Medically Compromised Patient Care

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Conflict of Interest Disclosure Statement

- The authors report no conflicts of interest associated with this course. They do not have any financial relationships to disclose.

Introduction

Learn about Medically Compromised Patient Care from the Medically Compromised Patient Care dental CE course & enrich your knowledge in oral healthcare field.

Course Contents

Overview

The purpose of the course is to provide an overview and guidelines for treating medically compromised patients. Each section will provide a definition of the disease or disorder and pertinent information related to that condition including any necessary modifications to dental treatment (e.g., local anesthetic, nitrous oxide, pre-medication, and medical consults). The conditions reviewed in this course are not intended to be all inclusive, and are provided as a supplement to the diseases which were presented in, "*Management of Patients with Chronic Diseases*". In addition, follow-up questions will be presented that should be asked when a positive response is indicated on the health history. This course is intended to be a helpful resource for oral healthcare students and professionals alike.

Learning Objectives

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

- Identify medically compromised patients who are seeking dental treatment.
- Identify the need to modify treatment due to disease or medication of a patient.
- Recognize drugs/medications commonly used by the medically compromised patient.
- Use critical thinking skills to identify questions to be asked to further establish the patient's medical history/status.
- Seek medical and/or dental consultation based on patient information gathered from the health history and patient interview.

Glossary

Angular cheilitis: a common inflammatory condition affecting the corners of the mouth or oral commissures.

Bacteremia: the presence of bacteria in the blood.1 Bacteremia can result from ordinary activities like vigorous toothbrushing, dental/medical procedures, or from infections.[2]

Cardiac dose of epinephrine: limiting the use of vasoconstrictor in local anesthetic to 0.04 mg or 2 cartridges of 1:100,000 epinephrine.

Co-morbidity: the simultaneous presence of two or more diseases or medical conditions in a patient.

Ecchymosis: a discoloration of the skin resulting from bleeding underneath, typically caused by bruising.

Evidence-based dentistry (EBD): the integration of the dentist's clinical expertise, the needs and preferences of the patient, and the most current, clinically relevant evidence. The three components are all considered during the decision-making process for patient care.[3]

Fibrinolysis: the enzymatic breakdown of fibrin.[4]

Infective endocarditis: infection within tissues lining the heart or within valves of the heart, caused by bacteria within the circulating blood that infect these cardiac issues.[1]

International Normalizing Ratio (INR): a system established by the World Health Organization (WHO) and the International Committee on Thrombosis and Hemostasis for reporting the results of blood coagulation (clotting) tests.

Osteonecrosis of the jaw (ONJ): exposed, necrotic bone in the maxillofacial region for at least 8 weeks in patients receiving an antiresorptive medication.
Osteoradionecrosis (ORNJ): similar to osteonecrosis of the jaw but caused by radiation to the head and neck.

Petechia: small, pinpoint collections of blood under the skin or mucous membrane.

Prosthetic joint infection (PJI): also known as periprosthetic infection, is an infection involving the joint prosthesis and surrounding tissue.[5]

Valvulopathy: a disorder of valve function causing a variety of cardiac disorders, such as arrhythmia, pulmonary hypertension, heart failure, and cardiogenic shock.[1]

Thrombocytopenia: medical term for a low blood platelet count.[1]

Introduction

Oral health care providers are very likely caring for dental patients who are also medically compromised. This is due to a variety of reasons, such as improved medical treatment for chronic conditions, increased access to care for patients who have not seen medical/dental providers in the past, and medical advancements that have enabled patients with severe disease to experience a higher quality of life. For these reasons, it is imperative for clinicians to be knowledgeable about different medical conditions and to use guidelines developed by health professional associations when determining how to properly care for patients with medical conditions.

The goal of the course is to help oral health practitioners identify those patients who may be medically compromised and understand ways to modify dental treatment as necessary. In addition, course participants will be able to recognize drugs that are commonly used by medically compromised patients. Each section will have sample questions for the clinician to ask their patient to further establish the patient's medical history and current status. Using that information, the oral health provider can determine whether to seek medical consultation based on the subjective and objective data that has been gathered from the heath history and patient interview. Proper recognition and management of patients who are medically compromised will be beneficial for both the patient and the practice.

Antibiotic Prophylaxis

Bacteremia is induced during any dental procedure that involves gingival manipulation, perforation of oral mucosa, or manipulation of the periapical regions of the teeth. This includes procedures such as probing, scaling and root planing, etc. For example, orthodontic bands are often placed subgingivally, which causes bacteremia and would require antibiotic premedication for certain medically compromised individuals. However, the placement of brackets alone would not require premedication due to the supragingival location of the brackets (Figure 1). Bacteremia can cause infections (both orally and systemically) and antibiotics are needed to treat those infections. However, there is concern that when antibiotics are used too often, it can lead to adverse events, such as Type 1 allergic reactions to penicillin and antibiotic resistance. Antibiotic resistance does not discriminate and can occur in all ages and geographic locations. Misuse of antibiotics is accelerating the process of antibiotic resistance and is becoming a serious public health concern. As a result, more infections

Figure 1. Subgingival orthodontic band and supragingival orthodontic bracket.

are becoming harder to treat, due to the reduced effectiveness of the antibiotics that are available. This leads to an increase in hospital stays, medical costs, and ultimately to increased mortality.[6] According to the CDC, antibiotic resistance is currently one of the greatest public health challenges that exists. In the U.S., approximately 2.8 million people acquire antibiotic-resistant infections each year and 35,000 die from them.[7]

According to the American Dental Association (ADA), current guidelines support premedication for a small subset of patients, because scientific evidence has confirmed that the risks of adverse reactions outweigh the benefits for patients who were eligible under the previous guidelines. There was also concern about the development of drug-resistant bacteria, thus new guidelines were created and continue to be updated with the latest update in 2021.[8] Table 1 provides examples of procedures that would require antibiotic premedication when indicated and those procedures that are acceptable to perform without antibiotic premed.

Cardiac Patients

Antibiotic pre-medication is required for cardiac conditions associated with **high risk** for developing infective endocarditis. There are five conditions associated with adverse outcomes for which **prophylaxis for dental treatment is indicated**:

1. Prosthetic heart valve, which includes transcatheter-implanted prostheses and homografts.

2. Prosthetic material used for cardiac valve repair, such as annuloplasty rings and chords.

3. Previous history of infective endocarditis.

4. Cardiac transplant with valve regurgitation due to a structurally abnormal valve.

5. Congenital heart disease (CHD), or conditions which have been present since. Specifically, the following two CHD's are a concern:

   a. Unrepaired cyanotic CHD, including palliative shunts and conduits

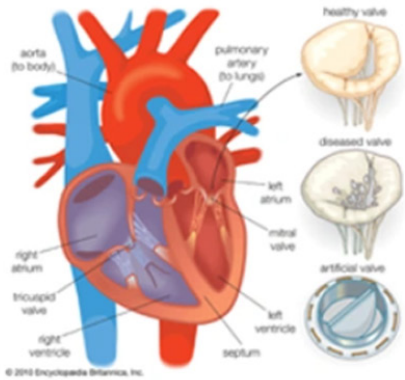
   b. Repaired CHD defect with residual shunts or valvular regurgitation at the site of, or adjacent to the site of, a prosthetic patch or a prosthetic device (Figure 2).[8,9]

Table 1. Antibiotic Premedication Treatment Examples [1]

These cases DO need antibiotic premed if there is manipulation of gingival tissue or periapical region of teeth, or perforation of oral mucosa, such as:	**These procedures are ok to perform WITHOUT antibiotic premed:**
✓ Biopsies ✓ Suture removal ✓ Placement of ortho bands ✓ Root planing ✓ Adult prophy ✓ Filling or root canal ✓ Injections through PDL (intraligamentary and intraosseous)	✓ Routine anesthetic injections (nerve blocks and supraperiosteal) through non-infected tissue ✓ Taking radiographs ✓ Placement of removable appliances ✓ Adjusting ortho appliances & placing orthodontic brackets ✓ Shedding deciduous teeth

Figure 2. Summary of High-Risk Cardiac Conditions Requiring Antibiotic Prophylaxis[8,9]

Severe acquired cardiac **valvular** conditions requiring antibiotic premedication



- Prosthetic (artificial) heart valve or material to repair heart valve
- Previous infective endocarditis
- Damaged valves in transplanted heart

Congenital Heart Diseases (CHD) requiring antibiotic premedication

- Unrepaired, cyanotic CHD
- Repaired (completely in last 6 months)
- Repaired CHD with residual defects

Notes:

- Congenital heart diseases are those that are present at birth.
- Use clinical judgment to determine if medical consult is needed.

Table 2 provides questions that are helpful for oral health practitioners to ask when reviewing the medical history of patients suspected of having high risk cardiac conditions.

In summary, premedication is most often indicated in situations involving severe valvular conditions. These premedication requirements are standard protocol per the ADA and American Heart Association (AHA) and do not require a medical consult. However, congenital heart conditions will often times require a consult with the medical provider to determine specific antibiotic prophylactic needs.

- Mitral valve prolapse does NOT require antibiotic prophylaxis.
- Prosthetic heart valves DO require antibiotic prophylaxis.

Antibiotic Prophylaxis Guidelines - High Risk Cardiac Patients

The AHA and ADA have conducted extensive research to determine appropriate antibiotic premedication guidelines for high-risk cardiac patients. Table 3 outlines the specific antibiotics that can be used in situations, such as patients who are unable to take oral medication or have an allergy to penicillin. The table also lists the recommended dosages for adults and children.

- Cephalosporins (Cephalexin) should NOT be used in an individual with a history of Type1 allergic reaction to penicillin.
- This is due to the similar chemical structure of penicillin and cephalosporin.

The reason amoxicillin is the first-line drug for antibiotic prophylaxis, is because it can effectively kill the three types of microorganisms that most often cause infective endocarditis. These microorganisms are 1) staphylococcus aureus, which generally inhabits the skin, 2) viridans group streptococci (alpha-hemolytic), which include microorganisms from the mouth and the pharynx, and 3) enterococci from the G.I. tract. The dental health professionals' primary concern involves the second group of streptococci.

Amoxicillin should NOT be used as an alternative for patients who are allergic to penicillin.

When a patient takes antibiotic premedication, it must be taken 30-60 minutes before dental treatment in order to be effective. It takes at least 60 minutes for the elevated amounts of antibiotic to be present in the patient's blood. If the antibiotic is inadvertently not administered prior to the procedure, it can be given up to 2 hours after the procedure. However, that is not ideal. If follow-up treatment is needed in <10 days, a different antibiotic must be given. If the patient is on an antibiotic for another reason (e.g., sinus infection), it does NOT cover their prophylactic antibiotic requirement for dental treatment. They must be premedicated with a different antibiotic than the one they are currently using. Finally, if amoxicillin has been administered and the dental procedure will last longer than 6 hours, another full dose must be given.

Table 2. Follow-Up Questions for High Risk Cardiac Patients[1]

- ✓ Do you have an artificial heart valve?
- ✓ Do you have a history of infective endocarditis?
- ✓ Do you have a heart transplant? If yes, how long ago? Do you have any heart valve damage?
- ✓ Do you have congenital heart disease? If so what type? How has it been treated?
- ✓ Has your cardiologist told you to take antibiotics prior to having dental work?

Table 3. Antibiotics & Dosing for High Risk Cardiac Patients [1,10]			
Situation	**Agent**	**Adults**	**Children**
Oral	✓ Amoxicillin	2 g	50mg/kg
Unable to take oral medication	✓ Ampicillin or ✓ Cefazolin or ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin-oral	✓ Doxycyline ✓ Azithromycin/ Clarithromycin ✓ Cephalexin*	100 mg 500 mg 2 g	50 mg/kg 20 mg/kg 15mg/kg
Allergic to penicillins or ampicillin OR unable to take oral medication	✓ Cefazolin or ceftriaxone	1 g IM or IV	50 mg/kg IM or IV
** Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillin or ampicillin.*			

Cardiac Conditions No Longer Needing Antibiotic Prophylaxis

According to the AHA, there are conditions for which antibiotic premedication is no longer recommended due to the higher risk of antibiotic resistance and adverse events. The AHA states that patients with mitral valve prolapse (MVP) with or without regurgitation (i.e., murmur), rheumatic heart disease, bicuspid valve disease, calcified aortic stenosis and congenital heart conditions, such as ventricular or atrial septal defects and hypertrophic cardiomyopathy do not require antibiotic premedication (Table 4). Some dental patients may benefit from education on the current guidelines if they have been accustomed to taking premedication for these conditions in the past.

Total Joint Replacement Patients

In general, no premedication is required for total joint replacement (TJR) patients without additional risk factors that will be discussed in this section. However, it is recommended to send a medical consult for high-risk TJR patients for possible pre-medication prior to dental treatment if they present with the

Table 4. Conditions No Longer Recommended for Premedication [AHA]
✓ Mitral valve prolapse (MVP) with or without regurgitation (i.e., murmur) ✓ Rheumatic heart disease ✓ Bicuspid valve disease ✓ Calcified aortic stenosis ✓ Congenital heart conditions (CHD), such as: • Ventricular or atrial septal defects • Hypertrophic cardiomyopathy

following risk factors: 1) immunocompromised/ immunosuppressed, 2) patients with co-morbidities. For example, patients in the first group may have a condition such as rheumatoid arthritis or systemic lupus, or they may be experiencing drug- or radiation-induced immunosuppression. Patients in the second group would be those with the following co-morbidities: history of joint infection/ failure, insulin dependent diabetes, hemophilia, malnourishment, HIV, or malignancy (PME). The decision should always be based on a consult between the dentist, physician, and patient. In essence, there will be three options to move forward with a TJR patient: 1) no pre-med necessary if there are no risk factors present, 2) medical consult required if one of the risk factors is present, or 3) current medical consult exists in the medical history that states pre-med guidelines from the orthopedic surgeon.

For assistance with antibiotic recommendations, dental practitioners can refer to the American Academy of Orthopedic Surgeons Appropriate Use Criteria document. Table 5 outlines specific clinical circumstances that suggest the patient may be at increased risk of joint infection, while Table 6 lists recommendations for when to send a consultation for a dental patient with a prosthetic joint.

Once the dentist and patient with a prosthetic joint have discussed the current health status and any previous need for antibiotics, the dentist can ascertain whether there are any clinical circumstances that suggest increased risk for the patient and take the appropriate action (Figure 3). If the patient does not have clinical circumstances that suggest increased risk (green), the dentist must determine whether the orthopedic surgeon has or has not recommended antibiotic prophylaxis in the past. If they have not, then it is ok to proceed with dental treatment. However, if the surgeon has recommended antibiotics, then the dentist should send a consultation to the surgeon first. The dentist can follow the appropriate steps if the patient may have increased risk (yellow) or if they definitely do have clinical circumstances that suggest increased risk (red).

However, even with these guidelines, there are numerous conditions that either the patient, physician, or dentist may feel warrant providing antibiotic prophylaxis before dental treatment in order to prevent infections at remote locations due to oral bacteria.[8] Using the questions in Table 7, the dental practitioner can gather helpful information that will ensure dental treatment is completed at the proper time.

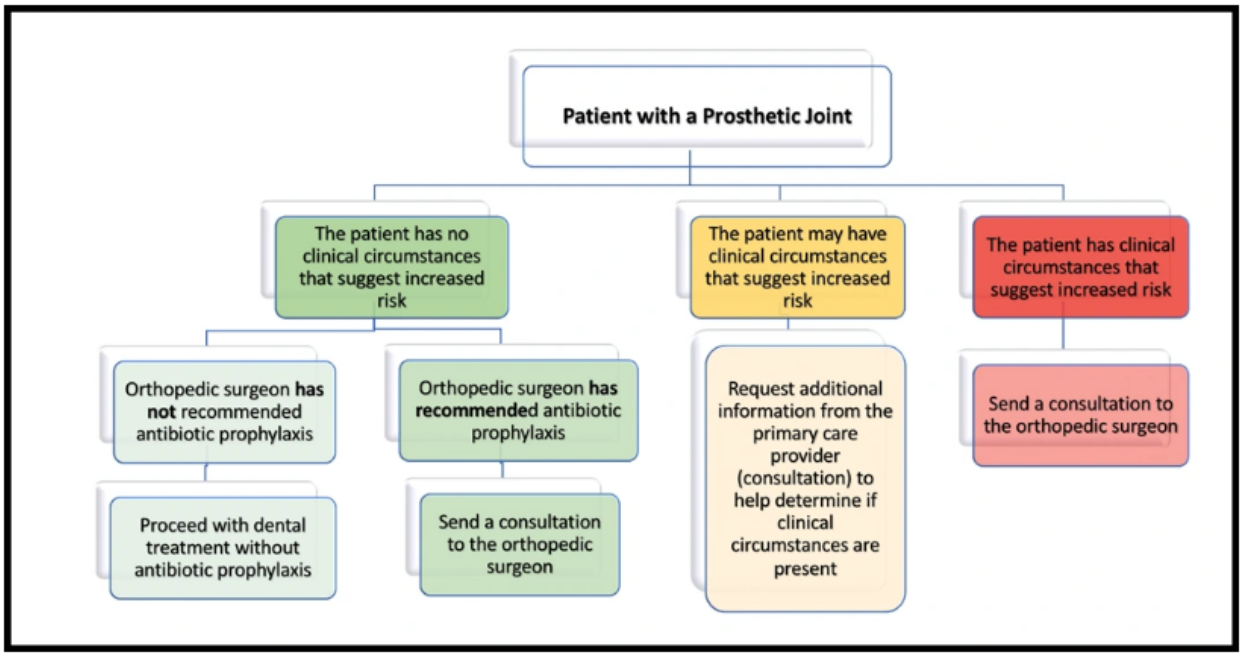


Figure 3. Decision Tree for Joint Replacement Patients.[11]

Table 5. Clinical circumstances that suggest the presence of increased risk of joint infection [11]	
Circumstances related to the artificial joint:	✓ Patients with previous late prosthetic joint infection
Severely immunocompromised patients	✓ Diabetic patient with poor glycemic control (>8.5 A1c within last 3 months or current blood glucose reading >200) ✓ Patient with Stage 3 AIDS with CD4T lymphocyte count < 200 ✓ Cancer patient ✓ Patient with autoimmune disorders (i.e., rheumatoid arthritis and lupus erythematosus) MAY be at increased risk ✓ Patient taking biologic disease modifying agents or other immunosuppressive medications: • Patient taking >10 mg of prednisone (or equivalent) per day • Patient with organ or bone marrow transplant on immunosuppressives ✓ Patient with inherited diseases of immunodeficiency
* *Adapted from: Appropriate Use Criteria for Management of Patients with Orthopedic Implants Undergoing Dental Procedures. 2016.*	

Table 6. Recommendations for consultations for dental patients with prosthetic joints [11]

- ✓ In cases where there are no circumstances (see Table 5) present that suggest the patient has an increased risk of late prosthetic joint infection, NO consultation with the orthopedic surgeon is necessary.
  - In these cases, if the patient states that their orthopedic surgeon has recommended antibiotic prophylaxis in the past, a consultation should be sent to the surgeon with a copy of the current guidelines.
  - A statement should be included that if antibiotics are still recommended, the prescription should be provided by the orthopedic surgeon.
- ✓ When clinical circumstances are present that suggest the patient is at higher risk of a late prosthetic joint infection, it is appropriate for the dentist to make the final judgment to use antibiotic prophylaxis.
- ✓ In cases where the patient's current status is in question, it may be helpful to consult the patient's treating physician (for diabetes, AIDS, cancer, etc.) for additional information.

Table 7. Follow-Up Questions for Patients with Total Joint Replacements [1]

- ✓ When was the prosthetic joint surgery?
- ✓ Have you been told to take antibiotics prior to having dental work?
- ✓ If so, who advised antibiotic prophylaxis? (Please provide name and contact number)
- ✓ Are you allergic to any antibiotics?

Chronic Renal Failure

Chronic renal failure often leads to End Stage Renal Disease (ESRD), which is defined as progressive bilateral deterioration of renal function resulting in uremia and eventually death.[12] Uremia is the toxic condition produced by the retention of urinary constituents in the blood. Some of the manifestations of ESRD are increased risk of infection, bleeding and bone fractures.

Dialysis

There are two forms of dialysis, hemodialysis and peritoneal dialysis. Hemodialysis uses a dialyzer, which is an artificial filter that removes toxins, and is performed every other day for approximately 4-6 hours. These patients are usually given heparin, an anticoagulant, to help prevent blood clotting during the hemodialysis process. Peritoneal dialysis can be done at home via a catheter that is surgically implanted into the abdomen. It is usually performed 4 times a day and can cause acid reflux as a result, so these patients may prefer to be treated in a semi-supine position.

When considering how to modify dental treatment for patients with renal disease, a medical consult may be indicated to establish disease control and determine the possible need for antibiotic premedication due to a hemodialysis shunt. These patients can be treated safely with nitrous oxide and local anesthetic with vasoconstrictor. It is also helpful to schedule appointments on the day following dialysis, because the patient will be rested and the heparin effects are no longer in the body. When monitoring patient vitals make sure **not** to use the arm with the hemodialysis shunt. It is also important to check for excessive bleeding and review the lab results from the medical consult if available.

Specifically, check the platelet count and platelet function analyzer (PFA-100) lab results. Given the potential for bleeding, aspirin and NSAIDs must be avoided; however, low doses of acetaminophen may be used. A frequent recall is helpful to prevent infections or identify them early.

In summary, if a patient presents to the dental office indicating they have chronic renal failure, there are several follow-up questions that are helpful to ask to determine the severity of the disease (Table 8).

Bleeding Disorders

Bleeding disorders can be divided into several categories, such as platelet disorders, anticoagulant disorders, anemia and drug-induced clotting abnormalities. Patients with bleeding disorders may experience spontaneous gingival bleeding. Therefore, they need good oral hygiene instructions to prevent infections and reduce bleeding. If the patient presents for dental treatment with an infection, the infection should be treated first before the dental treatment is completed.

Platelet Disorders

Normal platelet count (140,000-400,000). Thrombocytopenia is the medical term for a low blood platelet count, which usually occurs at 50,000 and is a dangerously low level for dental providers to treat a patient. Dental considerations for patients with thrombocytopenia include watching for gingival bleeding, petechiae (i.e., small, pinpoint collections of blood under the skin or mucous membrane), ecchymosis (i.e., discoloration of the skin caused by blood within the tissue), jaundice, pallor and ulcers. Aspirin or other NSAIDS are contraindicated for patients with this disorder. If their platelet level falls below

Table 8. Follow-Up Questions for Chronic Renal Failure Patients[1]

- ✓ When were you diagnosed with renal failure?
- ✓ Are you currently receiving dialysis? If so, what type?
- ✓ When was your last dialysis treatment?
- ✓ Do you have a shunt, graft, catheter, or fistula? If so, where and when was it placed?

50,000/mm^3 a medical consult is required to determine if platelet infusion or a hemostatic agent is needed.

The next platelet disorder is called Von Willebrand Disease, which is an inherited bleeding disorder that is caused by deficiency and/or dysfunction in Von Willebrand factor and factor VIII. There are three types of the disorder (Type 1, 2, and 3). These patients may report increased bleeding (e.g., gums, nose bleeds, menstrual periods, cuts or surgeries, and blood in stool or urine). They may also experience large bruises. Patients with Type 1, have a mild form of the disease and the provider can proceed with dental treatment with caution. However, patients with Type 2 & 3 have a more severe deficiency and are at higher risk for uncontrolled bleeding. Therefore, a medical consult is beneficial before proceeding with treatment when a patient has Type 2 or 3 Von Willebrand Disease.

One of the treatments available for Von Willebrand's Disease is desmopressin (DDAVP), which is a man-made hormone that is usually taken by injection or nasal spray. It helps the body release more Von Willebrand factor and factor VIII into the bloodstream. Desmopressin works for most people who have Type 1 and for some people who have Type 2 disease. Another treatment option is aminocaproic acid or tranexamic acid, which are antifibrinolytic medicines that help reduce bleeding by slowing the breakdown of blood clots.[13]

Anticoagulant Disorders

Hemophilia is a rare, inherited bleeding disorder where blood doesn't clot normally. The symptoms include increased or prolonged bleeding (e.g., gums, nosebleeds, circumcision, menstrual periods, cuts or surgeries, and blood in stools or urine). Patients may also experience bleeding into the joints and subsequent pain and swelling, called arthropathy.

There are two main types of Hemophilia, which are A & B. Hemophilia A is the most common type and can be mild, moderate or severe. It is a result of a lack of blood clotting factor VIII and usually occurs in males. However, women can be carriers. Hemophilia B is due to the lack of blood clotting factor IX and is referred to as "Christmas disease"[14], because the first person diagnosed with the disease was named Stephen Christmas in 1952. In addition, the first report of its identification was found in the Christmas edition of the British Medical Journal.

Patients with mild to moderate hemophilia are generally safe to treat. It is important to treat acute oral infection in these patients and to help them establish good oral hygiene practices. However, a medical consult is required for patients with severe hemophilia. Patients with severe hemophilia are usually treated in the hospital setting with platelet infusions or drugs to decrease bleeding. If a patient presents to the dental office with hemophilia, there are several follow-up questions to ask in order to understand the type and severity of disease (Table 9).

Anemia

Anemia is a condition characterized by a deficiency of hemoglobin. Basically, there are too few red blood cells (RBC) present, which is caused by blood loss, decreased production of RBC's or increased destruction of RBC's. Patients with this condition have an increased susceptibility to infections and poor wound healing. Clinically, they may present with the following oral manifestations: pallor in oral

Table 9. Follow-Up Questions for Suspected Hemophilia Patients [1]

- ✓ What kind of bleeding problem do you have?
- ✓ Do you know the cause?
- ✓ Have you had any bleeding problems following dental or medical treatment? If so, describe them.
- ✓ How do you control bleeding problems?
- ✓ Has your physician warned you about having dental procedures?

mucosa, loss of papilla from tongue (sore and red), or angular cheilitis.

There are several types of anemia, such as iron deficiency anemia, pernicious anemia, and sickle-cell anemia. Patients with iron deficiency anemia experience low iron levels. Those with pernicious anemia have insufficient B12 levels due to lack of an intrinsic factor. A distinguishing factor of sickle cell anemia is that the RBC is sickle shaped and it occurs in approximately 1 in 500 African Americans[15]. Patients who carry 1 gene for the disorder have sickle cell trait and may have routine dental treatment. If patients carry a gene from each parent, they have sickle cell disease.

There are several modifications to dental treatment when a patient presents with sickle cell anemia. First, confirm with the medical doctor to determine the patient's level of disease control. A medical consult is necessary when disease is poorly controlled or when oral infection is present. During dental treatment, it is helpful to limit local anesthetic with vasoconstrictor. Nitrous oxide sedation is ok to use during a short appointment with at least 50% oxygen.[1,16] Finally, these patients require premedication for major surgical procedures.

The most critical emergency that can occur is sickle cell crisis, so it is important to treat during a non-crisis period.

Drug Induced Clotting Abnormalities

It is also imperative to ask what the patient's International Normalizing Ratio (INR) is if they are taking blood thinners, such as Warfarin (Coumadin).[17] Warfarin is the most commonly used anti-coagulant drug and is best monitored by INR or PT (prothrombin time). Table 11 outlines normal and elevated INR values. It is acceptable to treat patients with an INR in the range of 2.0-3.0, but INR readings of > 3.5 require a medical consult prior to treatment. Prothrombin time should be less than 20 seconds.

When patients are on antiplatelet drugs, such as Clopidogrel (Plavix), they are best monitored by a platelet count and platelet function analyzer (PFA-100), rather than an INR reading. Aspirin, Ibuprofen and other NSAIDs are also considered antiplatelet drugs and are not monitored by the INR reading. Regardless of the type of drug being used, dental practitioners should never take a patient off their anticoagulant or antiplatelet medication without consulting the patient's hematologist first.

Table 10. Follow-Up Questions for Patients with Anemia [1]

- ✓ What type of anemia do you have?
- ✓ Are you being treated and does the treatment control the condition?
- ✓ Has the physician given you any warnings regarding medical or dental treatment or drugs to avoid?
- ✓ Do you have any problems healing too slowly?

Table 11. International Normalizing Ratio (INR) Values [10]

INR < 2.5	Normal range
INR 2.0-3.0	Routine care may be performed
INR > 3.5	Physician consult recommended

REMINDER

Do not ask a patient on anti-platelet meds (Plavix) their INR reading, since INR is only for anti-coagulant meds (Warfarin/Coumadin).

New therapies are being developed, which do not require blood labs prior to dental treatment. In addition, there is limited evidence that direct-acting oral anticoagulants, such as apixaban and rivaroxaban, do not require altering therapy before dental treatment.[18]

REMINDER

For anti-platelet medication, the best way to check for increased risk of bleeding is to scale 1-3 teeth and see if clotting occurs. If not, apply digital pressure to help improve clotting time.[1]

Immunocompromised Patients

Certain conditions, such as hepatitis, HIV and cancer, place patients at greater risk of being immunocompromised. Each of these diseases are discussed in further detail and necessary modifications to dental treatment are included.

Hepatitis

By definition, hepatitis is an inflammation of the liver caused by a viral infection. While there are five types of hepatitis (A-E), the three main types (A-C) are the focus of this section.

First, Hepatitis A is transmitted via the fecal-oral route and a vaccine does exist. Due to the route of transmission, there is not a high risk of dental health care workers transmitting the disease. While Hepatitis A does not result in chronic infection, it can result in significant liver failure.

Second, Hepatitis B is transmitted through blood, saliva and semen/vaginal fluid (e.g., needle stick, IV drug use, sex). A three-part vaccine exists to prevent acquiring the disease. Hepatitis B can result in both acute and chronic infection that can eventually lead to liver cancer.

Third, Hepatitis C is most frequently transmitted from IV drug use and more than half of patients develop chronic infection, which may lead to liver failure and/or cancer. A vaccine is currently not available.[19] Table 12 provides a summary of the various types of Hepatitis, the mode of transmission, prevention and the level of occupational risk associated with each type.

Table 12. Summary of Hepatitis(1)

	Mode of Transmission	Prevention	Risk to You / Occupational Exposure
Hepatitis A	Fecal, oral	Vaccine Hand washing	Little to none
Hepatitis B *Chronic	Blood or bodily fluids	Vaccine Universal Precaustions Avoid High risk behaviors	Up to 30% risk of trasmission with needle stick
Hepatitis C *Chronic	Blood or bodily fluids	Universal Precaustions Avoid High risk behaviors	About 2% risk of transmission
Hepatitis D	Blood or bodily fluids	Hep B Vaccine	Little to none
Hepatitis E	Fecal, oral travel	Hand Washing	Little to none

When providing dental care for patients with hepatitis, limit local anesthetic with vasoconstrictor to 2-3 cartridges.1 If they have a known history of infection, use standard precautions and be aware that they may have bleeding tendencies as well. One of the most important modifications for dental treatment in a patient with active hepatitis (acute infection) is that elective treatment should be postponed and that a medical consult is required before treatment.

Some helpful follow-up questions to ask patients with hepatitis are listed in Table 13.

HIV

The human immunodeficiency virus (HIV) is found in bodily fluids and is transmitted via blood, semen, vaginal secretions, and breast-milk. HIV is the etiologic agent for the acquired immunodeficiency syndrome (AIDS). Currently, there are no reports of HIV zero-conversion in dental professionals in the U.S. after percutaneous exposure (PME). In HIV disease, the number of CD4+ T lymphocytes decrease as the viral load and the symptoms of disease and the incidence of oral infections/lesions related to the HIV infection increases. A patient is usually diagnosed if their viral load is > 3000 copies/mL. A healthy individual has a CD4+ count of 800-1200 mm^3, but if it falls below 200 mm^3, that is indicative of late-stage disease or AIDS infection. The count of the T-helper cells is most commonly used to track progression of the infection and helps to determine the extent of treatment.

When preparing for dental treatment, a medical consult is needed if current lab reports aren't available to determine patient's current CD4 and level of immunosuppression. Antibiotic premedication is necessary only if the patient is experiencing severe immune neutropenia (i.e., ANC less than 500 cell/mm^3).[1] It is ok to use nitrous oxide sedation and local anesthetic with vasoconstrictor. Standard precautions and personal protective equipment should be worn and any oral lesions should be documented if observed. An oral pathology consult and medical consult may be indicated in that case. If the patient will be needing an extraction, request that they bring their latest lab results with them and review the platelet, white blood cell and red blood cell counts.

Table 14 includes helpful follow-up questions for dental patients with HIV.

Table 13. Follow-Up Questions for Hepatitis Patients[(1)]

- ✓ When were you diagnosed with hepatitis?
- ✓ What type of hepatitis did/do you have?
- ✓ What type of treatment did you receive?
- ✓ Have you been tested to determine if you are a carrier?
- ✓ Do you have any liver problems/damage?

Table 14. Follow-Up Questions for HIV Patients[(1)]

- ✓ When were you diagnosed with HIV/AIDS?
- ✓ When was your last complete blood count and do you have the results with you?
- ✓ How has your overall health been recently?
- ✓ Have you recently experienced any infections?
- ✓ Are you on any medications for this condition?

Cancer Patients

Oral complications can be common after patients receive chemotherapy or radiation therapy for cancer treatment. Patients may present with oral mucositis, or inflammation and ulceration of the mouth. They may also experience fungal infections, such as candidiasis, or xerostomia (dry mouth) as a result of salivary gland dysfunction. If patients have taken bisphosphonate medication, they may also be at greater risk for osteonecrosis of the jaw (ONJ). Necrosis that is specifically related to head and neck radiation is referred to as osteoradionecrosis of the jaw (ORNJ).

As dental providers, it is possible to provide relief for several of the oral manifestations that can occur in cancer patients. Table 15 lists possible treatments to ease symptoms of mucositis, xerostomia and radiation caries.

There are several modifications for dental treatment when caring for cancer patients. First, if the patient is receiving chemo or has an indwelling catheter/port present, consult their oncologist before any dental treatment is performed. The patient may need antibiotic premedication prior to treatment and this should be prescribed by the patient's oncologist. Also, have the oncology team conduct blood work 24 hours before invasive dental treatment to determine whether the patient's platelet count, clotting factors, and neutrophil count are sufficient to treat. Treatment must be postponed if the platelet count <50,000 platelets/mm^3, abnormal clotting factors are present, or the neutrophil count < 1,000 cells/mm^3.

Table 16 provides follow-up questions for cancer patients who are seeking dental care.

Pregnant Patients

Table 15. Treatment for Oral Conditions Related to Cancer [1]

Mucositis	✓ Benadryl or viscous lidocaine in milk of magnesia • Best treatment to offer relief • Requires prescription from oncologist • Must be made at compounding pharmacy • Called Miracle Mix ✓ Alcohol-free mouthrinses (CHX) or Rx antimicrobial agents ✓ Maintain hydration (avoid alcohol, soda, & tobacco) ✓ Salt and sodium bicarbonate mouthrinse ✓ Topical steroids; Orabase; Biotene products; Nystatin
Xerostomia	✓ Xylimelts ✓ Food with liquid ✓ Xylitol-based gum ✓ Suck ice chips ✓ Glycerine & water ✓ Saliva substitutes
Radiation Caries (following radiation to head & neck)	✓ Education patient concerning risks ✓ Motivate them to maintain optimum oral health ✓ Frequent dental recall ✓ Custom trays for daily fluoride application (for LIFE) • 1.1% Neutral sodium • 0.4% Stannous fluoride gel • Avoid Acidulated Phosphate Fluoride • Single, daily brush-on application of 5000 ppm fluoride may be more effective

Table 16. Follow-Up Questions for Current Cancer Patients Seeking Dental Care[1]
✓ Does your oncologist know you are here today?
✓ Did you have lab work done before this appointment? What is you ANC?
✓ What type of cancer do you have and what area of the body is affected?
✓ May I have permission to contact your oncologist about your treatment?
✓ When did/will your oncology treatment start?
✓ What type of treatments are you receiving?
✓ Has your physician given you any instructions related to having oral health treatment?

The main concern for patients with chronic renal failure, bleeding disorders and immunocompromised patients are **increased risk for infection** and **bleeding**.

When caring for pregnant patients seeking dental care, elective treatment is best during the second trimester and emergency dental treatment can be performed whenever indicated. Nitrous oxide should be avoided if possible, but it can be used for short periods if needed at approximately 25 ppm during administration.[20] Local anesthetic with vasoconstrictor may be used during pregnancy, but should be limited. Monitoring blood pressure and vitals helps to detect pre-eclampsia, which is characterized by elevated BP. Radiographs should be taken only when the benefits outweigh the risks.[1]

Pregnant patients must have excellent oral hygiene during pregnancy. They can be educated regarding the increased risk for pregnancy gingivitis during the second month of pregnancy, as well as the possibility of getting pyogenic granulomas, or pregnancy tumors. If the patient is experiencing morning sickness, dental appointments should be scheduled in the afternoon and every effort can be made to prevent the gag reflex during treatment by seating them in a semi-supine position. In addition, pregnant patients can rinse with sodium bicarbonate after vomiting and then brush their teeth once the pH level has increased.

During pregnancy, unnecessary drugs should be avoided, but if they are needed refer to the new FDA labeling which replaces the old five-letter system (A, B, C, D and X). The new labeling system addresses risks to expectant mothers, developing fetuses and infants who are breastfeeding.[21] If analgesic is needed, acetaminophen is recommended as NSAIDs and Aspirin are contraindicated during pregnancy. Dental appointments should be kept short and the patient placed in a supine position as hypotension is possible in the 3rd trimester.

Table 17 provides follow-up questions that are helpful when caring for pregnant patients.

Endocrine Disorders

Thyroid Disorders

The two main type of thyroid disorders hyperthyroid and hypothyroid. Hyperthyroid occurs when there are elevated levels of T4 and T3 and low or undetectable TSH levels. The disease is often associated with an autoimmune disorder, called Grave's Disease. The most

Table 17. Follow-Up Questions for Pregnant Patients[1]
✓ What trimester are you in? How many weeks?
✓ Are you experiencing any complications with the pregnancy?
✓ Are you having nausea or morning sickness?

common medical emergency seen in patients with hyperthyroid is a thyroid storm, which includes rapid pulse, fever and even fainting.[22] Modifications to dental treatment depend on whether the patient's hyperthyroidism is controlled or uncontrolled. If it is uncontrolled, no treatment should be performed. A medical consult is indicated for uncontrolled hyperthyroid patients and they must not be given any epinephrine. If the patient is controlled, nitrous oxide administration is ok and no premedication is necessary. Patients with controlled hyperthyroid can receive a cardiac dose of epinephrine.

Hypothyroid is characterized by decreased levels of T_4 and T_3 and increased TSH levels. Symptoms include cold intolerance, fatigue, weight gain, and diffuse goiter. It is often associated with the autoimmune disease Hashimoto's Thyroiditis. The medical emergency that can occur in hypothyroid patients is called myxedema coma, which has hallmark symptoms of lethargy, confusion, weakness, and breathing difficulties.[23] When planning dental treatment for patients with hypothyroidism, nitrous oxide and local anesthetic with vasoconstrictor are ok when a cardiac dose is used. No premedication is necessary and a medical consult is only needed if the condition is undiagnosed or uncontrolled.

Adrenal Gland Disorders

Patients may present with primary or secondary adrenal insufficiency. Addison's disease is an example of primary adrenal insufficiency resulting in underproduction of cortisol. Symptoms include bronzing of the skin and melanotic macules. A medical emergency that can occur when receiving dental treatment is adrenal crisis, which is caused by a severe lack of cortisol. The necessary treatment involves activating the Emergency Medical System, giving the patient oxygen and IV glucocorticoids. Secondary adrenal insufficiency occurs when there is an insufficient amount of adrenocorticotropic hormone (ACTH), but the patient still secretes aldosterone. This condition is more common than primary insufficiency. Patients with Cushing's syndrome, or hypercortisolism, experience symptoms of a moon shaped face and buffalo hump.

Synthetic glucocorticoids may be used for treating the following conditions: adrenal insufficiency, rheumatoid arthritis, systemic lupus, asthma, hepatitis, or as immunosuppressive therapy for organ transplantation or joint replacement. Dental providers should be familiar with the corticosteroid equivalent doses as shown in Table 18.

When planning dental care for patients with disorders of the adrenal gland, nitrous oxide can be used and is helpful for minimizing stress and reducing the cortisol demand. Local anesthesia with vasoconstrictor is ok as profound anesthesia is necessary for stress reduction for the patient. Premedication is not necessary unless there is an acute infection and a medical consult is required to determine that. A medical consult would be necessary if the patient was poorly controlled, had an acute

Table 18. Corticosteroid Equivalent Doses

Cortisone	25 mg
Hydrocortisone (Cortisol)	20 mg
Prednisone	5 mg

Table 19. Follow-Up Questions for Patients with Adrenal Gland Disorders[1]
✓ When were you diagnosed? ✓ Are you controlled? ✓ How are you feeling today? ✓ What are your symptoms?

infection, and to inquire about supplemental steroid use for surgical procedures or infection.

The following questions are helpful to ask patients who present to the dental office with adrenal gland disorders (Table 19).

Summary

Providing dental care for medically compromised patients is something that can be done with care and caution. Oral health is imperative for medically compromised patients, especially given the relationship between oral and systemic health. In many cases, improving oral health can make it easier to control the disease or prevent it from getting worse. Dental providers can play a pivotal role in assessing patients for disease control when performing the health history and physical assessments. Knowing when dental care can be safely provided and when to consult with the patient's primary physician or specialist can save valuable time for both the dental personnel and the patient. Using the information provided in this course, in addition to professional experience, dental practitioners can address the needs of medically compromised patients with more confidence.

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/ce-courses/ce628/test*

1. Which of the following statements about antibiotic resistance is correct?

A. Antibiotic resistance occurs most frequently in the elderly population.
B. Antibiotic resistance is seen most often in hot, humid climates.
C. Antibiotic resistance is causing antibiotics to become more effective at treating infections.
D. Antibiotic resistance leads to increased hospital stays and mortality rates.

2. According to the American Dental Association, the proper antibiotic regimen for a patient who is allergic to penicillin is:

A. Doxycycline (100 mg)
B. Amoxicillin (2 g)
C. Azithromycin (500 mg)
D. A & B
E. B & C
F. A & C

3. Which of the following cardiac conditions does NOT require antibiotic prophylaxis according to the American Heart Association?

A. Prosthetic heart valve.
B. Repaired congenital heart diseases with residual defects.
C. Mitral valve prolapse with regurgitation.
D. History of infective endocarditis.
E. Transplanted heart with damaged valves.

4. Each of the patients below has had a total joint replacement and has a corresponding medical condition. All of them may need a medical consult to determine the need for premedication, except one. Which patient does NOT need premedication?

A. John, who is an insulin-dependent diabetic.
B. Kirk, who has osteoarthritis.
C. Maria, who has systemic lupus.
D. Anne, who has HIV.

5. All of the following treatment modifications are necessary when caring for a patient with chronic renal failure, or ESRD, EXCEPT one. Which one is the exception?

A. Appointments should be scheduled on the same day as dialysis.
B. Patients with hemodialysis shunt may need a medical consult.
C. Do not use the arm with the hemodialysis shunt when taking vitals.
D. Check for excessive bleeding and review lab results from the medical consult.

6. If a patient presents with thrombocytopenia, which of the following platelet counts would require a medical consultation before treatment?

A. 45,000/mm3
B. 100,000/mm3
C. 150,000/mm3
D. 350,000/mm3

7. Which of the following treatment modifications are necessary for patients with sickle cell anemia?

A. Nitrous oxide may be used with at least 25% oxygen.
B. Premedication is required for minor surgical procedures.
C. Patients may receive dental treatment during a sickle cell crisis.
D. Local anesthetic with vasoconstrictor should be limited.

8. Which of the following is an acceptable INR to perform dental treatment on patients with bleeding disorders?

A. 1.4
B. 2.5
C. 3.6
D. 3.8

9. Which type of hepatitis currently does NOT have a vaccine available?

A. Hepatitis A
B. Hepatitis B
C. Hepatitis C
D. Hepatitis D

10. Antibiotic premedication is necessary for an HIV patient if:

A. Current labs aren't available to determine level of immunosuppression.
B. Local anesthetic will be used for the dental procedure.
C. Nitrous oxide will be used during the dental procedure.
D. The patient is experiencing severe immune neutropenia.

11. All of the following conditions are oral manifestations of cancer treatment or radiation to the head and neck EXCEPT one. Which is the exception?

A. Xerostomia
B. Oral mucositis
C. Salivary stones
D. Candidiasis
E. Osteonecrosis

12. It is imperative to monitor blood pressure and vitals for pregnant patients during dental treatment in order to?

A. Detect pre-eclampsia.
B. Prevent premature labor.
C. Detect signs of a stroke.
D. Monitor the effects of epinephrine.

13. If an analgesic is needed during pregnancy, the best medication to use would be:

A. Advil
B. Acetaminophen
C. Aspirin
D. NSAIDs

14. Which of the following statements is TRUE regarding dental treatment for patients with hyperthyroidism?

A. The most common medical emergency for hyperthyroid patients is myxedema coma.
B. Nitrous oxide must not be given to a patient with controlled disease.
C. Patients with controlled hyperthyroidism must not be given epinephrine.
D. If the hyperthyroidism is uncontrolled no dental treatment should be performed.

15. Myxedema coma is a medical emergency associated with?

A. Hepatitis A
B. Hypothyroidism
C. Cushing's syndrome
D. Addison's Disease

16. What could cause a patient to experience adrenal crisis?

A. A severe lack of cortisol.
B. Low or undetectable TSH levels.
C. A CD4+ count that falls below 200 mm3.
D. A deficiency in factor VIII.

17. Which of the following is an equivalent dose of Cortisone (25 mg)

A. Cortisol (10 mg)
B. Hydrocortisone (25 mg)
C. Prednisone (5 mg)
D. Hydrocortisone (15 mg)

18. All of the following are reasons to send a medical consult for a patient with adrenal gland disorder, EXCEPT one. Which is the exception?

A. The patient is poorly controlled.
B. The patient requires local anesthesia for a restorative procedure.
C. The patient has an acute infection.
D. A surgical procedure is planned and the dental provider needs to inquire about supplemental steroid use.

References

1. Pickett, F. & Guerenlian, J. Preventing Medical Emergencies: Use of the Medical History in Dental Practice. Lippincott, Williams & Wilkins, 3rd edition. Burlington, MA: Jones et Bartlet Learning; 2015.
2. Forrester, J. (2021). Bacteremia. Merck Manual Consumer Version. Accessed May 1st, 2022.
3. ADA. Clinical Practice Guidelines and Dental Evidence. Accessed May 1st, 2022.
4. Merriam-Webster. Fibrinolysis. Accessed May 1st, 2022.
5. Ayoade F, Li DD, Mabrouk A, et al. Prosthetic Joint Infection. [Updated 2022 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022. Accessed May 1st, 2022.
6. World Health Organization. (31 July 2020). Antibiotic resistance. Accessed May 1st, 2022.
7. Centers for Disease Control & Prevention (CDC). Antibiotic/Antimicrobial Resistance. Accessed May 1st, 2022.
8. ADA. Antibiotic Prophylaxis Prior to Dental Procedures. Accessed May 1st, 2022.
9. ADA. Health History Form. Accessed May 1st, 2022.
10. Wilson WR, Gewitz M, Lockhart PB, Bolger AF, DeSimone DC, Kazi DS, Couper DJ, Beaton A, Kilmartin C, Miro JM, Sable C, Jackson MA, Baddour LM; American Heart Association Young Hearts Rheumatic Fever, Endocarditis and Kawasaki Disease Committee of the Council on Lifelong Congenital Heart Disease and Heart Health in the Young; Council on Cardiovascular and Stroke Nursing; and the Council on Quality of Care and Outcomes Research. Prevention of Viridans Group Streptococcal Infective Endocarditis: A Scientific Statement From the American Heart Association. Circulation. 2021 May 18;143(20):e963-e978. doi: 10.1161/CIR.0000000000000969. Epub 2021 Apr 15. Erratum in: Circulation. 2021 Aug 31;144(9):e192. Erratum in: Circulation. 2022 Apr 26;145(17):e868.
11. Rees HW. AAOS Appropriate Use Criteria: Management of Patients with Orthopaedic Implants Undergoing Dental Procedures. J Am Acad Orthop Surg. 2017 Jul;25(7):e142-e143. doi: 10.5435/JAAOS-D-17-00004.
12. Costantinides F, Castronovo G, Vettori E, Frattini C, Artero ML, Bevilacqua L, Berton F, Nicolin V, Di Lenarda R. Dental Care for Patients with End-Stage Renal Disease and Undergoing Hemodialysis. Int J Dent. 2018 Nov 13;2018:9610892. doi: 10.1155/2018/9610892.
13. National Institutes of Health. The Diagnosis, Evaluation and Management of von Willebrand Disease: Full Report. Accessed May 1st, 2022.
14. National Hemophilia Foundation. Hemophilia B. Accessed May 1st, 2022.
15. Sedrak A, Kondamudi NP: Sickle Cell Disease. StatPearls. StatPearls Publishing, 2021, Treasure Island (FL).
16. Little JW. Dental Management of the Medically Compromised Patient. 8th ed. St. Louis Mo: Elsevier/Mosby; 2013.
17. American Dental Association. Oral Anticoagulant and Antiplatelet Medications and Dental Procedures. Accessed May 1st, 2022.
18. Teoh L, Moses G, McCullough MJ. A review of drugs that contribute to bleeding risk in general dental practice. Aust Dent J. 2020 Jun;65(2):118-130. doi: 10.1111/adj.12751. Epub 2020 Mar 13.
19. Centers for Disease Control. Hepatitis C Questions and Answers for Health Professionals. Accessed May 1st, 2022.
20. ADA. Pregnancy: Medication Use. Accessed May 1st, 2022.
21. Food & Drug Administration (FDA). 2014. Pregnant? Breastfeeding? Better Drug Information is Coming. Accessed May 1st, 2022.
22. DerSarkissian, C. (2019). What is a Thyroid Storm or Thyroid Crisis? Accessed May 1st, 2022.
23. Felson, S. (2020). Myxedema Coma. Accessed May 1st, 2022.

Additional Resources

1. Prevention of Infective Endocarditis Wallet Card
2. ADA Health History Form

3. Beam E, Osmon D. Prosthetic Joint Infection Update. Infect Dis Clin North Am. 2018 Dec;32(4):843-859. doi: 10.1016/j.idc.2018.06.005. Epub 2018 Sep 18.
4. Ricciardi BF, Muthukrishnan G, Masters EA, Kaplan N, Daiss JL, Schwarz EM. New developments and future challenges in prevention, diagnosis, and treatment of prosthetic joint infection. J Orthop Res. 2020 Jul;38(7):1423-1435. doi: 10.1002/jor.24595. Epub 2020 Jan 31.
5. Teixeira, EC, Warren, JJ, McKernan, SC, McQuistan, MR, Qian, F. Prescribing practices for antibiotic prophylaxis in patients with prosthetic joints. Spec Care Dentist. 2020.
6. Lockhart PB, Thornhill MH, Zhao J, Baddour LM, Davis J, McKnight PE, Gilbert GH, Mungia R, Mougeot JL; National Dental PBRN Collaborative Group. Prophylactic antibiotic prescribing in dental practice: Findings from a National Dental Practice-Based Research Network questionnaire. J Am Dent Assoc. 2020 Oct;151(10):770-781.e6. doi: 10.1016/j.adaj.2020.04.027.
7. Wilkins EM Wyche CJ. Clinical Practice of the Dental Hygienist. 11th ed. Philadelphia PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2013.

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