

## DPBRN Study 10 Development of a patient-based provider intervention for early caries



## Agenda

- Research Aims
- Study Background
- DPBRN Data
- Current Evidence
- ADA recommendations
- Caries Management by Risk Assessment (CAMBRA)
- References

## Research Aims

1. Develop a patient handout to improve patient knowledge and increase the occurrence of non-invasive treatment for early caries in permanent teeth.
2. Quantify patient satisfaction with surgical and non-surgical treatment options for early caries.
3. Quantify pre- and post-intervention caries stages at which dentists place the first restoration to determine the feasibility of the intervention

Note:  
Early caries are defined  
as E1 and E2 caries



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## Study Background

- Quality improvement is important for public health.
  - Need to improve consistency among the dental profession
- Systematic translation of research findings into practice is critical to quality improvement.
  - Need to close the gap between research and clinical practice
- Caries continues to be prevalent, with substantial incidence among all age groups.
  - Despite major advancements in caries prevention, placement of restorations and extraction of teeth are still common.

## Study Background

- Caries diagnosis and treatment are associated with substantial variation.
  - Variation has no foundation in research.
- Progression of caries in modern society is slow.
  - In adults with average oral hygiene caries lesions take about four years to pass through enamel and another four years until the lesion reaches the pulp.
  - Hamilton found that non-invasive treatment for incipient caries and surgical intervention after 2 years, if deemed necessary, did not result in a larger restoration.

## Study Background

- Placing the first restoration in any tooth is a crucial time in the life of that tooth.
  - Dental restorations have limited durability; placing the first restoration in a tooth is a crucial decision.
  - Approaches that delay placement of the first restoration may be a key source of improving the long-term effectiveness of dental care.
- Restorative treatment may be influenced by patients' characteristics and caries risk.
  - Monitoring incipient primary enamel lesions is a recognized clinical approach for primary caries lesions.
  - In a pilot study on risk-based prevention in private practices, Bader et al. identified a relatively small percentage of patients at high-risk of developing caries (4%) with little variation across practices.

## Study Background

- **Patient satisfaction is important because it leads to quality improvement.**
  - Medical professionals' perceptions and patients' perceptions about treatment they receive differ.
  - Patient satisfaction is linked to regular return visits, caregiver trust, perception of technical competence, and treatment outcomes.
- **Patient education and decision aids can improve the provider-patient relationship, decision-related outcomes, decrease complaints, and decrease malpractice lawsuits.**
  - There is a positive correlation between education materials and patient knowledge, treatment compliance, and the patient-provider relationship.
  - Patient treatment preferences are not significantly altered, with most patients relying greatly on providers' treatment decisions.

## DPBRN Data

### DPBRN Study: Reasons for Placing Restorations on Previously Unrestored Permanent Tooth Surfaces

- Objectives of interest for the current study:
  - To identify the reasons that dentists place restorations in unrestored tooth surfaces.
  - To assess pre- and post-operative depth of caries lesions.
- Data:
  - Posterior teeth: 6730 lesions (of which 898 E1 or E2)
  - Anterior teeth: 1410 lesions (of which 180 E1 or E2)
  - 85% restorations for carious reasons

## DPBRN Data

### Distribution of one-surfaced and multi-surfaced lesions by pre-operative depth assessments

Lesion Depth	Posterior One-surface			Posterior Multi-surface	Total
	O	M or D	B or L	M/O/ D/ B/ L	
E1 [N (%)]	123 (6%)	12 (1%)	45 (5%)	42 (2%)	222 (3%)
E2 [N (%)]	347 (16%)	66 (4%)	123 (13%)	140 (7%)	676 (10%)
D1 [N (%)]	1165 (54%)	825 (56%)	550 (58%)	1003 (48%)	3543 (53%)
D2 [N (%)]	461 (21%)	434 (29%)	202 (21%)	633 (30%)	1730 (26%)
D3 [N (%)]	78 (4%)	138 (9%)	28 (3%)	275 (13%)	519 (8%)
<b>Total [N (%)]</b>	<b>2174 (100%)</b>	<b>1475 (100%)</b>	<b>948 (100%)</b>	<b>2093 (100%)</b>	<b>8095 (100%)</b>

## DPBRN Data

### Distribution of one-surfaced and multi-surfaced lesions by pre-operative depth assessments

Lesion Depth	Anterior One-surface			Anterior Multi-surface	Total
	M or D	B or L	I	M/ D/ B/ L/ I	
E1 [N (%)]	5 (1%)	17 (5%)	2 (6%)	13 (2%)	37 (3%)
E2 [N (%)]	25 (6%)	66 (19%)	5 (16%)	47 (8%)	143 (10%)
D1 [N (%)]	261 (63%)	195 (56%)	17 (55%)	288 (47%)	761 (54%)
D2 [N (%)]	98 (24%)	54 (16%)	4 (13%)	182 (30%)	338 (24%)
D3 [N (%)]	24 (6%)	16 (5%)	3 (10%)	83 (14%)	126 (9%)
<b>Total [N (%)]</b>	<b>413 (100%)</b>	<b>348 (100%)</b>	<b>31 (100%)</b>	<b>613 (100%)</b>	<b>1405 (100%)</b>

## DPBRN Data

### Concordance between pre-operative and post-operative depth assessments of one-surfaced caries lesions.

Lesion Depth	Posterior						Anterior		
	O (N=2174)			M or D (N=1475)			M or D (N=413)		
	Pre<P ost	Pre=P ost	Pre>P ost	Pre<P ost	Pre=P ost	Pre>P ost	Pre< Post	Pre= Post	Pre>P ost
E1 (%)	57	43	0	92	8	0	40	60	0
E2 (%)	48	51	1	44	53	3	16	72	12
D1 (%)	34	63	3	25	72	2	17	80	3
D2 (%)	31	63	6	16	77	7	17	69	13
D3 (%)	0	90	10	0	93	7	0	96	4
Mean (%)	34	62	4	35	61	4	18	75	6

*Pre<Post: percentage of pre-operative assessments that underestimated depth;  
 Pre=Post: percentage in which the pre-operative and post-operative assessments were the same;  
 Pre>Post: percentage of pre-operative assessments that overestimated depth. O: occlusal; M: mesial;  
 D: distal; B: buccal/facial; L: lingual/palatal;  
 Percentages are within rows for each caries lesion depth.*

## Current Evidence

<http://ebd.ada.org/about.aspx>

## Current Evidence

Evaluate evidence by:

1. Quantity
  - ✓ Number of studies
  - ✓ Sample size
2. Quality
  - ✓ Type(s) of study design
  - ✓ Quality of individual studies
3. Consistency
  - ✓ Direction of the results
  - ✓ Magnitude of the effect

AHRQ, 2002

## Current Evidence

### Quality of Evidence

- Evidence from at least one properly randomized controlled trial
- Evidence from well-designed controlled trials without randomization
- Evidence from well-designed cohort or case control studies from more than one center
- Evidence from multiple time series
- Opinions from respected authorities

US Preventive Services Task Force

## Current Evidence

### Levels of Evidence

- Systematic review of randomized controlled clinical trials (RCTs)
- Individual RCT
- Systematic review of cohort studies
- Individual cohort study
- Outcomes research ecologic studies
- Systematic review of case-control studies
- Case series
- Expert opinion

J Evid Base Dent Pract 2007;7 (Dec. #4), 5A

## Current Evidence

	Diagnosis	Treatment / Prevention	Prognosis
<b>Level 1: Good Evidence</b>	<i>In vivo</i> observational studies with similar conclusions: -objective gold standard -adequate size -typical lesion spectrum -blinding	RCTs with consistent findings across studies: -blinding -allocation concealment -intent to treat analysis -follow-up >80%	Prospective cohort studies with follow-up > 80%
<b>Level 2: Limited Evidence</b>	<i>In vitro</i> observational studies, lesser quality in-vivo studies, or inconsistent results across studies, regardless of quality	Inconsistency across studies or lower strength clinical trials, including cohort studies and case control studies	Retrospective cohort studies or prospective cohorts with poor follow-up. Also, case-control and case series
<b>Level 3: Poor Evidence</b>	Single studies, expert opinion, case reports	Expert opinion, case reports	Expert opinion, case reports

Ebell, 2004

## Current Evidence

### When should I intervene surgically?

1. When there is cavitation
  - ✓ Cavitation is difficult to confirm visually on proximal surfaces Evidence: **Good**
  - ✓ Some cavitated lesions are inactive Evidence: **Limited**
2. When caries penetrates into the dentin radiographically
  - ✓ Radiolucency into dentin Evidence: **Limited**
  - ✓ Cavitation for outer half of dentin Evidence: **Limited**
3. When the surface can't be kept plaque free
  - ✓ Difficult to confirm through one observation Evidence: **Poor**
4. When demineralization is progressing
  - ✓ Difficult to confirm with one observation Evidence: **Poor**

Bader, 2008

## Current Evidence

### Restore when progression occurs or is inevitable

- > If determined at a single visit:
  - ✓ Penetration into inner ½ of dentin radiographically Evidence: **Limited**
  - ✓ Clinical identification of cavitation with soft dentin Evidence: **Good**
- > If determined over time
  - ✓ Change in penetration on radiograph Evidence: **Good**
  - ✓ Change in laser reflectance measure Evidence: **Limited**

**Otherwise, remineralize!**

Bader, 2008

## Current Evidence

### How well does fluoride work?

Cochrane reviews:

fluoride rinses, 34 RCTs (in children & adolescents)	=	strong evidence effective, PF~26%
fluoride gels, 23 RCTs (in children & adolescents)	=	strong evidence effective, PF~28%
fluoride varnish, 7 RCTs (in children & adolescents)	=	strong evidence effective, PF~46%
any topical fluoride, 133 RCTs (in children & adolescents)	=	strong evidence effective, PF~26%

Bader, 2008

Limited or poor evidence  
does not necessarily mean that a procedure  
is not effective....

It means that there are insufficient published  
reports to establish its effectiveness....

Or that the available reports do not agree  
about the procedure's effectiveness.

Bader, 2008

## ADA Recommendations

### Professionally applied topical fluoride

RISK CATEGORY	AGE CATEGORY FOR RECALL PATIENTS					
	< 6 Years		6 to 18 Years		18+ Years	
	Recommendation	Grade of Evidence	Recommendation	Grade of Evidence	Recommendation	Grade of Evidence
<b>Low</b>	May not receive additional benefit from professional topical fluoride application	Systematic Reviews of RCT	May not receive additional benefit from professional topical fluoride application	Systematic Reviews of RCT	May not receive additional benefit from professional topical fluoride application	Expert Opinion
<b>Moderate</b>	Varnish application at 6-month intervals OR Fluoride gel application at 6-month intervals	Systematic Reviews of RCT	Varnish application at 6-month intervals OR Fluoride gel application at 6-month intervals	Systematic Reviews of RCT	Varnish application at 6-month intervals OR Fluoride gel application at 6-month intervals	Expert Opinion
<b>High</b>	Varnish application at 6-month intervals OR Varnish application at 3-month intervals	Systematic Reviews of RCT	Varnish application at 6-month intervals OR Varnish application at 3-month intervals OR Fluoride gel application at 6-month intervals OR Fluoride gel application at 3-month intervals	Systematic Reviews of RCT	Varnish application at 6-month intervals OR Varnish application at 3-month intervals OR Fluoride gel application at 6-month intervals OR Fluoride gel application at 3-month intervals	Expert Opinion

## ADA Recommendations

### Use of pit-and-fissure sealants

TOPIC	RECOMMENDATION	GRADE OF EVIDENCE
<b>Noncavitated Caries Lesions</b>	Pit-and-fissure sealants should be placed on early (noncavitated) carious lesions, as defined in this document, in children, adolescents and young adults to reduce the percentage of lesions that progress	Systematic Reviews of RCT
	Pit-and-fissure sealants should be placed on early (noncavitated) carious lesions, as defined in this document, in adults to reduce the percentage of lesions that progress	Systematic Reviews of RCT
<b>Resin-Based vs. Glass Ionomer Cement</b>	Resin-based sealants are the first choice of material for dental sealants	Systematic Reviews of RCT
	Glass ionomer cement may be used as an interim preventive agent when there are indications for placement of a resin based sealant but concerns about moisture control may compromise such placement	Expert Opinion

## Caries Management by Risk Assessment

### CAMBRA

- Paradigm shift in the management of dental decay: dental caries as an infectious disease that is curable and preventable
- Goal:
  - guidance on how to educate and motivate patients to improve their behaviors
  - give patients strategies and products to achieve and maintain a healthy oral environment
- CAMBRA Assessment Tool
- CAMBRA Clinical Guidelines

## Caries Management by Risk Assessment

### CAMBRA Assessment Tool

- **Caries disease indicators** – low SES (socioeconomic status); development problems; and presence of cavities, white spots, and restorations placed in the previous 3 years
- **Caries risk factors** – type and quantity of *Mutans streptococci* (MS) and *lactobacilli* (LB); visible plaque; exposed roots; saliva reducing factors and inadequate saliva flow; frequent snacks; deep pits and fissures; and orthodontic appliances
- **Caries protective factors** – systemic and topical fluoride sources; adequate saliva flow; and regular use of chlorhexidine, xylitol, and calcium and phosphate paste
- **Clinical examination** – presence of white spots, decalcification, restorations, and plaque; and bacterial culture and saliva flow tests

**Caries Management by Risk Assessment**

**CAMBRA clinical guidelines**

- Caregiver/parent or patient answers the questions on the risk assessment form
- Determine the overall caries risk:
  - Low risk** – no dental lesions, no visible plaque, optimal fluoride, regular dental care
  - Moderate risk** – dental lesion in previous 12 months, visible plaque, suboptimal fluoride, irregular dental care
  - High risk** – one or more cavitated lesions, visible plaque, suboptimal fluoride, no dental care, high bacterial challenge, impaired saliva, medications, frequent snacking
  - Extreme risk** – high risk patient with special needs or severe hyposalivation
- Perform bacteria and saliva testing as indicated by risk level

**Caries Management by Risk Assessment**

**CAMBRA clinical guidelines**

- Determine the plan for caries intervention and prevention
  - Patients age 0 to 5** – consider the following for the caregiver and patient based on risk level:
    - saliva and bacterial testing;
    - antibacterials;
    - fluoride consumption, use, and professional application of fluoride varnish;
    - frequency of radiographs;
    - frequency of periodic examinations;
    - oral hygiene instructions;
    - xylitol and/or baking soda;
    - sealants.

**Caries Management by Risk Assessment**

**CAMBRA clinical guidelines**

- Patients age 6 through adult** – consider the following based on patient risk level:
  - frequency of radiographs;
  - frequency of caries recall examinations;
  - oral hygiene instructions;
  - saliva and bacterial testing;
  - antibacterials (chlorhexidine and xylitol);
  - fluoride use and professional application of fluoride varnish;
  - pH control;
  - calcium and phosphate;
  - sealants.
- Discuss home care recommendations based on risk level
- Provide follow-up care and reassess risk level

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