Electronic Dental Records

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8/2/2008 Dr Benn, University of Florida
Why Use Computers for the Dental Office?

• To solve problems!
• What are our problems?
Topics

• Identify current problems in oral health care – especially caries
• Discuss possible changes needed
• Barriers to change
  – Technical
  – Financial
• Possible solutions
  – Computer
  – Spreadsheet model for predicting impact of office population changes
DENTISTRY TODAY

DENTIST

PATIENT

HYGIENIST

TECHNICIAN

INSURANCE

DENTAL ASSISTANT

TREATMENT Outcome?

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$
DENTISTRY TOMORROW

PATIENT

HYGIENIST

DENTIST

Dental Therapist

INSURANCE

DENTAL ASSISTANT

TECHNICIAN

IMPROVED HEALTH

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Possible changes

- Non-outcomes based to outcomes based care
- Changing roles for the dental team
- Possible introduction of new non-dentist clinicians
  - Dental therapists (Alaska, Canada, United Kingdom, Australia, New Zealand)
  - Denturists (U.S. 6 states)
Relationship between prevalence of diseases and dental practice

- The amount and severity of caries and the periodontal diseases varies from individual to individual and from social group to social group
- Low socioeconomic groups → high disease risk
- Middle class → low disease risk
Population High Risk Groups

25% Caries

60% Low risk caries & perio

15% Periodontal


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Current Problems

• Conventional patient management
  – Any sign of caries leads to fillings
  – All patients seen at 6 months intervals
  – Lack of disease risk assessment
    • High caries risk
    • Medium
    • Low
Conclusions?

- Filling teeth removes the softened tooth structure caused by the caries disease processes. It does not remove the factors that cause the destruction i.e. bacteria, sugar..
- Filling teeth does not CURE caries
- Changing patient behavior and using Chlorhexidine does.
Caries Management – Alternative Strategies?

• Conventional management
  – Remove all softened tissue from lesion
  – Remove undermined enamel
  – Extension for prevention
  – Early removal of non-cavitated demineralized enamel fissures (air abrasion)
  – Fill interproximal enamel lucencies
Non-cavitated Fissure Caries

Enamel

Progression

Radiographically half way through dentin - 65% NO CAVITY - Can still repair itself
Non-cavitated - no bacteria, can remineralise

Cavity - unlikely to repair itself
Needs treatment – what type?

Bacteria
When do we need to remove carious tooth tissue?
Can we safely seal in caries?
The Molar Life Cycle

Generations born post-1960/70

Application

Reapplication
What about the dangers of sealing over caries?

- Many dentists are concerned about inadvertently sealing in caries
- Are there real risks from doing this?
Sealing in Caries

- JADA 1998;129:55-68. 10-year follow-up

Occlusal caries x-ray up to ½ dentin. Enamel margin made caries free, undermined enamel and soft caries NOT removed. 75 composites in 75 patients sealed to enamel. Monitored 10 years. No progression.
Bevel on enamel margin. No caries removed and undermined enamel left in situ. Mertz-Fairhurst 1995

8/5/97
Dr. Benn
Baseline. 15 year-old female. Occlusal lucencies in central and distal pits of #14. (Mertz-Fairhurst 1995)
6 months

8/5/97

Dr. Benn, Univ Florida
Year 2: Restorations remain completely sealed
Mertz-Fairhurst 1995
Year 4: No progression
Bevel on enamel margin. No caries removed and undermined enamel left in situ. Mertz-Fairhurst 1995

Year 9: Remains sealed
#30 baseline
### RESULTS AT BASELINE AND AT YEAR 10.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. OF TEETH</th>
<th>RESTORATION TYPE*</th>
<th>CLINICALLY ACCEPTABLE MARGINAL INTEGRITY RATINGS (% OF TEETH)</th>
<th>CLINICAL FAILURES (% OF TEETH)</th>
<th>UNRELATED FAILURES (% OF TEETH)</th>
<th>OTHERS (% OF TEETH)</th>
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</thead>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Oscar† Oscar/Alfa‡ Alfa§ Oscar/Bravo** Bravo††</td>
<td></td>
<td></td>
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<tr>
<td>Baseline</td>
<td>156</td>
<td>Comp-S/C</td>
<td>86  4 10 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>77</td>
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<td></td>
<td>79</td>
<td>AGU</td>
<td>NA†† NA 100 NA 0</td>
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<td>10</td>
<td>85</td>
<td>Comp-S/C</td>
<td>16  54 0 7 1</td>
<td>13</td>
<td>4</td>
<td>5</td>
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<td></td>
<td>44</td>
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<td>0§§</td>
<td>2</td>
<td>4</td>
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<tr>
<td></td>
<td>41</td>
<td>AGU</td>
<td>NA NA 56 NA 29</td>
<td>15</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* CompS/C: bonded and sealed composite restoration over caries; AGS: sealed amalgam restoration; AGU: unsealed amalgam restoration.
† Restoration, including all margins, is completely sealed.
‡ Restoration is partly sealed and has no open margin—that is, the restoration has no visible crevice and either the explorer does not catch or it catches only one way.
§ There is no sealant but no open margin.
** The restoration is partly sealed and there is an open margin (a visible v-shaped crevice at the margin or one determined by an explorer catch both directions), but no dentin or base is exposed. (The terms open margin and crevice are interchangeable.)
†† There is no sealant and there is an open margin.
‡‡ NA: not applicable.
§§ There was a single clinical failure in the group that received the bonded and sealed amalgam restorations. The failure occurred at year 4, but the patient did not come for an evaluation at year 10.
Conclusions from study

• Sealing in extensive caries is safe over 10 years
• No caries progression or pulpal symptoms/signs of damage
• Leaving unsupported enamel did not cause fractures of crown/filling
• Sealing over stained fissures, non-cavitated lesions, or even cavities is not hazardous
Current Problems

• Conventional patient management
  – Any sign of caries leads to fillings
  – All patients seen at 6 months intervals
  – Lack of risk assessment
    • High caries risk
    • Medium
    • Low
Population High Risk Groups

- 25% Caries
- 15% Periodontal
- 60% Low risk caries & perio


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Clinical Examination Intervals

• If some people get a lot of decay and some get none, why do we recommend 6 month examination intervals for ALL patients?

• Why not see low risk patients once every 12-18 months, medium risk 6-monthly, high risk 3-monthly?
Current Problems

• Conventional patient management
  – Any sign of caries leads to fillings
  – All patients seen at 6 months intervals
  – Lack of risk assessment
    • High caries risk
    • Medium
    • Low
Risk Assessment

• Look for risk factors: frequent sugar, lack of fluoride, caries, plaque, reduced saliva, deep fissures…
• As factors found increase risk from low -> medium -> high
• Change recall intervals and management strategy
Need for change in oral health care delivery?

• Yes, for increased efficiency, improved oral health, decreased costs to patient
What are the barriers to change?
Barriers To Change

- Complexity of Decision Making
- Lack of a suitable caries representation for lesion severity and activity
- Education of dentists
- Payment plans
Conventional Management of Caries

New patient

Examination
Baseline or Subsequent

Prophylaxis, Oral Hygiene

Set fixed interval for clinical and radiographic examinations

Signs of Caries?
Yes → Restore tooth
No → Prophylaxis, Oral Hygiene
Severity Threshold Management of Caries

New patient

Examination
Baseline or Subsequent

Set variable interval clinical and radiographic examinations, management protocols

Caries Risk Assessment

Signs of Caries?

Severity threshold reached?

Yes

Monitor

No

Restore tooth

Yes

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New patient

Examination Baseline or Subsequent

Estimate Caries Activity

(CRA) Caries Risk Assessment

"A" High Risk

Urgent treatment (eliminating pain, endodontic treatment, or extraction of teeth). Initiate protocol to reduce bacteria, remineralize lesions and reduce risk level.

"B" Medium Risk

CRA = 8?

Yes

Urgent treatment. Initiate protocol to reduce bacteria, remineralize lesions and reduce risk level.

No

Recall after 3 months to conduct S. mutans test and selective BWs.

"C" Low Risk

Urgent treatment (eliminating pain, endodontic treatment, or extraction of teeth). Initiate protocol to reduce bacteria, remineralize lesions and reduce risk level.

Recall after 3 months to conduct S. mutans test and selective BWs.

"D" CARIES RISK ASSESSMENT

"E"
Selection of Recall Interval for X-Ray Examination

LOW RISK

- The patient is low risk.
- Last X-Ray taken at the baseline examination?
  - Yes
    - X-Ray interval ≥ 12 months
  - No
    - X-Ray interval ≥ 18 months
  - Return to Risk Assessment

HIGH/MEDIUM RISK

- The patient is then medium or high risk.
- Last X-Ray taken at the baseline examination?
  - Yes
    - Repeat X-Rays 12 months after baseline examination.
  - No
    - For a child and an adult X-ray after 6 months.
    - Last X-Ray taken >12 <24 month interval?
      - Yes
        - Repeat X-Rays a 24 month interval.
      - No
        - Retake X-Rays after a 36 month interval.
    - Return to Risk Assessment

Figure 2. Radiographic examination interval selected by caries risk, age and period since last radiographic examination
Barriers To Change

- Complexity of Decision Making
- Lack of a suitable caries representation for lesion severity and activity
- Education of dentists
- Payment plans
Limitations of Conventional Caries Representation

Tooth Surface

Different Lesions

Conventional Chart Diagram

Same red circular caries representation
Comparison between caries and perio disease representations

• Perio
  – Probing depth, loss of attachment, bleeding, mobility, furcation, radiographic alveolar bone loss
  – “#30 disto-buccal root there is new periodontal disease” – Below standard of care

• Caries
  – “New or recurrent caries on 1 of 5 surfaces”
  – Below standard of care in the future?
Goals: I

• Need for an electronic patient chart which uses evidence-based guidelines (where available) to suggest prevention and treatment strategies to improve health care
Goals: II

• Need for software to use in general dental offices and dental schools that assists in:
  – The collection of extensive med/dent/soc history data
  – Automatic examination of data collected, risk assessment for diseases, generation of treatment plans using evidence-based protocols
  – Reduction of treatment decision variability
• **Without an increase in office costs**
Goals: III

– Facilitate change from
  • surgical to chemotherapeutic management of disease
  • From individual patient management to office population management

– Generation of valid outcomes data to allow measurement of quality and success in managing oral health in dental offices
UNIVERSITY OF FLORIDA DECISION SUPPORT SYSTEM

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History & Examination
Prevention, Monitoring, S. mutans reduction, Remineralization Operative Treatment

Identification of Risk Factors

Tooth Charting

Printed Explanation to Patient
Dr. Benn

Suggested Treatment Plan to Doctor

Computer calculation of Risk for Treatment Plan
Medical History

Cardiovascular
Endocrine
Facial Pain
Gastro-Intestinal
Genitourinary
Hematologic
Immunologic
Implants
Medication
Musculo-skeletal
Neurologic
Respiratory
Special Senses
Surgery-Anesthesia
SOCIAL HISTORY

Yes  No  Don't know

Between meals, do you have drinks containing sugar (sweet sodas, hot chocolate)?

Between meals, do you add sugar to drinks (coffee, tea)?

Do you snack between meals (candy, cookies)?

Do you chew gum with sugar?

Is your tap water fluoridated?

Do you brush at least twice a day with a fluoridated toothpaste?

Do you use nightly a fluoride mouth rinse?

Do you smoke?

Do you chew tobacco or use snuff?

Do you drink alcohol?
Last Dental Visit

How long ago was your last dental visit?

- Days
- Weeks
- Months
- One year
- More than one year
- Never

Was your last dental visit:

- A planned checkup
- An emergency
CARIES RISK ASSESSMENT FORM

Please double-check the active factors, then click CONTINUE:

- Enamel caries (Any clinical or Lucencies: to age 12 >= 2, older >= 3)
- Coronal Dentin caries
- Restorations for caries placed less than 1 year ago
- More than 3 mft or 1 MFT (age 6-9) or 2 MFT (10-12) or 5 MFT (excluding exfoliated primary, 3rd molars, orthodontic extractions)
- Fluoride exposure is inadequate
- Poor oral hygiene
- Sugar / diet history suggests frequent acid production
- Expected patient compliance: physical / mental handicap or disinterested
- Restoration margins or irregular anatomy favors plaque retention

- Caries Risk lowered due to lack of disease activity

MODERATE CARIES RISK  Xray taken:  

[ ] Print  [ ] Continue
Tooth: 2

Region | Condition | Xray | Rec. | DiagnoDent
---|---|---|---|---
D | | D | 0000 | 00
OM | | | 1351 | 00
OD | | | Rest | 00

Chart Date: 2002-03-01 00:00:00

Joe Smith
ID: 2
Caries Management Strategy

DOUGLAS BENN has been classified as MODERATE risk on 4/1/03
The following caries management strategies are recommended:

- Oral hygiene instruction
- Dietary counseling
- Prophylaxis
- Xylitol gum
- Avoid sugar between meals
- Home Fluoride Treatment
- Office Fluoride Treatment

The following recall strategy is recommended:

- Recall patients every 6 months
- Monitor progression radiographically (Take next bitewings in 6 months)

Recommended Treatment:
CARIES RISK ASSESSMENT FORM

Please double-check the active factors, then click CONTINUE:

- Enamel caries (Any clinical or Lucencies: to age 12 >= 2, older >= 3)
- Coronal Dentin caries
- Restorations for caries placed less than 1 year ago
- More than 3 mft or 1 MFT (age 6-9) or 2 MFT (10-12) or 5 MFT (excluding exfoliated primary, 3rd molars, orthodontic extractions)
- Fluoride exposure is inadequate
- Poor oral hygiene
- Sugar / diet history suggests frequent acid production
- Expected patient compliance: physical / mental handicap or disinterested
- Restoration margins or irregular anatomy favors plaque retention
- S. Mutans count in saliva is high (>=100,000 CFU/ml)
- Unstimulated saliva flow is below normal (<02 ml/min)
- Caries Risk lowered due to lack of disease activity

HIGH CARIES RISK  Xray taken:  [ ]  Print  Continue
Caries Management Strategy

DOUGLAS BENN has been classified as HIGH risk on 4/1/03
The following caries management strategies are recommended:

- Oral hygiene instruction
- Dietary counseling
- Prophylaxis
- Xylitol gum
- Antimicrobial treatment
- Avoid sugar between meals
- Home Fluoride Treatment
- Office Fluoride Treatment
- S. Mutans culture at recall

The following recall strategy is recommended:

- Recall patients every 3 months for 'Strip Mutans test' and clinical exam
- Continue recalls until 2 consecutive cultures are < 100,000 CFU / ml
- Monitor progression radiographically (Take next bitewings in 6 months)
Office Population Size vs Risk and Elective Treatment Group Sizes

Population - Individual Patients Per Dentist Per Year

Office population size 1997 ADA data

% Of Populn Low Risk for Caries & Periodontal Disease

Annual Dr time
- 5 minutes for each Low Risk Caries and Periodontal patient
- 10 minutes
- 15 minutes
- 30 minutes

Years

0 1 2 3 4 5

6 19 31 44 56 69
Impact of risk based recalls and multiple hygienists

- By extending 6-month recalls for low-risk patients (majority in most offices) to 12 months
- And using 2 FT hygienists to screen low risk patients at recalls, perform preliminary charting, x-rays, OHI/clean & 5 mins DDS check patient
- And 1 FT hygienist for medium & high risk patients
- Pt annual payments 50% less, office populn 1100 \( \rightarrow \) 5,000, dentist net doubles.\(^1\)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>TRADITIONAL MANAGEMENT OF PATIENTS WITH CARIES RISK</th>
<th>RISK-BASED MANAGEMENT OF PATIENTS WITH CARIES RISK*</th>
<th>CHANGE FROM TRADITIONAL TO NEW (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Risk</td>
<td>Medium Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Percentage of Dentist’s Time Spent With Patients</td>
<td>100</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Office Gross per Year of Dentist in Solo Practice†</td>
<td>$390,790</td>
<td>$429,333</td>
<td>$175,886</td>
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<tr>
<td>No. of Unique Patients Seen Per Year</td>
<td>1,123</td>
<td>4,667</td>
<td>198</td>
</tr>
<tr>
<td>No. of Patient Visits per Year§</td>
<td>2.4</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Annual Gross per Patient§</td>
<td>$348</td>
<td>$109</td>
<td>$445</td>
</tr>
<tr>
<td>Total No. of Dentist Hours per Year§</td>
<td>1,581</td>
<td>399</td>
<td>395</td>
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<tr>
<td>Mean Dentist Hourly Rate</td>
<td>$247</td>
<td>$1,076</td>
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<tr>
<td>Mean No. of Dentist Hours per Patient per Year</td>
<td>1.41</td>
<td>0.08</td>
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<tr>
<td>Total No. of Hygienist Hours per Year</td>
<td>1,750</td>
<td>3,500</td>
<td>600</td>
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<tr>
<td>Mean No. of Hygienist Hours per Patient per Year</td>
<td>1.56</td>
<td>0.75</td>
<td>3.00</td>
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</table>

* Based on identification of groups at risk of developing caries by one dentist who employs three hygienists.
† Total number of different patients seen per year, not number of patient visits.
§ N/A: Not applicable.
§ Source: American Dental Association.
Take Home Message

• Oral health care delivery needs to change
• Disease risk assessment of pts needed
• Vary management by risk
• Evidence Based Dentistry is complicated and needs computers
• Dentists can earn the same income but by emphasis shifting to diagnosis, monitoring, prevention, sealing caries, fewer fillings
THANK YOU!

- For further information please contact

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