Evaluation of the Integrated Dental Medicine Care Model

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Integrated Dental Medicine

• Is based in the fact that oral health is a vital aspect to overall systemic well being
• A partnership between all health care providers that identifies and creates a care structure with the areas of overlap that can improve the patient experience
• Sets goals to improve both oral and systemic outcomes
Integrated Dental Medicine

- Systemic Treatment with Dental Care
- Improving oral health with medical communication
- Creating opportunities
  - Medicine providing preventive dental care
Systemic Treatment with Dental Medicine

- Diabetes
- Cardiovascular Disease
- Stroke Intervention
- HIV/AIDS
- Behavior Health (Opportunity)
Diabetes impact on oral health
Salivary Flow Rate (Xerostomia)

- Saliva not only begins the digestive process; it protects teeth by preventing decay, regulating your mouth's acidity level and keeping bacteria in your mouth from running rampant.
- But when saliva's lacking, plaque builds, enamel erodes, cavities quickly form and fungal growth runs rampant.
Salivary Flow Rate (Xerostomia)

- Diabetes and Dry Mouth
  - Prevalence of dry-mouth symptoms (xerostomia),
  - Prevalence of hyposalivation
  - Possible interrelationships between salivary dysfunction and diabetic complications.
Self Report - Xerostomia

- Does your mouth usually feel dry?
- Do you regularly do things to keep your mouth moist?
- FOX QUESTIONNAIRE
  - Do you have to sip liquids to aid in swallowing foods?
  - Does your mouth feel dry when eating a meal?
  - Do you have difficulties swallowing dry foods?
  - Does the amount of saliva in your mouth seem too little?

# Self Report - Xerostomia

<table>
<thead>
<tr>
<th>Diabetes Subjects</th>
<th>Control Subjects</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your mouth usually feel dry? (MOUTH DRY?)</td>
<td>15.8%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Do you regularly do things to keep your mouth moist?</td>
<td>20.2%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Fox Questionnaire:</td>
<td>24.1%</td>
<td>17.6%</td>
</tr>
</tbody>
</table>
## Salivary Flow Rate Measures

<table>
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<th>Diabetes Subjects</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Resting Salivary Flow Rate (ml/min)</strong></td>
<td>0.22 ± 0.014</td>
<td>0.28 ± 0.016</td>
<td>0.045</td>
</tr>
<tr>
<td><strong>Stimulated Salivary Flow Rate (ml/min)</strong></td>
<td>0.89 ± 0.047</td>
<td>1.02 ± 0.054</td>
<td>0.071</td>
</tr>
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CONCLUSIONS

• Hyposalivation and xerostomia were significant oral complications in type 1 diabetic patients.

• Xerostomia was frequently associated with more frequent snacking behaviors and with the current use of cigarettes.

• Higher rates of dental decay were found among diabetic subjects having low resting salivary flow rates.

• Elevated fasting blood glucose concentrations were associated with significant reductions in resting salivary flow rates.

• Loss of salivary amylase!
Oral health impact on diabetes
Dentistry influencing systemic well being
Oral Health - Diabetes

- A national focus in recent years
- Surgeon General’s report, *Oral Health in America*, emphasized the need to better understand the correlation between systemic and oral disease
  - Reported oral health complications associated with diabetes
Poor Glycemic Control

• Expanding body of literature implicating severe periodontitis as a risk for poor glycemic control
• Periodontal treatment in individuals with diabetes can improve glycemic control
  ▫ Leading to a reduction of the effects of diabetes

Poor Glycemic Control
Remove all the teeth!!!

• [Edentulous] Periodontal disease and subsequent tooth loss significantly impact overall health by compromising a patient’s ability to maintain a healthy diet and proper glycemic control.
  ▫ Edentulous participants consumed fewer vegetables, less fiber and carotene, and more cholesterol, saturated fat and calories than participants with 25 or more teeth.

Poor Glycemic Control

• [Edentulous] University of Pittsburgh study found that diabetic participants who had partial tooth loss or who were edentulous were generally older, had lower incomes and education and had higher rates of nephropathy, neuropathy, retinopathy, and peripheral vascular disease.

Poor Glycemic Control

- Landmark Study – Pima Indian Tribe (Az)
  - Effective treatment of periodontal infection and reduction of periodontal inflammation is associated with a reduction in level of glycated hemoglobin.
  - In addition, at 3 months, significant reductions ($P \leq 0.04$) in mean $\text{HbA}_{1c}$ reaching nearly 10% from the pretreatment value.
  - Control of periodontal infections should thus be an important part of the overall management of diabetes mellitus patients.

Poor Glycemic Control

- Stewart et al. – statistical review of study suggests that periodontal therapy was associated with improved glycemic control in persons with type 2 DM.
  - During the nine-month observation period, there was a 6.7% improvement in glycemic control in the control group when compared to a 17.1% improvement in the treatment group, a statistically significant difference.

CSC Oral Health Diabetes Clinic

Year Two

A1C
Number of Medications

- A1C
- Number of Medications

months months months months
3 6 9 12
Engebretson et al. (2013)

- At 6 months, mean HbA$_{1c}$ levels in the periodontal therapy group increased 0.17% (SD, 1.0), compared with 0.11% (SD, 1.0) in the control group.

- Conclusion: Nonsurgical periodontal therapy did not improve glycemic control in patients with type 2 diabetes and moderate to advanced chronic periodontitis. These findings do not support the use of nonsurgical periodontal treatment in patients with diabetes for the purpose of lowering levels of HbA$_{1c}$. 

Engebretson et al. The effect of nonsurgical periodontal therapy on HA1C levels in persons with type 2 Diabetes and chronic periodontitis. JAMA 2013; 310:2523-2532.
Meta analysis

- Meta-analyses confirm that reductions in glycated hemoglobin (HbA1c) can follow effective periodontal therapy.
  - Janket et al.: The weighted average decrease in actual HbA1c level was 0.38% for all studies, 0.66% when restricted to type 2 diabetic patients, and 0.71% if antibiotics were given to them.
  - Cochrane Collaboration published a review of studies that investigated the relationship between periodontal disease and the glycemic control: They reported a reduction in HbA1c of 0.40% 3–4 months after conventional periodontal therapy.


Importance of Reductions

- Stratton et al. in 2000 reported that each 1% reduction in HbA1c is associated with 21% reduced risk of any endpoint related to diabetes, 21% for deaths related to diabetes, 14% for myocardial infarction and 37% for microvascular complications.
Summary?

- Different messages; communication to patients differs
  - Reduction in A1C does occur according to meta-analysis
  - Periodontal therapy alone will not significantly reduce glycemic levels in patient
  - Fight against edentulous outcomes (Symptomatic vs. Asymptomatic)
  - Pre screen successes reported
  - More than a year / three month intervals
Integration with Diabetes

- Bissett et al.
  - A substantial body of evidence exists that links diabetes and periodontitis; it appears to have had a limited impact on the work of health professionals
  - The divisions that exist between the medical and dental professions negatively impact patient care
  - A potential need is discovered for professional collaboration to develop an oral health educational initiative that provide clear and effective advice to people with diabetes

Integrated Dental Medicine

Medical Role

- Oral examination
- Oral health education
- Appropriate referral for care
Oral Examination

• Caries identification
  ▫ Surface caries easily identifiable
  ▫ Incipient decay harder to identify but more important with preventive strategies

• Gum disease
  ▫ Gingivitis vs. periodontal disease
Caries/Cavities
Caries/Cavities
Periodontal Disease

- Rather than a single disease entity, periodontal disease is a combination of multiple disease processes that share a common clinical manifestation.
- The etiology includes both local and systemic factors.
- The disease consists of a chronic inflammation associated with loss of alveolar bone.
- Advanced disease features include pus and exudates [infection – more difficult to anesthetize].

Periodontal Disease
Diabetes and Severe Tooth Pain

• Patients less likely to eat full meal or eat at all with oral pain
• However, patients will take regular dosage of insulin, metformin, etc…
• Hypoglycemia is the most common diabetic emergency in dental offices
  ▪ Seen with some regularity in large dental, especially clinics with emergency schedules

Diabetes and Severe Tooth Pain
New hypothesis being examined

- Chronic severe oral pain may effect A1Cs / Daily BG
  - Lack of appropriate diet with same medicinal management
- Possible increase risk with cardiovascular issues
  - Patients with A1Cs lower than 6% have increased cardiovascular issues/events
- Dietary changes may occur: a diet in higher saturated fat and “bad calories” (convenience food)

Dental Role
Periodontal disease as a predictor

- Conflicting data; HOWEVER,
- Studies have demonstrated that it is an early complication of diabetes
- Pre-existing periodontitis predicts poor cardiovascular and renal outcomes


Dental-Medical Screening

- 70% of US adults see a dentist at least once a year (CDC)
- Individuals tend to seek routine and preventive oral care more frequently than routine and preventive medical care

Dental-Medical Screening

• Analysis of the NHANES revealed that an algorithm using simple periodontal measures, available only in dental settings, and risk factors known by patients may offer an unrealized opportunity to identify undiagnosed individuals.

• Finding supported by two other retrospective studies.


1. At least one of the following self-reported risk factors
   - Family history of diabetes
   - Hypertension
   - High cholesterol
   - Overweight/Obesity

2. Continue to receive a periodontal examination
   - Simple algorithm composed of two dental parameters
     - Number of missing teeth
     - Percentage of deep periodontal pockets
   - Optimal cut-offs of ≥26% deep pockets and ≥4 missing teeth

3. A point of care HbA1C test
   - Fasting – at second appointment
   - The addition of a fingerstick HbA1C with 2 dental parameters are of significant merit (73% to 92% increase in sensitivity)

Feasibility of Screening for Diabetes in Dental Practices

• Genco et al. found that screening for diabetes is feasible in the dental office.
• Of the 1022 patients screened, 416 (40.7%) had significantly elevated HBA1C.
  ▫ Of those that went for a diagnosis visit to the physician, 35.6 had diabetes or pre-diabetes (only HBA1C was screened, no oral health markers were included)
  ▫ Only approximately 35% went to the follow up visit [more likely if patient seen in a community health center]
Patients Desire for Screening

Barasch et al. show that 84% of dental practitioners and 83% of patients felt that blood glucose testing was a good idea.

- Study included BG testing with finger stick blood testing to screen 498 patients.

Integrated Model

• Cost Effective
  ▫ Jeffcoat et al. found that $10,672 was spent for medical care for patients with diabetes who did not have periodontal treatment.
  ▫ Revealed an average reduction of approx. $2,500 (23%) in cost per year of those with periodontal treatment
  • Dental care estimated cost of standard fees (CSC)
    • $463.00
Cardiovascular Disease
ASVD and Periodontal Disease

- A link between oral health and cardiovascular disease has been proposed for the greater part of the last century.
- Recently, concern about possible links between periodontal disease (PD) and atherosclerotic vascular disease (ASVD) has intensified
  - This is driving an active field of investigation into possible association and causality.
ASVD and Periodontal Disease

- Both processes share several common risk factors, including cigarette smoking, age, and diabetes mellitus.
- Patients and providers are increasingly presented with claims that PD treatment strategies offer ASVD protection; these claims are often endorsed by professional and industrial stakeholders.
Available data indicate a general trend toward a periodontal treatment–induced suppression of systemic inflammation and improvement of noninvasive markers of ASVD and endothelial function.

HOWEVER, The effects of PD therapy on specific inflammatory markers are not consistent across studies, and their sustainability over time has not been established convincingly.
HOWEVER, This review highlights significant gaps in our scientific understanding of the interaction of oral health and ASVD.

HOWEVER, Identification of clinically relevant aspects of their association or therapeutic strategies that might improve the recognition or therapy of ASVD in patients with PD would require further study in well-designed controlled interventional studies.
Oral Health and Stroke
Periodontal Disease and Stroke

• In a combined analysis of two prospective studies, periodontal disease was found to increase the risk of incident stroke nearly three fold.

• Proposed mechanisms include inflammation mediated pro-coagulant state, atherosclerosis mediated by direct microbial invasion of blood vessel wall, and interaction with recognized vascular risk factors.

Oral Health and Stroke

- Regular dental examinations allow for early detection and treatment of oral conditions associated with the risk of further vascular events.
- Loss of teeth or masticatory function is associated with poor compliance of home health care in stroke patients.
- Less than half of stroke survivors in the United States received dental care, leaving substantial room for improvement.
- Stroke survivors need education about the importance of regular dental care, particularly minority groups.

The Dental Intervention Model for Stroke Prevention

- A true controlled dental intervention study for stroke prevention is not available.
-Currently in the early stages of research and development.
- A handful of studies reveal:
  - Women may have better benefit than men.¹
  - Quality of life can be maintained if poor oral health is reduced through better daily oral hygiene practices, education, and professional maintenance.²
  - The effects of healthy teeth in the prevention of stroke and cardiovascular disease appear to be quite compelling.³

Behavioral Health
Depression and Oral Health

- Depression, loss of teeth, and dentures
- Three major sources that significantly influence patient responses to tooth loss and subsequent dentures exist.
  - Parental/spousal influences,
  - The symbolic significances of teeth
  - Current life circumstances.

Dementia and Oral Health

- The Leisure World Cohort Study
  - Men with inadequate natural masticatory function had a 91% greater risk of dementia than those with adequate natural masticatory function (≥10 upper teeth and ≥6 lower teeth).
  - This risk was also greater in women but not significantly so.
  - Dentate individuals who reported not brushing their teeth daily had a 22% to 65% greater risk of dementia than those who brushed three times daily.

Medical Referral to Dental
Evaluating the Medical Referral Process

- Quality Study to evaluate pilot program of medical referrals into dental program
  - Urgent Need Appointments
- Analysis of all referrals until 50 (n=50) referrals were completed
Evaluation of Medical Referral Process

- Completed referrals by 12 physician teams (n=50)
  - Referrals most likely completed by nursing staff and occasionally by front office
  - 2 physicians completing referral forms sent to CSCDM – 0% no show rate on these referrals
    - Add’l information – form completed in the presence of patient
Evaluation of Medical Referral Process

- Questionnaire to patients consisting of a series of care related questions
- Completed by all 50 subjects
Patient Questionnaire

• Have you been to the ER in the last year for the same oral/tooth issue that brought you here today?
  ▫ YES: 48.0%
  ▫ NO: 52.0%
Patient Questionnaire

- When was the last time you saw a dentist/hygienist for a cleaning and examination?
  - Less than six months: 26.0%
  - Within last year: 14.0%
  - Within last two years: 12.0%
  - Two to four years: 14.0%
  - More than four years: 34.0%
Patient Questionnaire

- Why did you not complete that care or continue with the dentist?
  - Did not like dentist / office 29.8%
  - Cost of care 23.4%
  - Did not take insurance 12.8%
  - Transportation 8.5%
  - Lost dental insurance 6.4%
  - Confused by explanation of care 4.2%
  - Pain went away 4.2%
  - Family obligations 2.1%

[8.5% stated that could not recall]
Patient Questionnaire

• Rate the importance of your overall oral health
  ▫ 8.54 out of 10 (±2.13)
Patient Questionnaire (Likert)

- 8 questions used the Likert scale to determine agreement with statement
  - 1- Strongly agree
  - 2- Agree
  - 3- Neither agree or disagree
  - 4- Disagree
  - 5- Strongly disagree
Patient Questionnaire (Likert)

- I found it unusual that my doctor/physician referred me directly to a dentist for care.
  - $1.16 \pm 1.69$ (Strongly Agree)
- My teeth have a very important impact on my overall health.
  - $1.82 \pm 1.02$ (Agree)
- It is absolutely necessary for the dentist to have knowledge of my own personal medical history or doctor treatment.
  - $1.74 \pm 0.99$ (Agree)
Patient Questionnaire (Likert)

- Because the dentist only treats the teeth, it really is not necessary for him/her to know all of the medicine I take.
  - 3.02 ±1.62 (Neither)
- The dentist does not really need to know my entire medical history because I am being seen for an emergency/urgent care appointment.
  - 3.50 ±1.13 (Neither -to- Disagree)
- I feel it is very important for my doctor to talk with my dentist to help coordinate my complete health care.
  - 1.56 ±0.77 (Agree -to- Strongly Agree)
Patient Questionnaire (Likert)

- I prefer and enjoyed this process of my dentist and doctor/physician talking to each other during my appointments with them both.
  - 1.70 ±0.76 (Agree)
- I do not feel comfortable talking with the dentist about my medical history.
  - 4.02 ±0.98 (Disagree)
Comparing Medical History

- Comparisons between the Medical History provided by a physician completed H and P and patient’s self report to dental office (n=24)
  - H and P included $1.15 \pm 0.37$ more diagnoses than the patient’s dental self report
  - Missing:
    - Smoking (7)
    - Substance abuse (3)
    - Arthritis (3)
    - Diabetes (3)
    - Joint replacement; MI; stomach ulcer (2)
    - Asthma; nervous disorder; pulmonary hypertension (1)
Comparing Medications

• Comparisons between the medication list provided by the physician and patient’s self report to dental office (n=25)

  ▫ Physician’s medication list contained 3.13 ±2.91 more medications than the patient’s self report

  ▫ Missing
    • Hydrocodone / APAP (10)
    • Aspirin (7)
    • Ibuprofen (4)
    • Tobacco cessation [patch/gum] (4)
    • Metformin (3)
    • Albuterol; lisinopril; omeprazole; warfarin; xanax (2)
    • Flonase; claritin; metoprolol; valium; plavix (1)
Physician RX for oral treatment

- Significant variation

- 14 different RX found with 12 physicians
Physician RX for oral treatment

- **MOST COMMONLY SEEN**
  - None: (44.0%)
  - Amox (500) TID 7 days; Ibuprofen (800); Vicodin (7.5) (16%)
  - Amox Suspension (125mg/5mL) (10.0%)
  - Penicillin VK (500) TID 5 days; Ibuprofen (800) (10.0%)
Physician RX for oral treatment

- **Categorical Breakdown (n=28)**
  - **Antibiotic (100%)**
    - Amoxicillin (60.7%)
    - Penicillin VK (17.9%)
    - Augmentin (10.7%)
    - Clindamycin (10.7%)
  - **Pain Management (75%)**
    - Vicodin (39.3%)
    - Ibuprofen (32.1%)
    - Tramadol (3.6%)
Physician description of oral issue

- Abscess of tooth or teeth: 36.0%
- Large cavities or cavity: 26.0%
- In need of dental exam: 12.0%
- Broken tooth: 6.0%
- Large cavity with pain: 4.0%
- A1C >9: 4.0%
- 6 other descriptors: 12.0%
Evaluating possible variables with No-Shows

- Age of No-Show patients: 22.6 [vs. 39.3]
- Sex of no shows (males vs. females)
- Physician vs. Nurse vs. Front Office
  - Patient with copy of referral in hand
- No difference with time to appt
  - Mean for both groups at 3-5 days
- Description of oral health issue
  - “Dental home needed” descriptor less likely to keep appointment as opposed to “abscess/infection or oral pain”
- RX treatment not impactful
- Referral Source???
Questions???