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National Primary Oral Health
Conference 20112
“Evidence-based” what?
What is evidence-based dentistry?

- Patient preferences & values
- Clinical expertise
- High level of evidence

Graded:
- Validity
- Importance
- Bias
<table>
<thead>
<tr>
<th><strong>Tradition-based</strong></th>
<th><strong>Science-based</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The bulk of what we “know” is acquired in dental school</td>
<td>A significant volume of new scientific knowledge is acquired throughout a career</td>
</tr>
<tr>
<td>“My current knowledge is correct and I know it is correct because it has been working for my patients and me for the past 10 years.”</td>
<td>“My current knowledge may be outdated or contain gaps which I wish to seek out and make corresponding changes in my approach to care.”</td>
</tr>
<tr>
<td>Information seeking:</td>
<td>Information seeking:</td>
</tr>
<tr>
<td>• Ask our friends we golf and fish with</td>
<td>• After reviewing the scientific evidence, consult “expert” opinion if gaps in knowledge remain</td>
</tr>
<tr>
<td>• Attend CE that is taught by “experts”</td>
<td></td>
</tr>
<tr>
<td>Scientific resources:</td>
<td>Scientific resources:</td>
</tr>
<tr>
<td>• Dental Town, Dr. Bicuspid, manufacturer marketing, “throw away” journals</td>
<td>• Electronic scientific databases (PubMed, EBD.ADA.org))</td>
</tr>
<tr>
<td>Dental education:</td>
<td>Dental Education:</td>
</tr>
<tr>
<td>• Tradition – what the attending told us to do</td>
<td>• EBD curriculums: teach evidence seeking and grading of the quality of evidence</td>
</tr>
<tr>
<td>• Textbooks</td>
<td></td>
</tr>
<tr>
<td>Change practice based on one study read in a journal or communicated by a friend or “expert” who’s read the study</td>
<td>Change practice after reviewing the <em>full range</em> of evidence on a topic and MANY similar studies conclude the same outcome</td>
</tr>
<tr>
<td>Practitioner doesn’t evaluate research quality: animals and laboratory research, no control, funding source, no blinding, expert opinion</td>
<td>Practitioner evaluates research quality: done in humans, control, funding, blinding, statistical methods, validity, clinical significance to patient</td>
</tr>
</tbody>
</table>
Why should we change?

It’s been working.
Science Changes

• Advances in science: new technologies which advance diagnostic and treatment modalities, refined research and statistical methods
• Sometimes science gets it wrong but that’s Ok, because....

Research
Why does some science fail us?

- Lack of an *a priori* question
- Lack of a proper control
- Lack of randomization
- Bias:
  - Lack of blinding (both investigators and/or subjects)
  - Selection bias: only selecting studies that support the topic of interest
  - Publication bias: the fact that more studies with positive results get published
    - Encourages researchers to portray findings as more significant than they really are
    - Distorts the findings in the literatures
  - Conflict of interest
  - Measurement bias: observer, responder and instrument bias
- Lack of statistical “power”
- Small sample size
Why does some science fail us?

• The use of **surrogate outcomes** (i.e. using “attachment loss” instead of tooth survival as an end point of a study)

• **Confounding**: when the association of an exposure (i.e. smoking) and the outcome (i.e. cardiovascular disease) is mixed up with the real effect of another exposure (i.e. periodontal disease) and the same outcome (i.e. cardiovascular disease)

• **Researcher degrees of freedom**: researcher bias and choices they make about which variables to include, when to stop collecting data, which comparisons to make and which statistical analysis to use and how results are presented can have a profound influence on the outcome of a study

• Even the way statistics are presented in a study can make a finding appear more significant than it really is

• Researchers are evil and can find an association between anything!!!!!
Correlation between pirates and global warming
Retraction of articles in journals

![Graph showing retraction trends in PubMed and Web of Science notices from 1977 to 2009.](image)

- **Number of retraction notices**
- **PubMed notices**
- **Web of Science notices**

**MISCONDUCT**

- **Self-plagiarism**: 11%
- **Plagiarism**: 17%
- **Honest error**: 28%
- **Irreproducible**: 11%
- **Other**: 17%

**Fabrication**: 16%
Post-republication of retracted citations

Figure 1

Click on image to zoom

Incidence of post-republication citation at four-, eight-, and twelve-year intervals
Significant need for an science-based approach

• Blind spots in knowledge (outdated, misinformation, gaps)
  – Poor at identifying deficiencies
  – Cognitive barriers to knowledge change
    • Cognitive dissonance
    • Confirmation bias
Does “practice make perfect”? 

In a meta-analysis:

62 published studies that measured clinician quality of care and time since graduation

73% of those studies suggested that clinician performance declines over time.

Only one study suggested improved performance.

Choudry 2005
Does “practice make perfect”? 

Figure 2. Distribution of study results relating physician age to clinical performance in various domains.
How good are we at self-assessing our clinical gaps in knowledge?

A SR of practitioner’s ability to self assess the level of their competency compared with external measures of their competency suggest clinicians:

• “...have limited ability to self assess”

• “Finally, perhaps of greatest concern are the findings that those who perform the least well by external assessment also self-assess less well.”

Davis 2006

Not very good!!!!
Cognitive Dissonance
Sir Francis Bacon

I know that most men—not only those considered clever, but even those who are very clever, and capable of understanding most difficult scientific, mathematical, or philosophic problems—can very seldom discern even the simplest and most obvious truth if it be such as to oblige them to admit the falsity of conclusions they have formed, perhaps with much difficulty—conclusions of which they are proud, which they have taught to others, and on which they have built their lives.
Significant need for an EBD approach

• Ethical principle to “do no harm”

• Improve value (health results/dollar spent)
A science-based dentistry approach maximizes the use of unbiased evidence and minimize the impact of our tendency towards confirmation bias and cognitive dissonance.
Levels of evidence

- Systematic reviews based upon RCT’s
- Randomized controlled trials
- Cohort studies
- Case control studies
- Case series
- Expert opinion without explicit critical appraisal, theories based on physiology or plausibility, bench top research & animal studies
What is a systematic review?

IMPORTANT: a systematic review helps maximize objectivity and minimize bias
Total body of evidence

- Low quality studies
- High quality: RCT's and other well designed studies

combine

- Systematic review
- Meta Analysis

remove
Elements of a systematic review

☐ Start with an *a priori* clinical question that includes a stated Population, Intervention, Comparison and Outcome (PICO question).

☐ Search and consider *every study* that relates to this question. Include information obtained from search engines (i.e. Medline), journals and unpublished studies.

☐ Sort “high quality” studies from “low quality” studies based upon standard selection criteria that was established *before* the systematic review began. A minimum of two independent reviewers must complete this process and then resolve differences through discussion.

☐ Using only the “high quality” research identified, attempt to pool the data to draw some common conclusion (i.e. Treatment X in children decreases caries rate compared to treatment Y.). This is called a meta analysis.
# Forest Plot

The figure illustrates a forest plot for a meta-analysis of binary outcome measures. The plot includes the following key components:

- **Study IDs**: Identifiers for each study.
- **Intervention group** and **Control group**: Numbers of events and sample sizes for each group.
- **Relative risk (fixed)** and **95% CI**: Measures of effect size and confidence intervals.
- **Weight (%)**: Contribution of each study to the overall analysis.

### Table:

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention group</th>
<th>Control group</th>
<th>Relative risk (fixed)</th>
<th>Weight (%)</th>
<th>Relative risk (fixed) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study A</td>
<td>1/141</td>
<td>2/142</td>
<td>0.50 [0.05, 5.49]</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Study B</td>
<td>7/27</td>
<td>9/29</td>
<td>0.84 [0.36, 1.93]</td>
<td>77.7</td>
<td></td>
</tr>
<tr>
<td>Study C</td>
<td>1/100</td>
<td>0/100</td>
<td>3.00 [0.12, 72.77]</td>
<td>4.5</td>
<td></td>
</tr>
</tbody>
</table>

**Overall effect**:
- Relative risk (fixed): 0.87 [0.41, 1.87]
- Weight: 100.0%

**Heterogeneity** ($I^2$) = diversity between studies: 0.0%

**Line of no effect**

**Scale of treatment effect**

**$p$ value indicating level of statistical significance**

**Outcome effect measure**
- Shown graphically and numerically
- Fixed effect model used for meta-analysis

**Influence of studies on overall meta-analysis**

**Figure 1. Meta-analysis of binary outcome measure**
## Saturated fat and cardiovascular disease

<table>
<thead>
<tr>
<th>Organization</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Heart Association</td>
<td>“limiting the amount of saturated fats ... to less than 7 percent of total daily calories.”</td>
</tr>
<tr>
<td>NIH</td>
<td>“Saturated fat should be limited to 10% of calories.”</td>
</tr>
<tr>
<td>FDA</td>
<td>Age &gt; 2 “should try and keep their saturated fat intake under 10% of their total daily calories.”</td>
</tr>
<tr>
<td>Harvard School of Public Health</td>
<td>“Seven percent of total calories or lower is a good target.”</td>
</tr>
<tr>
<td>USDA</td>
<td>“Consume less than 10 percent of calories from saturated fatty acids.”</td>
</tr>
<tr>
<td>WHO</td>
<td>“10% from saturated animal-based fats to unsaturated vegetable-oil based fats.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Risk Ratio IV, Random, 95% CI</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Heart Disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shekelle et al(17)</td>
<td>1.11 [0.91, 1.36]</td>
<td>1981</td>
</tr>
<tr>
<td>McGee et al(9)</td>
<td>0.86 [0.67, 1.12]</td>
<td>1984</td>
</tr>
<tr>
<td>Kushi et al(13)</td>
<td>1.33 [0.95, 1.87]</td>
<td>1985</td>
</tr>
<tr>
<td>Posner et al(16)</td>
<td>0.92 [0.68, 1.24]</td>
<td>1991</td>
</tr>
<tr>
<td>Goldbourt et al(35)</td>
<td>0.86 [0.56, 1.35]</td>
<td>1993</td>
</tr>
<tr>
<td>Fehily et al(28)</td>
<td>1.57 [0.56, 4.42]</td>
<td>1994</td>
</tr>
<tr>
<td>Ascherio et al(4)</td>
<td>1.11 [0.87, 1.42]</td>
<td>1996</td>
</tr>
<tr>
<td>Esrey et al(6)</td>
<td>0.97 [0.60, 1.60]</td>
<td>1996</td>
</tr>
<tr>
<td>Pietinen et al(15)</td>
<td>0.93 [0.60, 1.44]</td>
<td>1997</td>
</tr>
<tr>
<td>Boniface et al(5)</td>
<td>1.37 [1.17, 1.60]</td>
<td>2002</td>
</tr>
<tr>
<td>Jakobsen et al(8)</td>
<td>1.03 [0.66, 1.60]</td>
<td>2004</td>
</tr>
<tr>
<td>Oh et al(33)</td>
<td>0.97 [0.74, 1.27]</td>
<td>2005</td>
</tr>
<tr>
<td>Tucker et al(18)</td>
<td>1.22 [0.31, 4.77]</td>
<td>2005</td>
</tr>
<tr>
<td>Xu et al(10)</td>
<td>1.91 [0.31, 11.84]</td>
<td>2006</td>
</tr>
<tr>
<td>Leosdottir et al(14)</td>
<td>0.95 [0.74, 1.21]</td>
<td>2007</td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>1.07 [0.96, 1.19]</strong></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 0.02; Chi² = 25.54, df = 15 (P = 0.04); I² = 41%

Test for overall effect: Z = 1.22 (P = 0.22)
Implementing EBD in a CHC

• Create an EBD learning environment
• Rate level of evidence:
  – Standard Operating Procedures (SOP)
  – Quality assurance (i.e. chart reviews)
  – Programs (i.e. school-based program)
  – Political advocacy
  – Top volume procedure codes
• Translate findings into practice
Create an EBD Learning Environment

EBD Training Workbooks for the Dental Team
Save the Date! - The Next EBD Champions Conference is scheduled for April 25-27, 2013.

To access this year's conference presentations (held March 10-12, 2012), please click here and scroll down to the conference program.

The goal of the EBD Champions Conference is to recruit and train selected dental professionals throughout the United States to learn what Evidence-Based Dentistry is and how to apply EBD principles and tools in clinical decision-making and then disseminate information about EBD to their colleagues.

Funding for this year's conference was made possible in part by Grant Number 1R13HS020551-01A1 from the Agency for Healthcare Research and Quality (AHRQ). The views expressed in written conference materials or publications and by speakers and moderators do not necessarily reflect the official policies of the Department of Health and Human Services; nor does mention of trade names, commercial practices, or organizations imply endorsement by the U.S. Government.
Create an EBD Learning Environment

• Dental team EBD study club
• Compensation for EBD learning participation
• Identify and train an EBD Champion
• Form an EBD workgroup
• Rate level of evidence of procedures, protocols and programs
Rating of Top Volume Procedure Codes

What are the 2 most common preventive dental encounters in dentistry?

• What is the evidence for a 6 month recall exam interval in adults?

• What is the evidence for a 6 month interval of scaling and polishing in adults?
WELCOME TO A WEBSITE FOR EVIDENCE-BASED DENTISTRY

A practical resource for scientific evidence
Looking for answers? We provide systematically assessed evidence as tools and resources to support your clinical decisions. A practical approach to integrating evidence into your patient care!

About EBD
Insufficient evidence to support or refute a specific dental recall interval

A Critical Summary of:
Recall intervals for oral health in primary care patients

Clinical Questions:
To determine the relative benefit or harm of various dental recall intervals.

Review Methods:
The authors conducted an all-language search of four electronic databases from January 1, 1966 to March 5, 2007. Inclusion criteria were: a) randomized controlled trials, b) subjects of all ages, c) dental check-ups received in primary care settings. Several outcomes were assessed, including clinical (caries, fillings, periodontal status, etc.), psychosocial (patient/parent satisfaction, oral comfort, etc.), and economic (patient and provider costs). Hand searching of reference lists was performed, and some authors were contacted to obtain additional information. Two individuals independently reviewed studies for inclusion, abstracted data, and assessed study quality.

Main Results:
The authors identified 496 titles and abstracts in the initial search, from which 47 full reports were obtained. However, only one study met all inclusion criteria. The excluded studies either were irrelevant or nonrandomized trials. The included study had...
Critical Evaluation of Dental Recall SR and Results

**Strengths and Weaknesses of the Systematic Review:**
This was a thorough review with no apparent weaknesses. The authors searched four databases, and also searched reference lists and contacted authors. The inclusion criteria were stated, and lists of included and excluded studies, with reasons, were provided. Two independent reviewers assessed studies for inclusion, performed data abstraction, and judged the quality of the included studies.

**Strengths and Weaknesses of the Evidence:**
Despite the clinical importance of the central question, only one randomized trial was identified, which was judged to be of poor methodological quality. The systematic review authors stated that reliable conclusions cannot be made based on the paucity of evidence provided by this randomized trial. The authors also discussed the non-randomized literature on this topic, which was assessed in a prior systematic review (reference 2), as well as in a practice guideline formulated by the National Health Service in England and Wales (reference 3). Interestingly, there was consistency in the randomized and nonrandomized trials, which suggest that on a population basis, the optimal recall interval is unknown.

**Implications for Dental Practice:**
The current evidence does not provide clear guidelines for establishing appropriate recall intervals. Therefore, dentists should determine, with their patients, recall intervals based on each patient’s dental history, preferences, and risk status.
Routine Scale and Polish

No Summary. Original is FREE for ADA members
The research evidence is of insufficient quality to reach any conclusions regarding the beneficial and adverse effects of routine scaling and polishing for periodontal health and regarding the effects of providing this intervention at different time intervals.
Clinical Outcomes of Single-Visit Oral Prophylaxis: A Practice-based Randomised Controlled Trial

Clare L Jones¹*, Keith M Milsom¹,², Philip Ratcliffe³, Annette Wyllie⁴, Tatiana V Macfarlane⁵ and Martin Tickle¹

Abstract

Background: Practice-based general dental practitioners routinely provide “scale and polish” or “oral prophylaxis” to patients attending their practices. Despite its routine provision, there is no evidence to support the clinical effectiveness of single-visit scale and polish, nor the frequency at which it should be provided. A recent systematic review recommended that future trials investigating scale and polish should involve dental practice patients.

Methods: A practice-based parallel randomised controlled trial with 24-month follow-up was conducted. Healthy adults (Basic Periodontal Examination [BPE] codes <3) were randomly assigned to 3 groups (6-month, 12-month, or 24-month interval between scale and polish). The primary outcome was gingival bleeding with the hypothesis that 6-monthly scale and polish would result in lower prevalence than 12-month or 24-month frequency. Follow-up measurements were recorded by examiners blinded to the allocation. 125, 122 and 122 participants were randomised to the 6-month, 12-month and 24-month groups respectively. Complete data set analyses were conducted for 307 participants: 107, 100, and 100 in the 6-month, 12-month and 24-month groups respectively. Chi-square test and ANOVA were used to compare treatment groups at follow-up. Logistic regression and ANCOVA were used to estimate the relationship between outcome and treatment group, adjusted for baseline values. Multiple imputation analyses were also carried out for participants with incomplete data sets.

Results: Prevalence of gingival bleeding at follow-up was 78.5% (6-month), 78% (12-month) and 82% (24-month) (p = 0.746). There were no statistically significant differences between groups with respect to follow-up prevalence of plaque and calculus. Statistically significant differences detected in the amount (millimetres) of calculus were too small to be clinically significant. Seventeen (4.6%) participants were withdrawn from the trial to receive additional treatment.
Recall parameters

• Exam Recall: Lack of evidence for 6 month recall

• Routine Prophy: Lack of evidence to support 6 month interval and some evidence of good quality to support no difference in oral health between 6m, 12m and 24m
Recall parameters

- Exam Recall: Based on risk, dental history and preferences
- Prophy Recall: need determined at time of recall exam

Default setting for recall exam and prophy for a healthy adult will be 24 months

Reassess the literature in 1 year
Thank you!

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