Caring for Patients with Cardiovascular Disease
Collaborating with Nursing for Improved Health Outcomes

Learning Outcomes
Upon completion of this course, the dental professional will be able to:

1. Understand the scope of the relationship between oral health and cardiovascular disease, focusing on both traditional and non-traditional risk factors such as inflammation, Vitamin D and sleep apnea
2. Identify patients who need prophylactic antibiotics prior to dental procedures as outlined in the American Heart Association guidelines
3. Understand how to manage and educate dental patients on antiplatelet and anticoagulant medications
4. Identify opportunities and strategies to educate patients about cardiovascular risk reduction when discussing oral health

Scope of the Problem
Cardiovascular disease (CVD) takes an enormous toll on the American public and our healthcare system. There are 15.4 million individuals in the United States who currently have CVD, and this is expected to increase from the current rate of 6.4% to close to 18% by 2030. Concurrently, the projected total costs of CVD will double to reach over one trillion dollars. Cardiovascular disease is the leading cause of death in the United States, with one cardiovascular death occurring every 40 seconds.1 (See Table 1) Most individuals with CVD are on multiple medications that can cause oral related side effects such as xerostomia, or impact dental procedures. Best practice for comprehensive care requires that the dental professional be aware of each patient’s medications and any contraindications for care.

Even more prevalent in our society is the presence of periodontal disease (PD). 47.2% of American adults thirty years and older have periodontal disease, and 64% of adults 65 years or older have moderate to severe periodontal disease.2,3

Research at a more basic science level supports the relationship between PD and CVD. Analysis of thrombus specimens extracted from blood vessels revealed that 78.2% of these blood clots contained DNA of bacteria associated with an endodontic infection, while 34.7% contained periodontal pathogens, including whole bacteria.4 In the past few years, there has been more evidence demonstrating that there could be a link between PD and endothelial inflammation, which is known to contribute to CVD. One controlled study showed that intensive treatment of periodontitis resulted in an improvement in endothelial function at six months post intervention.5 However, the actual causal link between PD and CVD is not as clear. Cohort and case-control studies have shown that PD is associated with atherosclerosis and an increased risk of cardiovascular events such as myocardial infarction and stroke.6 It is well established that there is a bidirectional link between PD and diabetes, and diabetes is a well known risk factor for the development of CVD.7 The severity of PD correlates with the severity of CVD, however, this relationship may be confounded by shared risk factors.8

Based on the lack of evidence of a cause and effect connection, the American Heart Association (AHA) published a position paper in

---

Table 1. Cardiovascular Disease Definitions

- Cardiovascular diseases (CVD) are a group of disorders of the heart and blood vessels.
- Coronary artery disease (CAD) – disease of the blood vessels supplying the heart muscle, possibly leading to myocardial infarctions (MI)
- Cerebrovascular disease (CVD) - disease of the blood vessels supplying the brain leading to strokes or transient ischemic attacks (TIA)
- Peripheral arterial disease (PAD) – disease of blood vessels supplying the abdomen, arms and legs, leading to claudication and sometimes amputations
- Rheumatic heart disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria
- Congenital heart disease (CHD) - malformations of heart structure existing at birth
- Deep vein thrombosis (DVT) and pulmonary embolism (PE) – blood clots in the leg veins (DVT), which can dislodge and move to the heart and lungs (PE)
2012 which left the impression that optimally treating oral disease will not reduce a person's risk of systemic disease. The American Academy for Oral Systemic Health agrees that no direct cause and effect connection has been proven, however they “hold that the absence of proof of connection does not establish definitive proof of no connection.” Regardless of the position paper, we know that much work still needs to be done to address these risk factors and prevent the development of both CVD and PD.

Obstructive sleep apnea (OSA) is a disease where improvement is needed in both diagnosis and management. An estimated 39.4 million people, close to 90% of all who suffer from OSA, remain undiagnosed and therefore do not receive crucial treatment. The significant effects of OSA impact multiple body systems, including the cardiovascular system (see Figure 1). OSA is present in patients with a variety of CVD forms and is associated with a number of risk factors for developing CVD. Simple screening can occur with the 8-item STOP-BANG questionnaire which can identify patients at risk for OSA. A positive screen can trigger health care professionals to refer to a sleep specialist and/or for a sleep study. While Continuous Positive Airway Pressure therapy (CPAP) is the primary treatment option, smaller, less obtrusive oral devices may help those with mild to moderate OSA and can be fabricated by dental sleep medicine specialists after referral by a physician. These are often better tolerated, increasing the chance that the patient will use the device and therefore minimize some of the complications that develop due to OSA. The presence of a scalloped tongue or signs of clenching or grinding of teeth might be clues that OSA is present. Additional dental concerns of patients with OSA include xerostomia, bruxism, temporomandibular joint (TMJ) disorders, tooth hypersensitivity, and periodontitis.

Until we are more successful at prevention, we will continue to have millions of patients with CVD, PD and OSA who need dental and medical care. It is clear that the work to prevent disease and manage those who already have disease needs to occur across multiple disciplines. The information that follows documents the need for interdisciplinary collaboration between nursing and dental professionals in order to manage individuals with cardiovascular disease.

**Keys To Prevention**

*“An ounce of prevention is worth a pound of cure.”*  
~ Benjamin Franklin

There are three points of time where an intervention can prevent a disease from occurring or progressing (see Figure 2):

1. **Primordial prevention** includes the promotion of a combination of favorable health habits and conditions that protect against the development of any disease. This can and should be targeted at individuals at any age who have not yet developed risk factors. More evidence is showing that these interventions should begin during gestation and continue throughout adulthood to prevent risk factors from ever developing.

2. **Primary prevention** is intended to prevent the first event by detecting and treating risk factors in individuals who are healthy but at risk for developing disease.

3. **Secondary prevention** is targeted at individuals who already have disease but have additional risk factors that put them at risk for worsening disease.

Substantial progress in the primary and secondary prevention of CVD has occurred over the past 40 years. The majority of CVD is caused by risk factors that can be controlled, treated...
LifeLongLearning

or modified, such as high blood pressure, high cholesterol, overweight/obesity, tobacco use, physical inactivity and diabetes. The CVD risk factor which contributes most significantly to mortality is elevated blood pressure, followed by tobacco use, raised blood glucose, physical inactivity followed by overweight and obesity.16 PD, OSA and CVD have multiple common risk factors, including older age, tobacco use, obesity, lack of health awareness, low socioeconomic status, stress, and lack of access to health and dental services.17 Diabetes and low Vitamin D levels are shared risk factors for PD and CVD.18,19 The traditional markers of high cholesterol identify only about half of the individuals at risk for CVD. Additionally 50% of men and 64% of women who die suddenly of CVD have no previous symptoms of this disease, indicating there are other unidentified risk factors.16

New information about potential and actual CVD and PD risk factors is constantly emerging through research. Inflammation is a topic that has received a lot of time and energy, especially around atherosclerosis and the oral-systemic health link. Studies of healthy men and women have demonstrated that individuals with elevated high sensitivity C-Reactive Protein (CRP) levels have an increased risk of heart attack, diabetes and stroke.20 CRP is also noted to be high in individuals with PD.21 Lp-PLA2 (lipoprotein associated phospholipase A2) is another inflammatory marker, more specific to vascular inflammation, that when elevated strongly predicts heart disease and is also present with PD.22-24 Both CRP and Lp-PLA2 decrease when the PD is treated and under control. A low vitamin D level associated with obesity, hypertension and dyslipidemia has been identified as a risk factor for diabetes, PD, and CVD. Vitamin D has an anti-inflammatory as well as a potential antibiotic effect which can benefit patients. In a recent study presented at American College of Cardiology in March, 2014, 1,484 patients were evaluated to explore the relationship between vitamin D levels and coronary artery disease (CAD). Vitamin D deficiency (less than 20ng/mL) was observed in 70.4% of patients undergoing coronary angiography. A progressive increase in CAD was found as the vitamin D levels decreased.25 Radiopaque nodules in the carotid arteries, which can be predictive of heart attack or stroke, are sometimes identifiable on dental panoramic x-rays.26

Traditional risk factors are now more frequently identified and treated in those not yet ill and among those with established CVD, OSA and PD. It is important for health care professionals to be aware of the new risk factors that are being discovered through research. (See Table 2). Ideally, health care professionals across a variety of settings will begin to regularly focus on primordial prevention, before risk factors develop. An interprofessional, collaborative approach is the best strategy to begin to reduce and ultimately eliminate these diseases and expand the achievements of primary and secondary prevention. Since patients frequently visit the dental office more often than they visit their nurses or physicians, dental professionals need to understand the inherent challenges associated with patients who have CVD and OSA.14,15

Infective Endocarditis Prophylaxis
Antibiotics: Pre-medicate or Not?

Infective endocarditis (IE) is caused by bacteria that enter the bloodstream and settle in the heart lining, heart valve or a blood vessel. IE is a serious illness associated with significant morbidity and mortality. Some people with certain heart conditions are at greater risk of contracting IE. In the past, patients with nearly every type of congenital heart defect and certain types of valvular disease or repair required antibiotic premedication prior to certain invasive dental procedures. In 2007/2008, the American Heart Association (AHA) simplified the recommendations based on research

<table>
<thead>
<tr>
<th>Table 2. CVD Risk Factors and Goals for Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Factor</strong></td>
</tr>
<tr>
<td>Blood Pressure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
</tr>
<tr>
<td>Tobacco</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Inflammation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
demonstrating that IE was more likely to result from frequent exposure to random bacteremias resulting from activities of daily living than from bacteremia caused by a dental procedure.27 (See Table 3) Antibiotic prophylaxis may prevent only a small number of cases and the risk of antibiotic-associated adverse effects exceeds any potential benefit. The new recommendations stated that the goal is to maintain optimal oral health and hygiene, which is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE.

Many patients have taken prophylactic antibiotics for years and may not be aware of the changes in the recommendations, or they may be taking antibiotics for another condition (e.g. artificial joint with compromised immune system). Therefore, some individuals may be hesitant to change something that, in their opinion, has worked in the past. Encourage them to speak with their cardiologist about the rationale and the evidence supporting the change in the guidelines. The American Dental Association (ADA) website also has information on antibiotic premedication in lay language on their web site at: www.mouthhealthy.org/en/az-topics/p/ Premedication-or-Antibiotics.

What to Do About Blood Thinners?

Many patients take medications that fall into the category of “blood thinners.” However, it is important to distinguish between the different categories, understand why the patient is on the specific anticoagulant and inform them how the medication impacts their visit to the dental office. Additionally, there are new versions of anticoagulants, beyond warfarin and aspirin, that are now being used for patients with CVD. (See Figure 3)

Anticoagulants: Patients with a history of a blood clot or irregular heart beat may be taking anticoagulant medications. Without these medications, they are at high risk for developing a new blood clot and the risks associated with stopping or reducing their medication outweighs the consequences of prolonged bleeding. Experts agree that anticoagulants should not be changed prior to dental treatment.28-30 A systematic review of the research found that during single or multiple tooth extractions, there was no increased risk of bleeding when patients took their regular dose of anticoagulants as opposed to complications associated with modifying the medication dose.31

Antiplatelets: Patients who have a stent(s) placed in the coronary artery or other blood vessels or have had a stroke may be taking antiplatelet medications. The coronary stent may be either drug-coated or plain “bare” metal. A rare but serious risk for both types of stents is the development of a stent thrombosis, a blood clot inside the stent. Stent thrombosis can potentially lead to a heart attack or even death in some cases but the risk of thrombosis can be significantly reduced with continued use of antiplatelets.32 Patients usually take aspirin for life, and an additional antiplatelet for at least a month or possibly for years. There have been twenty-three studies on over 1,000 patients undergoing at least 1,090 visits for dental surgery while on continuous antiplatelet medications and only two bleeding complications (0.2% of patient

<table>
<thead>
<tr>
<th>Table 3. Conditions Requiring Antibiotics and Endocarditis Prophylaxis for Dental Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiac Conditions Requiring Antibiotics</strong></td>
</tr>
<tr>
<td>Artificial heart valve or a heart valve that has been repaired with artificial material</td>
</tr>
<tr>
<td>History of endocarditis</td>
</tr>
<tr>
<td>Heart transplant with abnormal heart valve function</td>
</tr>
<tr>
<td>Certain congenital heart defects (CHD):</td>
</tr>
<tr>
<td>• Cyanotic CHD not fully repaired</td>
</tr>
<tr>
<td>• CHD fully repaired with artificial material or a device for the first six months after the repair procedure.</td>
</tr>
<tr>
<td>• Repaired CHD with residual defects (e.g. leaks)</td>
</tr>
</tbody>
</table>

Figure 3. Blood Thinners

ANTICOAGULANTS
• warfarin (Coumadin)
• dabigatran (Pradaxa)
• rivaroxaban (Xarelto)
• apixaban (Eliquis)

BLOOD THINNERS

ANTIPLATELETS
• aspirin
• clopidogrel (Plavix)
• prasugrel (Effient)
• ticagrelor (Brilinta)

Continued on Page 10
visits) requiring more than local measures for hemostasis were reported. The risk of bleeding is extremely low following dental procedures in patients on therapeutic levels of antiplatelet medication. It is recommended that oral healthcare providers performing invasive or surgical procedures with concerns about procedural bleeding should contact the patient’s cardiologist to discuss the optimal antiplatelet or anticoagulant regimen before advising a patient to discontinue using these medications.

“Whether a patient comes in to see me for a checkup, or if they’re coming in for a cold, there is an opportunity to talk about what they can be doing to improve their lifestyle, such as quitting smoking, losing weight, or exercising more. When you think about how many nurses and dental hygienists there are and how many patient interactions we have, there are many opportunities to interject the importance of heart disease prevention.”

~ Kim Newlin, RN

Education and Collaboration

Working Together to Help Each Other and Our Patients

One of our main goals as health care providers should be to help our patients prevent disease of all types, and for those patients with established disease, help them prevent progression of the disease. In order to do this successfully, all health care disciplines need to collaborate. The complex needs of these patients exceed the capabilities of any single discipline. (See sidebar for a unique medical/dental hygiene healthcare partnership!) Current and emerging research data demonstrates a relationship between PD and CVD, so it seems only natural for dental hygienists to provide risk screening and cardiovascular health education focusing on behavior modification. With many patients visiting their dentists more often than they visit their doctors, dental hygienists can also play a critical role in screening patients for OSA. (See Figure 4) Our patients and the overall health and well-being of society will benefit greatly from this collaborative effort focusing on the multiple risk factors for CVD, OSA and PD.

Charles Whitney, MD, owner of a direct, personalized care practice, Revolutionary Health Services, believes that healthcare providers should proceed on the assumption that there is a cause and effect connection between PD and CVD. He states that the worst thing that can happen if we are wrong in this assumption, is that more people will take better care of their mouths. There is no downside to educating patients on the role of inflammation and drawing a connection between CVD and PD. Recently, Dr. Whitney hired Lisa Wadsworth, RDH, BS, as Operations Director for his practice. She will oversee the practice’s day-to-day operations, employee training, patient education, and professional relations. This is an excellent example of dental and medical collaboration providing patients the opportunity to receive comprehensive patient education and evaluation from multiple disciplines.
About the Author:

Kim Newlin is currently practicing as a Cardiovascular CNS and ANP at Sutter Roseville Medical Center. After earning a BS in Exercise Physiology at UC Davis, she completed the RN/CNS program at UC San Francisco, and the Gerontology/Adult Nurse Practitioner post-master’s program through the University of Massachusetts at Boston.

Kim is the Heart Failure Program Manager, seeing patients and supervising operations at the hospital’s Heart Failure Clinic, which she helped establish two years ago. She recently developed a Care Transitions Program, working with multiple disciplines and organizations to improve the patient experience during their transition home and reduce readmissions back to the hospital. She also teaches classes to the nursing staff and works on process improvement programs within the hospital and region.

Kim has been the president of the local Preventive Cardiovascular Nurses Association (PCNA) chapter for 8 years and was recently selected to serve on PCNA’s Board of Directors. Kim can be reached at NewlinK@sutterhealth.org

References continued on Page 33