

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



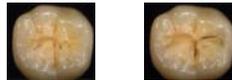
## Agenda

- 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%)    |
| Total [N (%)] | 2174 (100%)           | 1475 (100%) | 948 (100%) | 2093 (100%)             | 8095 (100%) |

## 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%)    |
| Total [N (%)] | 413 (100%)           | 348 (100%) | 31 (100%) | 613 (100%)             | 1405 (100%) |

## 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<P ost      | Pre=P ost | 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=P: 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:<br>-objective gold standard<br>-adequate size<br>-typical lesion spectrum<br>-blinding | RCTs with consistent findings across studies:<br>-blinding<br>-allocation concealment<br>-intent to treat analysis<br>-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<br>(in children & adolescents)       | = | strong evidence<br>effective, PF~26% |
| fluoride gels, 23 RCTs<br>(in children & adolescents)         | = | strong evidence<br>effective, PF~28% |
| fluoride varnish, 7 RCTs<br>(in children & adolescents)       | = | strong evidence<br>effective, PF~46% |
| any topical fluoride, 133 RCTs<br>(in children & adolescents) | = | strong evidence<br>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<br>OR<br>Fluoride gel application at 6-month intervals | Systematic Reviews of RCT | Varnish application at 6-month intervals<br>OR<br>Fluoride gel application at 6-month intervals  | Systematic Reviews of RCT | Varnish application at 6-month intervals<br>OR<br>Fluoride gel application at 6-month intervals  | Expert Opinion    |
| <b>High</b>     | Varnish application at 6-month intervals<br>OR<br>Varnish application at 3-month intervals      | Systematic Reviews of RCT | Varnish application at 6-month intervals<br>OR<br>Varnish application at 3-month intervals<br>OR<br>Fluoride gel application at 6-month intervals<br>OR<br>Fluoride gel application at 3-month intervals | Systematic Reviews of RCT | Varnish application at 6-month intervals<br>OR<br>Varnish application at 3-month intervals<br>OR<br>Fluoride gel application at 6-month intervals<br>OR<br>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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