginal ridge. None of the teeth sealed when the distal marginal ridge was above the gingival level required treatment 	<ul style="list-style-type: none"> • 2 Guidelines <ul style="list-style-type: none"> ○ 1 Single Study ○ 1 Systematic Review
	<p>There is no post-eruptive time limit on the placement of PFS</p>	<ul style="list-style-type: none"> • 1 Guideline <ul style="list-style-type: none"> ○ 2 Single Studies
Which teeth should have PFS?	<p>In children and adolescents, priority for sealant placement should be given to the first and second permanent molar teeth</p> <ul style="list-style-type: none"> • A survey of children's oral health in Ireland found that the first and second permanent molar teeth accounted for 80% or more of the total caries experience 	<ul style="list-style-type: none"> • 1 Guideline <ul style="list-style-type: none"> ○ 1 Survey

	Sealants should be applied to children’s ^{vi} permanent molars	<ul style="list-style-type: none"> • 1 Guideline <ul style="list-style-type: none"> ○ 1 Systematic Review
Who should get PFS?	PFS should be applied to all children ^{vi}	<ul style="list-style-type: none"> • 1 Guideline <ul style="list-style-type: none"> ○ 1 Single Study
	PFS should be applied to children and adolescents who are at high risk of caries	<ul style="list-style-type: none"> • 1 Guideline <ul style="list-style-type: none"> ○ 1 Systematic Review

Recommended Sealant Material

There are several types of PFS materials, including but not limited to resin-based sealants, glass ionomers, and mixed material sealants. Resin-based sealants, over other sealants materials, are recommended for the prevention of pit and fissure caries in children and youth (Irish Oral Health guidelines and SIGN guideline). The SIGN guideline sourced evidence from a high quality 2013 Cochrane review, which showed that evidence was not consistent enough to draw conclusions about the superiority of either resin-based and glass ionomer materials; however, the retention figures of five studies in the review favoured resin sealants (mean 76%) over glass ionomers (mean 8%) at 36-48 months follow-up. Also, three of five studies included in the review found the retention rates of resin-based sealants to be around 70% at 48-54 months.

Appropriate Time to Apply Sealants

The permanent molar teeth of children and adolescents should be sealed as soon as the tooth is fully erupted (Irish Oral Health guideline and SIGN guideline). A prospective study found:

“After three years, 54 per cent of teeth sealed when the operculum covered the marginal ridge required retreatment compared to 26 per cent of teeth

^{vi} In this guideline “children” refers to those ages 0-18.

sealed when the gingival tissue was level with the marginal ridge. None of the teeth sealed when the distal marginal ridge was above the gingival level required treatment. (Irish Oral Health guideline)”

In addition, due to the slow progression of dental caries, the occlusal surface of teeth remain at risk throughout childhood, youth and early adulthood, thus there is no post-eruptive time limit indicated for the placement of PFS. Two single studies were used as the basis for this statement (Irish Oral Health guideline).

Recommended Teeth to Seal

The permanent molars of children should be sealed (Irish Oral Health guideline and SIGN guideline). The Irish Oral Health guideline referred to a survey of children’s oral health in Ireland which found that the first and second permanent molar teeth accounted for 80 per cent or more of the total caries experience in the permanent teeth of Irish children, making these teeth the most important for sealant application. The Irish Oral Health guideline also mentions that other teeth (e.g. premolars and third molars) may also be considered for sealant application, based on the dentist’s assessment.

Focus Population

PFS should be applied to the permanent molar teeth of both children and youth. The SIGN guideline recommended that all children^{VI} have sealants applied to permanent molars. The Irish Oral Health guideline specifies that children and youth at high risk for caries should have PFS applied.

10 Applicability and Transferability

In February 2015, representatives from PPH Oral Health teams and local community health centre staff were invited to assess the applicability and transferability of this review in a facilitated group discussion. A summary of this meeting is provided below (see appendix E for a complete summary of the meeting).

Applicability

Political Acceptability or Leverage

- A new Peel Regional Council has been appointed. The council will need educating on the necessity for PFS in the child and youth population.
- Sealants work synergistically with community water fluoridation to prevent caries. Community water fluoridation is currently a topic of interest at Regional Council.
- Provincially, advocacy is needed for universal dental programs for children under 18 years of age.
- It is unclear if there is a consistent belief and view about the effectiveness of PFS in the regional and provincial dental communities.

Social Acceptability

- PFS are ethical, non-invasive and are relatively quick to apply, which should make them easily accepted by the target population (i.e. Parents, Children and Youth).
- Parents are becoming increasingly educated about oral health issues; there is a need to identify how to raise awareness about the benefits of PFS in this target population.

- The cost of PFS may be of concern for those without dental coverage for PFS (i.e. those with or without dental insurance coverage) and who are not eligible for PPH dental programs.

Available Essential Resources

- Applying PFS is not a controlled act under the Regulatory Health Professions Act (1991) and thus there is potential to use staff to their full scope of practice (e.g. dental assistants may apply PFS, which costs less than a dentist applying PFS).
- Applying sealants costs less than filling dental caries. PFS interventions may potentially lead to long-term savings into adulthood for the healthcare system as they may aid in preventing costly dental treatments, pain, infections and poor dental health.
- The actual cost of applying PFS varies across settings, but the variance is unknown.
- Based on the retention rates of PFS in the literature, a certain percentage of children will need retreatment. Peel resources for retreatment should be investigated.
- Later this year the Ministry of Health and Long-Term Care will be integrating publicly funded dental programs into one program with strict financial criteria, which could impact PPH preventive services resources (e.g. applying sealants to teeth).

Organizational Expertise and Capacity

- PFS as an intervention conforms to both the Ontario Public Health Standards and PPH Strategic Plan.
- Prevention of dental caries is part of public health's mandate, and PFS is an intervention targeted to prevent caries in teeth at high risk.

- Dentists and dental hygienists within the community currently seal teeth; however, rates for applying sealants are lower for publically funded clients in private practice than in PPH Oral Health clinics.

Transferability

Magnitude of Health Issue in Local Setting

- There are a high percentage of Peel secondary students with dental caries. These caries could be prevented.
- There are limited local data on the oral health of children, especially adolescents.

Magnitude of the Reach and Cost Effectiveness of the Intervention

- PFS programming would reach those children that could not afford dental care on their own. These children are found through PPH dental screenings.
- Currently, the proportion of Peel students who would be clinically eligible for PFS is unknown.

Target Population Characteristics

- There is no reason to believe that sealants would not work in Peel's at risk population related to study populations.
- Key considerations

- PPH's population of clients do not necessarily seek out dentists; however, school screenings aid in identifying children who have caries and may be at risk for caries.
- The assumption is that all children that attend PPH preventive clinics are at high risk for caries.
- Currently 13-18 year olds are not being actively sought out for PFS.

11 Recommendations

- Apply sealants to the permanent molar teeth of children and youth who are identified at risk by a caries risk assessment, in PPH Oral Health clinics.
- Place sealants on teeth as soon as possible after eruption; however, the length of time after eruption should not be a barrier to placement of sealants.
- Use resin-based sealant materials to seal teeth, for increased retention of dental sealants.
- Disseminate the review findings to Peel dentists, dental hygienists, level II dental assistants and other healthcare providers to promote the use of PFS.
- Share relevant evidence with parents of children and youth in the community in order to promote discussions about and requests for PFS from their practitioners.
- Collect and analyze the cost of PFS application for various providers in different settings throughout Peel, to aid in assessing cost effectiveness of sealant application throughout the region.

References

1. Ontario Ministry of Health and Long-term Care. (2011). *Health Bulletins: Drinking Water Fluoridation*. Canada: Author. Retrieved from http://www.health.gov.on.ca/en/news/bulletin/2011/hb_20110404_2.aspx
2. Peel Public Health. (2102). *School Health 2011: Measuring the Health of Peel's Youth*. Canada: Author. Retrieved from <http://www.peelregion.ca/health/health-status-report/studenthealth2011/>
3. ten Cate, J.M. (2009). The need for antibacterial approaches to improve caries control. *Adv Dent Res*. 21(1), 8-12. doi: 10.1177/0895937409335591.
4. Horowitz, H.S. (1982). The potential of fluorides and sealants to deal with problems of dental decay. *Pediatric Dent.*, 4(4), 286-295. Retrieved from <http://www.aapd.org/assets/1/25/Horowitz-04-04.pdf>
5. Ahovuo-Saloranta, A., Hiiri, A., Nordblad, A., Makela, M., & Worthington, H.V. (2008). Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. *Cochrane Database Syst Rev*. (4). doi: 10.1002/14651858.CD001830.pub3.
6. Community Dental Health Service Research Unit. (1999). *The Update of Evidence-based Recommendation for the Use of Pit and Fissure Sealants in the North York Public Dental Program: An Evidence-based Report (Report No. 18)*. Canada: Jokovic, A., Leake, J.L. & Main, P.A.
7. Peel Public Health. (2013). *Oral Health Program Business Plan 2013-2018*. Canada: Author.
9. Minister of Health and Long-Term Care. (2008). *Children in Need of Treatment Program Protocol*. Canada: Author. Retrieved from http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/ci_not.pdf
10. Health Canada. (2010). *Canadian Health Measures Survey: Oral Health Statistics 2007-2009*. Canada: Author. Retrieved from <http://www.hc-sc.gc.ca/hl-vs/pubs/oral-bucco/fact-fiche-oral-bucco-stat-eng.php>.
11. Peel Public Health. 2003. *Children's Dental Health: A Peel Health Status Report*. Canada: Author. Retrieved from <http://www.peelregion.ca/health/health-status-report/dental-health/pdfs/dh-full.pdf>
12. Peel Public Health. (2013). *Dental Insurance*. 2013. Canada: Author. Retrieved from <http://peelregion.ca/health/statusdata/pdf/dental-insurance-a.pdf>
13. Ontario Ministry of Health and Long-Term Care. (2008). *Preventive Oral Health Services Protocol*. Canada: Author. Retrieved from http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/preventive_oral_health.pdf

14. Irish Oral Health Services Guideline Initiative. (2010). *Pit and Fissure Sealants: Evidence-based guidance on the use of sealants for the prevention and management of pit and fissure caries*. Ireland: Author. Retrieved from http://www.dentalhealth.ie/download/pdf/fs_guideline_online_final_v_2.pdf
15. Scottish Intercollegiate Guidelines Network (SIGN). (2014). *Dental interventions to prevent caries in children* (SIGN publication no. 138). Scotland: Author. Retrieved from <http://www.sign.ac.uk/pdf/SIGN138.pdf>
16. Scottish Intercollegiate Guidelines Network (SIGN). (2008). *SIGN 50: A guideline developer's handbook*. Scotland: Author. Retrieved from <http://www.sign.ac.uk/pdf/sign50nov2011.pdf>
17. Ahovuo-Saloranta, A., Forss, H., Walsh, T., Hiiri, A., Nordblad, A., Mäkelä, M., & Worthington, H.V. (2013). Sealants for preventing dental decay in the permanent teeth. *Cochrane Database Syst Rev*. (3).
19. Richardson, P.S., & McIntyre, I.G. (1996). Susceptibility of tooth surfaces to carious Attack in young adults. *Community Dent Health*. 13(3),163–8.
20. Stahl, J.W., & Katz, R.V. (1993) Occlusal dental caries incidence and implications for sealant programs in a US college student population. *J Public Health Dent*. 53(4), 212–8.
21. Irish Oral Health Services Guideline Initiative. (2009). *Strategies to prevent dental caries in children and adolescents: Guidance on identifying high caries risk children and developing preventive strategies for high caries risk children in Ireland*. Ireland: Author. Retrieved from <http://ohsrc.ucc.ie/html/guidelines.html>
22. Oral Health Services Research Centre. (2002). *North South Survey of Children's Oral Health in Ireland*. Unpublished data. Whelton, H., Crowley, E., O'Mullane, D., Harding, M., Guiney, H., Cronin, M., & Kelleher, V.
23. Yengopal, V., Mickenautsch, S., Bezerra, A., Leal, S. (2009). Caries-preventive effect of glass ionomer and resin-based fissure sealants on permanent teeth: a meta analysis. *J Oral Sci*. 51(3), 373–82.
24. Beirut, N., Frencken, J.E., van 't Hof, M.A., & van Palenstein Helderma, W.H. (2006) Caries-preventive effect of resin-based and glass ionomer sealants over time: a systematic review. *Community Dent Oral Epidemiol*. 34(6), 403–9.
25. Yengopal, V., & Mickenautsch, S. (2010). Resin-modified glass-ionomer cements versus resin-based materials as fissure sealants: a meta-analysis of clinical trials. *Eur Arch Paediatr Dent*. 11(1),18–25.
26. Amin, H.E. (2008). Clinical and antibacterial effectiveness of three different sealant materials. *J Dent Hyg*. 82(5), 45–54.

27. Barja-Fidalgo, F., Maroun, S., & de Oliveira, B.H. (2009). Effectiveness of a glass ionomer cement used as a pit and fissure sealant in recently erupted permanent first molars. *J Dent Child*. 76(1), 34–40.
28. Oba, A.A., Dulgergil, T., Sonmez, I.S., & Dogan, S. (2009). Comparison of caries prevention with glass ionomer and composite resin fissure sealants. *J Formos Med Assoc* 108(11), 844-8.
29. Leroy, R., Bogaerts, K., Lesaffre, E., & Declerck, D. (2003). The emergence of permanent teeth in Flemish children. *Community Dent Oral Epidemiol* 31(1), 30–9.
30. Kochhar, R., & Richardson, A. (1998). The chronology and sequence of eruption of human permanent teeth in Northern Ireland. *Int J Paediatr Dent*. 8(4), 243–52.
31. Ekstrand, K.R., Christiansen, J., & Christiansen, M.E. (2003). Time and duration of eruption of first and second permanent molars: a longitudinal investigation. *Community Dent Oral Epidemiol*. 31(5), 344–50.
32. Nystrom, M., Kleemola-Kujala, E., Evalahti, M., Peck, L., & Kataja M. (2001). Emergence of permanent teeth and dental age in a series of Finns. *Acta Odontol Scand* 59(2), 49–56.
33. Hagg, U., & Taranger, J. (1986). Timing of tooth emergence. A prospective longitudinal study of Swedish urban children from birth to 18 years. *Swed Dent J*. 10(5), 195–206.
34. Dennison, J.B., Straffon, L.H., & More, F.G. (1990). Evaluating tooth eruption on sealant efficacy. *J Am Dent Assoc*. 121(5), 610-4.
35. Minister of Health and Long-Term Care. (2008). *Healthy Smiles Ontario*. Canada: Author. Retrieved from <http://www.health.gov.on.ca/en/public/programs/dental/>
36. Minister of Health and Long-Term Care. (2013). *Dental Health (CINOT)*. Canada: Author. Retrieved from <http://www.mhp.gov.on.ca/en/healthy-communities/dental/>
37. Minister of Health and Long-Term Care. (2008). *Preventive Oral Health Services Protocol*. Canada: Author. Retrieved from http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/preventive_oral_health.pdf

Data References

- A. School Health Assessment Survey, 2011. Peel Public Health
- B. Oral Health Community Clinic Data, 2014. Peel Public Health

Appendices

Appendix A: Concept Model

Appendix B: Search Strategy

Appendix C: Literature Search Flowchart

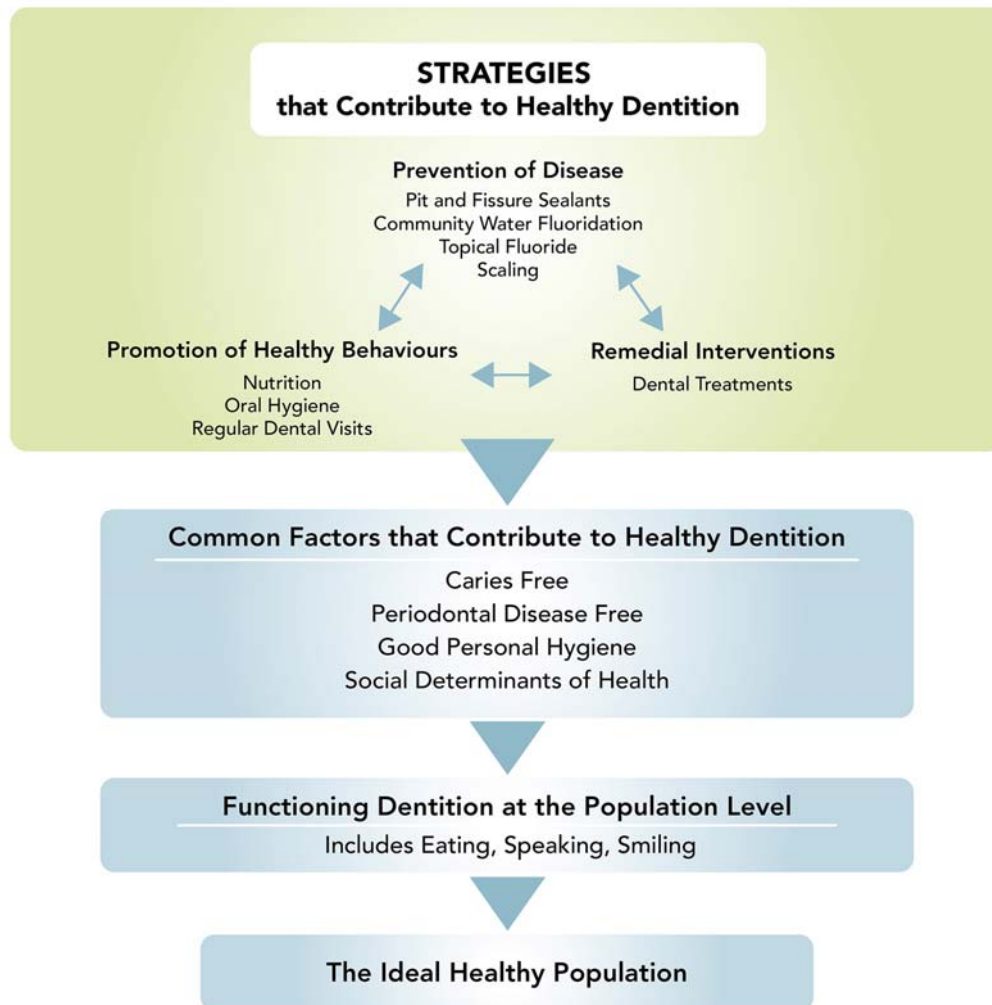
Appendix D: Data Extraction Tables

Appendix E: Applicability & Transferability Worksheet

Appendix F: Dental Program Eligibility Criteria

Appendix A: Concept Model

THE IMPACT OF PIT AND FISSURE SEALANTS ON ORAL HEALTH



Appendix B: Search Strategy

Academic Search Strategy

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to June 2014>, EBM Reviews - ACP Journal Club <1991 to July 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <2nd Quarter 2014>, EBM Reviews - Cochrane Central Register of Controlled Trials <July 2014>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <3rd Quarter 2014>, EBM Reviews - NHS Economic Evaluation Database <3rd Quarter 2014>, Global Health <1973 to 2014 Week 31>, Ovid MEDLINE(R) <1946 to July Week 5 2014>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <August 07, 2014>

Search Strategy:

- 1 exp "Pit and Fissure Sealants"/ (3199)
- 2 "dental sealant*".ti,ab. (327)
- 3 1 or 2 (3328)
- 4 meta-analysis.mp,pt. (123021)
- 5 systematic review.tw. (97660)
- 6 cochrane database of systematic reviews.jn. (20182)
- 7 4 or 5 or 6 (184203)
- 8 exp guideline/ (45692)
- 9 (practice guideline or guideline).pt. (25715)
- 10 8 or 9 (45722)
- 11 7 or 10 (228817)
- 12 (comment or letter or editorial or note or erratum or short survey or news or newspaper article or patient education handout or case report or historical article).pt. (1820915)
- 13 11 not 12 (221818)
- 14 3 and 13 (60)
- 15 remove duplicates from 14 (56)
- 16 limit 15 to yr="2004 -Current" [Limit not valid in DARE; records were retained] (39)

Grey Literature Web Searching Checklist

Requestor	Nadine Khan/ Paul Sharma
Date	July 28, 2014
PICOT/Search Strategy	Dental sealants and adolescent

Resource	
NGC	
Page Title	Location
Pit and Fissure sealants: Evidence-based guidance on the use of sealants for the prevention and management of pit and pit and fissure caries	http://www.ucc.ie/en/media/research/ohsrc/PitandFissureSealantsFull.pdf
Guideline on Adolescent Health care	http://www.aapd.org/media/Policies_Guidelines/G_Adoleshealth.pdf
Evidence-Based Clinical Recommendations for the Use of Pit-and-Fissure Sealants A Report of the American Dental Association Council on Scientific Affairs	http://jada.ada.org/content/139/3/257.full

Resource	
CDC – The community guide	
Page Title	Location
Preventing Dental Caries: Community-Based Initiatives to Promote the Use of Dental Sealants	http://www.thecommunityguide.org/oral/communitysealants.html
Preventing Dental Caries: School-Based Dental Sealant Delivery Programs	http://www.thecommunityguide.org/oral/schoolsealants.html

Resource	
Center for Reviews and Dissemination	
Page Title	Location
Cost-effectiveness analysis of a school-based dental sealant program for low-socioeconomic-status children: a practice-based report	http://www.crd.york.ac.uk/CRDWeb/ShowRecord.asp?AccessionNumber=22002007651&UserID=0

Resource	
Random Finds	
Page Title	Location
Critically Appraised Topics (CAT) Library	https://cats.uthscsa.edu/

Resource	
Health Evidence	
Page Title	Location

Pit and fissure sealants versus fluoride varnishes for preventing dental decay in children and adolescents.	http://www.ncbi.nlm.nih.gov/pubmed/20238319?dopt=Abstract <i>This has been appraised by Health Evidence as strong.</i>
Pit and Fissure Sealants in the Prevention of Dental Caries in Children and Adolescents: A Systematic Review	http://www.cda-adc.ca/jcda/vol-74/issue-2/171.pdf <i>This has been appraised by Health Evidence as moderate.</i>

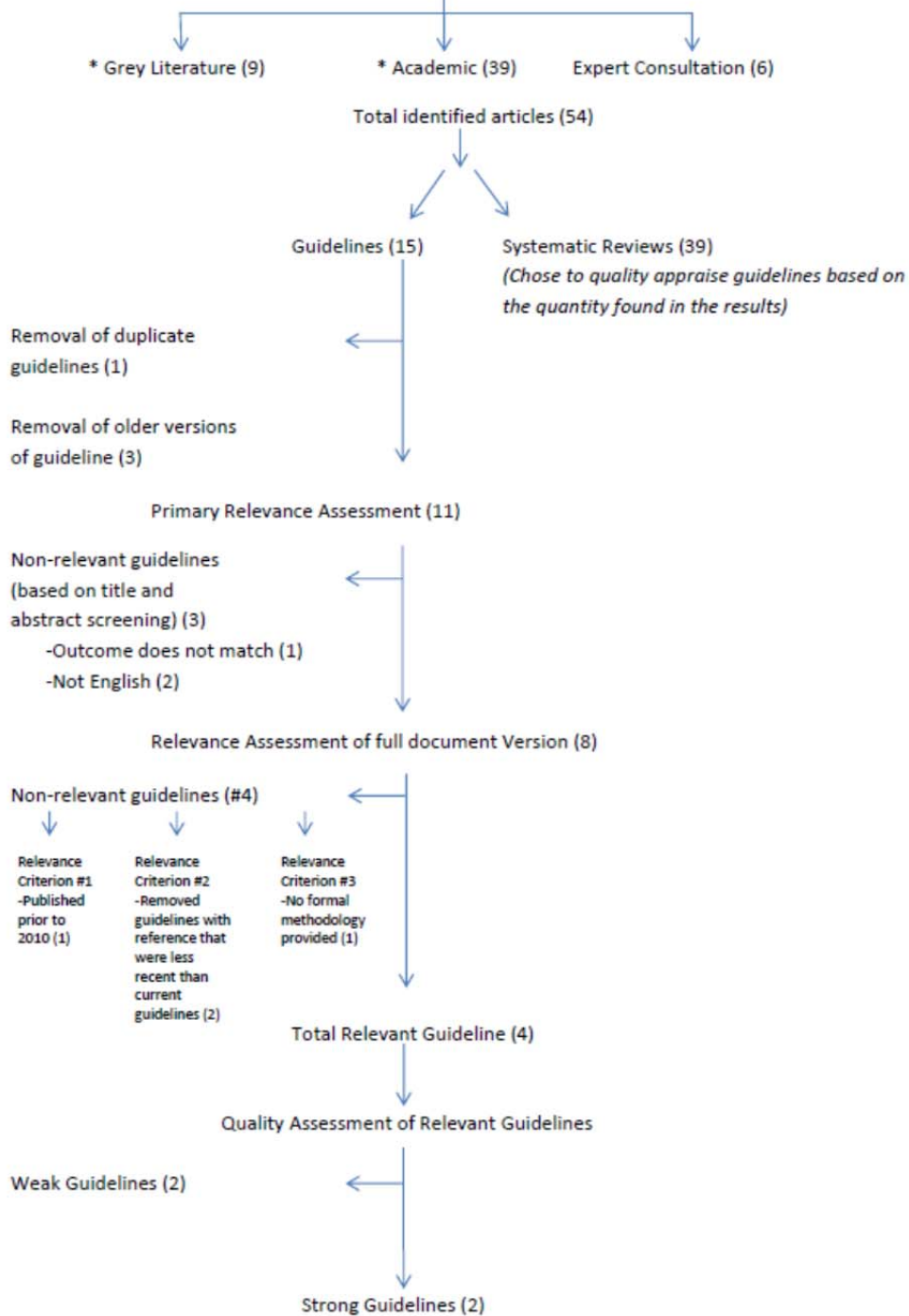
Websites Searched

National Guideline Clearinghouse http://www.guideline.gov/index.aspx	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Registered Nurses Association of Ontario http://rnao.ca/bpg	N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>
World Health Organization (WHO) http://www.who.int/en/	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
National Institute for Health and Clinical Excellence (NICE) http://www.nice.org.uk/	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
CDC – The community Guide http://www.thecommunityguide.org/index.html	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Center for Reviews and Dissemination http://www.crd.york.ac.uk/CRDWeb/	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
EPPI http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=53	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
NCCMT (National Collaborating Centre for Methods and Tools) Public Health portal http://www.nccmt.ca/public_health_plus/all/1/list-eng.html	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
The Campbell Collaboration http://www.campbellcollaboration.org/	N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>
The TRIP database http://www.tripdatabase.com/	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Public Health Agency of Canada http://www.phac-aspc.gc.ca/index-eng.php	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Health Evidence http://www.healthevidence.org/	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Google Scholar (only the first 5 pages, limited to current year)	N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Appendix C: Literature Search Flowchart

Does the application of pit and fissure sealants (PFS) on the permanent posterior teeth of children and youth, regardless of time of application, prevent fissure caries?

August 2014



• See Appendix B for a list of the databases searched

Appendix D: Data Extraction Tables

Quality Rating: Level of Evidence and Grading of Recommendations

LEVELS OF EVIDENCE

- 1++** High quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias
- 1+** Well conducted meta-analyses, systematic reviews or RCTs with a low risk of bias
- 1-** Meta-analyses, systematic reviews or RCTs with a high risk of bias
- 2++** High quality systematic reviews of case-control or cohort studies
High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
- 2+** Well conducted case control or cohort studies with a low risk of confounding or bias and a Moderate probability that the relationship is causal
- 2-** Case control or cohort studies with a high risk of confounding or bias and a significant risk that The relationship is not causal
- 3** Non-analytic studies, e.g., case reports, case series
- 4** Expert opinion

GRADES OF RECOMMENDATIONS

- A** At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population
OR
A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
- B** A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results
OR
Extrapolated evidence from studies rated as 1++ or 1+
- C** A body of evidence including studies rated as 2+, directly applicable to the target population, and demonstrating overall consistency of results
OR
Extrapolated evidence from studies rated as 2++
- D** Evidence level 3 or 4
OR

Extrapolated evidence from studies rated as 2+

GPP

Good Recommended best practice based on the clinical experience of the Guideline Development Group
Practice
Point

Items Reviewed	Pit and Fissure Sealants: Evidence-based guidance on the use of sealants for the prevention and management of pit and fissure caries
General Information & Quality Rating for Guideline	
1. Date	2010
2. Organization & Country	Irish Oral Health Services, Ireland
3. Quality Rating	Strong (6/7)
4. Focus & Objective(s)	To determine the use of pit and fissure sealants for the prevention and management of caries in the pits and fissures of primary and permanent teeth
5. Target Audience (for Guideline)	Dental clinicians, those responsible for the planning and management of public dental services, members of the dental team, members of the primary health care team, parents, teachers, children and those working in social, health and education services that deal with children.
6. Types of Evidence used to Inform the Guideline	Guidelines, systematic reviews, clinical trials, economic evaluations.
Details of Review	
7. Search Period	<ul style="list-style-type: none"> • For Guidelines: 2000-2009 • For additional systematic review and clinical trials search: 2004-2010
8. Databases Searched	Guidelines: <ul style="list-style-type: none"> • NHS Evidence Health Information Resources, National Institute for Health and Care Excellence (NICE), Scottish Intercollegiate Guidelines Network (SIGN), NZ Guideline Group, Australian National Health and Medical Research Council, National Guideline Clearinghouse, Centers for Disease Control and Prevention (CDC), Guidelines International Network (G-I-N), TRIP database, FDI World Dental Federation, CMA Infobase (Canadian Medical Association), PubMed, Google Systematic reviews and clinical trials: <ul style="list-style-type: none"> • PubMed, Cochrane, Embase
9. Inclusion and Exclusion Criteria	Criteria: <ul style="list-style-type: none"> • Fissure sealants are the main topic of all papers

	<ul style="list-style-type: none"> • Publication date from 2000 onwards • Indication that a literature search has been done (ideally using a systematic method) • References are included • Explicit link between the recommendations and the supporting evidence
10. Types of Studies Included	<p>The following documents specifically address the PICOT question in this review:</p> <ul style="list-style-type: none"> • 4 systematic reviews (1 older version of a Cochrane review used in the SIGN guideline) • 12 single studies <ul style="list-style-type: none"> ○ 2 RCTs with a low risk of bias ○ 1 RCT with a high risk of bias ○ 8 Non-analytic studies ○ 2 Well conducted case control or cohort studies with a low risk of confounding or bias and a Moderate probability that the relationship is causal • 1 unpublished survey
Results of Review	
11. Relevant Recommendations and Evidence	<p>Recommendation 1:</p> <ul style="list-style-type: none"> • Children and adolescents who are assessed as being at high caries risk should have resin-based fissure sealant applied and maintained in pits and fissures of permanent teeth– Grade A recommendation <ul style="list-style-type: none"> ○ Due to the slower progression of dental caries, the occlusal surface remains at risk throughout childhood and adolescence and even into early adulthood.^{19,20} Thus, there is no post-eruptive time limit on the placement of sealants, if indicated. <p>Related Evidence:</p> <ul style="list-style-type: none"> • A Cochrane systematic review concluded that sealants were effective for children at high caries risk, but that information was lacking on the benefits of sealant application for different levels of caries risk.⁵ (1++) ‘High caries risk’ refers to individuals or groups who are at risk of developing high levels of caries, or who are at risk from the consequences of caries, including those who are at risk by virtue of their medical, psychological or social status (4). A caries risk assessment checklist has been developed to encourage a formal, risk-based approach to the management of caries in Ireland. It takes into account factors that put a patient at high caries risk (i.e., previous caries experience, dietary habits, tooth morphology, deprivation) and factors that reduce a patients risk (e.g., adequate exposure to fluoride); however, this is still an imprecise measure and a person’s risk can change over time.²¹
	<p>Recommendation 2:</p> <ul style="list-style-type: none"> • When indicated, sealants should be applied as soon as the tooth is sufficiently erupted to be isolated – Grade D recommendation

	<p>Related Evidence:</p> <ul style="list-style-type: none"> • Prospective European studies of tooth emergence have shown consistent mean/median ages of emergence for first permanent molars (6.0–6.3 years for girls and 6.3–6.5 years for boys) and second permanent molars (11.5–12.3 years for girls and 11.8–12.4 for boys). The age range for permanent molar emergence is wide: from age 5 to 8 for first permanent molars and from age 9 to 15 for second permanent molars, which highlights the considerable individual variation in the timing of permanent molar emergence. It is important to note that most tooth emergence studies do not record the stage of eruption of the tooth, but only whether any part of the tooth is visible in the mouth. ²⁹⁻³³ (3) • A prospective study, in which PFS was applied to the first and second molar teeth at varying stages of eruption found that after three years, more than half (54 per cent) of the teeth that were sealed when the operculum covered the marginal ridge required retreatment, compared to 26 per cent of the teeth sealed when the gingival tissue was level with the distal marginal ridge. None of the sealants placed on teeth where the distal marginal ridge was above gingival level required retreatment. ³⁴ (3)
	<p>Recommendation 3:</p> <ul style="list-style-type: none"> • In children and adolescents, priority should be given to sealing first and second permanent molar teeth– <i>Grade D recommendation</i> <p>Related Evidence:</p> <ul style="list-style-type: none"> • A survey of children’s oral health in Ireland found that the first and second permanent molar teeth account for 80per cent or more of the total caries experience in permanent teeth of Irish children, making these teeth the most important for sealant application. Other teeth, such as premolars, third molars or the palatal surfaces of incisor teeth, may be considered for sealant application, based on the dentist’s overall assessment of the individual’s caries risk status and a thorough assessment of the tooth surface. ²² (3)
	<p>Recommendation 4:</p> <ul style="list-style-type: none"> • Resin-based sealants are the first choice of material for dental sealants - <i>Grade A recommendation</i> <p>Related Evidence:</p> <p>Resin-based sealants compared to no treatment</p> <ul style="list-style-type: none"> • Resin-based fissure sealants are effective at preventing caries on pit and fissure surfaces in children and adolescents. A Cochrane systematic review of 16 trials found that first permanent molar teeth sealed with resin-based sealant had 78 per cent less caries on occlusal surfaces after 2 years and 60 per cent less after 4–4.5 years compared to unsealed molars. ¹⁵ (1++) • Sealant retention is critical to the effectiveness of resin-based sealants and retention has become an important

	<p>measure of sealant effectiveness. The Cochrane systematic review reported widely varying complete sealant retention rates for the studies it included. These ranged from 79per cent to 92per cent at 12 months, 71per cent to 85per cent at 24 months, 61 per cent to 80 per cent at 36 months, 52per cent at 48 months, 72per cent at 54 months and 39per cent at 9 years. There was a clear trend for decreasing sealant retention with time.⁵ (1++)</p> <p>Glass ionomer sealants compared to no treatment</p> <ul style="list-style-type: none"> • The evidence for the effectiveness of glass ionomer as a sealant material is less clear. Only one study which compared glass ionomer sealant with no treatment was included in the Cochrane review. The results of this study showed a significant reduction in occlusal caries increment after 24 months for children aged 7–8 years who had their first permanent molars sealed with glass ionomer compared to children who had not received sealant. However, for children aged 12–13, no significant difference in caries increment was found between the sealed and non-sealed groups.⁵ (2+) <p>Resin-based sealants compared to glass ionomer sealants</p> <ul style="list-style-type: none"> • The evidence for the relative caries-preventive effect of resin-based and glass-ionomer sealants is conflicting. Of the eight trials included in the Cochrane systematic review which compared the two materials: <ul style="list-style-type: none"> ○ three trials found that resin-based sealants were superior ○ two trials found that glass ionomer was better ○ three trials did not find any difference between the two materials ○ Comparison of retention rates of the two materials yielded similarly divergent results¹⁹ (1-) • Three subsequent systematic reviews which compared the caries-preventive effect of glass ionomer or resin-modified glass ionomer sealants with resin-based sealant also found inconsistent results among the included studies.^{22,24,25} (1-) • Clinical trials comparing the two sealant materials published since these reviews are of varying quality and also provide conflicting results for the relative effectiveness of glass ionomer and resin-based sealants.^{26,27,28} (1+,1+, 1-) <p>Resin-based sealants compared to compomer (poly-acid modified composite resin) sealants</p> <ul style="list-style-type: none"> • The Cochrane review also included two trials that compared resin-based sealant with compomer sealants, which found no difference in effect for caries prevention but conflicting findings for retention. The review authors concluded that more research is needed to clarify the relative effectiveness of different sealant materials.⁵ (1-)
13. Comments/Limitations	<ul style="list-style-type: none"> • The Irish oral health system provides state-funded dental services to children and adolescents under the age of 16; PFS are a part of their prevention services. • Factors that might put the patient at high caries risk include but are not limited to previous caries experience,

	<p>dietary habits, tooth morphology, deprivation and medical and other conditions (refer to http://www.dentalhealth.ie/download/pdf/fs_guideline_online_final_v_2.pdf for a caries risk assessment tool).</p>
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Items Reviewed	SIGN 138 – Dental Interventions to Prevent Caries in Children: A national guideline
General Information & Quality Rating for Guideline	
1. Date	2014
2. Organization & Country	Scottish Intercollegiate Guidelines Network (SIGN), Scotland
3. Quality Rating	Moderate (6/7)
4. Focus & Objective(s)	Objective: The use of dental interventions for the prevention of caries in children and young people aged 0–18 years
5. Target Audience (of Guideline)	<ul style="list-style-type: none"> Healthcare professionals providing oral health advice to children in a one-to-one situation and members of the dental care team It may also be of interest to parents and carers, primary care and public health staff and others involved in children’s health, well-being and development
6. Types of Evidence used to Inform the Guideline	Guidelines, systematic reviews, and additional studies
7. Search Period	
	2000–2011 (August)
8. Databases searched	
	Medline, Embase, Cinahl, PsycINFO and the Cochrane Library
9. Inclusion and Exclusion Criteria	
	<p>Inclusion:</p> <ul style="list-style-type: none"> Studies which looked at sealants for permanent dentition Studies with analyses of young people, even if the overall study population included a wider age range <p>Exclusion:</p> <p>Studies which were not published in English</p>
10. Types of Studies Included	
	1 systematic review relevant to the PICOT question
11. Relevant Recommendations and Evidence	
	<p>Recommendation 1:</p> <ul style="list-style-type: none"> Resin-based fissure sealants should be applied to the permanent molars of all children as early after eruption as possible – Grade A recommendation <ul style="list-style-type: none"> <i>Glass ionomer sealants may be considered if the application of a resin-based sealant is not possible (this is a best practice based on clinical experience).</i>

- Sealants should be applied to permanent molars within one year of eruption which usually takes place between the ages of six to seven years for first molars and 11–12 years for second molars. There is a degree of variability, however, in the age of eruption for individual children which can be anywhere from five to nine years of age for first molars and eight to 14 years for second molars.

Related Evidence:

A Cochrane review compared the effects of different types of fissure sealants in preventing caries in the permanent teeth of children and adolescents. It included 34 trials with 6,529 participants aged between five and 16 years. All of the trials investigated use of sealants on occlusal surfaces and none considered proximal surfaces. Thirteen studies (n=2,979) compared any type of sealant against control without sealant. Fifteen trials, compared resin-based sealants with glass ionomer sealants. The guideline does not report results for other sealant materials.¹⁷ **(1++)**

Resin-based sealants compared to no treatment (1++)

- Twelve trials in the Cochrane review, (n=2,575) compared resin-based sealants with a no sealant control group.
- There were nine split-mouth and three parallel group studies and these included children aged five to ten years. Meta-analysis of eight split-mouth studies and one parallel group study comparing second or third generation resin sealants with a control was highly significant, with pooled OR values for prevention of caries in first molar teeth of 0.16 (95 per cent CI 0.08 to 0.30), 0.12 (95 per cent CI 0.07 to 0.19), 0.17 (95 per cent CI 0.11 to 0.27), and 0.21 (95 per cent CI 0.16 to 0.28) at 12, 24, 36 and 48–54 months follow up, respectively (p<0.00001).
- Long term effectiveness of sealants for the prevention of caries was shown by one study with nine years of follow up which reported 27 per cent of sealed surfaces to be decayed compared to 77 per cent of surfaces without sealant. Considerable heterogeneity was identified across all analyses (I² range 45–90 per cent).
- Retention of resin sealants was generally good with four of seven studies reporting retention rates of around 90 per cent at 12 months. At 24 months, six of the eight studies reported retention rates of over 80 per cent. Even after 48–54 months, the complete retention of resin-based sealants was 70 per cent in three of the five studies.

Glass ionomer sealants compared to no treatment (1++)

- The Cochrane review reported a single parallel group study (n=404) which compared the 24-month decayed filled surfaces (DFS) increments for two glass ionomer sealant groups with one control group receiving no treatment for age group 12 to 13 years. There was no significant difference in caries increments between the groups (mean difference in DFS -0.18, 95per cent CI -0.039 to 0.03).
- The Cochrane review reported a single study which compared resin-modified glass ionomer cement with oral health education against oral health education alone. Children at high and low risk of caries were compared. After 24 months, only the children at high risk of caries who received both sealant application and oral health education

	<p>showed statistically lower DMF (decayed, missing filled) increments on occlusal surfaces of first permanent molars compared with the children at high risk of caries who received only oral health education. For children at low risk of caries, no statistical difference was observed between the treatment groups. The study authors concluded that “in a 2-year period, oral health education was sufficient to control occlusal caries in low-risk children while for high-risk children, sealant application in addition to oral health education was considered the best strategy.”</p> <p>Resin-based sealants compared to glass ionomer sealants (1++)</p> <ul style="list-style-type: none"> • The Cochrane review analysed 15 trials comparing glass ionomer with resin sealants and concluded that the evidence was too inconsistent to make any conclusions about the superiority of either of the two materials. (Four studies found better caries reductions for resin-based sealants than for glass ionomers, two studies found better caries reductions for glass ionomers than for resin-based sealants, and nine studies did not find differences between these materials for this outcome). • The retention figures in the studies favoured resin sealants at 36–48 months follow up. In five studies for which follow-up data was available, the complete retention for resin sealants was documented to be good (mean 76per cent), and for glass ionomers was poor (mean 8per cent).
13. Comments/Limitations	<ul style="list-style-type: none"> • Scotland has a national Childsmile programme (www.child-smile.org) which provides a comprehensive, free, public health pathway for disease prevention and care to all children and young people up to the age of 17 years. • The guideline includes a caries assessment section to aid with identifying those at high caries risk.

Appendix E: Applicability & Transferability Worksheet

Factors	Questions	Notes
Applicability (feasibility)		
Political acceptability or leverage	<ul style="list-style-type: none"> • Will the intervention be allowed or supported in current political climate? • What will the public relations impact be for local government? • Will this program enhance the stature of the organization? <ul style="list-style-type: none"> ○ <i>For example, are there reasons to do the program that relate to increasing the profile and/or create a positive image of public health?</i> 	<p>- PFS focuses on prevention of dental caries – Dental treatment is extremely costly in comparison</p> <p>Regionally: Yes</p> <ul style="list-style-type: none"> • Stakeholders at the meeting thought that council would be in favour of sealants for children. Sealants are cheap and effective. • There is a new regional council which will need information on sealants and how many children could be impacted by this intervention <p>Provincially:</p> <ul style="list-style-type: none"> • Advocacy is needed for expansion of dental programming to those 18 years. • PFS interventions may potentially lead to long-term savings into adulthood for the healthcare system but this may come with the initial cost for sealing (placing PFS cost less than filling caries). <p><i>-What are the current practices at other PH units?</i></p> <p>Positive as the Target audience (e.g. parents of school aged children) would most likely be supportive of PFS</p> <p>Yes</p> <ul style="list-style-type: none"> • Sealants work synergistically with fluoride (e.g. community water fluoridation), which is a hot topic in council. Fluoride is used for prevention of caries on the “smile” while sealants are for the “bite”

	<ul style="list-style-type: none"> • Will the public and target groups accept and support the intervention in its current format? 	<p>(smile and bite) - However, would everyone screened who are eligible for PFS receive them?</p> <p>In the dental community are there consistent beliefs/ views about PFS effectiveness?</p> <p>Ontario Dental Association: -More information on their stance is needed. However, there may be a good economic argument to change practice and encourage sealants.</p> <p>Ontario Dental Hygienists Association: -probably not for or against as their focus is on pre-disease</p> <p>College of Dental Hygienists of Ontario: Would probably support this as dental hygienists work on their own in some practices and PFS can be applied by them without a dentist present</p>
Social acceptability	<ul style="list-style-type: none"> • Will the target population find the intervention socially acceptable? Is it ethical? <ul style="list-style-type: none"> ○ Consider how the program would be perceived by the population. ○ Consider the language and tone of the key messages. ○ Consider any assumptions you might have made about the population. Are they supported by the literature? ○ Consider the impact of your program and key messages on non-target groups. 	<p>Yes</p> <ul style="list-style-type: none"> • No ethical issues identified for sealing children’s teeth • PFS are non-invasive and are relatively quick to place on teeth, so they should be easily accepted by the public • Parents are becoming more educated about oral health. How do we get parents buy-in for PFS? • Issues relating to BPA have been previously addressed • Highly vulnerable populations may not visit dentists • PPH does school dental screenings; however some students choose not to have them • Cost of PFS may be a concern for some without PFS

		<p>coverage and who do not meet eligibility for PPH programs</p> <ul style="list-style-type: none"> • Need to enhance awareness of PFS in the region
<p>Available essential resources (personnel and financial)</p>	<ul style="list-style-type: none"> • Who/what is available/essential for the local implementation? • Are they adequately trained? If not, is training available and affordable? • What is needed to tailor the intervention locally? • What are the full costs? <ul style="list-style-type: none"> ○ <i>Consider: in-kind staffing, supplies, systems, space requirements for staff, training, and technology/administrative supports.</i> • Are the incremental health benefits worth the costs of the intervention? <ul style="list-style-type: none"> ○ <i>Consider any available cost-benefit analyses that could help gauge the health benefits of the intervention.</i> ○ <i>Consider the cost of the program relative to the number of people that benefit/receive the intervention.</i> 	<ul style="list-style-type: none"> • PPH staff are competent at sealing teeth • PPH has dental clinics where sealing occurs • This process is not labour intense or expensive. • Applying sealant to teeth is not a controlled act under the Regulatory Health Professions Act (1991). • There is potential to use staff to their full scope of practice (e.g. dental assistants to apply PFS, which costs less than a dentist applying PFS) <p>N/A</p> <ul style="list-style-type: none"> • The actual cost of sealant materials is minimal; PPH currently seals four sets of molar teeth for approximately \$20.00. However, this cost needs verification. • Private practice charges are not the same as PPH • Applying sealants to teeth cost less than filling dental caries <p>Yes</p> <ul style="list-style-type: none"> • Is there capacity to increase the amount of children sealed? • PPH needs to investigate the cost to seal at the dentist level (which is assumed to cost more). • Does PPH have the capacity to seal all children who are candidates for sealants at the clinics? • Based on retention rates in the literature, a certain percentage of children will need retreatment. Are

		<p>there the available resources for retreatment?</p> <ul style="list-style-type: none"> • With funding from the Ministry potentially changing, resources to seal may be impacted • PFS may prevent costly dental treatments, pain, infections, missed school due to pain, poor dental health, cycle of decay, poor self-esteem etc.
Organizational expertise and capacity	<ul style="list-style-type: none"> • Is the intervention to be offered in line with Peel Public Health’s 10-Year Strategic Plan (i.e., 2009-2019, ‘Staying Ahead of the Curve’)? • Does the intervention conform to existing legislation or regulations (either local or provincial)? • Does the intervention overlap with existing programs or is it symbiotic (i.e., both internally and externally)? • Does the intervention lend itself to cross-departmental/divisional collaboration? • Any organizational barriers/structural issues or approval processes to be addressed? • Is the organization motivated (learning organization)? <ul style="list-style-type: none"> ○ <i>Consider organizational capacity/readiness and internal supports for staff learning.</i> 	<ul style="list-style-type: none"> • Intervention conforms with Ontario Public Health Standards and Peel’s strategic plan • Prevention of dental caries is part of the mandate for public health and this intervention is targeted to teeth with high caries risk • Both PPH and dentist/dental hygienists within the community are sealing children’s teeth, though rates of sealant application for publically funded clients in practices are lower than in Peel Public Health clinics • This procedure of placing sealants can be done by a dental hygienist and dental assistants without the supervision of a dentist

Transferability (generalizability)		
Magnitude of health issue in local setting	<ul style="list-style-type: none"> • What is the baseline prevalence of the health issue locally? • What is the difference in prevalence of the health issue (risk status) between study and local settings? 	<ul style="list-style-type: none"> • There are limited local data on the oral health of children, especially adolescents (see context section for statistics) • There are a high percentage of Peel secondary students with dental caries, which could be prevented

	<ul style="list-style-type: none"> ○ <i>Consider the Comprehensive Health Status Report, and related epidemiological reports.</i> 	
Magnitude of the “reach” and cost effectiveness of the intervention above	<ul style="list-style-type: none"> ● Will the intervention appropriately reach the priority population(s)? <ul style="list-style-type: none"> ○ What will be the coverage of the priority population(s)? 	<ul style="list-style-type: none"> ● PFS programming would reach those children that could not afford to see a dentist on their own through PPH screenings ● <i>Significant issue - what proportion of Peel students would be clinically eligible for PFS?</i> ● Since children must have their teeth fully erupted before application of PFS, some children may miss the opportunity to have PFS applied at their clinic visit. How would PPH make sealant application equitable to these clients?
Target population characteristics	<ul style="list-style-type: none"> ● Are they comparable to the study population? ● Will any difference in characteristics (e.g., ethnicity, socio-demographic variables, number of persons affected) impact intervention effectiveness locally? <ul style="list-style-type: none"> ○ <i>Consider if there are any important differences between the studies and the population in Peel (i.e., consider demographic, behavioural and other contextual factors).</i> 	<ul style="list-style-type: none"> ● There is no reason to think PFS won’t work in Peel’s at risk population related to study populations ● Key considerations: <ul style="list-style-type: none"> ○ Assumption is that all children that attend PPH dental clinics are at high risk for caries ○ Our population of clients does not necessarily seek out dentists ○ School screenings identify children who have or are at risk for having dental caries ○ Currently 13-18 year olds are not being actively sought out for PFS
<p>Proposed Direction (after considering the above factors): Recommend that PPH:</p> <ul style="list-style-type: none"> ● Communicate the review findings with Peel dentists, dental hygienists and other health care providers to promote the use of PFS. ● Advise parents of children and youth in the community of the review findings to seek or request PFS from their practitioners. ● Verify the cost of PFS application for various provinces in different settings 		

Worksheet adapted from: Buffet C., Ciliska D., and Thomas H. National Collaborating Centre for Methods and Tools. November 2007. *Can I Use this Evidence in my Program Decision? - Assessing Applicability and Transferability of Evidence.*

Appendix F: Dental Program Eligibility Criteria

Healthy Smiles Ontario eligibility³⁵:

Children 17 and under are eligible if:

- They are residents of Ontario;
- They are members of a household that meets income eligibility requirements; and
- They do not have access to any form of dental coverage (including other government-funded programs, like Ontario Works).

Children in Need of Treatment eligibility³⁶:

CINOT covers basic treatment including oral exams, x-rays, topical fluoride, cleaning, fillings, root canals, extractions and out-of-hospital anesthetic coverage.

Children 17 years and under are eligible if:

- They are residents of Ontario;
- They have an urgent dental condition identified during screening by one of the public health unit's dental team;
- They do not have access to any form of dental coverage (including other government-funded programs, like Ontario Works); and
- The parent/legal guardian signs a declaration that their family does not have any dental insurance for the necessary dental treatment and that the costs of dental treatment for this treatment will create a financial hardship. The parent/legal guardian also signs to say that they understand they may be required to provide financial documentation to substantiate the declaration of financial hardship.

Preventive eligibility³⁷:

Children who are in need of preventive oral health services are identified through school and community oral health screening using standards and protocols established by the MOHLTC. Services offered may include:

- Professionally applied topical fluoride (PATF)
- Pit and Fissure Sealants (PFS)
- Scaling

The family is assessed for financial eligibility based on evidence provided by the parent/guardian of one of the following:

- The child is a dependent of a recipient of the Ontario Child Benefit;
- The family's income is below the financial eligibility cut-off (the cut-off is set at 20 per cent above Statistics
- Canada's Low Income Cut Offs [LICO]); or
- The child is currently on the Children in Need of Treatment (CINOT) Program.