

Management of Patients with Chronic Diseases



Course Author(s): Melanie Simmer-Beck, RDH, PhD
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Conflict of Interest Disclosure Statement

- The author report no conflicts of interest associated with this course.

Introduction – Chronic Diseases

Management of Patients with Chronic Diseases will provide an overview of the ten common chronic diseases and present ways for dental professionals to manage the provision of oral health care to meet each patient’s unique needs.

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Overview

Chronic Diseases are the leading cause of death and disability in the United States. To facilitate evidence-based care for individuals diagnosed with chronic diseases, dental professionals must have the knowledge and tools to conduct a thorough assessment and be aware of chronic disease clinical signs and symptoms, epidemiology and etiology, and appropriate oral health considerations. This course will provide an overview of the ten common chronic diseases and present ways for dental professionals to manage the provision of oral health care to meet each patient’s unique needs.

Learning Objectives

Upon completion of this course, the dental professional should be able to:

- Describe the prevalence and contributing factors of chronic disease.
- List patient assessment considerations.
- Recognize clinical signs and symptoms of ten chronic diseases.
- Explain the epidemiology and etiology of ten chronic diseases.
- Recognize oral health conditions associated with ten chronic diseases.
- Describe patient management considerations for ten chronic diseases.

Chronic Diseases

Chronic Diseases include a broad list of conditions, such as diabetes and heart disease, which last for at least 1 year. They are the leading cause of death and disability in the United States. The National Center for Chronic Disease Prevention and Health Promotion report 60% of adults have at least one chronic disease and 40% of adults have two or more.¹ Patients diagnosed with a chronic disease should be carefully examined for secondary disease. Tobacco use, exposure to secondhand smoke, poor nutrition, lack of physical activity, and excessive alcohol use contribute to developing chronic diseases. Poor oral health has also been cited as a contributing factor, symptom, and consequence of chronic diseases.² The relationship between oral health and chronic disease has been well documented in a growing body of evidence.³⁻⁹

Patient Assessment Considerations

Understanding a patient’s medical history is a critical element of the patient assessment when providing dental care to any patient, but, is especially important when a patient has been diagnosed with a chronic disease. The medical history should include vital signs and detailed discussions about the patient’s medications, medical condition, disease prognosis, comorbidities, patient’s perception of their oral status, physical limitations, and cognitive status (level of cooperation and mental state).^{10,11} Tools are available to help dental providers understand a patient’s physical limitations and cognitive status so that appropriate appointment modifications and accommodations can be made. Branson developed a patient assessment form, specific for dental providers, to aid in gathering this information (Figure 1).¹² This guide provides a structured way to examine mobility, positioning, approachability, verbal and visual interactions, ability to open mouth and turn head, and supportive equipment that is needed.¹²

Dental providers should collaborate with the patient’s health care team (family, caregivers, physician, nurses, occupational therapists, psychiatrists, and other health professionals)

PATIENT ASSESSMENT

Patient Name: _____

Specific Ability Or Characteristic	Level at Which the Ability Can be Accomplished	✕
Mobility	Able to Walk from Room to Room Independently Without A Wheelchair or Care-Taker Assistance	
	Walks from Room to Room with Care-Taker Assistance	
	Uses a Wheelchair for Mobility Without Assistance	
	Uses a Wheelchair and Requires Care-Taker Assistance	
	Unable to be Moved from Bed	
Positioning for Care	Able to Sit in some form of Chair for Procedure	
	Cannot be Moved from Bed and Must be Propped in a Supine Position	
Approachability	Individual is Easily Approached by the DH	
	Individual is Hesitant but Open to DH	
	Individual is Resistant to Being Approached	
Verbal Interaction	Verbal	
	Non-verbal	
Visual Interaction	Makes Eye Contact Readily	
	Able, But Unwilling to Make Eye Contact	
	Cannot Move Head to Make Eye Contact	
	Visually Impaired-Blind	
Opens Mouth	Opens Mouth when Directed and Maintains an Open Mouth for Procedures	
	Opens Mouth Briefly When Directed, But Closes Quickly	
	Unwilling to Open Mouth	
	Physically Unable to Open Mouth	
Turns Head	Turns Head Willingly When Directed and Remains in the Desired Position Until Re-directed	
	Turns Head When Directed but Unable to Remain in the Desired Position for the Procedure	
	Unwilling to Turn Head When Directed	
	Physically Unable to Turn Head	
Support Equipment	Requires Full Time Oxygen	
	Requires that A Suction Be Nearby	
NOTES:		

Figure 1. Branson Patient Assessment Form.

Adapted with permission from Branson, 2013.

to gain a better understanding and confirm medical history findings. Communication with these individuals should be ongoing and documented throughout each phase of dental treatment.¹⁰ An interdisciplinary approach is critical for success. The following sections in this course provides specific information about Alzheimer's disease, arthritis, COPD, depression, diabetes, heart disease, high blood pressure, multiple sclerosis, Parkinson's disease, and stroke.

Alzheimer's Disease

A progressive, degenerative brain disease beginning with mild memory loss and over time possibly leading to loss of the ability to carry on a conversation and respond to the environment.¹³⁻¹⁵ A brain with Alzheimer's disease typically has an accumulation of beta-amyloid plaques outside the neuron and tau tangles inside the neuron.¹⁴ As the number of damaged neurons increase, signals will no longer be able to carry information through the synapses. Clinical signs and symptoms are summarized in Figure 2.

Epidemiology and Etiology

Alzheimer's disease is the most common cause of dementia.^{13,17} In 2020, 5.8 million Americans were diagnosed with this disease. The number of diagnoses are projected to increase to 14 million people by 2060.¹³ Signs and symptoms typically of Alzheimer's disease typically develop after age 60 and risk increases with age.¹³ Although dementia is caused by damage to brain cells, the actual cause of the damage in Alzheimer's disease is not yet fully known.¹⁶ Age, family history, and genetics appear to increase the likelihood of developing the disease.^{13,16} There is strong evidence that traumatic brain injury, mid-life obesity, and current smoking also increases the risk of developing AD.^{18,19} Figure 3 provides additional statistics about this disease.

Patient Management and Oral Health Considerations for Alzheimer's Disease

Understanding the oral health status of a patient diagnosed with Alzheimer's disease can be complicated. Individuals in advanced stages may be unable to verbalize oral pain or discomfort. This may lead to refusal to

Figure 2. Clinical Signs and Symptoms of Alzheimer's Disease.^{13,16}

- Memory loss disruptive to daily life
- Changes in planning or solving problems
- Difficulty handling money or paying bills and completing other familiar tasks
- Confusion with time or place
- Decreased or poor judgment
- Misplacing things and inability to retrace steps to find them
- Changes in mood, personality, or behaviors¹³
- Withdrawal from work or social activities
- Problems with words when speaking or writing

Figure 3. Alzheimer's Disease Statistics and Risk Factors.

- 6th leading cause of death among US adults; 5th among those 65 years or older^{13,16}
- Nearly 2/3rds of Americans with Alzheimer's disease are women¹⁶
- Older African-Americans are about twice as likely to have Alzheimer's or other dementias as older whites¹⁶
- Hispanics are about one and one-half times as likely to have Alzheimer's or other dementias as older whites¹⁶
- Risk factors for heart disease and stroke (like high blood pressure/high cholesterol) may also increase risk of Alzheimer's disease¹⁶

eat, pulling at the face or mouth, refusal to wear dentures, increased restlessness or shouting, disturbed sleep, refusal to participate in activities, and aggressive behavior.²⁰ Care providers must be aware of behavioral changes that may indicate a patient is experiencing dental problems. It is helpful to have a baseline understanding of each patient's typical behavior in order to identify when these behaviors are atypical.¹⁰

Patients diagnosed with Alzheimer's disease routinely experience problems in the oral

cavity such as periodontal disease, caries, tooth loss, tooth mobility, orofacial pain, impaired swallowing, articular abnormalities in temporomandibular joints, difficulty wearing dentures, sores in mouth, cracked lips, coated tongue, and halitosis.^{11,14,21-26} Patients may forget how to brush their teeth¹⁷ or be unable to remember the need for oral hygiene, which may contribute to oral cavity problems.²⁰ Additionally, patients may be taking medications, such as antidepressants, antipsychotics, and sedatives, which have oral side effects such as dry mouth, glossitis, mucositis, glossodynia, dysphagia, candidiasis, and involuntary repetitive tongue and jaw movements.^{31,32} These oral problems can have a negative impact on eating, smiling, laughing, self-esteem, and quality of life.²⁷⁻²⁹ Dental providers should recommend rigorous preventive measures such as 3-month hygiene recall appointments, to also include fluoride varnish applications.

Patients diagnosed with Alzheimer's disease will have diminishing decision-making capacity as the disease progresses. This can create problems with obtaining valid informed consent. When given the opportunity, dental providers should discuss informed consent alternatives with the patient prior to the patient reaching this stage.^{11,15} Unfortunately, this is not always an option. If a patient is unable to provide valid informed consent, and a surrogate has not been identified, treatment procedures should not be initiated. In emergency situations dental providers may legally act in the best interest of the patient without having informed consent.³⁰

Arthritis

The inflammation or swelling of one or more joints. The term encompasses more than 100 diseases and conditions that affect the joints, tissues surrounding the joints, and other connective tissues.³¹ Some of the most common types of arthritis include osteoarthritis, rheumatoid arthritis, fibromyalgia, gout, and juvenile idiopathic arthritis. Some forms of arthritis, such as rheumatoid arthritis and juvenile idiopathic arthritis, have inflammation present that affects the entire body including the skin, muscles, gastrointestinal tract, lungs, heart, and eyes.^{31,32} Clinical signs and symptoms of arthritis are summarized in Figure 4. These

symptoms will vary depending on the type of arthritis present.

Epidemiology and Etiology

Arthritis is one of the most common chronic diseases in the United States.³¹ The Centers for Disease Control reports 58.5 million adults and 300,000 children have been diagnosed with this disease.^{31,33} The etiology of arthritis varies depending on the type of arthritis present. Common risk factors for arthritis include joint injury and overuse, occupations involving repetitive movements, infection of joints, obesity, autoimmune disorders, and genetic factors.³¹ Osteoarthritis is a type of arthritis caused by the joint cartilage between bones breaking down.^{45,46} Common risks factors for rheumatoid arthritis (an autoimmune disorder) are inherited genotypes, smoking and early life exposure to secondhand smoke.^{45,46} Fibromyalgia can be triggered by stressful events.^{45,46} Gout is a type of arthritis resulting from too much uric acid in the blood.^{45,46} Juvenile idiopathic arthritis appears to be genetic.³² Chronic heart failure, hypertension, insulin resistance, metabolic syndrome or diabetes increases the risks for developing gout.^{45,46} Figure 5 provides additional statistics about this disease.

Figure 4. Clinical Signs and Symptoms of Arthritis.^{31,32}

- Pain and stiffness in and around one or more joints is the most common symptom
- Decreased range of motion
- Swelling and erythema
- Unsteadiness
- Deformity
- Weight loss
- Fever
- Fatigue
- Weakness
- Depression/anxiety
- Sleep problems
- Headaches
- Memory and concentration problems
- Tingling/numbness
- Pain in the face/jaw, including temporomandibular joint dysfunction
- Digestive problems

Figure 5. Arthritis Statistics and Risk Factors.^{31,32}

- Arthritis is the leading cause of disability in the United States
- Risk for developing arthritis increases with age
- Most types of arthritis are more common in women
- Gout is more common in men
- Some Asian populations have a lower risk of osteoarthritis
- Women who have given birth have a lower risk of developing rheumatoid arthritis

Patient Management and Oral Health Considerations for Arthritis

Patients diagnosed with arthritis routinely experience problems in the oral cavity such as periodontitis, temporal joint dysfunction (TMD), oral ulcers, xerostomia, and Sjogren's syndrome.^{31,32,34} There are a number of factors that contribute to this. Arthritis medications frequently suppress the immune system which inhibits the mouth's ability to fight harmful bacteria.³¹ Methotrexate is known to induce oral ulcers.³⁴ And, stiff, painful hands can make oral self-care difficult.³⁵ Dental providers should keep these items in mind when developing treatment plans for patients diagnosed with arthritis.

Dental providers must also be aware of the considerable amount of evidence that a relationship exists between rheumatoid arthritis and periodontal disease. Historically dental providers assumed that rheumatoid arthritis led to periodontal disease because of the strong epidemiological serological and clinical associations.³⁶ However, we now know the relationship is much more complicated. Joint tissue and oral tissue have similar inflammatory processes.³⁶ In fact, periodontal problems can precede the diagnosis of rheumatoid arthritis. Research has revealed multiple intersecting pathobiologic pathways.^{34,36} Nonsurgical treatment for periodontal disease has been shown to improve rheumatoid arthritis symptoms.^{34,35,37}

Chronic Obstructive Pulmonary Disease (COPD) / Asthma

A group of diseases that cause airflow blockage and breathing-related problems, including emphysema, chronic bronchitis, and asthma.³⁸ Clinical signs and symptoms are summarized in Figure 6.

Epidemiology and Etiology

At the present time 16 million Americans have been diagnosed with COPD⁴⁰ and 22 million Americans have been diagnosed with asthma.⁴⁰ Many people are unaware they have decreased lower pulmonary function so these numbers are likely an underestimate.³⁸ COPD is typically caused by long-term exposure to lung irritants such as air pollution, chemical fumes and dust from the workplace, and secondhand smoke.⁴⁰ It is estimated that 75% of people who have COHP smoke or used to smoke.⁴⁰ Additional risk factors include genetic factors,³⁸ alpha-1 antitrypsin deficiency,⁴⁰ smoking (particularly in the US),^{38,40} air pollutants,³⁸ chemical fumes, dusts,⁴⁰ and respiratory infections.^{38,39} The social determinants of health are also a COPD risk factor. Individuals who are unemployed, retired, unable to work, divorced, widowed, or separated, and people who had less than a high school education are more likely to report COPD.³⁸ Figure 7 provides additional statistics about this disease.

Patient Management and Oral Health Considerations for COPD

Asthma medications reduce the quantity

Figure 6. Clinical Signs and Symptoms of COPD.

- Coughing that produces large amounts of mucus - COPD
- Night or early morning cough – asthma³⁹
- Wheezing
- Chest tightness^{38,40}
- Shortness of breath,³⁸ particularly with physical activity⁴⁰
- Frequent respiratory infections
- Severe COPD can cause lower extremity edema, weight loss, decreased muscle endurance, blue lips or fingernails, tachycardia, and decreased alertness⁴⁰

Figure 7. COPD Statistics and Risk Factors.

- COPD (not including asthma) is the 4th leading cause of death in the United States⁴⁰
- COPD is more common in people greater than 40 years old⁴⁰
- COPD is more common in American Indian/Alaska Native and multiracial non-Hispanic³⁸
- COPD is more common in women³⁸
- COPD is more common in people who have a history of asthma³⁸
- 1 in 13 Americans have asthma⁴¹
- Allergies are a risk factor for triggering asthma.^{39,42}

and quality of saliva and increase the risk of mouth breathing, dental caries, dental erosion, periodontal disease and oral candidiasis.⁴³ Gastroesophageal acid reflex is more common in patients diagnosed with asthma. This can result in enamel erosion. In patients that are chronic smokers, dental providers may observe leukoplakia, erythroplakia or frank carcinoma.⁴² COPD has been known to increase the risk of arthritis and depression.³⁸ The oral conditions associated with these diseases could also affect people diagnosed with COPD.

Depression

A mood disorder which affects how a person feels, thinks, and handles daily activities.⁴⁴ Clinical signs and symptoms are summarized in Figure 8. These signs and symptoms must be present for at least 2 weeks to signal the presence of depression (also called major depressive disorder or clinical depression).

Epidemiology and Etiology

Mood disorders are the 3rd most common cause of hospitalization in the US for people age 18 to 44 years old.⁴⁵ Depression is one of the most common mood disorders in the United States.^{44,45} It is thought to be caused by a combination of genetic, biological, environmental, and psychological factors.⁴⁴ It may present itself at any age, but often it begins in adulthood. Risk factors include high levels of anxiety as a child, a personal or family

Figure 8. Signs and Symptoms of Depression.

- Persistent sad, anxious, or “empty” mood
- Feelings of hopelessness, or pessimism
- Irritability
- Feelings of guilt, worthlessness, or helplessness
- Loss of interest or pleasure in hobbies and activities
- Decreased energy or fatigue
- Moving or talking more slowly
- Feeling restless or having trouble sitting still
- Difficulty concentrating, remembering, or making decisions
- Difficulty sleeping, early-morning awakening, or oversleeping
- Appetite and/or weight changes
- Thoughts of death or suicide, or suicide attempts
- Aches or pains, headaches, cramps, or digestive problems without a clear physical cause and/or that do not ease even with treatment⁴⁴

history of depression, being diagnosed with a serious medical condition or medications, and major life changes, trauma, or stress.⁴⁴ In children, depression often presents as irritability.⁴⁴ Serious mental illness decreases life expectancy by 25 years.⁴⁵

Patient Management and Oral Health Considerations for Depression

Patients experiencing depression may not recognize their oral hygiene needs or they may not care about their oral health. This can lead to poor oral self-care, fewer dental appointments, and ultimately oral health problems.⁴⁶ Medications used to treat depression can also contribute to oral health problems (Figure 9).^{20,47} Antidepressants have been associated with bruxism and TMD.⁴⁶

Antidepressants, antihistamines, anticholinergics, antihypertensives, and antipsychotics are known to alter salivary gland function resulting in xerostomia.^{20,47} A high percentage of patients taking these medications experience dry mouth. This

Figure 9. Oral Side Effects from Medications Prescribed to Treat Depression.^{42,46}

- Aphthous stomatitis
- Bruxism
- Burning mouth syndrome
- Candidiasis or candida albicans
- Cheilitis
- Dental caries
- Distortion with the sense of taste
- Dysphagia
- Facial, tongue or oral edema
- Gingival hyperplasia
- Glossitis
- Halitosis
- Mucositis and stomatitis
- Oral ulcers
- Periodontitis
- Periodontal abscesses
- Sialadenitis
- Sinusitis
- Temporomandibular joint disorder (TMD)
- Toothache
- Ulcerative gingivitis
- Xerostomia

leads to many of the other problems listed in Figure 9 such as dental caries, taste distortion, chewing, swallowing, and oral infection.

Diabetes

A chronic metabolic disease affecting how the body turns food into energy resulting in too much sugar in the blood (high blood glucose).⁴⁸ There are several types of diabetes. Type 1 is an autoimmune disease where the pancreas does not make enough insulin. Type 2 is a condition where the body cannot use the insulin which it makes (insulin resistance).⁴⁸ Sometimes women develop type 2 diabetes during pregnancy. This condition is called gestational diabetes. Uncontrolled diabetes can result in hyperglycemia (high blood sugar) or hypoglycemia (low blood sugar). Hypoglycemia can result in unconsciousness, coma, or death. Clinical signs and symptoms of diabetes are summarized in Figure 10.

Epidemiology and Etiology

More than 122 million Americans are living

Figure 10. Clinical Signs and Symptoms of Diabetes.⁴⁸

- Urinate a lot, often at night
- Are very thirsty
- Smell of acetone (sweet, fruity odor) on breath
- Lose weight without trying
- Are very hungry
- Have blurry vision
- Have numb or tingling hands or feet
- Feel very tired
- Have very dry skin
- Have sores that heal slowly
- Have more infections than usual
- Elevated blood sugar
- Type 1 diabetes may also cause nausea, vomiting, and stomach pain
- Gestational diabetes typically has no symptoms

with diabetes (34.2 million) or prediabetes (88 million).^{48,100} It is the most common endocrine disease. The risk factors for developing this condition differ depending on the type of diabetes that is present. However, having a family history of diabetes (a parent or sibling) is a common risk factor among all types of diabetes. Figure 11 provides additional statistics and risk factors about this disease.

Patient Management and Oral Health Considerations for Diabetes

When providing care to patients diagnosed with diabetes, dental providers must be mindful of the patient's blood glucose levels. Dental procedures can cause physiological and psychological stress, which increases the risk for developing hyperglycemia. Epinephrine 1:100,000 is typically well tolerated; however, the pharmacologic effect can increase blood glucose levels.⁴⁹ Generally morning appointments are most suitable because there is a lower risk for hypoglycemia.⁵⁰ Long-term control of blood glucose levels is evaluated by measuring the extent of glycosylation of hemoglobin A in red blood cells which forms HbA1c. HbA1c levels are normally 6-8%. Measurements below 7% indicate the patient's diabetes is well controlled.⁴⁹ It is advisable for dental providers to keep a glucose meter in the

Figure 11. Diabetes Statistics and Risk Factors.

Type 1 diabetes

- Family history
- Can develop at any age but it's more likely to develop in children, teens, and young adults

Type 2 diabetes

- Family history
- Prediabetes (symptomless slightly elevated blood sugar levels)
- Overweight
- Age 45 years or older
- Physical activity less than 3 times a week
- History of gestational diabetes or given birth to a baby who weighed more than 9 pounds
- African American, Hispanic/Latino American, American Indian, Alaska Native, and some Pacific Islanders and Asian Americans

Gestational diabetes

- Family history of type 2 diabetes
- History of gestational diabetes or given birth to a baby who weighed more than 9 pounds
- Overweight
- Age 25 years or older
- History of polycystic ovary syndrome (a hormone disorder)
- African American, Hispanic/Latino American, American Indian, Alaska Native, Native Hawaiian, or Pacific Islander

office to check a patient's blood glucose level when needed. If a glucose meter is not available, dental providers should ask the patient to bring their glucose meter to appointments. Dental providers should ask the patient when their last meal was and compare that to the patient's typical meal times. They should also confirm that the patient has taken all regularly scheduled medications including insulin. It is advisable to have a 15-20 grams of an oral fast acting carbohydrate readily available to administer when blood glucose levels fall below 70 milligrams per deciliter (mg/dL).^{51,52}

Patients diagnosed with diabetes may experience accelerated periodontal disease, gingival proliferations, periodontal abscesses, xerostomia, poor healing, infection, oral ulcerations, candidiasis, numbness, burning mouth syndrome, and pain in the oral cavity.^{42,53} These conditions may be more severe in patients who do not have good glycemic control. Patients who have not yet been diagnosed may present with oral problems that can be one of the first signs of disease. Dental providers that observe conditions, such as poor healing after having a tooth removed or periodontal therapy, should talk with their patient about diabetes and see if any of the clinical signs and symptoms are present.⁵⁴

Heart Disease

Conditions that affect the heart and how it functions including coronary artery disease, myocardial infarction (heart attack), congestive heart failure, and atrial fibrillation.⁵⁵ Coronary artery disease (the buildup of plaque inside the coronary arteries⁵⁶) is the most common form of heart disease.⁵⁵ Clinical signs and symptoms of heart disease are summarized in Figure 12.

One of the signs and symptoms of heart disease that oral health professionals need to be mindful of is orofacial (jaw) pain that mimics a toothache. This is an early cardiac warning sign that is especially prevalent in women. When a patient presents with unexplained orofacial pain oral health providers may want to see if the pain subsides when the patient takes the vasodilator called nitroglycerin. There

Figure 12. Signs and Symptoms of Heart Disease.^{55,56}

- Chest pain, particularly pain that worsens with activity
- Pain in the jaw, neck, or back
- Feeling weak, lightheaded, or faint
- Pain in arms or shoulder
- Shortness of breath
- Unusual tiredness
- Nausea/vomiting
- Heart failure – shortness of breath, fatigue, and swelling of lower extremities, stomach, and veins in the neck

Figure 13. Risk Factors for Heart Disease.^{55,56}

- High blood pressure, high cholesterol, and diabetes
- Physical inactivity, diet high in saturated fats/trans fats/cholesterol, obesity, excessive alcohol, tobacco use
- Genetics and family history
- Increasing age
- Metabolic syndrome
- Elevated C-reactive protein, sleep apnea, stress, preeclampsia

are several signs that may suggest orofacial pain is due to heart issues. These include pain that is: burning or pulsing, oppressive, spontaneous in multiple teeth, does not stop after administering local anesthesia block, or does not respond to dental treatment.¹⁰¹

Epidemiology and Etiology

Heart disease is the leading cause of death for both men and women in the United States.⁵⁵ In the United States it accounts for 25% of deaths.⁵⁵ Figure 13 lists disease risk factors.

Patient Management and Oral Health Considerations for Heart Disease

When providing care to patients diagnosed with some form of heart disease, dental providers should assess the patient's risk for complications before providing any dental care. Items to consider include severity of the disease, type and magnitude of dental procedure, and patient stability.⁴⁹ Patients who have experienced a myocardial infarction within the last 30 days are at major risk for complications. Elective care should be postponed.⁴⁹ A consultation with the patient's physician is recommended. Short stress-free appointments scheduled in the morning reduce the risk for complications. It is important to make sure the chair position is comfortable. Dental providers may need to provide care with the patient seated semi supine or upright. Patients who are taking Warfarin should report their international normalized ratio (INR). A therapeutic range is 3.5 or less. It is not necessary to discontinue or alter the dosage for most dental procedures (including minor

surgery)⁴⁹ Avoid placing a retraction cord impregnated with epinephrine and prescribing anticholinergics.⁴⁹ Prescribing NSAIDs should be avoided in patients who have a history of myocardial infarction because NSAIDs increase the risk for subsequent myocardial infarctions.⁴⁹ If using NSAIDs is unavoidable, the drug of choice is naproxen administered for less than 7 days.⁴⁹

Effective pain control during and following the procedure will reduce stress and the risk for complications. Local anesthesia should have a limited amount of vasoconstrictor (epinephrine). If a vasoconstrictor is necessary, patients can be safely given 2 cartridges of anesthesia with epinephrine 1:100,000 (0.036 mg) or 2 cartridges of levonordefrin 1:20,000 (0.20 mg). Intravascular injections should be avoided. It is very important to effectively aspirate before depositing any anesthesia. Dental providers should observe the patient for signs of digitalis toxicity, such as hypersalivation, if a patient is taking digitalis glycoside (digoxin).⁴⁹

There are no oral manifestations that are the direct result of heart disease. Medications used to treat heart disease may produce taste changes, stomatitis, gingival bleeding, petechiae, xerostomia or lichenoid mucosal lesions.⁴⁹ Calcium channel blockers may produce gingival overgrowth.⁴⁹

Hypertension

Elevated arterial blood pressure (high blood pressure) that over time can damage organs such as the heart and kidneys.⁴⁹ The disease is referred to as the "silent killer" because often there are no warning signs and people are unaware they have the condition.⁵⁷ The only way to identify hypertension is by measuring blood pressure. The American Heart and Stroke Association blood pressure guidelines are in Figure 14.⁵⁸

Epidemiology and Etiology

Hypertension affects 1 out of 3 adults living in the United States.⁵⁷ It is a primary or contributing cause in many deaths.⁵⁹ Health conditions such as diabetes and kidney disease, an unhealthy diet, lack of physical

Figure 14. Blood Pressure Guidelines.⁵⁸

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

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Figure 15. Hypertension Statistics.^{57,59}

- Hypertension is a primary or contributing cause of more than a half a million deaths yearly
- Hypertension is present in 7 out of 10 people who have their first heart attack
- Hypertension is present in 8 out of 10 people who have their first stroke
- In adults with hypertension, 35% are unaware they have the disease
- Hypertension is a major risk factor for cardiovascular disease and stroke

activity, obesity, too much alcohol, tobacco use, and family history increase a person’s risk for developing this condition. Figure 15 lists additional hypertension statistics.

Patient Management and Oral Health Considerations for Hypertension

When providing care to patients diagnosed with hypertension, dental providers should assess the patient’s risk for complications before providing any dental care. The risk for most patients who are having routine

treatment is very low. Items to consider include severity of the disease, type and magnitude of dental procedure, and patient stability.⁴⁹ Patients who have uncontrolled high blood pressure ($\geq 180/110$ mm Hg) are at high risk for complications. Elective care should be postponed.⁴⁹ A consultation with the patient’s physician is recommended. Short stress-free appointments scheduled in the morning reduce the risk for complications. Dental providers may administer nitrous oxide with oxygen and oral premedication with a short-acting benzodiazepine to reduce stress. Orthostatic hypertension may be caused by antihypertensive agents. Dental providers need to avoid sudden changes with the patient chair and when treatment is finished return the chair slowly to an upright position.⁴⁹ They should also avoid placing a retraction cord impregnated with epinephrine.

Effective pain control during the procedure and post-operative will reduce stress and the risk for complications. Topical vasoconstrictors are not recommended. Local anesthesia should have a limited amount of vasoconstrictor (epinephrine). If a vasoconstrictor is necessary, patients can be safely given 2 cartridges of anesthesia

with epinephrine 1:100,000 (0.036 mg). Intravascular injections should be avoided. It is very important to effectively aspirate before depositing any anesthesia.⁴⁹

There are no oral manifestations that are the direct result of hypertension. Medications used to treat hypertension may produce xerostomia, lichenoid mucosal lesions, burning mouth, delayed healing, and gingival bleeding. Gingival hyperplasia may be present in patients who are taking a calcium channel blocker. Oral lesions may be present in patients who have an allergic reaction to mercurial diuretics.⁴⁹

Multiple Sclerosis

A chronic, inflammatory, *immune-mediated disease* of the central nervous system for which there is currently no cure. Multiple Sclerosis is a disease that results from individuals' immune system attacking their central nervous system (brain, spinal cord, and optic nerves). The immune system damages myelin sheath (fatty substance surrounding the nerve fibers), Schwann cells, and the nerve fiber itself, disrupting the transmission of nerve impulses.⁶⁰ This results in the damaged myelin forming scar tissue, commonly referred to as demyelination. Demyelination episodes are commonly referred to as relapses, exacerbations, attacks, or flare-ups. This leads to fatigue, weakness, numbness, incoordination, imbalance, vision loss, bladder dysfunction, bowel dysfunction, difficulty speaking, and cognitive impairment.⁶¹ Clinical signs and symptoms are summarized in Figure 16.

Epidemiology and Etiology

Multiple sclerosis affects approximately 400,000 individuals in the U.S. and 2.3 million individuals worldwide.⁶⁰ Diagnosis generally occurs between the ages of 20 and 50; however it can also occur in children.⁶⁷ The average age of multiple sclerosis disease onset is 30 years; though, this can vary widely depending on the type of multiple sclerosis and one's gender. The etiology of multiple sclerosis is thought to be multifactorial; the interaction of a genetically susceptible individual with one of more environmental factors. The environmental factors include exposure to Epstein-Barr virus,

Figure 16. Clinical Signs and Symptoms of Multiple Sclerosis.⁶²

- Bladder dysfunction
- Cognition
- Constipation
- Depression
- Dizziness (vertigo)
- Dysesthesias
- Dysphagia
- Emotional changes⁶³
- Fatigue and weakness
- Numbness, tingling, and weakness
- Pain syndromes⁶⁴
- Problems with gait
- Sexual problems
- Spasticity⁶⁵
- Trigeminal neuralgia⁶⁶
- Vision problems (optic neuritis)
- Walking (gait) difficulties

Figure 17. Multiple Sclerosis Statistics.⁶⁰

- 2-3 times more common in women
- More common when there is a family history of MS
- Frequency of disease is higher in the northern United States, southern Canada, Europe, New Zealand, and southeast Australia (farther from the equator)
- Most common in Non-Hispanic white people of northern European ancestry

sun exposure, Vitamin D, and smoking.^{61,68-72} It is important for the dental professional to understand that smoking has been shown to exacerbate symptoms of multiple sclerosis and increase risk of disease progression.^{73,74} Figure 17 provides additional statistics about this disease.

Patient Management and Oral Health Considerations for Multiple Sclerosis

Many multiple sclerosis symptoms can make it difficult to adequately care for the teeth (hand numbness, pain, spasticity, etc.) leading to dental caries, periodontal disease, and

other conditions due to neglect.⁷⁵ Oral self-care instructions should be based on the patient's functional ability and values. It is also not uncommon for patients diagnosed with multiple sclerosis to experience oral cavity problems such as drug-induced xerostomia, bruxism, and malocclusion.⁷⁵ Dysarthria, dysphonia, stuttering and dysphagia are also commonly associated with the disease.⁶² Depression is one of the more common symptoms of multiple sclerosis.⁶² The same oral conditions described in the depression section of this course are also seen in individuals diagnosed with multiple sclerosis. Extra-oral facial nerve pain, such as trigeminal neuralgia,⁶⁶ is also common in individuals diagnosed with multiple sclerosis and may be an early symptom before a patient has the diagnosis of multiple sclerosis. Always note extra-oral findings of facial nerve pain in a patient's dental record and immediately make physician referrals when patients report facial pain that cannot be explained.

Parkinson's Disease

A neurodegenerative disorder that affects predominately dopamine-producing ("dopaminergic") neurons in the substantia nigra, a specific area of the midbrain.⁷⁶ Damaged neurons in the substantia nigra display a primary diagnostic marker of Parkinson's disease called Lewy body.⁷⁷⁻⁷⁹ This decreases the availability of dopamine, a chemical that is partially responsible for transmitting messages which control movement and coordination in the midbrain and emotions in the forebrain.⁷⁸⁻⁸⁰ Parkinson's disease clinical signs and symptoms are diverse. In most cases, they begin subtly and progress gradually over time. Providers may initially notice a patient's body is stiff and unsteady or their face lacks expression and animation.⁷⁹ As the disease progresses, providers may observe individuals with Parkinson's disease begin to exhibit the clinical signs and symptoms summarized in Figure 18.

Epidemiology and Etiology

Parkinson's disease is the second most common adult-onset neurodegenerative disease lagging only behind Alzheimer's disease.⁸² Worldwide, it is estimated that four to six million individuals have this disorder.⁷⁷

Figure 18. Clinical Signs and Symptoms of Parkinson's Disease.^{76,79,81}

- Resting tremors which often begins in a hand, foot, or jaw
- Muscular rigidity which causes resistance to movement or short, jerky movements
- Loss of spontaneous and automatic movement
- Autonomic signs and symptoms- problems with gait, balance, and coordination
- Mood/cognitive signs and symptoms- apathy, depression, constipation, sleep behavior disorders, loss of sense of smell and cognitive impairment

Figure 19. Parkinson's Disease Statistics.⁷⁶

- Only 4% of those diagnosed have symptoms before 50
- 1.5x more common in men
- 10-15% of all cases are thought to be solely genetic
- 85-90% genetics determines the effects of an environmental factor
- In large population studies, individuals with an affected first-degree relative (parent or sibling) have a 4-9% higher chance of developing Parkinson's disease, as compared to the general population.⁸⁷

In the United States it is estimated that nearly one million individuals have Parkinson's disease.⁷⁶ The cause remains largely unknown.⁷⁶ There is ongoing debate about the etiology of Parkinson's disease and whether the disease is from genetic factors, environment toxins or injury, an illness, or some other event. Many experts think it is combination of factors. Scientific advances point towards genetic mutations as the most likely etiology of the disease.⁸³⁻⁸⁵ Environmental factors such as long-term pesticide exposure, have also been shown to play a causative role in developing Parkinson's disease. However, there is no evidence to substantiate that environmental factors can singlehandedly cause the disease.

Other factors that contribute to developing Parkinson's disease include head trauma involving loss of consciousness, gender, and increasing age.^{76,82,86} Protective factors have also been identified. They include caffeine, uric acid, anti-inflammatory drugs, smoking, vitamin D, exercise, and low cholesterol levels.⁷⁶ Figure 19 provides additional statistics about this disease.

Patient Management and Oral Health Considerations for Parkinson's Disease

Patients diagnosed with Parkinson's disease have altered face and tongue muscle function.⁸⁸ Apathy, depression, forgetfulness, and the physical effects of rigidity and tremors can make oral self-care challenging for them. Patients experience oral motor and sensorimotor impairment, salivary dysfunction, dysphagia, burning mouth pain, loss of taste, and olfactory dysfunction.⁸⁹⁻⁹¹ Factors such as medications, dry mouth, nutritional deficiencies, and functional deficiencies contribute to developing these problems.^{89,92} Dental providers must be attentive to these impairments because they may lead to inadequate oral self-care, poor oral health, decreased quality of life, and increased risk for developing oral infections such as caries, periodontal involvement, tooth mobility, and tooth loss.^{89,93-98} Dental providers must be attentive to salivary dysfunction (conditions of sialorrhea in conjunction with xerostomia) because this can increase problems with dysphagia and result in choking, sudden coughing, and "silent aspiration" pneumonia.⁸⁹ They must also be attentive to the medications patients are taking and the length of time the patient has been taking each medication. Patients who have been taking levodopa for several years may begin to develop dyskinesia which can affect the jaw and create difficulty in safely accessing the patient's mouth.⁹⁰ Patients diagnosed with Parkinson's disease may be unable to verbalize dental pain.²⁷

Stroke

A cerebrovascular accident due to a lack of blood flow to the brain. This causes a lack of oxygen and brain cells begin to die. This can result in death or disability. Clinical signs and symptoms of a stroke are listed in Figure 20. If the dental provider observes any of these

Figure 20. Clinical Signs and Symptoms of a Stroke.⁹⁹

- A severe headache with unknown cause
- Sudden numbness of the face, arm, or leg on one side of the body
- Sudden confusion, trouble speaking, or difficulty understanding speech
- Sudden trouble with vision in one or both eyes
- Sudden trouble walking, dizziness, loss of balance, or loss of coordination

Figure 21. Stroke Statistics.^{59,99}

- After age 55 the chance of developing a stroke doubles every 10 years
- Nearly 1 in every 4 strokes occur in people who have had a previous stroke
- Pregnancy and birth control increase the risk of stroke in women
- Blacks, Hispanics, American Indians, and Alaska Natives are at higher risk for having a stroke than non-Hispanic whites and Asians

signs and symptoms, it is critical to act fast. Treatment must be started within 3 hours of having a stroke to be effective.

Epidemiology and Etiology

Stroke affects 795,000 people living in the United States.⁹⁹ It is a primary or contributing cause in 1 out of 20 deaths.⁹⁹ High blood pressure is the leading cause of strokes. Other risk factors include previous stroke or Transient Ischemic Attack (TIA), high cholesterol, heart disease, diabetes, and sickle cell disease. An unhealthy diet, lack of physical activity, obesity, too much alcohol, tobacco use, family history, age, gender, and race also increase a person's risk for developing this condition. Figure 21 lists additional stroke statistics.

Patient Management and Oral Health Considerations for Stroke

When providing care to patients who have had a stroke, dental providers should assess

the patient's risk for complications before providing any dental care. Items to consider include the timing of the stroke and type and magnitude of dental procedure.⁴⁹ Patients who have experienced a TIA or stroke within the last 6 months are unstable. Elective care should be postponed.⁴⁹ A consultation with the patient's physician is recommended. Patients who are taking Warfarin should report their international normalized ratio (INR). A therapeutic range is 3.5 or less. Metronidazole and tetracycline interact with warfarin which can increase the INR. Dental providers should avoid concurrent use of these drugs. Short stress-free appointments scheduled in the morning reduce the risk for complications. Dental providers should avoid placing a retraction cord impregnated with epinephrine.

Effective pain control during the procedure and post-operative will reduce stress and the risk for complications. Dental providers may administer nitrous oxide with oxygen. Local anesthesia should have a limited amount of vasoconstrictor (epinephrine). Patients can be safely given local anesthesia with epinephrine 1:100,000 or 1:200,000. The amount of vasoconstrictor should be ≤ 0.04 mg.

Oral manifestations associated with a stroke include unilateral paralysis of the face, loss of sensory stimuli or oral tissues, a flaccid tongue with multiple folds, and dysphagia. You may also notice that patients neglect oral self-care

on one side of their mouth. This is associated with the brain damage that has occurred.⁴⁹ Increased caries, periodontal disease, and halitosis is also common due to challenges with oral self-care. Dental providers should recommend rigorous preventive measures such as 3-month recall appointments and application of fluoride varnish.

Conclusion

As part of an integrated health care team, dental professionals provide daily care to more patients who have an underlying chronic disease. In fact, many chronic diseases can alter a person's oral health status and/or present with various oral manifestations. Dental providers must maintain an up-to-date knowledge base of medical conditions that may require the dental professional to modify oral health treatment approaches and make the appropriate medical referral/consultation. The oral and overall health of the person is intertwined, e.g., diabetes and periodontal disease. As new medications are brought to market, the negative oral side effects from the medications to manage diseases and associated oral conditions are also common. When dental providers are prepared to provide safe, patient-centered, evidence-based oral health care to those with chronic diseases, the patient-provider relationship will be rewarded with increased trust and treatment outcomes that continually improve the quality of life of those we serve.

Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-us/professional-education/ce-courses/ce567/start-test

- 1. Which of the following factors does NOT contribute to developing chronic diseases?**
 - A. Exposure to secondhand smoke
 - B. Fluoride in drinking water
 - C. Lack of physical activity
 - D. Excessive alcohol use
- 2. When assessing the patient, the medical history should include all of the following EXCEPT for one. Which is the exception?**
 - A. Financial limitations
 - B. Vital signs
 - C. Physical limitations
 - D. Cognitive status
- 3. The risk of developing Alzheimer's disease is increased in _____.**
 - A. people who eat a lot of chocolate
 - B. people who have more years of formal education
 - C. people who are currently smoking
 - D. None of the above.
- 4. Informed consent is NOT legally necessary _____.**
 - A. when a spouse is present at the dental appointment
 - B. if a patient is not submitting an insurance claim
 - C. in emergency situations when the dental provider is acting in the best interest of the patient
 - D. when a procedure is reversible
- 5. Rheumatoid arthritis only affects joints, tissues surrounding the joints, and connective tissue.**
 - A. True
 - B. False
- 6. Which of the chronic diseases listed below increases the risk for developing gout?**
 - A. Chronic heart failure
 - B. Depression
 - C. Parkinson's disease
 - D. Multiple sclerosis
- 7. Asthma medications do not increase the risk of _____.**
 - A. mouth breathing
 - B. dental caries
 - C. oral cancer
 - D. oral candidiasis
 - E. dental erosion
- 8. _____ have been associated with bruxism and TMD.**
 - A. Antihistamines
 - B. Anticholinergics
 - C. Antidepressants
 - D. Antihypertensives

9. _____ is an autoimmune disease where the pancreas does not make enough insulin.
- A. Type 1 diabetes
 - B. Type 2 diabetes
 - C. Gestational diabetes
10. Urinating often at night, smell of acetone on breath, and weight loss without trying are signs and symptoms of _____.
- A. Arthritis
 - B. COPD
 - C. Depression
 - D. Diabetes
11. HbA1c levels below ____ indicate the patient's diabetes is well controlled.
- A. 7%
 - B. 8%
 - C. 9%
 - D. 10%
12. Shortness of breath, fatigue, and swelling of the lower extremities, stomach, and veins in the neck are signs and symptoms of _____.
- A. COPD
 - B. Heart failure
 - C. Multiple sclerosis
 - D. Stroke
13. Patients who are taking Warfarin should discontinue or alter their dose for most dental procedures.
- A. True
 - B. False
14. According to the American Heart Association guidelines, a blood pressure range of 145/100 is considered _____.
- A. Normal
 - B. Elevated
 - C. High blood pressure-stage 1
 - D. High blood pressure-stage 2
 - E. Hypertensive crisis
15. Elective dental treatment should be postponed for patients who have uncontrolled high blood pressure ($\geq 180/110$ mm Hg).
- A. True
 - B. False
16. Multiple sclerosis is _____.
- A. an auto-immune disease of the central nervous system
 - B. an immune-mediated disease of the central nervous system
 - C. an auto-immune disease of the circulatory system
 - D. an immune-mediated disease of the circulatory system

- 17. Which of the following is NOT a typical motor or sensory abnormality that individuals diagnosed with MS may experience?**
- A. Hearing loss
 - B. Numbness
 - C. Fatigue
 - D. Bladder dysfunction
- 18. Which of the following is NOT a symptom of multiple sclerosis?**
- A. Trigeminal neuralgia
 - B. Depression
 - C. Hearing problems
 - D. Dysphagia
- 19. The etiology of Parkinson's disease is most likely _____.**
- A. genetic factors
 - B. environmental toxins or injury
 - C. an illness
 - D. All of the above.
- 20. Oral impairments from Parkinson's disease may lead to all of the following EXCEPT _____.**
- A. poor oral health
 - B. decreased quality of life
 - C. increased risk for oral cancer
 - D. increased risk for developing oral infections
- 21. Sudden numbness of the face, arm, or leg on one side of the body is a classic sign and symptom of _____.**
- A. Stroke
 - B. Chronic heart failure
 - C. Multiple sclerosis
 - D. Asthma
- 22. Patients who have experienced a stroke _____.**
- A. should never be given a vasoconstrictor
 - B. should never be given nitrous oxide with oxygen
 - C. can be safely given local anesthesia with epinephrine 1:100,000 or 1:200,000

References

1. CDC. National Center for Chronic Disease Prevention and Health Promotion. About chronic diseases. 2021 Oct 28. Accessed October 28, 2021.
2. Association of State & Territorial Dental Directors. Chronic disease and medical/dental integration. 2021. Accessed October 28, 2021.
3. Shi Q, Zhang B, Xing H, et al. Patients with Chronic Obstructive Pulmonary Disease Suffer from Worse Periodontal Health-Evidence from a Meta-Analysis. *Front Physiol*. 2018 Jan 25;9:33. doi: 10.3389/fphys.2018.00033. eCollection 2018.
4. Beck J, Philips K, Moss K, et al. Periodontal disease classifications and incident coronary heart disease in the atherosclerosis risk in communities study. *J Periodontol*. 2020;91:1409-1418. Accessed October 22, 2018.
5. Bensley L, VanEenwyk J, Ossiander EM. Associations of self-reported periodontal disease with metabolic syndrome and number of self-reported chronic conditions. *Prev Chronic Dis*. 2011 May;8(3):A50. Epub 2011 Apr 15.
6. Maldonado A, Laugisch O, Bürgin W, Sculean A, Eick S. Clinical periodontal variables in patients with and without dementia-a systematic review and meta-analysis. *Clin Oral Investig*. 2018 Sep;22(7):2463-2474. doi: 10.1007/s00784-018-2523-x. Epub 2018 Jun 22. PMID: 29934798.
7. Chen CK, Wu YT, Chang YC. Association between chronic periodontitis and the risk of Alzheimer's disease: a retrospective, population-based, matched-cohort study. *Alzheimers Res Ther*. 2017 Aug 8;9(1):56. doi: 10.1186/s13195-017-0282-6.
8. Cheng F, Zhang M, Wang Q, et al. Tooth loss and risk of cardiovascular disease and stroke: A dose-response meta analysis of prospective cohort studies. *PLoS One*. 2018 Mar 28;13(3):e0194563. doi: 10.1371/journal.pone.0194563. eCollection 2018.
9. Nascimento GG, Leite FRM, Vestergaard P, et al. Does diabetes increase the risk of periodontitis? A systematic review and meta-regression analysis of longitudinal prospective studies. *Acta Diabetol*. 2018 Jul;55(7):653-667. doi: 10.1007/s00592-018-1120-4. Epub 2018 Mar 3.
10. Fiske J, Frenkel H, Griffiths J, et al. Guidelines for the development of local standards of oral health care for people with dementia. *Gerodontology*. 2006 Dec;23 Suppl 1:5-32. doi: 10.1111/j.1741-2358.2006.00140.x.
11. Pynn TP, Kolic JE. Oral Health and Dementia: Obstacles, Assessments, and Management of Patients with Dementia. *Oral Health*. 2014 Jun 01. Accessed October 28, 2021.
12. Branson BG. Tips for Treating Facility-Based Patients. *Dimensions of Dental Hygiene*. 2013 Nov;11(11):19-22. Accessed October 28, 2021.
13. CDC. Alzheimer's Disease and Healthy Aging. 2020. Oct 26. Accessed October 28, 2021.
14. Alzheimer's Association. 2015 Alzheimer's disease facts and figures. *Alzheimers Dement*. 2015 Mar;11(3):332-84.
15. Alzheimer's Association. What is Alzheimer's? 2021. Accessed October 28, 2021.
16. Alzheimer's Association. 2021 Alzheimer's Disease Facts and Figures. 2021. Accessed October 28, 2021.
17. MedlinePlus. Alzheimer's Disease. 2019 Oct 21. Accessed October 28, 2021
18. Blazer DG, Yaffe K, Liverman CT. Cognitive Aging: Progress in Understanding and Opportunities for Action. Committee on the Public Health Dimensions of Cognitive Aging; Board on Health Sciences Policy; Institute of Medicine. Washington (DC): National Academies Press (US); 2015 Jul.
19. Baumgart M, Snyder HM, Carrillo MC, et al. Summary of the evidence on modifiable risk factors for cognitive decline and dementia: A population-based perspective. *Alzheimers Dement*. 2015 Jun;11(6):718-26. doi: 10.1016/j.jalz.2015.05.016. Epub 2015 Jun 1.
20. Alzheimer's Association. Dental Care. Daily Care. 2021. Accessed October 28, 2021.
21. Mancini M, Grappasonni I, Scuri S, et al. Oral health in Alzheimer's disease: a review. *Curr Alzheimer Res*. 2010 Jun;7(4):368-73.
22. Ciccì M, Maticena G, Signorino F, et al. Relationship between oral health and its impact on the quality life of Alzheimer's disease patients: a supportive care trial. *Int J Clin Exp Med*. 2013 Sep 25;6(9):766-72. eCollection 2013.

23. Vitaliano PP, Persson R, Kiyak A, et al. Caregiving and gingival symptom reports: psychophysiological mediators. *Psychosom Med.* 2005 Nov-Dec;67(6):930-8. doi: 10.1097/01.psy.0000188485.65153.7b.
24. Chalmers JM, Carter KD, Spencer AJ. Oral diseases and conditions in community-living older adults with and without dementia. *Spec Care Dentist.* 2003;23(1):7-17.
25. Syrjälä AM, Ylöstalo P, Sulkava R, et al. Relationship between cognitive impairment and oral health: results of the Health 2000 Health Examination Survey in Finland. *Acta Odontol Scand.* 2007 Apr;65(2):103-8. doi: 10.1080/00016350601083521.
26. de Souza Rolim T, Fabri GM, Nitrini R, et al. Oral infections and orofacial pain in Alzheimer's disease: a case-control study. *J Alzheimers Dis.* 2014;38(4):823-9. doi: 10.3233/JAD-131283.
27. Chalmers JM. Behavior management and communication strategies for dental professionals when caring for patients with dementia. *Spec Care Dentist.* 2000 Jul-Aug;20(4):147-54.
28. Lee KH, Wu B, Plassman BL. Cognitive function and oral health-related quality of life in older adults. *J Am Geriatr Soc.* 2013 Sep;61(9):1602-7. doi: 10.1111/jgs.12402. Epub 2013 Aug 26.
29. Locker D. Oral health and quality of life. *Oral Health Prev Dent.* 2004;2 Suppl 1:247-53.
30. Litch CS, Liggett ML. Consent for dental therapy in severely ill patients. *J Dent Educ.* 1992 May;56(5):298-311.
31. CDC. Arthritis. 2021 Oct 12. Accessed November 3, 2021.
32. Arthritis Foundation. Arthritis by the numbers. Atlanta, GA. 2021. Accessed October 28, 2021.
33. Barbour KE, Holmick CG, Boring MA, Brady TJ. Vital signs: prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation-United States, 2013-2015. *Morb Mortal Wkly Rep.* 2017 Mar 66(9);246-253.
34. Bingham CO 3rd, Moni M. Periodontal disease and rheumatoid arthritis: the evidence accumulates for complex pathobiologic interactions. *Curr Opin Rheumatol.* 2013 May;25(3):345-53. doi: 10.1097/BOR.0b013e32835fb8ec.
35. Arthritis Foundation. Mouth Bacteria May Trigger RA. Atlanta, GA. 2021 Apr 14. Accessed October 28, 2021.
36. Potempa J, Mydel P, Koziel J. The case for periodontitis in the pathogenesis of rheumatoid arthritis. *Nat Rev Rheumatol.* 2017 Oct;13(10):606-620. doi: 10.1038/nrrheum.2017.132. Epub 2017 Aug 24.
37. Zhao X, Liu Z, Shu D, et al. Association of Periodontitis with Rheumatoid Arthritis and the Effect of Non-Surgical Periodontal Treatment on Disease Activity in Patients with Rheumatoid Arthritis. *Med Sci Monit.* 2018 Aug 20;24:5802-5810. doi: 10.12659/MSM.909117.
38. CDC. Chronic Obstructive Pulmonary Disease (COPD). 2021 Feb 22. Accessed October 28, 2021.
39. NIH. National Heart Lung and Blood Institute. Asthma. Accessed October 28, 2021.
40. NIH. National Heart Lung and Blood Institute. COPD. Accessed October 28, 2021.
41. CDC. Asthma. 2021 Sept 16. Accessed October 28, 2021.
42. AHRQ. Dental Recommendations for Preventing Complications in Patients with Chronic Conditions. Accessed October 28, 2021.
43. Thomas MS, Parolia A, Kundabala M, et al. Asthma and oral health: a review. *Aust Dent J.* 2010 Jun;55(2):128-33. doi: 10.1111/j.1834-7819.2010.01226.x.
44. NIMH. Depression. 2018 Feb. Accessed October 28, 2021.
45. CDC. Mental Health. 2021 Jul 20. Accessed October 28, 2021.
46. Datta D, Kumar RS, Narayanan AM, et al. Depression and Oral Health. *International Journal of Current Research.* 2018;10(3):66561-66564.
47. Daly C. Oral and dental effects of antidepressants. *Aust Prescr.* 2016 Jun;39(3):84. doi: 10.18773/austprescr.2016.035. Epub 2016 Jun 1.
48. CDC. Diabetes. 2021 Oct 15. Accessed October 28, 2021.
49. Little JW, Miller CS, Rhodus NL. *Dental Management of the Medically Compromised Patient*, 9th Ed. St. Louis, MO. Elsevier. 2018.
50. Lalla RV, D'Ambrosio JA. Dental management considerations for the patient with diabetes mellitus. *J Am Dent Assoc.* 2001 Oct;132(10):1425-32.

51. NIH. National Institute of Diabetes and Digestive and Kidney Diseases. Low Blood Glucose (Hypoglycemia). 2021 Jul. Accessed October 28, 2021.
52. Malamed SF. Medical emergencies in the dental office, 7th ed. St. Louis, MO. Elsevier. 2015.
53. American Diabetes Association. Diabetes and Oral Health. Accessed October 28, 2021.
54. Borgnakke WS, Ylöstalo PV, Taylor GW, et al. Effect of periodontal disease on diabetes: systematic review of epidemiologic observational evidence. *J Periodontol*. 2013 Apr;84(4 Suppl):S135-52. doi: 10.1902/jop.2013.1340013.
55. CDC. Heart Disease. 2021 Jan 19. Accessed October 28, 2021.
56. NIH. National Heart Lung and Blood Institute. Coronary Heart Disease. Accessed October 28, 2021.
57. CDC. High Blood Pressure. 2021 Sept 27. Accessed October 28, 2021.
58. American Heart Association. High Blood Pressure. Accessed October 28, 2021.
59. Virani SS, Alonso A, Benjamin EJ, et al. Heart Disease and Stroke Statistics-2020 Update: A Report From the American Heart Association. *Circulation*. 2020 Mar 3;141(9):e139-e596. doi: 10.1161/CIR.0000000000000757. Epub 2020 Jan 29. PMID: 31992061.
60. National Multiple Sclerosis Society. What Is MS? Accessed October 28, 2021.
61. National Multiple Sclerosis Society. Definition of MS. Accessed October 28, 2021.
62. National Multiple Sclerosis Society. Symptoms & Diagnosis. Accessed October 28, 2021.
63. American Academy of Neurology. Emotional disorders in people with Multiple Sclerosis. Accessed October 28, 2021.
64. Wynn RL, Meiller TF, Crossley HL. Drug information handbook for dentistry, 19th Ed. Hudson, OH. Lexcomp, 2013.
65. Paty DW, Ebers GC. Multiple Sclerosis, 3rd ed. Philadelphia, PA. FA Davis. 1998.
66. Pilitsis J, Khazen O. Trigeminal Neuralgia. American Association of Neurological Surgeons. Accessed October 28, 2021.
67. Hilas O, Patel PN, Lam S. Disease modifying agents for multiple sclerosis. *Open Neurol J*. 2010 May 26;4:15-24. doi: 10.2174/1874205X01004010015.
68. van der Mei IA, Simpson S Jr, Stankovich J, et al. Individual and joint action of environmental factors and risk of MS. *Neurol Clin*. 2011 May;29(2):233-55. doi: 10.1016/j.ncl.2010.12.007.
69. Simon KC, Munger KL, Xing Yang, et al. Polymorphisms in vitamin D metabolism related genes and risk of multiple sclerosis. *Mult Scler*. 2010 Feb;16(2):133-8. doi: 10.1177/1352458509355069. Epub 2009 Dec 9.
70. Fontaine B, Barcellos LF. Evidence for a complex interaction between HLA-DRB1 and environmental factors in MS. *Neurology*. 2008 Jan 8;70(2):97-8. doi: 10.1212/01.wnl.0000296821.72466.d3.
71. Wingerchuk DM. Environmental factors in multiple sclerosis: Epstein-Barr virus, vitamin D, and cigarette smoking. *Mt Sinai J Med*. 2011 Mar-Apr;78(2):221-30. doi: 10.1002/msj.20240.
72. Ascherio A, Munger KL, Simon KC. Vitamin D and multiple sclerosis. *Lancet Neurol*. 2010 Jun;9(6):599-612. doi: 10.1016/S1474-4422(10)70086-7.
73. Hernán MA, Jick SS, Logroscino G, et al. Cigarette smoking and the progression of multiple sclerosis. *Brain*. 2005 Jun;128(Pt 6):1461-5. Epub 2005 Mar 9.
74. Riise T, Nortvedt MW, Ascherio A. Smoking is a risk factor for multiple sclerosis. *Neurology*. 2003 Oct 28;61(8):1122-4.
75. National Multiple Sclerosis Society. Dental Health: The Basic Facts. Accessed October 28, 2021.
76. Parkinson's Foundation. What Is Parkinson's? Accessed October 28, 2021.
77. Parkinson's Foundation. Causes & Statistics Accessed October 28, 2021.
78. Golbe LI, Mark MH, Sage JI. Parkinson's Disease Handbook. A guide for patients and their families. New Brunswick, New Jersey. The American Parkinson Disease Association, Inc., 2014. Accessed October 28, 2021.
79. NIH. National Institute on Aging. Parkinson's Disease. 2017 May 16. Accessed October 28, 2021.
80. American Parkinson Disease Association. Basic Information on Parkinson's Disease: How We Can Help. Accessed October 28, 2021.

81. Friedlander AH, Mahler M, Norman KM, et al. Parkinson disease: systemic and orofacial manifestations, medical and dental management. *J Am Dent Assoc.* 2009 Jun;140(6):658-69.
82. Wirdefeldt K, Adami HO, Cole P, et al. Epidemiology and etiology of Parkinson's disease: a review of the evidence. *Eur J Epidemiol.* 2011 Jun;26 Suppl 1:S1-58. doi: 10.1007/s10654-011-9581-6. Epub 2011 May 28.
83. Schapira AH. Etiology of Parkinson's disease. *Neurology.* 2006 May 23;66(10 Suppl 4):S10-23.
84. Martin I, Dawson VL, Dawson TM. Recent advances in the genetics of Parkinson's disease. *Annu Rev Genomics Hum Genet.* 2011;12:301-25. doi: 10.1146/annurev-genom-082410-101440.
85. Singleton AB, Farrer MJ, Bonifati V. The genetics of Parkinson's disease: progress and therapeutic implications. *Mov Disord.* 2013 Jan;28(1):14-23. doi: 10.1002/mds.25249.
86. Jafari S, Etminan M, Aminzadeh F, et al. Head injury and risk of Parkinson disease: a systematic review and meta-analysis. *Mov Disord.* 2013 Aug;28(9):1222-9. doi: 10.1002/mds.25458. Epub 2013 Apr 22.
87. American Parkinson Disease Association. What Is Early Onset Parkinson's Disease? Accessed October 28, 2021.
88. Parkinson's Foundation. Dental Health. Accessed October 28, 2021.
89. Huber MA. Parkinson's disease and oral health. Educational supplement #7. Staten Island, NY. The American Parkinson Disease Association, Inc., 2007. Accessed October 28, 2021.
90. Parkinson's Foundation. Understanding Parkinson's. Accessed October 28, 2021.
91. Persson M, Osterberg T, Granérus AK, et al. Influence of Parkinson's disease on oral health. *Acta Odontol Scand.* 1992 Feb;50(1):37-42.
92. Dirks SJ, Paunovich ED, Terezhalmay GT, et al. The patient with Parkinson's disease. *Quintessence Int.* 2003 May;34(5):379-93.
93. Elbaz A, Moisan F. Update in the epidemiology of Parkinson's disease. *Curr Opin Neurol.* 2008 Aug;21(4):454-60. doi: 10.1097/WCO.0b013e3283050461.
94. Hanaoka A, Kashihara K. Increased frequencies of caries, periodontal disease and tooth loss in patients with Parkinson's disease. *J Clin Neurosci.* 2009 Oct;16(10):1279-82. doi: 10.1016/j.jocn.2008.12.027. Epub 2009 Jun 30.
95. Schwarz J, Heimhilger E, Storch A. Increased periodontal pathology in Parkinson's disease. *J Neurol.* 2006 May;253(5):608-11. Epub 2006 Mar 6. doi: 10.1007/s00415-006-0068-4.
96. Müller T, Palluch R, Jackowski J. Caries and periodontal disease in patients with Parkinson's disease. *Spec Care Dentist.* 2011 Sep-Oct;31(5):178-81. doi: 10.1111/j.1754-4505.2011.00205.x.
97. Bakke M, Larsen SL, Lautrup C, et al. Orofacial function and oral health in patients with Parkinson's disease. *Eur J Oral Sci.* 2011 Feb;119(1):27-32. doi: 10.1111/j.1600-0722.2010.00802.x.
98. Nakayama Y, Washio M, Mori M. Oral health conditions in patients with Parkinson's disease. *J Epidemiol.* 2004 Sep;14(5):143-50.
99. CDC. Stroke Signs and Symptoms. 20 Aug 28. Accessed October 28, 2021.
100. CDC. National Diabetes Statistics. Accessed October 28, 2021.
101. Kreiner M, Okeson J, Tanco V, Waldenström A, Isberg A. Orofacial Pain and Toothache as the Sole Symptom of an Acute Myocardial Infarction Entails a Major Risk of Misdiagnosis and Death. *J Oral Facial Pain Headache.* 2020 Winter;34(1):53-60. doi: 10.11607/ofph.2480. Epub 2019 Aug 27. PMID: 31465031.

Additional Resources

- No Additional Resources Available

About the Author



Melanie Simmer-Beck, RDH, PhD

Melanie Simmer-Beck, PhD, RDH, is a Department Chair and Professor at the University of Missouri-Kansas City School of Dentistry, USA. She holds joint appointments in the departments of Dental Public Health and Behavioral Science and Oral and Craniofacial Sciences. Dr. Simmer-Beck uses her interdisciplinary background in Oral and Craniofacial Sciences, Public Affairs & Administration, and Dental Hygiene to teach courses in Ethics & Professionalism and Evidence-Based Decision Making, in addition to directing the dental pipeline program, STAHR Scholars Dentistry. Her research focuses on implementation science, program evaluation, access to oral health care, oral health disparities, dental workforce models and policy, and ergonomics. She has been the recipient of federal funds to move forward her research agenda. Dr. Simmer-Beck's research has been presented at national and international professional meetings and published in peer-reviewed journals.

Email: simmerbeckm@umkc.edu