Caries Management by Risk Assessment (CAMBRA): Implementation in Your Practice
Session 3

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Caries Management by Risk Assessment (CAMBRA):

Session 3 – Part 1
Caries Risk Assessment

Use the caries balance to assess the caries risk
Caries Risk Assessment

Risk Levels
- Low
- Moderate
- High
- Extreme (High risk plus hyposalivation)

Sometimes there is a delicate balance

Q: When is a Patient at High Risk for Future Cavities?
- When the protective factors outweigh the pathological factors
- When the protective factors balance the pathological factors
- When the pathological factors outweigh the protective factors
- None of the above
When is a Patient at High Risk for Future Cavities?

- When the protective factors outweigh the pathological factors
- When the protective factors balance the pathological factors
- When the pathological factors outweigh the protective factors
- None of the above

What is the Caries Risk of Joe Cornish?

- 55 year old male
- Two new cavities since last visit two years ago
- Four new approximal lesions by radiograph
- Exposed root surfaces
- Bacteria?
- Frequent snacker – truck driver
- No symptoms of dry mouth
- No hyposalivatory meds
- 1X daily F toothpaste?

Decayed Surfaces vs. log MS and log LB

Baseline Bacterial Levels vs Decay

Existing Cavity = High Risk
The Caries Balance - Risk?

**Protective Factors**
- Saliva flow and components normal
- Fluoride, 1X F toothpaste daily

**Pathological Factors**
- Two new cavities
- Four new approximal lesions
- Acid-producing bacteria
- Frequent eating/drinking of fermentable carbohydrates
- 55 year old = exposed roots

No Caries

Caries

Featherstone, Community Dent Oral Epidem, 1999

The Caries Balance - High Risk

**Protective Factors**
- Saliva flow and components normal
- Fluoride, 1X F toothpaste daily

**Pathological Factors**
- Two new cavities
- Four new approximal lesions
- Acid-producing bacteria
- Frequent eating/drinking of fermentable carbohydrates
- 55 year old = exposed roots

No Caries

Caries

Featherstone, Community Dent Oral Epidem, 1999

Putting into practice the results of many years of research.

“Caries Management by Risk Assessment”
October, November 2007. On line, free
California Dental Association Journal
based upon the “Caries Balance”
http://www.cdafoundation.org/journal
Three Categories for Risk Assessment – Disease Indicators

- Disease indicators: Clinical observations
  - Cavities or lesions radiographically into dentin
  - Approximal lesions in enamel by radiograph
  - Smooth surface white spot lesions
  - Restorations (fillings) due to caries in the last 3 years (or 1 year for patient of record)

Three Categories for Risk Assessment – Pathological Factors

- Pathological factors: Biological risk factors
  - Cariogenic bacteria
  - Frequent snacking of fermentable carbohydrates
  - Salivary dysfunction and its causative agents
  - Others, such as exposed tooth roots

Three Categories for Risk Assessment – Protective Factors

- Protective factors: Biological protective factors
  - Normal/adequate salivary function
  - Fluoride, calcium, phosphate from various sources
  - Antibacterial agents from external sources
Caries Risk Assessment

Featherstone et al, CDAJ, 2007

Circle Yes’s

Visualize the Balance

Decide on caries risk level: Low, Moderate, High, Extreme

Used in UCSF student clinics and beyond

Used in many private practices, with modifications

Caries Management by Risk Assessment (CAMBRA):

Session 3 - Part 2
Caries Risk Assessment Validation
**Disease Indicators**

**UCSF predoctoral clinics (CDA Jnl Oct 2011)**

<table>
<thead>
<tr>
<th>Disease Indicator</th>
<th>No</th>
<th>Yes</th>
<th>P-value</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restorations last 3 years</td>
<td>3,052</td>
<td>2,761</td>
<td>&lt;0.001</td>
<td>1.46</td>
</tr>
<tr>
<td>Approximal enamel lesions on x-rays</td>
<td>3,059</td>
<td>3,425</td>
<td>&lt;0.001</td>
<td>8.21</td>
</tr>
<tr>
<td>White spots</td>
<td>4,636</td>
<td>3,059</td>
<td>&lt;0.001</td>
<td>2.77</td>
</tr>
</tbody>
</table>

*OR = odds ratio. 1.0 = no relationship; > 1.0 = positive relationship; < 1.0 = negative relationship*

**Biological Risk Factors**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>No</th>
<th>Yes</th>
<th>P-value</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy plaque</td>
<td>3,052</td>
<td>2,761</td>
<td>&lt;0.001</td>
<td>2.55</td>
</tr>
<tr>
<td>Recreational drugs</td>
<td>5,783</td>
<td>3,792</td>
<td>&lt;0.001</td>
<td>1.95</td>
</tr>
<tr>
<td>Deep pits &amp; fissures</td>
<td>5,079</td>
<td>1,456</td>
<td>&lt;0.001</td>
<td>1.80</td>
</tr>
<tr>
<td>Frequent snacks</td>
<td>5,894</td>
<td>3,408</td>
<td>&lt;0.001</td>
<td>1.77</td>
</tr>
<tr>
<td>Inadequate saliva flow</td>
<td>3,862</td>
<td>2,348</td>
<td>&lt;0.001</td>
<td>1.27</td>
</tr>
<tr>
<td>Exposed roots</td>
<td>3,353</td>
<td>1,769</td>
<td>&lt;0.001</td>
<td>1.19</td>
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</tbody>
</table>
### PROTECTIVE FACTORS

<table>
<thead>
<tr>
<th>12,954 baseline CRA</th>
<th>CAVITATIONS</th>
<th>P-value</th>
<th>OR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoridated community</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>687</td>
<td>58.3</td>
<td>&lt;0.011</td>
</tr>
<tr>
<td>Yes</td>
<td>5,068</td>
<td>54.4</td>
<td></td>
</tr>
<tr>
<td>Fluoride toothpaste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>518</td>
<td>58.7</td>
<td>0.81</td>
</tr>
<tr>
<td>Yes</td>
<td>5,068</td>
<td>54.5</td>
<td></td>
</tr>
<tr>
<td>Fluoride mouthrinse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5,379</td>
<td>56</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>871</td>
<td>58.4</td>
<td></td>
</tr>
</tbody>
</table>

* OR = Odds ratio. 1.0 = no relationship; > 1.0 = positive relationship; < 1.0 = negative relationship

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### 2,571 follow-up CRA (16.0 +/- 12.6 months)

<table>
<thead>
<tr>
<th>Risk @ Baseline</th>
<th>First follow-up</th>
<th>Proximal lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>23.6 %</td>
<td>9.9 %</td>
</tr>
<tr>
<td>Moderate</td>
<td>38.6%</td>
<td>12.4 %</td>
</tr>
<tr>
<td>High</td>
<td>69.3 %</td>
<td>28.7%</td>
</tr>
<tr>
<td>Extreme</td>
<td>88%</td>
<td>23.5%</td>
</tr>
</tbody>
</table>

P-Value $\chi^2$ <0.001 <0.001

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**Mutans streptococci**

- Low
- High

**Lactobacilli**

![Vivadent Test Strips. Used to measure mutans streptococci and lactobacilli bacterial challenge level.](image)
**The Caries Imbalance**

**Disease Indicators**
- Cavities/dentin
- Enamel lesions
- Restorations < 3 yr
- White spots

**Risk Factors**
- Acidogenic bacteria
- Frequent carbohydrates
- Sub-normal saliva

**Protective Factors**
- Saliva
- Fluoride, Ca, P
- Antibacterials

**Caries Progression**  
- No Caries

Featherstone, Young, Wolff, 2007
Caries Management by Risk Assessment (CAMBRA):  

**Caries Management Step by Step**
- Dental/medical history
- Clinical exam
- Detect caries lesions early enough to reverse or prevent progression
- Assess caries risk
- Treatment plan including chemical therapy
- Use fluoride and/or antibacterial therapy based on observations
- Use minimally invasive restorative procedures to conserve tooth structure
- Recall and review

Session 3 – Part 3  
Caries Risk Assessment  
Step by Step
Caries Management Step by Step

- Dental/medical history
- Clinical exam
- Detect caries lesions early enough to reverse or prevent progression
- Assess caries risk
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Risk Assessment
Assessing the risk for caries in the future

Caries Risk Assessment Form

- Featherstone et al, CDAJ, 2007
- Circle Yes’s
- Visualize the Balance
- Decide on caries risk level: Low, Moderate, High, Extreme
- Used in UCSF student clinics and beyond
- Used in many private practices, with modifications
Caries Risk assessment
(Age 6 years and older/adult) - 1

1. Disease Indicators = Clinical Observations
a) Visible cavities present
b) Caries restored in last 3 years (or 1 year for patient of record)
c) Approximal caries lesions/radiolucencies
d) White spots on enamel surfaces

These are all clinical observations that tell us nothing about the cause of the disease - they indicate presence of disease

Caries Risk assessment
(Age 6 years and older/adult) - 2

2. Risk Factors (Biological determinants of caries risk)
a) Bacterial activity (ATP?) medium or high – all patients
b) Visible heavy plaque on teeth
c) Frequent (greater than 3 times) between meal snacks of sugars/cooked starch
d) Deep pits and fissures
e) Recreational drug use
f) Inadequate saliva flow (less than 0.5 ml/min)
g) Saliva reducing factors: 1) medications, 2) radiation to the head and neck, 3) systemic reasons, e.g. Sjogren’s syndrome
h) Exposed tooth roots
i) Orthodontic appliances present

Caries Risk assessment
(Age 6 years and older/adult)

Tests
- Stimulated saliva flow rate is measured by chewing and spitting for 3-5 minutes (timed). Amount (in ml) divided by time = rate (ml/min). Less than 0.7 ml/min is low and less than 0.5 ml/min is dry.
- Bacteria testing by the CRT (Caries Risk Test, from Vivadent, Amherst, NY). Use selective media sticks for mutans streptococci and lactobacilli as per manufacturers instructions. Incubate 72 hours and read as low, medium or high.
- Alternatively ATP test meter - CariFree
- Follow up with repeat tests at 3-6 months until stable. Record images or numbers in the patient’s chart
Mixed saliva is added to the two-sided selective media slide (mutans streptococci and lactobacilli).

Incubate for 72 hours and read versus density scale.

Vivadent Test Strips. Used to measure mutans streptococci and lactobacilli bacterial challenge level.

Mutans streptococci

Lactobacilli

Vivadent Test Strips. Used to measure mutans streptococci and lactobacilli bacterial challenge level.

Cariogenic Bacteria Assessment (alternative – now in use in our predoc clinics – some studies)

- CariFree products: www.carifree.com
- CariScreen caries detection meter.
- The patent pending CariScreen uses ATP bioluminescence to identify oral bacterial load.
- Chairside in minutes.
CariScreen™ ATP Test
- Real time (15 second)
screening test for
quantitative measure of
bacterial activity
- >4,000 high bacteria
- >1,500 moderate
- <1,500 low

CariScreen score had a strong positive correlation \( r = 0.76 \) with total cell count, a positive correlation with MS counts \( r = 0.69 \). OHSRU

Caries Risk assessment
(Age 6 years and older/adult) - 3
3. Protective Factors
   a) Lives/works/school in community with fluoridated water
   b) Uses fluoride toothpaste once daily
   c) Uses fluoride toothpaste at least twice daily
   d) Uses 5000 ppm F toothpaste daily
   e) Uses fluoride rinse/gel daily
   f) Fluoride varnish in last 6 months
   g) Uses fluoride rinse/gel in last 6 months
   h) Fluoride varnish in last 6 months
   i) Chlorhexidine rinse prescribed/used daily for 1 month every month last 6 months
   j) Chlorhexidine rinse prescribed/used daily last 6 months
   k) Xylitol gum/candies 4 times daily last 6 months
   l) Calcium/phosphate paste last 6 months
   m) Saliva flow visibly adequate or > 1 ml/min by test