

# IMPROVING SYSTEMIC OUTCOMES WITH ORAL HEALTH INTERVENTION

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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
  - Systemic treatment with dental care

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## Levels of Integration

- Low (basic/simple)
- Moderate
- High
- Creative

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safety net  
SOLUTIONS



# Target Populations

- Based on Population Health
- Assess the most at risk populations with individual practices and start by focusing on those patients
- Reach a level of success with those individual populations and move onto the next

# Initial Primary Pediatric Care



# Pediatric Primary Care – Caries Disease

- CDC: One in five children have untreated decay
- Pew: 29 million children enrolled in Medicaid: only 12.9 million received dental care
- Cavities are the 4<sup>th</sup> most expensive disease in the U.S.
- Poor children had one half the number of dental visits compared with higher income children
  - Limited access to dental: higher encounter rates with medical
- “Despite acknowledgement of this problem by dental health providers little has changed to improve these statistics.”\*\*
- Pediatricians may be able to improve oral health outcomes.

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**\*\*Mattheus and Mattheus (2014); CDC (2010); Truman et al. (2002); USDHHS (2000); PEW (2011)**

# Fluoride application at Child Well Visits

- Children with 4 or more treatments had 15.5 dmfs (95%CI 10.8–20.4) versus children with no fluoride varnish treatments who had 23.6 dmfs (95%CI 19.5–25.8) for a **35% decrease in overall caries.**
- Fluoride varnish applied at well child care visits can reduce early childhood caries.

# Barriers to Universality

- Pediatricians will require adequate training in oral health in medical school, residency and CE courses.
- Pediatricians will require current information and guidelines on preventive dental care.
  - Lewis et al. reports that very little is available to guide pediatricians in oral health promotion that goes beyond cursory oral health advice that is limited to fluoride and dental referral
- Pediatricians must be ensured that all of their patients, Medicaid and uninsured included, can receive timely preventive and restorative dental care.
- Pediatricians will require sufficient resources to successfully assume greater involvement in oral health related activities. Time pressures and inadequate staffing as well as low reimbursement will make it difficult for pediatricians to devote attention to oral health.



# Diabetes and Salivary Flow Rate

- Early studies first looked at role of diabetes with dry mouth
- 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 Measures

	<b>Diabetes Subjects</b>	<b>Control Subjects</b>	
<b>Resting Salivary Flow Rate (ml/min)</b>	<b><math>0.22 \pm 0.014</math></b>	<b><math>0.28 \pm 0.016</math></b>	<b>p = 0.045</b>
<b>Resting Salivary Flow Rate &lt; 0.01ml/min</b>	<b>11.8%</b>	<b>2.7%</b>	<b>p = 0.0005</b>
<b>Stimulated Salivary Flow Rate (ml/min)</b>	<b><math>0.89 \pm 0.047</math></b>	<b><math>1.02 \pm 0.054</math></b>	<b>p = 0.071</b>
<b>Stimulated Salivary Flow Rate &lt; 0.10 ml/min</b>	<b>12.4%</b>	<b>5.5%</b>	<b>p = 0.019</b>

# Summary:

## Salivary Flow Rate and Diabetes

- **Hyposalivation and xerostomia were significant oral complications.**
- **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!**

# 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

- 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 HbA<sub>1c</sub> 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.

# Question of Linkage from Medicine

- Engebretson et al. (2013)
  - At 6 months, mean HbA<sub>1c</sub> 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<sub>1c</sub>.

# 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.

# 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)

# 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)
  - More than a year / three month intervals

# 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

- 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  $\geq 26\%$  deep pockets and  $\geq 4$  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.

# Cardiovascular Disease



# Lockhart et al.

American Heart Association, April 18, 2012.

- 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.

## Lockhart et al. (AHA)

- **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.

# Cardiovascular Disease

- Where are we looking now?
  - Association between number of missing teeth and cardiovascular disease
- “The knowledge gaps included limited understanding of the relationship of the number of missing teeth and cardiovascular disease.”

# Association with cardiovascular disease and missing teeth

- Biological mechanisms proposed for an association of the number of missing teeth and cardiovascular disease include:
  - (1) Inflammation,
    - Chronic oral infection contributes to systemic inflammation and increases in the plasma concentration of acute-phase proteins, inflammatory cytokines and coagulation factors which increase the potential for cardiovascular disease (persists long after tooth extraction)
  - (2) Infection,
    - Bacterial end products enter the blood stream and result in transient bacteremias
  - (3) Diet and nutrition
    - Based on the dysfunctional masticatory system and on the ability to obtain proper nutrition from the diet

# Connection of CVD and Missing Teeth

- Limited large quantity studies, so
- New study: 275,424 subjects
- Older adults with 1 to 5 missing teeth and greater than 6 missing teeth, but not all teeth missing, were more likely to report presence of cardiovascular disease as compared with older adults who had no missing teeth.
- Observed that adults who visited the dentist were less likely to report cardiovascular disease compared to those who did not visit dentists in the past year.

# Blood Pressure Evaluation (Detecting HTN)

- Dental care is usually the only public health profession/organization to which healthy people consistently come for regular check ups.
- Thus, the dental service might be one of the most suitable health care entities for systematic opportunistic screening of healthy subjects.
- Engstrom et al. found that dental based blood pressure screening was efficient, effective for detecting previously unknown hypertension, and that one out of every 18 subjects screened had confirmed hypertension.

# Referral Guidelines for Dentists

Diastolic Pressure	Systolic Pressure		
	100 -130	131 - 189	≥ 190
≤ 90	No Action	Advise Patient of Need for Correction (Refer for Primary Care evaluation)	Immediate Action
91 – 109	Advise Patient of Need for Correction (Refer for Primary Care evaluation)	Advise Patient of Need for Correction(Refer for Primary Care evaluation)	Immediate Action
≥110	Immediate Action	Immediate Action	Immediate Action

# Oral Health and Stroke



# Periodontal Disease and Stroke

- Post hoc analysis of prospective longitudinal studies and smaller case control studies have reported the association between periodontal disease and stroke
- Early studies demonstrated that periodontal disease appears to bear a stronger association with stroke than with coronary artery disease.

# 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.

# Periodontal Disease and Stroke

- Several studies have also reported a major positive association between periodontal disease and ischemic stroke, in stroke free patient populations.
- A new study completed at the Univ. of South Carolina also found periodontal disease is independently associated with recurrent vascular events in stroke/TIA patients and aortic arch thickness

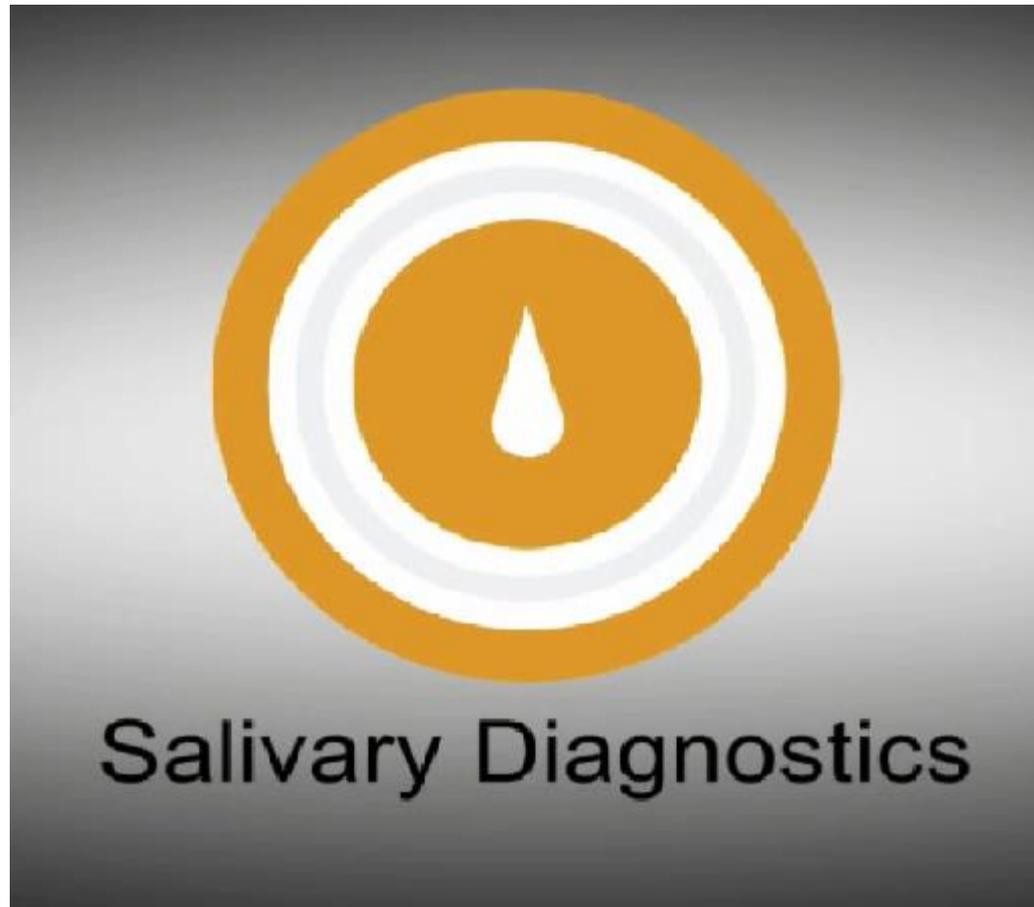
# Oral Health and Stroke

- 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.
  - Quality of life can be maintained if poor oral health is reduced through better daily oral hygiene practices, education, and professional maintenance.
  - The effects of healthy teeth in the prevention of stroke and cardiovascular disease appear to be quite compelling.

# The Future: Salivary Diagnostics



Salivary Diagnostics

# Salivary Diagnostics

- The use of salivary diagnostics continues to develop and advance the field of risk determination and treatment options
- Advancing to include genetic, microbial and protein biomarkers to translate to clinical care:
  - Screening
  - Monitoring
  - Treatment planning

# Saliva

- The mechanism of the saliva to blood / blood to saliva entry is by transcellular, passive intracellular diffusion and active transport, or paracellular routes by extracellular ultrafiltration within the salivary glands or through the gingival crevice
- Saliva is a complex fluid containing
  - A library of hormones
  - Proteins
  - Enzymes
  - Antibodies
  - Cytokines
  - Antimicrobial constituents
  - Serum and blood derivatives
  - Bacteria and bacterial by products
  - Bronchial and nasal secretions

# Salivary Diagnostics

- New technologies have discovered valuable salivary biomarkers for different disease conditions.
- Several companies are using these biomarkers in the diagnosis of disease processes
  - Diagnos-Techs (Several Saliva based tests)
  - OraIDNA (HPV; Drug DNA Profile; PerioID and PerioPath)
  - Genova Diagnostics (Adrenal Stress Test Plus)
  - Great Smokies Diagnostic Lab (Saliva Hormone Testing)

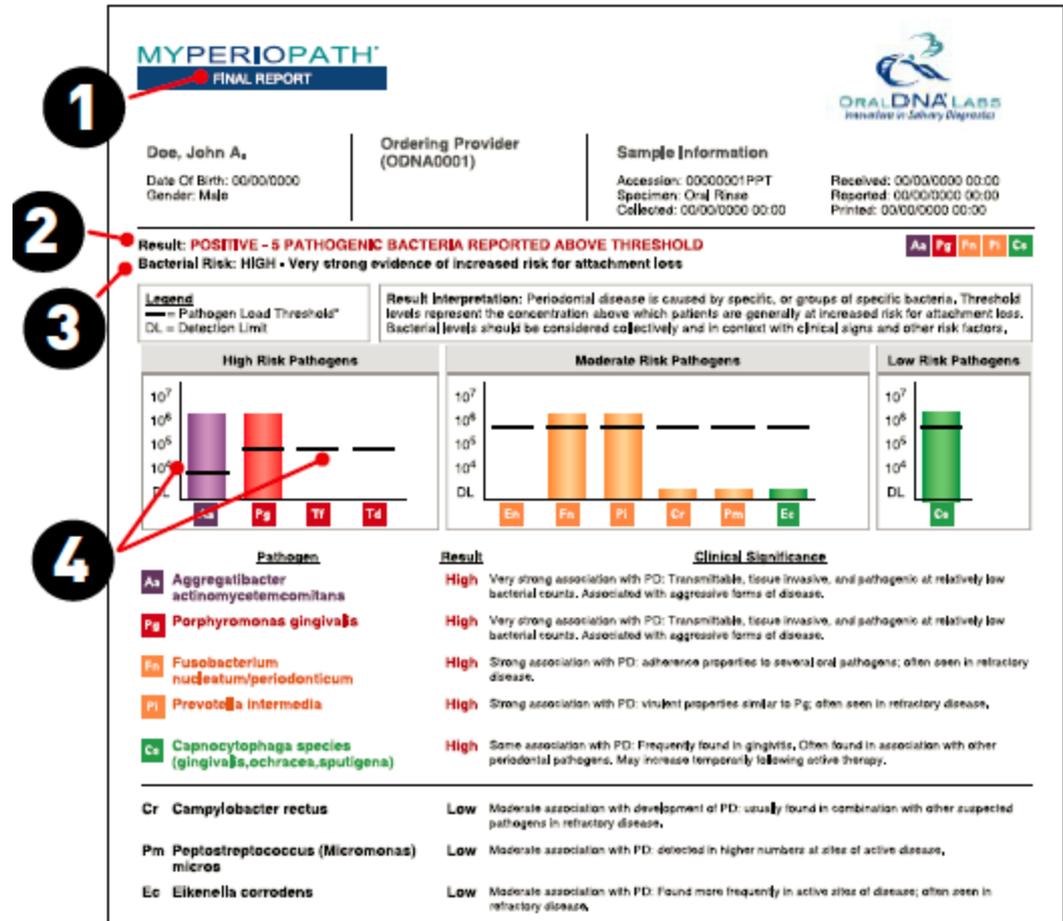
Diseases	Biomarkers
Autoimmune diseases Sjogren's syndrome Multiple sclerosis Sarcoidosis	Lactoferrin, beta 2 microglobulin, lysozyme C, cystatin C, salivary amylase, and carbonic anhydrase IgA production Alpha-amylase and kallikrein
Cardiovascular markers	Cardiac toponins, C reactive protein, myoglobin, myeloperoxidase, ICAM-1; CD 40; and salivary lysozyme
Dental caries and periodontal disease	Streptococcus mutans and lactobacilli count; aspartate aminotransferase, alkaline phosphatase; uric acid, albumin; pIgR, Arp 3; CA VI, IL-1Ra, PIS-2, LEI, and IGJ
Diseases of adrenal cortex	Salivary cortisol
Forensic evidence	DNA
Cystic Fibrosis	Cathepsin D, sodium, potassium, chloride, calcium, magnesium and lactate dehydrogenase
Ectodermal dysplasia	Inorganic constituents, total protein
Malignancy	Inc RNA; miRNA, CCNi, EGFR, FGF19; FRS2; and GREB1; AGPAT1, B2M; BASP2; IER3; and IL1B, p53; CA15-3 and approximately 20 other markers
Renal Disease	Cortisol, nitrite, uric acid, sodium chloride, pH, alpha-amylase, and lactoferrin. Salivary phosphate serum creatinine.
Human Papilloma Virus	HPV assays: tests available now specific to HPV 16 and HPV 18

# Testing Process

- Usually involves a lab specific test kit with all materials and supplies needed to complete the salivary test
- Very simple procedure:
  - Patient swishes a saline solution for 30 seconds
  - Patient expectorates into funneled collection tube
  - Funnel is removed, cap is secured to top of collection tube
  - Samples are sent via pre-paid FedEx/UPS envelope to Labs for analysis
  - E-mail notification is sent to clinician when electronic result report is available

# Salivary Diagnostic Reports

- ORALDNA
  - PerioPath



# Salivary Diagnostic Reports

- OralDNA
  - HPV Risk Analysis

FINAL REPORT



Doe, Jane P.  
Date Of Birth: 01/01/1988  
Gender: Female

Ordering Provider

Sample Information

Accession: 8008531  
Specimen: Oral Rinse  
Collected: 11/28/2009 19:39

Received: 11/30/2009 19:39  
Reported: 12/01/2009 21:12  
Printed: 12/01/2009 21:12

**Result: POSITIVE - HIGH RISK HPV IDENTIFIED**

**16 18**

HPV Type(s) Identified	Patient Risk
Mixed Types	High

Type	Clinical Significance
16	This HPV Type is classified as being of <b>high</b> risk for the development of cancer.
18	This HPV Type is classified as being of <b>high</b> risk for the development of cancer.

Test Information	
Reason for test:	Presence of Lesion
Lesion Size:	40mm x 50mm
Lesion Color:	Red
Lesion Location:	Soft Palate
Additional Clinical	

# Salivary Diagnostic Reports

- ORALDNA
  - MyPerioID Test

## FINAL REPORT



### Patient3, 3 (Id: 333333)

Date Of Birth: 05/06/1965  
Gender: Female  
Reason for Testing: Patient with signs and symptoms of periodontal disease

### Ordering Provider

### Sample Information

Accession: 33333333  
Specimen: Oral Rinse  
Collected: 04/29/2013 11:13

Received: 04/30/2013 11:13  
Reported: 05/01/2013 22:30  
Printed: 05/03/2013 13:28

### Periodontal Inflammation Risk

**HIGH**

### Results:

MyPerioID Genotype **G**/**G**

### Interpretation:

This individual's interleukin 6 genotype (IL6) is G/G. This MyPerioID result indicates your patient has a high risk for periodontal inflammation due to the genetic variation examined in this test.

### Comments:

- **Significance:** The prevalence of the G/G genotype is reported to be higher in individuals with moderate to severe chronic periodontitis and aggressive periodontitis than in individuals with no

# References

- Albert et al. (2006); An examination of periodontal treatment and per member per month medical costs in an insured population. *BMC Health Services Research* 6:103-113.
- American Academy of Pediatrics (AAP), Medical Home Initiatives for Children With Special Needs Project Advisory Committee. (2002) The medical home. *Pediatrics*. 110:184–186.
- Anhang et al. (2004); HPV communications. Review of existing research and recommendations for patient education. *Cancer Journal for Clinicians* 54:248-259.
- Barasch A, et al. (2012) Random blood glucose testing in dental practice: a community based feasibility study from glucose testing in dental practice: a community based feasibility study from the Dental Practice-Based Research Network. *J Am Dent Assoc*. 143:262-269.
- Bassett, KB et al. (2014). *Local anesthesia for dental professionals*. Prentice Hall, 2014.
- Beck JD, Offenbacher S. (2005) Systemic effects of periodontitis: epidemiology of periodontal disease and cardiovascular disease. *J Periodontol* 76:2089-2100.
- Bernal-Pacheco O, Román GC. (2007) Environmental vascular risk factors: new perspectives for stroke prevention. *J Neurol Sci*. Nov 15;262(1-2):60-70. Epub 2007 Jul 25.
- Borrell LN, et al. (2007) Diabetes in the dental office: using NHANES III to estimate the probability of undiagnosed disease. *J Periodontal Res* 22:559-565.
- Brown TT, et al. (2011) The effect of dental care on cardiovascular disease outcomes: an application of instrumental variables in the presence of heterogeneity and self-selection. *Health Econ* 20(10):1241-56.
- Calayco DC et al. (2011) A1C and cardiovascular outcomes in type 2 diabetes. *Diabetes Care* 34:177-183.
- CDC (2010); National Center for Health Statistics, Oral and Dental Health. <http://www.cdc.gov/nchs/fastats/dental.htm>
- Chan HH et al. (2012); Salivary proteins associated with periodontitis in patients with type 2 diabetes mellitus. *International Journal of Molecular Sciences* 13:4652-4654.
- Cleveland et al. (2011); The connection between human papillomavirus and oropharyngeal squamous cell carcinomas in the United States. *JADA* 142:915-924.

# References

- Darre L et al. (2008) Efficacy of periodontal treatment on glycemic control in diabetic patients: a meta-analysis of interventional studies. *Diabetes Metab.* 34:497-506.
- D'Souza et al. (2007); Case control study of HPV and oropharyngeal cancer. *New England Journal of Medicine* 356: 1944-1956.
- Engebretson et al. (2013) The effect of nonsurgical periodontal therapy on HA1C levels in persons with type 2 Diabetes and chronic periodontitis. *JAMA* 310:2523-2532.
- Engstrom et al. Efficacy of screening for high blood pressure in dental health care. *BMC Public Health* 2011; 11:194-201.
- Genco RJ et al. (2014) Screening for diabetes mellitus in dental practices: a field trial. *J Amer Dent Assoc.* 145:57-64.
- Glick M, Greenberg BL. The potential role of dentists in identifying patients' risk of experiencing coronary heart disease events. *J Am Dent Assoc.* 2005; 136:1541-1546.
- Gordon et al (2011). Viral infections of the mouth. *Medscape Reference.* <http://emedicine.medscape.com/article/1079920-overview#showall>. Accessed 06/17/2014.
- Grau AJ et al. (2010) Common infections and risk of stroke. *Nat Rev Neurol* 6:681-694.
- Grossi SG. (1997) Treatment of Periodontal Disease in Diabetics Reduces Glycated Hemoglobin. *J Periodontol* 68:713-719.
- Haas DA. (2006); Management of medical emergencies in the dental office: conditions in each country, the extent of treatment by the dentist. *Anesth Prog* 2006; 53:20-24.
- Herrero et al. (2003); Human papillomavirus and oral cancer. The International Agency for Research on Cancer Multicenter Study. *Journal of the National cancer Institute.* 95:1772-1783.
- Holve, S. (2008). An observational study of the association of fluoride varnish applied during well child visits and the prevention of early childhood caries in American Indian children. *Maternal and child health journal*, 12, 64-67.
- Janket et al. (2003) Meta analysis of periodontal disease and risk of coronary heart disease and stroke. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003; 95:559-569.
- Janket et al. (2005) Does periodontal treatment improve glycemic control in diabetic patients: a meta analysis. *JDR* 84:1154-1159.

# References

- Jeffcoat et al. (2012); Periodontal therapy reduces hospitalizations and medical costs in diabetics. Abstract: Am Assoc of Dental Research; March 23, 2012.
- Joshipura et al. (1996). The impact of edentulousness on food and nutrient intake. J Am Dent Assoc. 1996; 127:459-467.
- Krol (2004); Educating pediatricians on children's oral health: past, present, and future. Pediatrics 113:487-492.
- Lee JM et al. Salivary diagnostics. Orthodontics and Craniofacial Research 2009; 12:206-211.
- Lewis C et al. (2000); The role of the pediatrician in the oral health of children: a national survey. Pediatrics 106:1-7
- Lewis C et al. (2005) Unmet Dental Care Needs Among Children With Special Health Care Needs: Implications for the Medical Home. Pediatrics 116:e426-e431.
- Li S, et al. (2011) Development of clinical guideline to predict undiagnosed diabetes in dental patients. J Am Dent Assoc. 142:28-37.
- Lockhart, P. B., Bolger, A. F., Papapanou, P. N., Osinbowale, O., Trevisan, M., Levison, M. E., ... & Baddour, L. M. (2012). Periodontal disease and atherosclerotic vascular disease: does the evidence support an independent association? A scientific statement from the American Heart Association. *Circulation*, 125(20), 2520-2544.
- Mattheus and Mattheus (2014); Saving one smile at a time: oral health promotion in pediatric primary care practice. Open Journal of Nursing. 4:402-408.
- Maxwell et al. (2010). Tobacco use in human papillomavirus-positive advanced oropharynx cancer patients related to increased risk of distant metastases and tumor recurrence. Clin Cancer Res 16:1226-1235.
- Malamed, S. F. (2004). *Handbook of local anesthesia*. Elsevier Health Sciences.
- Malathi et al. Salivary diagnostics: a brief review. ISRN Dentistry 2014; OPEN ID# 158786 (8 pages).
- Mealey BL. (2010) Diabetic emergencies in the dental office. Armenian Medical Network. <http://www.health.am/db/diabetic-emergencies/>
- Moore PA, et al (2001). Type 1 diabetes mellitus, xerostomia, and salivary flow. Oral Surg, Oral Med, Oral Pathol, Oral Radio, Endod. 92:281-91.

# References

- Moore PA. (2002) The diabetes-oral health connection. *Compendium* 23:14-20.
- Paz et al (1997). Human papillomavirus (HPV) in head and neck cancer: an association of HPV 16 with squamous cell carcinoma of Waldeyer's tonsillar ring. *Cancer* 79:595-604.
- PEW Center on States (2011); *The State of Children's Dental health: Making Coverage Matter*. The PEW Charitable Trust.
- Pfaffe T et al. Diagnostic potential of saliva: current state and future applications. *Clinical Chemistry* 2011; 57:675-687.
- Qvarnstrom M et al (2008); Salivary lysozyme and prevalent hypertension. *J of Dental Research* 87:5:480484.
- Sanossian N, et al. (2011) Subpar utilization of dental care among Americans with a history of stroke. *J Stroke Cerebrovasc Disease*. May-Jun;20(3):255-9. Epub 2010 Jul 24.
- Scannapieco et al. (2003). Associations between periodontal disease and risk for atherosclerosis, cardiovascular disease, and stroke. A systematic review. *Ann Periodontol*. 8:38-53.
- Sen S, Sumner R, Hardin J, et al. Periodontal disease and recurrent vascular events in stroke/transient ischemic attack patients. *Journal of Stroke and Cerebrovascular Diseases* 2013; 22:1420-1427.
- Seremi A, et al. (2005) Periodontal disease and mortality in type 2 diabetes. *Diabetes Care*. 28:27-32.
- Shultis WA, et al. (2007) Effect of periodontitis on overt nephropathy and end-stage renal disease in type 2 diabetes. *Diabetes Care*. 30:306-11.
- Sim SJ et al. (2008) Periodontitis and the risk for non fatal stroke in Korean adults. *J Periodontol*79:1652-1658.
- Simpson et al. (2010) Treatment of periodontal disease for glycemic control in people with diabetes. *Cochrane Database Syst Rev*;5:CD004714
- Starfield B, Shi L. (2004) The medical home, access to care, and insurance: a review of evidence. *Pediatrics*. 113(suppl):1493-1498.
- Stauss SM, et al. (2010) The dental office visit as a potential opportunity for diabetes screening: an analysis using NHANES 2003-2004 data. *J Public Health Dent* 70:156-162.

# References

- Stewart JE, et al. (2001) The effect of periodontal treatment on glycemic control in patients with type 2 diabetes mellitus. *J Clin Periodont.* 28:306-10.
- Stratton et al. (2000) Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *BMJ* 321:405–12.
- Taylor GW et al. (2008) Periodontal disease: associations with diabetes, glycemic control and complications. *Oral Dis.* 14:191-203.
- Tran P and Mannen J. (2009) Improving oral healthcare: improving the quality of life for patients after a stroke. *Spec Care Dentist.* Sep-Oct;29(5):218-21.
- Truman et al. (2002); Task force on community preventive services. Reviews of evidence on intervention to prevent dental caries, oral and pharyngeal cancers and sports related craniofacial injuries. *Am Journal of Preventative Medicine* 23:21-54.
- United Concordia Wellness Oral Health Study (2012); <http://directbenefits.com/PDFs%20-%20Tools/United%20Concordia%20Dental%20Wellness%20Study.pdf>
- United Healthcare and Optum. Medical Dental Integration Study, March 2013. [http://www.uhc.com/live/uhc\\_com/Assets/Documents/B2H\\_Study.pdf](http://www.uhc.com/live/uhc_com/Assets/Documents/B2H_Study.pdf)
- US Department of Health and Human Services [USDHHS] (2000); Oral Health in America: a report of the surgeon general. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health. <http://www.surgeongeneral.gov/library/reports/oralhealth/index.html>
- Watson et al. (2008); Using population based cancer registry data to assess the burden of human papillomavirus associated cancers in the United States. *Cancer* 113(10 suppl.):2841-2854.
- Wiener, R. C., & Sambamoorthi, U. (2014). Cross-Sectional Association between the Number of Missing Teeth and Cardiovascular Disease among Adults Aged 50 or Older: International Journal of Vascular Medicine. *BRFSS.*

Questions???