

Women's Health for Dental Professionals

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- Read the enclosed course.
- Complete the questions at the end of the course.
- Return your completed Answer Sheet to NetCE by mail or fax, or complete online at www.NetCE.com. Your postmark or facsimile date will be used as your completion date.
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Faculty

William E. Frey, DDS, MS, FICD, graduated from the University of California School of Dentistry, San Francisco, California, in 1966. In 1975, he completed residency training in Periodontics and received a Master's degree from George Washington University.

Dr. Frey retired from the United States Army Dental Corps in 1989 after 22 years of service. Throughout the course of his professional career, he has continuously practiced dentistry, the first 7 years as a general dentist and the past more than 40 as a periodontist. His military experience included the command of a networked Dental Activity consisting of five dental clinics. In his last assignment, he was in charge of a 38-chair facility. Colonel Frey was selected by the Army to serve on two separate occasions as the Chair of the Periodontal Department in Army General Dentistry Residency Training Programs.

Dr. Frey is the founder and president of Perio Plus, a practice management firm specializing in creating individually-designed hygiene and periodontal care programs for general dentists. He is also the creator of the Inspector Gum patient education series.

Faculty Disclosure

Contributing faculty, William E. Frey, DDS, MS, FICD, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

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Division Planner/Director Disclosure

The division planner and director have disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

Audience

This course is designed for dentists, dental hygienists, and dental assistants.

Accreditations & Approvals

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NetCE designates this activity for 5 continuing education credits.

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About the Sponsor

The purpose of NetCE is to provide challenging curricula to assist healthcare professionals to raise their levels of expertise while fulfilling their continuing education requirements, thereby improving the quality of healthcare.

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Disclosure Statement

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Course Objective

The purpose of this course is to provide dental healthcare professionals with a comprehensive update on healthcare-related issues affecting women.

Learning Objectives

Upon completion of this course, you should be able to:

1. Discuss the role that oral health plays in the overall health of women.
2. Describe the oral health manifestations associated with puberty and menstruation.
3. Discuss the changes in the oral cavity associated with oral contraceptives and pregnancy.
4. Identify the various types of cancer that affect women and describe how cancer treatments relate to women's oral health.
5. Describe the role of hormone replacement therapy for the treatment of perimenopausal and menopausal symptoms.
6. Identify strategies for the treatment and prevention of osteoporosis.
7. Identify dental issues relevant to cardiovascular disease.
8. Compare and contrast symptomatology and treatment of sexually transmitted infections.
9. Identify the signs of eating disorders that may be identified by dental health professionals.
10. Discuss the role of the dental health professional in identifying signs and symptoms associated with domestic violence.



Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

INTRODUCTION

In the last century, a virtual “knowledge explosion” has taken place with regard to women’s health issues. In addition, there have been changes in the roles assumed by women in the home and in the workplace. Alterations and improvements in the pharmacologic and surgical treatment of many women’s illnesses and health issues have also impacted outcomes and altered perspectives for long-term well-being and quality of life. For the dental healthcare professional, an expanded appreciation and knowledge of women’s health issues means more than just understanding the issues that directly impact oral health. Ongoing research and emerging information investigating possible mechanisms of action and confirming links between oral health and a woman’s overall well-being makes it imperative that dental professionals expand their knowledge of medicine. The information in this course has relevance and application to the daily practice of dentistry as conscientious healthcare professionals assume an expanded role in the total care of their patients.

PERIODONTAL DISEASE OVERVIEW

Periodontal disease is one of the most common of human diseases. It is an infectious condition resulting in the destruction of the supporting apparatus of the teeth, the periodontal ligament, and alveolar bone. Its pathogenesis is inflammatory in nature, initiated by the accumulation of bacteria at or beneath the gingival margin in dental plaques and biofilms. There are an estimated 700 or more bacterial species in residence in the oral cavity. Their accumulation in various combinations and relative proportions create diverse and complex microbiologic communities that persist in great numbers in close proximity to the adjacent soft tissues of the sulcular wall [1; 2].

The inflammatory response produced by these masses of micro-organisms results in an increase in epithelial turnover and a thinning and ulceration of the epithelial lining. The systemic circulation is thereby made accessible to a vast array and quantity of bacterial products, such as lipopolysaccharides (LPS), hydrolytic enzymes, and peptidoglycan fragments. The host response also produces cytokines and biologic mediators, such as interleukins and prostaglandins, in substantial amounts that also have ready access to the systemic circulation [3; 4]. It is reasonable to speculate then that the presence of large numbers of bacteria, their products, and the products of the host response, all with ready access to the systemic circulation, may have an influence on overall health.

WOMEN’S HEALTH OVERVIEW

In the recent past when healthcare professionals thought about “women’s health,” their attention focused primarily on the patient’s reproductive health. Times have changed. Women are assuming control over the elements and occurrences that may potentially impact their health and wish to make informed choices relative to every aspect of their health care. The definition of women’s health has become not merely the absence of illness or disability, but has expanded to a broader, more comprehensive approach, encompassing physical, emotional, spiritual, and social dimensions of total well-being. Women appreciate healthcare professionals who listen and understand the full dimension of their concerns.

Although there are more women than men in the United States, women have long been underrepresented in medical research. To respond to this crucial need, the National Institutes of Health (NIH) in 1990 established the Office of Research on Women’s Health (ORWH), which developed a research agenda to correct the gaps of knowledge in women’s health.

As a result, a record number of studies have been conducted, and more are underway, into areas such as heart disease, female cancers, gynecologic health, and osteoporosis, thus improving both the body of knowledge and therapeutic strategies for gender-specific disorders. The ORWH has specified research priorities for the 21st century that include research on: the health of girls and women across the life span; sex and gender factors; biomedical, behavioral, and psychosocial factors; socioeconomic and geographic factors; women with disabilities; and the advancement of women in biomedical research careers [5].

Oral health is an important part of an individual's general health and well-being. This was a critical conclusion reached in the Surgeon General's report on oral health in America, which was first published in 2000 [6]. There are a number of oral-health issues unique to women, many of which are directly related to shifts in hormone levels during puberty, menses, pregnancy, and menopause [7]. Oral bacteria may also have an influence on a number of systemic illnesses impacting women. There is epidemiologic and clinical evidence of an increased risk of mortality due to stroke, myocardial infarction, and other causes in older patients with periodontal disease; a bi-directional effect between periodontitis and systemic diseases seems to exist [8; 9; 10; 11; 12; 13; 14]. Researchers are continuing to expand and strengthen their understanding of the ways in which periodontitis and other oral-health conditions are associated with specific women's health concerns.

Many of the health problems that affect women today are amenable to community and public health approaches. Dentists, dental hygienists, and dental assistants are in a position to make a difference. Equipped with the information in this course, professionals whose main concern is oral health will expand their knowledge of women's healthcare issues and, with this knowledge, enhance their appreciation and understanding of the challenges women face. They should then be better equipped to identify and counsel their female patients on a number of health-related issues and to assist them in obtaining access and care for all of their health concerns.

PUBERTY AND MENSTRUATION

The onset of menstruation, or menarche, is the most discernible female benchmark of puberty. Menarche now begins at an earlier age in Western nations, most likely because of improved nutrition and health care; higher relative weight is strongly correlated with the likelihood of having reached menarche at a younger age. Young women in the United States typically experience menarche at 12 or 13 years of age [15].

The members of the dental health team can provide factual information and clarify any myths or misconceptions about menstruation that their young female patients may have. There are also changes associated with menstruation that can have a direct bearing on oral health. When young women enter puberty, the changes in estrogen levels can be reflected by changes in the gingival tissues. The relative proportions of anaerobes in the subgingival plaque may change, coinciding with fluctuations in the normal hormonal cycle. Symptoms of gingivitis often follow a pattern that coincides with the menstrual cycle [16]. Nodular hyperplastic reactions that are histologically similar to inflammatory hyperplasia may take place. These areas frequently involve the interdental papillae and can be very red and exuberant in appearance. Patients with a familial history of juvenile periodontitis should be closely monitored for signs of periodontal disease, and appropriate therapy should be initiated at the earliest possible time. Referral for specialty evaluation is highly recommended [17].

Bleeding can become more extensive after oral surgery during the time of menses, and salivary glands may swell. A small rise in tooth mobility may also be detectable. Many women report that oral aphthous ulcers tend to appear during the luteal phase of their menstrual cycle [18]. These changes, however, are not universal and may vary in severity from one woman to another as levels of estrogen and progesterone fluctuate during the normal cycle. Dentists, hygienists, and dental assistants should educate patients on the importance of good dental hygiene and effective plaque control that can minimize the increase in gingivitis during menses.

Dysmenorrhea, or painful menstruation, usually occurs at or one day prior to the onset of menstruation and decreases during the menstrual cycle. Primary dysmenorrhea is painful menstruation with no detectable organic disease. Prostaglandins, produced by the uterus in high concentrations during menses, are the primary cause of the cramping pain. These prostaglandins increase uterine contractility and decrease uterine arterial flow, causing ischemia. The chief complaints of women with dysmenorrhea include cramps, abdominal pain, headache, malaise, and fatigue, plus aching in the back and thighs and gastrointestinal symptoms. Drug therapy includes prostaglandin inhibitors such as ibuprofen (e.g., Advil, Motrin), naproxen (e.g., Anaprox, Naprosyn, Aleve), and oral contraceptives [19]. Nonpharmacologic treatments include moderate exercise, rest, applications of moderate heat to the abdomen, balanced nutrition, and biofeedback.

Secondary dysmenorrhea is associated with pelvic pathology. Conditions that most frequently contribute to secondary dysmenorrhea include endometriosis, pelvic inflammatory disease (PID), uterine prolapse, or the presence of an intrauterine device (IUD). Because primary and secondary dysmenorrhea may coexist, an accurate differential diagnosis is important [19].

Premenstrual syndrome (PMS) is a cluster of symptoms that occurs two to three days before the onset of menstruation and then disappears during the first few days of the menstrual period. While the symptoms can vary greatly among women, they follow a consistent pattern of timing and symptomatology in each individual. Clinicians recommend that women keep a log for three months, which allows their individual patterns of PMS to be identified with greater accuracy, and thus appropriate therapeutic regimens can be recommended. Nonpharmacologic treatments include decreasing sodium and sugar intake, restricting caffeine, and performing regular exercise. Supplemental vitamin therapy, including B-complex vitamins, and especially B6, is effective for some individuals. Other pharmacologic treatments include prostaglandin inhibitors and diuretics [20]. Sleep and rest are important as well.

GYNECOLOGIC HEALTH

YEAST INFECTIONS

Vaginitis is caused by a wide variety of organisms. These organisms can produce symptoms such as burning, itching, and vaginal discharge. Asymptomatic colonization may occur as well. Trends suggest that the incidence of yeast infections in particular is increasing, in part because of the widespread use of antimicrobial therapy. An estimated 75% of women will have at least one episode of vulvovaginal candidiasis, and 40% to 50% will have two or more episodes [21]. The organism most often responsible for vulvovaginal candidiasis is the fungus *Candida albicans*. Other species (e.g., *C. glabrata* and *C. tropicalis*) may also cause vulvovaginal candidiasis and are more resistant to treatment [22]. Vulvovaginal candidiasis is also commonly called moniliasis or referred to as a yeast infection [21; 23; 24; 25].

A growing number of healthy, asymptomatic women now harbor *C. albicans*. A change in the vaginal environment and pH may cause the candida organisms to grow, resulting in the symptoms of vaginitis. The risk of yeast infections increases when women take an antibiotic for an infection in another part of the body that inadvertently impacts the balance of the normal flora of the vagina. Because these bacteria, by their presence, limit growth of *Candida*, their elimination may result in proliferation and the clinical signs and symptoms of a yeast infection [21; 22; 23; 24; 26].

This issue is particularly relevant for dentists if they routinely prescribe broad-spectrum antibiotics. As a result of research and education efforts, most dentists, as well as many of their patients, are aware of the risk of the development of a yeast infection when using broad-spectrum antimicrobial agents. Subsequently, these drugs are being prescribed less often than in the past. It is important to note that some women are more prone to develop yeast infections than other women and may do so even when antibiotics are not taken.

Treatment

Over-the-counter antifungal medications (e.g., clotrimazole, miconazole nitrate) are available [21]. These medications are convenient and economical for women who are well informed on the etiology and symptoms of fungal infections. If the vulva is also infected, a cream is available for topical application in addition to the intravaginal insertions. Yeast infections may be treated for three to seven days with these agents. An infection that does not respond to topical treatment might respond to prescription medications, such as fluconazole, which is a 150-mg pill given in a one-time dose [21]. Candidiasis itself does not pose a serious health risk; however, any infection that does not respond to treatment should be taken seriously [21; 24]

ENDOMETRIOSIS

Endometriosis is a condition in which cells from the uterine lining are found in other locations within the pelvic cavity. In women with endometriosis, endometrial cells have traveled through the fallopian tubes and implanted on other structures, such as the bladder, rectum, ovaries, and the outside surfaces of the uterus, vulva, and vagina. The exact incidence of endometriosis is unknown, but as many as 33% of women seen for pelvic pain, infertility, or pelvic mass are ultimately diagnosed with endometriosis [27]. The symptoms are caused by changes in the endometrial patches with the hormonal cycle. These patches thicken and bleed just like normally functioning endometrial tissues. The symptoms increase in severity over the years as the patches grow. Women with endometriosis often complain of pain, pelvic heaviness, hypermenorrhea, and pain radiating to the thighs. Scar tissue, infertility, and distortion or blockage of the affected structures may result.

The diagnosis of endometriosis is confirmed by laparoscopic identification of the patches. Treatment options vary, depending on the severity of the condition and the woman's childbearing choices. Because endometriosis may cause infertility, treatment should not be greatly delayed when childbear-

ing is desired. Oral contraceptives are often helpful, as is treatment with danazol. Mild endometriosis is treated by surgically removing the endometrial patches. Women with severe endometriosis who do not wish to have children may consider hysterectomy [28].

ORAL CONTRACEPTIVES

Oral contraceptives (OC) are most commonly combinations of a progestational compound, such as norgestimate, and an estrogenic compound, such as ethinyl estradiol. In a general sense, their action mimics pregnancy, but they differ both in composition and action from the hormones that occur naturally. The apparent mode of action is by suppression of gonadotropins through the pituitary-hypothalamic axis, inhibiting ovulation. This hormonal suppression also alters the endometrium, lowering the likelihood of implantation, and affects the consistency of the cervical mucus, preventing sperm from entering the uterus [16; 29].

There is an increased risk of several potentially serious conditions for patients taking OC. These include thromboembolism, myocardial infarction, stroke, hepatic neoplasm, and gallbladder disease. The risk, however, is very small in healthy women without other underlying risk factors, such as hypertension, hyperlipidemias, obesity, and diabetes. Smoking is a substantial risk factor in the incidence of myocardial infarction for patients 35 years of age and older who take OC [30; 31; 32].

Gingival inflammation is a common side effect among women taking birth control pills, apparently due to changes in the microcirculation. There is also an alteration in the relative proportions in the established bacterial flora associated with the intake of these hormones. *Prevotella* species may overgrow disproportionately through a favorable increase in its nutritional supply, as female sex hormones may stereochemically resemble and substitute for the naphthoquinones needed by *Prevotella* [16; 33; 34].

Reports have also shown shifts in the makeup of saliva in women taking OC and other sex hormones. Salivary flow may change as well, with alteration in the rate of parotid and submandibular salivary secretions. There are also conflicting reports of chronic dry mouth in some women [35; 36].

Published studies have indicated a greater incidence of postoperative localized osteitis in women taking OC after they have had their mandibular third molars removed. One retrospective review found that alveolar osteitis occurred in 37.9% of women taking OC and in 8.9% of women not taking OC at the time of third molar extraction [37]. This may be related to the effect that birth control pills have on blood clotting. In one study, 40% of patients experiencing postoperative complications after third molar removal were users of OC [33]. It was speculated that the increase of fibrinolytic activity associated with the use of OC accounted for the high incidence of postoperative complications. Such an increase was speculated to be associated with lysis of the formed clot and subsequent "dry socket" formation. As a result, some researchers have suggested that the risk of developing postextraction osteitis may be reduced by performing extractions on days 23 to 28 of the pill cycle, which are nonestrogenic days [33; 38; 39; 40]. One study found that socket irrigation following extraction significantly increased dry socket formation [41]. A systematic review of surgical techniques suggested that placing platelet rich plasma or platelet rich fibrin in sockets may reduce the incidence of osteitis [42]. A study evaluating the impact of OC on women's periodontal health found that women who used OC had higher gingival-index scores and clinical attachment loss than nonusers [43].

Birth control pills, once absorbed in the stomach, are conjugated in the liver and enter the intestine in a conjugated, inactive form. The resident gut micro-organisms serve to restore the drug to its active form. It has been postulated that the effect of poorly absorbed, broad-spectrum antibiotics might significantly reduce the gut flora, thereby hindering this

"reactivation" and resulting in the ineffectiveness of the drug and perhaps an unplanned pregnancy. The antibiotic effect is controversial. However, for as long as the manufacturer's precautions listed for an antibiotic include its possible effect on OC, it is prudent for all clinicians choosing to prescribe one of these antibiotics to advise their patients of the possible effect. Patients should be counseled to use an alternative form of birth control while taking the antibiotic [44; 45; 46].

PREGNANCY

A number of changes in the oral cavity have been associated with pregnancy, including caries, perimylolysis, tooth mobility, xerostomia, pregnancy granuloma, and ptialism/sialorrhea [18]. Perhaps most commonly, the hormonal changes that occur during pregnancy have been linked with gingivitis. Shifts in hormone levels may cause changes in the established microbiota, with overgrowth of certain bacteria species, increases in the ratio of bacterial anaerobes to aerobes, and changes in the proportions of *P. intermedia*, *Bacteroides melaninogenicus*, and *Porphyromonas gingivalis* [18; 47; 48]. Pre-existing subclinical gingivitis may become exacerbated during pregnancy so that clinical signs become apparent, including swelling, redness, bleeding, and tenderness [49]. These signs may begin to be noticeable in the second trimester and peak around the eighth month. Anterior teeth may be more apparently involved than the posterior. Mouth breathing is a potential exacerbating factor. A woman who has poor oral hygiene runs the risk of even greater gingival problems, although gingivitis can develop in women with no changes in their plaque-management behavior. Postpartum studies have shown that after delivery, the mother's level of gingivitis decreases as the constituency of the microbiota changes back to approximate its prepregnancy status. With the inflammation comes an increase in tooth mobility. Xerostomia is also reported in a high percentage of patients.



The American Academy of Pediatric Dentistry asserts that programs that promote oral health must continue to inform pregnant women and care providers about the importance of dental care before, during, and after pregnancy. Oral health counselling during pregnancy and dental cleanings are recommended.

(https://www.aapd.org/globalassets/media/policies_guidelines/bp_pregnancy.pdf. Last accessed January 27, 2022.)

Level of Evidence: Expert Opinion/Consensus Statement

In a study published in 2010, researchers evaluated the way in which changing hormone levels influenced the gingival tissues in 48 pregnant and 28 nonpregnant women. In analyses of the subjects clinically and microbiologically, the researchers found that the proportions of the subgingival pathogens did not differ during pregnancy but did differ significantly after delivery. Patients who were *P. gingivalis*-positive presented with increased gingival inflammation that was not related to plaque [48]. Receptors for female sex hormones are located on human gingiva. The presence of progesterone, for example, may lead to greater gingival exudate. The inflammatory response also appears to be triggered as levels of estrogen and progesterone rise [47; 50; 51; 52].

In addition to generalized gingival changes, a solitary, tumor-like growth, frequently referred to as a “pregnancy tumor” or “pregnancy granuloma,” may appear. This lesion is often found associated with anterior interdental areas and has a histologic appearance similar to a pyogenic granuloma. Often, the lesion will regress after delivery, so decisions about surgical removal are best delayed until some time postpartum. Also, removal of the lesion during pregnancy may result in a recurrence [18].

Women in their childbearing years should be informed of the increased likelihood of developing gingivitis and other conditions that may accompany pregnancy. Advice on how they might reduce their risk should be given, including increasing the frequency of their visits with their dental hygienist and optimizing the effectiveness of their plaque control.

Some women may experience gestational diabetes. When, through their clinical findings and the reaction to treatment procedures, clinicians suspect that a patient may have diabetes, an expanded health history should be obtained, with inquiries regarding relatives who may have the disease or whether the patient has experienced diabetes during past pregnancies. Diabetics have a compromised ability to deal with infections, including periodontal disease. Research has also suggested that periodontal disease may influence the course of diabetes and affect glycemic control, with reviews suggesting that the influence is bidirectional [53; 54; 55; 56; 57; 58]. Evidence also is accumulating that periodontitis may play a role in increasing the incidence of new cases of type 2 diabetes and possibly gestational diabetes [57]. Results of a two-year study demonstrated that patients with severe periodontitis at the baseline examination had a sixfold increased risk of poor glycemic control (glycated hemoglobin greater than 9%) at follow-up. An intervention study conducted in 1992 evaluated the effects of scaling and root planing and systemic doxycycline given over a two-week period on glycemic control [53]. The results suggested that there were potential systemic benefits of this approach in treating diabetic patients. Results of one study on 50 patients with diabetes and generalized periodontitis found that scaling and root planing resulted in a statistically significant reduction in the clinical parameters of diabetes [59]. Patients with better-controlled diabetes appear to derive the most benefit [60].

PRETERM LOW-BIRTH-WEIGHT INFANTS

While infant mortality rates have declined, low birth weight in preterm infants remains a significant cause of infant morbidity and mortality. In spite of increased efforts to diminish these outcomes through preventive interventions during prenatal care that addresses traditional risk factors, these efforts appear to have only a minimal impact on the number of preterm low-birth-weight (PLBW) infants, with some research indicating weight increases of less than 1% [61]. Researchers are thereby investigating other, previously unrecognized risk factors that may contribute to the continuing prevalence of PLBW infants.

A number of studies have indicated that women with periodontal disease have an increased risk of preterm births [18; 62; 63; 64]. A PLBW baby is defined as one born before the 37th week of gestation, weighing less than five pounds, six ounces. In a study of 124 pregnant or postpartum mothers at the University of North Carolina School of Dentistry, those who delivered preterm newborns were more likely to have significantly worse periodontal disease than a comparable group of women who delivered normal birth weight infants. The researchers concluded that periodontal disease is a statistically significant risk factor for preterm low birth weight, with an adjusted odds ratio of 7.9 [62]. Another study of 870 women with pregnancy-associated gingivitis conducted by the Department of Conservative Dentistry in Santiago, Chile, found that periodontal treatment significantly reduced the incidence of preterm labor and/or low birth weight infants [65]. However, the results of more recent studies find limited and/or insufficient evidence to conclude that periodontal disease or its treatment led to a reduction in PLBW infants [66; 67]. Nevertheless, the American Academy of Periodontology has recommended that periodontal evaluations be a part of a woman's overall healthcare program as periodontal disease can impact a woman's health in a variety of ways throughout her life [68].

Although ongoing studies are exploring the way in which oral infections may trigger preterm births, several pieces of the puzzle have been postulated as to how the disease may affect delivery timing. For example, other types of maternal infections, including genitourinary infections, have been linked to premature labor, and certain bacteria similar to organisms associated with periodontal disease have been detected in the genital tracts of women at a higher risk for preterm birth. Within the oral cavity, periodontal plaque triggers an inflammatory process that leads to increases in levels of a number of substances, including prostaglandin E2 (PGE2) and tumor necrosis factor-alpha (TNF-a) molecules. The elevated presence of PGE2 can yield a molecule whose configuration is quite similar to oxytocin, which can induce labor. Thus, the presence of chemicals such as PGE2 may trigger preterm delivery [16; 69]. A study found that maternal periodontal disease is associated with systemic inflammation and elevated serum C-reactive protein (CRP) levels, a marker of inflammatory processes, and other studies have shown that a very high CRP level early in pregnancy is a risk factor for preterm delivery [70; 71]. One case-control study investigated the utility of inflammation markers as predictors of preterm birth by exploring longitudinal changes in interleukin (IL)-1B, IL-6, IL-10, TNF-a, and CRP in pregnant women [72]. Results indicate that maternal inflammation markers, particularly IL-6 and IL-10, are associated with increased risk of preterm birth, with associations varying by etiology of preterm delivery and gestational age at sample collection [72].

The relationship between infection, especially genitourinary infections, and adverse pregnancy outcomes has been well documented in both animal and human studies. University of North Carolina researchers found that gingival crevicular fluid levels of PGE2 are significantly elevated in mothers of preterm low-birth-weight infants, compared with mothers of normal birth weight controls.

Specifically, four micro-organisms associated with progressing periodontitis (i.e., *Bacteroides forsythus*, *P. gingivalis*, *Actinobacillus actinomycetemcomitans*, and *Treponema denticola*) were found in greater amounts in the mothers of preterm low birth weight infants, compared to controls [73]. In a separate study at Columbia University School of Dental and Oral Surgery, mothers of low birth weight infants had significantly increased levels of *B. forsythus* and *Campylobacter rectus*, as well as consistently higher levels of other species [74]. Results of one study found an association between certain maternal and fetal genes and increased risk of premature birth when mothers are exposed to urinary tract or vaginal infection [75].

A number of other factors are known to contribute to the incidence of preterm infants, which, in 2021, accounted for 10.5% of all live births [76]. It has also been reported that preterm births account for 35% of all U.S. healthcare spending for infants and 10% of spending for children as a whole [77]. In 2016, the average first-year medical costs (inpatient and outpatient care) were approximately four times greater for preterm (\$49,140) than for term infants (\$13,024) [76]. Widely acknowledged risk factors include a poor diet, maternal age younger than 20 years or older than 35 years, multifetal pregnancies, various maternal health problems (e.g., high blood pressure, diabetes), and maternal intake of alcohol, nicotine, or drugs [78]. The conclusions of a study conducted by the University of Alabama at Birmingham School of Dentistry led researchers to report that “poor periodontal health of the mother is a potential independent risk factor” for low-birth-weight infants [79]. This finding has also been reported by other researchers [78; 80].

Treatment of periodontal disease in pregnant women, and in all women of childbearing age, could have a positive effect upon the incidence of preterm births, although evidence of this benefit is still scarce. Intervention studies have begun at several universities that should shed greater light on the interrelationship and how it may be favorably influenced [61]. The Columbia University researchers cited above found that 19.9% of women who

did not receive periodontal intervention gave birth to PLBW infants, compared to 13.5% of women who did receive the therapy [74]. One study that included 586 women (148 PLBW infants, 438 full-term infants) found that the extent and severity of periodontal disease appears to be associated with increased risk of PLBW delivery [81].

HYPEREMESIS GRAVIDARUM

Commonly known as severe “morning sickness,” hyperemesis gravidarum is thought to be caused by hormones released by the placenta and is characterized by severe nausea and vomiting during pregnancy, which repeatedly exposes tooth enamel to gastric acid [82; 83]. Later in pregnancy, the enlarged uterus can exert pressure on the stomach and exacerbate acid reflux. Patients with hyperemesis may have enamel erosions.

Strategies to avoiding nausea, vomiting, and therefore oral acid exposure during pregnancy include dietary and lifestyle changes, such as reduction of exposure to hot showers; strong smells or flavors; bright or blinking lights; motion, such as riding in a car; and pressure on the stomach from tight clothing [82]. Antiemetics and/or antacids may also be prescribed.

A rinse made with one teaspoon of baking soda dissolved in 8 ounces of water should be used to neutralize acid in the oral cavity after vomiting. Tooth brushing should be delayed for several hours to protect the softened enamel. A soft-bristled toothbrush should be used to reduce damage to the enamel as long as the condition continues [83].

WOMEN'S CANCERS

No woman is immune from contracting cancer. In the United States, women have a one in four lifetime risk of developing cancer [84]. Although some types of cancer (e.g., lung cancer, colorectal cancer) strike both sexes in large numbers, others affect women exclusively (or, in the case of breast cancer, almost exclusively).

SUMMARY OF CERVICAL CANCER SCREENING RECOMMENDATIONS	
American Cancer Society	
<ul style="list-style-type: none"> • Initiate screening at 25 years of age • Age 25 to 65 years: HPV testing every five years (preferred); co-testing (cytology + HPV) if HPV unavailable • 65 years and older: No testing with adequate negative screening history 	
U.S. Preventive Services Task Force/American College of Obstetricians and Gynecologists^a	
<ul style="list-style-type: none"> • Younger than 21 years: No screening • Age 21 to 29 years: Cytology alone every three years • Age 30 to 65 years: Cytology alone every three years OR high-risk HPV alone every five years OR high-risk HPV with cytology every five years • 65 years and older: No screening • Hysterectomy with cervix removal and no history of CIN grade 2 or 3: No screening 	
^a ACOG adopted USPSTF guidelines in 2021.	
HPV=human papillomavirus; CIN=cervical intraepithelial neoplasia.	
Source: [92; 93; 94]	Table 1

CERVICAL CANCER

Although the exact cause of cervical cancer is unknown, cervical cell changes may be the result of an “insult” from viruses and multiple sexual partners. Women with cervical cancer often report a history of cervical infections. The infections most frequently linked to cervical carcinoma are caused by herpes simplex virus type 2 (HSV-2); human papillomavirus (HPV) types 16, 18, 45, and 58; human immunodeficiency syndrome (HIV); and perhaps cytomegalovirus. However, HPV infection is almost always the cause of cervical cancer. These viruses alter the DNA in the nuclei of immature cervical cells [85; 86; 87; 88].

The Papanicolaou (Pap) test, or smear, safely and inexpensively detects cervical cancer at an early stage. Dr. George Papanicolaou, a Greek physician, developed the Pap test in the 1940s, and it became a regular component of gynecologic examinations during the 1950s. Since then, the incidence of invasive cervical cancer and the death rate from cervical cancer have declined. The number of women with cervical intraepithelial neoplasia (CIN) had been increasing, but more recent reports indicate declining trends following introduction of HPV vaccination [89; 90; 91]. As part of general health education, dental health professionals can help ensure that women understand the importance of Pap smears.

Recommendations regarding how frequently average-risk women should have Pap tests have changed significantly as of 2012. National health organizations, such as the National Cancer Institute (NCI) and the American Medical Association (AMA), have adopted consensus recommendations. Other organizations, such as the American Cancer Society (ACS), the American College of Obstetricians and Gynecologists (ACOG), and the U.S. Preventive Services Task Force (USPSTF), have developed updated guidelines for cervical cancer screening. Guidelines from the ACS, the USPSTF, and the ACOG are summarized in **Table 1** [92; 93; 94]. Management of abnormal cervical cancer screening results should follow current guidelines [95].

In 2006, the U.S. Food and Drug Administration (FDA) approved a quadrivalent HPV (types 6, 11, 16, 18) recombinant vaccine, Gardasil, to prevent vulvar and vaginal precancerous lesions and cervical cancer caused by these strains of HPV. The vaccine is approved for administration in children and adults 9 to 26 years of age [96; 97]. This vaccine was the first of its kind to be made available. In 2009, a second HPV vaccine, Cervarix, was approved by the FDA for use in girls and women 10 to 25 years of age [98].

Cervarix protects against HPV strains 16 and 18 and contains a proprietary immune response boosting adjuvant that results in significantly higher serum neutralizing antibody titers compared to Gardasil [99]. In 2014, a 9-valent HPV recombinant vaccine (Gardasil 9) that adds protection to HPV types 31, 33, 45, 52, and 58 in addition to those types covered by the original Gardasil [100]. With this increased coverage, the 9-valent vaccine has the potential to prevent up to 90% of cervical, vulvar, vaginal, and anal cancers. Gardasil 9 is approved for girls and women 9 to 26 years of age and boys 9 to 15 years of age [100]. In 2018, the FDA expanded use of Gardasil 9 to include women and men 27 to 45 years of age [101]. Several other HPV vaccines are in development or clinical trials.

There is hope that HPV vaccination will have a significant positive impact on public health. As discussed, it is uncertain whether vaccination reduces the need for cervical cancer screening, and because neither vaccine provides protection against all HPV strains, both vaccine manufacturers and the Centers for Disease Control and Prevention (CDC) recommend continuation of routine cervical cancer screening [102; 103].

It is critical to emphasize to the professional and the public that healthcare appointments are needed for women to be assessed for sexual questions, risk factors, presence of sexually transmitted infections, contraceptive needs, blood pressure, weight control, clinical breast exam, and any other issues of concern.

UTERINE CANCER

The most common type of gynecologic cancer is cancer of the uterus, and approximately 66,200 women will be diagnosed with uterine cancer in 2023 [104]. The three layers that comprise the uterus are the inner layer or lining, which is called the endometrium, the middle muscular layer, which is called the myometrium, and the layer of tissue that coats the outside of the uterus, which is known as the serosa. Most uterine cancers begin in the endometrium. Endometrial cancer occurs around 60 years of age on average. Uterine cancer is uncommon in women younger than 45 years of age [104].

Endometrial cancer is familial, and research is underway to identify genetic markers. Research has indicated that a relationship of mismatch repair (MMR) gene mutations to endometrial cancer may be present [105]. MMR genetic abnormalities are also considered causal in hereditary nonpolyposis colorectal cancer (HNPCC), which may be a risk factor for endometrial cancer. Another gene called *PTEN*, this one responsible for suppressing tumor growth, is often anomalous in women with endometrial cancers [104]. More research is necessary to fully understand the genetics involved in the development of HNPCC-associated uterine cancers.

Risk factors for endometrial cancer include advancing age, hormone imbalance, estrogen therapy, use of birth control pills, intrauterine device use, breast or ovarian cancer, early menarche (before age 12), infertility or no pregnancies, obesity, high-fat diet, diabetes, Lynch syndrome, polycystic ovarian syndrome, and family history [85; 104]. The only sign of endometrial cancer, especially in postmenopausal women, is abnormal vaginal bleeding. Women should be instructed to seek treatment when any vaginal bleeding occurs. A pelvic examination with an endometrial biopsy should be performed. If the result of the biopsy is positive, a total abdominal hysterectomy and bilateral salpingo-oophorectomy are performed. Other treatments, depending on the stage of the cancer, include radiation and chemotherapy. These tumors tend to be well differentiated and localized. If the tumors are detected and treated early, women with endometrial cancer have a high survival rate [104; 106].

OVARIAN CANCER

Ovarian cancer is the deadliest of all female reproductive system cancers because it is difficult to detect and diagnose at an early stage [107]. Frequently, by the time it is diagnosed, the cancer has already spread throughout the pelvis. Screening for early ovarian cancer remains a scientific challenge, and new methods are being researched.

Ovarian cancer occurs most frequently between 40 and 70 years of age. The exact cause is unknown; however, evidence suggests a link to endocrine function. Factors preventing ovarian cancer include those that decrease the number of times a woman ovulates. Thus, protection is provided in women who conceive before 25 years of age, experience early menopause, and/or use oral contraceptives for years. Ovarian cancer is familial; if a woman's mother or sister had ovarian cancer, the woman herself is as much as 50% more likely to develop it. Environmental risk factors include talc and asbestos exposure, as well as a high-fat diet. The alarming factor with ovarian cancer is its elusive lack of symptoms. The most common sign is an enlargement of the abdomen [107]. Women may complain of an inability to fasten their pants and skirts. Other symptoms may include vague abdominal fullness or discomfort, pelvic pain, and ascites. Treatment options include surgery, radiation, and chemotherapy. Paclitaxel (Taxol), a newer anticancer medication, has successfully treated progressive ovarian cancer, especially when used in combination with carboplatin (Paraplatin). Another successfully used combination therapy includes cisplatin, etoposide, and bleomycin [108; 109]. Target drug therapy with bevacizumab has been shown to shrink or slow the growth of advanced epithelial ovarian cancers. The drug appears to be most effective when used in conjunction with chemotherapy [107].

BREAST CANCER

Breast cancer is the most common cancer in women, but it is also one of the most treatable if detected early. The risk to American women of developing breast cancer in their lifetime is reported as one in eight [110]. Nodal involvement remains the best prognostic indicator for long-term survival. The ACS has reported the five-year survival rate as 99% for localized, 86% for regional, and 29% for distal [111]. These survival rates underscore the importance of rigorous, consistent screening for all women.

The most widely accepted risk factors for breast cancer are age, gender, and personal and family history of breast cancer. The identification of genes associated with familial breast cancer has been a remarkable step forward in identifying risk factors for prevention. However, *BRCA1* and *BRCA2*, the predominant breast cancer genes, only account for 5% to 10% of the breast cancer cases in the United States [112].

Screening

The following breast cancer screening information is based on guidelines from the ACS, the NCI, and the ACOG [113; 114; 115].

Breast Awareness

Women should be aware of changes in their own breast tissue, including lumps or swelling, skin irritation or dimpling, nipple pain or retraction (turning inward), redness or scaliness of the nipple or breast skin, or a discharge other than breast milk [114]. Although breast self-examination (BSE) has been recommended in the past, the NCI states that the harms of BSE may outweigh the benefits [113]. According to the NCI, BSE does not reduce mortality and leads to a greater number of biopsies and diagnosis of benign lesions.

The ACS and the ACOG recommend that women older than 20 years of age become familiar with the feel and appearance of their healthy breasts in order to recognize any significant changes [114; 115]. The best time to examine the breasts is a few days after the menstrual period ends, when the breasts are least affected by hormonal changes, swelling, and fibrocystic changes. The examination is also most comfortable after the menstrual period because the breasts are less tender. In women who are menopausal, or who do not have regular periods, the BSE should be done on the same day every month, such as the first day of the month.

Clinical Breast Exam

The clinical breast examination (CBE) as part of breast cancer detection is another questionable practice; this is partially due to the lack of efficacy data from randomized controlled trials [113]. At this time, it is not known if CBE reduces a woman's risk of dying from breast cancer. Although the experienced professional may find an irregularity that the woman has missed, according to the NCI the potential harms may outweigh the benefits. CBE is associated with a false positive rate as high as 12%; additionally, cancerous lesions are not found in up to 43% of women using CBE alone [113].

The ACS does not recommend CBE for average-risk women [114]. The ACOG recommends CBE every one to three years in women 20 to 39 years of age and every year in older women; however, this is a C-level recommendation (i.e., based on consensus and opinion rather than consistent scientific evidence) [115].

Mammography

A mammogram is a special x-ray that compresses the breast tissue between two plates. It identifies suspicious or malignant tissue, measures the size, and locates any spread of cancer in the breast. Most breast lesions are present for several years before they can be palpated, and thus mammography can detect lumps and breast cancer much earlier than manual breast examination, at the earliest stage of development. When detected early, the five-year survival rate for women with in situ breast cancer is 99.1% [116].

In general, women 40 to 44 years of age should have the option to start screening with mammography every year. Women 45 to 54 years of age should have annual mammograms. Women 55 years of age and older may opt to have a mammogram every other year or may choose to continue with annual mammograms. Screening should continue as long as a

woman is in good health and is expected to live at least another 10 years [114]. The benefits of annual mammography are based on consistent evidence; there is a 15% to 20% relative reduction of mortality in women 40 to 79 years of age [113]. However, the harms associated with mammography are also based on solid evidence that cannot be ignored. These include overdiagnosis and the resulting treatment of insignificant cancers (up to 54%); false-positives with additional testing and anxiety; and false-negatives with a delay in treatment (between 6% and 46% of women with invasive cancer will have a false-negative result). Below are the general screening guidelines for the techniques discussed [113; 114; 115]:

Breast Awareness:

Any changes in one's breasts should be reported to a physician.

Clinical Breast Examination:

*Every three years for those 20 to 40 years of age
Yearly after 35 years of age, if at risk
Yearly after 40 years of age*

Mammography:

*Yearly for those 40 to 45 years of age and older
If at higher than average risk, discuss starting earlier*

Treatment Choices

A diagnosis of breast cancer threatens a woman's life, but it also can alter her self-image and change her roles, support systems, and family relationships. The varied choices of breast cancer treatment contribute to the complexity and confusion that the diagnosis can bring to a woman and her family and friends.

Not long ago, a diagnosis of breast cancer was usually followed by a radical mastectomy. Although surgery remains a primary component of treatment, now more breast tissue may be conserved, and surgery is typically combined with adjuvant therapies (i.e., chemotherapy, hormone therapy, radiation therapy).

If the woman has carcinoma in situ (i.e., noninvasive breast cancer), the surgical procedure might be the modified mastectomy or lumpectomy; these surgeries remove the breast tissue and axillary lymph nodes but leave the pectoralis muscle intact [117]. Women with small tumors (less than 4 cm) and in an early stage of cancer (Stage I or II) are often good candidates for lumpectomy. In these women, lumpectomy with radiation has demonstrated the same survival rate as other surgical techniques, while preserving breast tissue [24]. For many women, breast cancer is a hormonally influenced malignancy. Cancer cells are tested following surgical removal, and hormone therapy is used when the cancer is sensitive to estrogen (i.e., estrogen receptor positive).

Women with locally advanced breast cancer (stage III) generally require neoadjuvant chemotherapy and/or radiation prior to any surgery to promote tumor shrinkage and allow for a more manageable surgical procedure [118; 119]. Many of the chemotherapeutic agents prescribed for women's cancers have a pronounced effect on the oral mucosa. Multiple, painful ulcerations may be present, which may present a substantial therapeutic challenge to treat and ameliorate. Weight loss often takes place at a time when the patient could use all of the nutritional support she can get. Clinicians have prescribed oral rinses of local anesthetic agents, to be used at mealtimes or in combination with antibiotics to decrease the incidence of secondary infection, and antihistamines to reduce the inflammatory component. Antimicrobial oral rinses containing chlorhexidine gluconate have also been prescribed. Clinicians have also employed agents that coat the surface of the mucosa and cover the ulcerations. Such agents have a transient effect at best. There is no good solution for this problem. The National Cancer Institute recommends oral evaluation and management of patients prior to initiation of chemotherapy. Communication between the oncology team and the dental team as to the patient's medical status and treatment plans can help to maximize outcomes [120].

MENOPAUSE

The simplest definition of menopause is the end of menstruation. Although menopause literally means cessation of menses, menopause is actually a process rather than a discrete, single occurrence. It is defined as a transition of biologic and cultural events over a period of months to years. An average life expectancy of 78 years means that the "average" woman will live one-third of her life after her last menstrual period [23; 121; 122; 123].

Perimenopause refers to the stages of regression of ovarian function, which can be as long as 7 to 10 years. It culminates in the last menstrual cycle and extends at least one year after menopause. Menstrual periods stop when the ovaries no longer produce female hormones. This deficiency may cause symptoms such as hot flashes, vaginal dryness, emotional changes, and weight gain. Some women, however, are asymptomatic [23; 24; 122].

MENOPAUSE AND ORAL HEALTH

In the menopausal and postmenopausal periods, many women experience symptoms in their oral cavity, including dryness of the mouth, pain, burning sensations of the tongue, and changes in taste sensations [18; 121; 124; 125; 126; 127]. There may be alterations in the oral mucosa as well, including thinning of the epithelial lining. A condition called menopausal gingivostomatitis has been identified, in which the gingiva becomes dry, bleeds easily, and may experience changes in color (from pale to very red) [18; 128].

Before menopause, periodontal disease is more common in men than women. But in the postmenopausal years, women surpass men in the incidence of periodontal disease, except women who are on hormone replacement therapy (HRT) (also known as menopausal hormone therapy [MHT]) [129]. When informed that patients have discontinued an HRT regimen, typically because of concerns over the safety of the therapy, dental health professionals should show increased vigilance in detecting and treating periodontal symptoms.

PREVENTIVE HEALTH FOR PERIMENOPAUSAL WOMEN

To ease the transition into perimenopause, women should consider the following strategies [130; 131; 132; 133; 134; 135]:

- **Exercise:** Perimenopausal women should perform a program of moderate-intensity aerobic, weight-bearing exercise for at least 150 minutes per week. It is recommended that workouts last at least 10 to 15 minutes per session (30 minutes five days per week is ideal), in order to maintain an elevated heart rate for a prolonged period of time. Alternately, 25 minutes of vigorous-intensity exercise three days each week (a total of 75 minutes per week), or a combination of both, is recommended. If women need to achieve a healthy weight, one hour of moderate-intensity aerobic physical activity per day is recommended. Moderate-to-vigorous-intensity muscle strengthening activity performed two or more days per week is recommended for additional health benefits. Exercise has been shown to reduce bone loss, prevent weight gain, and improve overall well-being.
- **Diet:** The American Heart Association recommends eating a balanced diet, such as the DASH diet, that consists of six daily servings of grains (at least 50% whole grains); two to three servings per day of vegetables (variety of colors); two servings per day of fruits (variety of colors); three servings per day of dairy products; five or less servings of protein per day (e.g., legumes, nuts, fish, seafood, lean meats, poultry); three one-tablespoon servings per day of fats or oils (unsaturated); and no servings per week of added sugar or sweets.

- **Health screenings:** Perimenopausal women should be screened routinely for early detection of women's health problems, as discussed. Additionally, a lipid profile, colorectal cancer screening, and blood pressure checks should be performed at recommended intervals. Women should get a dental exam every 6 to 12 months.
- **HRT:** Although not without risk, HRT is an option for the treatment of both the physical and emotional effects of menopause. It is optimal to use HRT at the lowest dose and for less than five years.

Hormone Replacement Therapy

Treatment for perimenopausal/menopausal symptoms and for the prevention of long-term risk factors associated with postmenopausal women has generated clinical discussion and research studies on HRT. Although HRT may help some women, the availability of these medications does not imply that all women should take them. In fact, research called into question the advisability of the long-term use of HRT, leading many physicians to re-evaluate the criteria they use for determining candidates for this drug therapy [133].



EVIDENCE-BASED
PRACTICE
RECOMMENDATION

Given the variable response to hormone replacement therapy and the associated risks, the American College of Obstetricians and Gynecologists recommends that healthcare providers individualize care and treat women with the lowest effective dose for the shortest duration that is needed to relieve vasomotor symptoms.

(<https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2014/01/management-of-menopausal-symptoms>. Last accessed January 27, 2023.)

Strength of Recommendation: A (Recommendation based on good and consistent scientific evidence)

A study conducted to investigate the association between HRT and mortality both prior to and after publication of the Women's Health Initiative (WHI) trials results found that users of systemic hormone therapy, who had switched to local hormone therapy by 2005, had a substantially lower mortality than nonusers [136]. It appears that the healthiest users decided either to drop systemic hormone therapy altogether or switched to local hormone therapy, per the changed recommendations following publication of the WHI results [136]. Re-analyses and follow-up studies from the WHI trials and data from other studies suggest that the risk-benefit profiles of HRT are affected by a variety of factors, including the timing of use in relation to menopause and chronological age and the type of hormone regimen [137].

HRT and Cardiovascular Disease

The incidence of cardiovascular disease in women rises markedly after menopause. Research has shown that both natural and surgically induced menopause are associated with changes in serum lipid profiles, a decline in high density lipoproteins (HDL), and an increase in low density lipoproteins (LDL) [138]. These cholesterol changes may increase the risk of developing postmenopausal heart disease.

For years, many women were placed on HRT based on research such as the Nurses' Health Study, which reported that postmenopausal estrogen users had a reduced risk of coronary artery disease and fatal strokes compared with women who had never used estrogen [139]. Other studies suggested that postmenopausal estrogen had an independent, protective effect against cardiovascular disease.

But in 2002, surprising results from a major clinical trial, the Women's Health Initiative (WHI), were published in the *Journal of the American Medical Association* [134]. The study was designed to evaluate the health benefits and risks of the most commonly used estrogen-plus-progestin hormone preparation in more than 16,000 menopausal women. The trial was halted after a mean follow-up of 5.2 years because of the apparent increased risks of coronary heart disease, stroke, pulmonary emboli, and invasive breast cancer associated with HRT. The authors of the study reported that the rate of women experi-

encing coronary heart disease events rose 29% in women taking HRT, compared to placebo. Stroke rates were 41% higher in the HRT group, while the rate of venous thromboembolism was about double in the drug cohort [133; 134]. A 2005 Cochrane review of the data from ten clinical trials (two involving healthy women; eight involving women with heart disease) reported similar findings [140]. A 2015 Cochrane review of data from additional new trials concurred with these previous findings [141].

However, a review published in 2018 found that the absolute risks of adverse cardiovascular events for HRT initiated in women close to menopause are low, and that all-cause mortality effects are neutral or even favorable for younger menopausal women. For women in early menopause and without contraindications to treatment, the benefits of HRT are likely to outweigh the risks when used for menopausal symptom management [142]. According to the National Institute for Health and Care Excellence, HRT does not increase cardiovascular disease risk when started in women younger than 60 years of age and it does not affect the risk of dying from cardiovascular disease [143].

For HRT use in cardiovascular disease prevention, questions regarding benefits versus risks remain [144; 145]. The International Menopause Society does not recommend initiation of HRT in women older than 60 years of age for the primary prevention of cardiovascular disease [146].

HRT and Osteoporosis

Osteoporosis is one of the most serious long-term concerns of perimenopausal and postmenopausal women, affecting approximately one in four women [132]. The loss of bone mass accelerates after menopause and causes bones to become brittle and at increased risk of fractures. Hip fractures among elderly women are not only costly and debilitating, but women often die from subsequent complications within a year. Studies have shown that long-term estrogen use protects women from postmenopausal bone loss and osteoporosis [122]. Estrogen therapy slows the demineralization process, but it cannot restore bone that has already been lost. In addition, once estrogen replacement stops, bone loss resumes.

The WHI trial did show that women taking the estrogen-plus-progestin formulation experienced a one-third reduction in hip fractures and a 24% decline in total fractures [133].

Although HRT prevents fractures at any age after menopause, the age at initiation is important. A 2016 consensus statement published by several international societies and foundations states that menopausal hormone therapy is effective and appropriate for the prevention of osteoporosis-related fractures in at-risk women before 60 years of age or within 10 years after menopause. HRT can be considered first-line therapy for women 50 to 60 years of age or within 10 years after menopause [146]. Initiation of hormone therapy in those 60 to 70 years of age is considered second-line therapy and requires individually calculated benefit/risk, compared to other approved drugs. HRT should not be initiated after 70 years of age [146]. If HRT is elected, the lowest effective dose should be used [146; 147].

HRT and Cancer

During the 1970s, unopposed estrogen therapy was routinely given to menopausal women with an intact uterus, which resulted in an increased risk of endometrial hyperplasia and cancer. Adding progesterone to estrogen, however, greatly decreased the risk of endometrial cancer. HRT advocates argued that the risks of endometrial cancer were low and rare compared with the reported cardiovascular and osteoporotic benefits. For years, the link between breast cancer and HRT remained controversial. Some studies suggested that lower doses of estrogen did not increase the risk of breast cancer while others suggested the opposite. Comparison of existing studies was difficult due to selection biases and other methodologic differences.

But the WHI trial strongly fell on the side of increased breast cancer risks associated with HRT. The trial found that invasive breast cancer rates increased by 26% in women taking hormone therapy. At the same time, HRT users showed a 37% reduction in colorectal cancer rates [133; 148].

Although the degree of association between HRT and breast cancer remains controversial, HRT is generally contraindicated in breast cancer [146; 149].

HRT and Alzheimer Disease

Observational studies have indicated that long-term estrogen deficiency seems to be related to a higher risk of developing Alzheimer disease, but the reason why remains unknown [150; 151]. Among the 6.5 million people 65 years of age and older in the United States with Alzheimer disease, 4 million are women and 2.5 million are men [152]. Women also suffer more severe cognitive impairment [153]. The finding that women with Alzheimer disease have lower levels of estrogen than do those without Alzheimer disease seems to indicate that there is a relationship that bears further investigation; however, HRT is not recommended for cognitive improvement or maintenance in women with Alzheimer disease [151; 154; 155; 156].

The Future of HRT

Previously, women taking HRT needed to follow a schedule of two tablets, which was both confusing and inconvenient. Regular menstrual-like flow occurred at the end of the 28-day cycle of medications. In 1995, combined estrogen/progesterone tablets became available in two different HRT regimens; a continuous therapy regimen and a cyclic regimen. This increased the convenience for women on HRT who have an intact uterus. However, in light of the findings of the WHI trial, many women have been or will be removed from HRT therapy, while others are taking it only for short-term management of symptoms [133]. The USPSTF recommends against the use of combined estrogen and progestin for the prevention of chronic conditions in postmenopausal women and women who have had a hysterectomy [157]. As a result of research indicating the potential harms of HRT, many women are looking to nondrug approaches to manage their menopausal and postmenopausal symptoms, including dietary modification, exercise, and calcium supplementation for osteoporosis prevention.

OSTEOPOROSIS

Of all skeletal disorders, osteoporosis is the most common. It results from decreased density, or thinning, of the bone related to the aging process. Osteoporotic bone is more porous and is weaker than normal bone; thus, it fractures more easily. This condition is the leading cause of bone fractures in postmenopausal women and is associated with long-term disability, frailty, and enormous expense. Common sites for fractures are the spine, wrists, forearms, and hips. With the exception of arthritis, osteoporosis is the leading cause of musculoskeletal disturbances in the elderly [158].

PERIODONTAL DISEASE, TOOTH LOSS, AND OSTEOPOROSIS

Research seems to indicate that the loss of bone mass associated with osteoporosis may be associated with the incidence and severity of periodontitis. However, some of these clinical trials have evaluated small numbers of patients, and the control of potentially confounding factors has been inconsistent; the criteria used to define osteoporosis and to assess systemic bone density has also varied [159]. Nonetheless, a 2013 literature review found that 4 of 5 longitudinal studies, 20 of the 25 cross-sectional studies, and all 3 of the case-control studies reviewed showed an association between osteoporosis and periodontal disease [160].

Studies also support a relationship between osteoporosis and clinical attachment loss. While conclusions of the existing trials conflict with one another at times, the general consensus seems to be that an association may exist [159]. A 2022 survey of literature published in the last 25 years indicates that systemic low BMD is associated with alveolar bone loss, while evidence also suggests an association between clinical attachment loss and other parameters of periodontitis [161]. A 2021 study found that patients with osteoporosis and periodontal disease had higher indices of periodontal disease, including tooth mobility and tooth loss, than did patients with periodontal disease only [162]. Women who had experienced osteoporotic fractures also seemed to have an increased risk of loss of periodontal attachment [162].

One study compared the severity of periodontitis in postmenopausal women whose Fracture Risk Assessment Tool (FRAX) scores indicated a major risk for osteoporotic fracture versus controls [163]. Selection criteria for participants included: age 51 to 80 years; menopause for more than 1 year but less than 10 years; nonsmoker; hemoglobin A1c less than 7; and no pharmacologic treatment for osteoporosis within 5 years. FRAX scores were calculated and the participants were divided into two groups. Group 1 included 90 women with FRAX scores >20% (indicating major osteoporotic fracture risk); group 2 included 98 controls. The women in group 1 had significantly more severe periodontitis endpoints (e.g., clinical attachment loss, alveolar bone height, tooth loss) than controls. Plaque scores and bleeding on probe did not differ between the two groups [163].

The use of HRT appears to decrease the incidence of tooth loss in older women. In the Nurses' Health Study, which evaluated more than 42,000 postmenopausal women prospectively, the risk of tooth loss was lower in women taking HRT, after controlling for age and smoking [164]. A study of women in a California retirement community found that after adjusting for age, the use of estrogen replacement significantly decreased tooth loss and rates of edentia by 36%; the proportion of women with edentia declined with lengthier use of HRT [165].

Bisphosphonate drugs, such as alendronate, may retard the progression of alveolar bone loss associated with periodontitis. In one double-blind, placebo-controlled clinical study, alendronate lowered the risk of progressive loss of alveolar bone loss; during the nine-month trial, the relative risk of the loss of bone height and density was reduced to 0.45 in the alendronate group [166]. A study from 2019 found no improvement in maintaining alveolar bone level with the use of bisphosphonates but did suggest that its use may be promising as an adjunctive local delivery medication for management of periodontal diseases [167]. Two other studies support the assertion that bisphosphonates may be useful for periodontal treatment; however, existing information on this potential is limited [168; 169; 170]. However, bisphosphonate drugs are known to cause medication-related osteonecrosis of the

jaw (MRONJ) in some patients, particularly those who underwent IV bisphosphonate therapy, who were taking bisphosphonates for extended periods of time, and/or who underwent dental procedures while taking bisphosphonate drugs [171; 172].

DIAGNOSIS AND TREATMENT OF OSTEOPOROSIS

According to the Bone Health and Osteoporosis Foundation (formerly the National Osteoporosis Foundation), an estimated 12.3 million Americans have osteoporosis and an additional 43.4 million have low bone density [173]. The 2 million new cases of osteoporotic fracture each year exceeds the annual number of new cases of myocardial infarction, breast, cancer, and prostate cancer combined. Annual fracture incidence is expected to increase 68%, to 3.2 million, by 2040 [173]. Diagnosis of this disease in an aging population is challenging, even though impressive progress has been made. Bone densitometry is the procedure that measures bone mineral density. Dual-energy x-ray absorptiometry (DEXA or DXA) has become the routine method for bone density measurement. It is very precise and has the advantage over other, older diagnostic methods of a much shortened examination time (i.e., 2 minutes versus 20 to 40 minutes) [174]. DEXA is of particular advantage in measuring the lumbar spine and proximal femur areas and has become the gold standard for bone densitometry [173].

Various drug therapies exist for osteoporosis, and research findings suggest the possibility of newer treatments on the horizon. One of the most commonly prescribed drugs for women with osteoporosis is alendronate sodium, a bone resorption inhibitor. Alendronate has proven effectiveness in preserving bone tissue and decreasing bone loss. Calcitonin is a bone metabolism regulator that slows the rate of bone turnover and seems to increase normal bone formation. It is indicated for the treatment of osteoporosis in women: who have been postmenopausal for at least five years; who have low bone density; who refuse or cannot tolerate estrogens; or in women for whom estrogens are contraindicated. It has not been recommended as a first-line treatment [175].

Calcitonin decreases bone resorption by inhibiting the activity of osteoclasts. Increases in bone mass of 1.5% to 13% have been reported, with the best responses noted in individuals with the highest bone turnover [176; 177].

In 2011, the FDA approved denosumab for treatment of osteoporosis in postmenopausal women who are at high risk of fracture [177; 178; 179]. Denosumab acts by binding to and inhibiting receptor activator of nuclear factor kappaB ligand (RANKL). RANKL controls the differentiation, proliferation, and survival of osteoclasts. Inhibition of RANKL provides a lengthened period of absorption and inhibition of bone resorption [177; 180].

In 2019, the FDA approved romosozumab for the treatment of osteoporosis in postmenopausal women who are at high risk of fracture. Romosozumab is a monoclonal antibody that inhibits sclerostin and improves bone mineral density [177; 181].

PREVENTION OF OSTEOPOROSIS

Because most postmenopausal women have some degree of osteoporosis, they should take steps to prevent further bone loss. The best preventive measures are early education to encourage positive lifestyle habits before the disorder develops (ideally, well before menopause). The following methods have been identified as being helpful to prevent bone loss [158; 173; 182; 183]:

- Consume up to 1,200 mg per day of calcium.
- Raise vitamin D intake to 600–800 IU daily.
- Stop smoking.
- Limit the intake of alcohol, coffee, and soft drinks.
- Perform at least one to three hours of weight-bearing exercise per week.
- Engage in fall-prevention strategies by eliminating fall hazards in the home and work environment

Dairy products provide approximately 75% of the calcium in the average American's diet. However, the average daily calcium intake for women from dietary sources is only about half of the recommended amount. Women should be advised that it takes only three 10-ounce glasses of milk to supply 1,000 mg of calcium. Those who require more dietary calcium may choose to take supplements.

CARDIAC HEALTH

Coronary heart disease (CHD) is still generally thought of as a man's disease. Yet, according to the American Heart Association, of the 126.9 million Americans with one or more types of cardiovascular disease (CVD), men have a slightly higher prevalence of CVD (66.1 million) compared with women (60.8 million), as well as a slightly higher mortality rate (51.9% vs. 48.1%) [184]. However, heart disease is the leading killer of women in the United States [185].

Women tend to show signs of cardiovascular disease later in life than men. Between 20 and 59 years of age, men have a higher prevalence of CVD than women [184]. Although menopause decreases a woman's protection from heart disease, her biologic advantage persists until 65 to 70 years of age. Older women who have heart attacks, however, are twice as likely to die within a few weeks as men [106; 186; 187]. Dentists, dental hygienists, and dental assistants can play a key role in educating patients about heart disease in women, which is particularly important because of the research linking periodontal disease to cardiovascular disease.

SIGNS AND SYMPTOMS: GENDER DIFFERENCES

CHD signs and symptoms differ significantly between men and women. Women tend to have angina pectoris as the first symptom of heart disease; men initially have a myocardial infarction. Women rarely experience myocardial infarction as the initial manifestation of heart disease [85; 188]. Diagnosis of coronary disease in women is difficult. Women may have unspecified, misleading pain, which often

results in a search for other causes. In the past, women have not been included in major cardiovascular research and treatment. This has greatly compromised the discovery of facts concerning the early identification and treatment of heart disease in women and is only now being rectified.

RISK FACTORS AND PREVENTIVE HEALTH BEHAVIORS

Women may have combinations of negative social, psychological, cultural, physical, and addictive behaviors that increase their CHD risk. The major modifiable risk factors are cigarette smoking, high blood cholesterol, high blood pressure, diabetes, physical inactivity, excessive alcohol consumption, stress, and excessive weight gain. Women who smoke and also have high blood pressure and high blood cholesterol levels are eight times more likely to develop heart disease than those who do not. Women who have diabetes are four to six times more likely to die from CHD than women without diabetes [85].

Dental health professionals should make sure patients understand that heart disease is not an inevitable consequence of aging; rather, it is a disease process that can be greatly influenced by lifestyle modification. Factors such as diet, exercise, not smoking, maintaining normal weight, monitoring blood pressure and cholesterol, and taking HRT (when appropriate) are all beneficial health behaviors.

DENTAL HEALTH ISSUES

There is some evidence linking poor dental health with heart disease, particularly in studies that have shown a link between periodontitis and CHD. For example, a study by Helsinki University Central Hospital evaluated 100 patients with acute myocardial infarctions and 102 controls and graded their dental health. The researchers found that dental health was significantly worse in the patients who had experienced a heart attack, compared to the controls, even after adjusting for factors such as age, socioeconomic class, cholesterol (total, HDL) and triglyceride levels, C-peptide levels, diabetes mellitus, and smoking [189]. A separate study by the same researchers in Finland concluded that dental

infections were associated with the pathogenesis of atherosclerosis, which is the only characteristic other than traditional coronary risk factors that showed an independent association [190]. Subsequent studies have confirmed an association between chronic oral infections and slightly increased risk of myocardial infarction [191; 192; 193; 194; 195].

The National Health and Nutrition Examination Study (NHANES I) evaluated more than 9,000 people for a median of 14 years and found that individuals with periodontitis had a 25% greater likelihood of developing CHD (an association found to be statistically significant). Poor dental hygiene characterized by extensive dental debris and calculus also increased the risk of CAD [196]. A 2021 literature review found that the prevalence of heart disease is more common among individuals with periodontitis [197]. A systematic review published in 2022 concluded that periodontal disease may be an important nontraditional risk factor for acute coronary syndrome [198].

One hypothesis explaining the possible mechanism responsible for the link between CVD and periodontitis centers on bacterial products, such as lipopolysaccharides (LPS), that can enter the bloodstream and affect the cardiovascular system. Several studies have reported the presence of periodontal bacteria in cardiovascular specimens [199]. It has also been postulated that micro-organisms normally present in the oral cavity, including *P. gingivalis* and *Streptococcus sanguis*, enter the bloodstream through local action that induce bacteremias, grow within the vascular plaques, and have the potential to induce platelet aggregation [200]. A study of carotid atheromas using polymerase chain reaction found that 42% of atheromas contained at least one of the periodontal micro-organisms studied and 72% contained the bacterial DNA of one of these micro-organisms [201]. Although periodontal treatment as a means to prevent CVD is not recommended, the emergence of periodontal infection as a risk factor for CVD should lead dental and healthcare professionals to recognize that patients cannot be healthy without good oral health [14; 202].

SEXUALLY TRANSMITTED INFECTIONS

Environmental factors and lifestyle choices have an enormous influence on public health. This is particularly true for sexually transmitted infections (STIs). Although the organisms, modes of transmission, and complications resulting from STIs are well known, healthcare professionals have not been able to control these diseases, and their prevalence has increased over the last few decades. An estimated 1 in 5 people in the United States have an STI; half of these were among youth 15 to 24 years of age [203].

Dental health professionals may encounter these infections in patients who have oral manifestations of STIs, which are most often contracted via oral-genital contact. For this reason, dentists and hygienists should be able to recognize unusual lesions, determine a diagnosis, and refer the patient to a physician for appropriate treatment. When discussing STIs with patients, the dental health professional should display a nonjudgmental attitude. Good communication is a hallmark of the relationship between the dental professional and the patient, and this is all the more true regarding communication about sexuality. Many patients may not understand that STIs can be transmitted through oral sex. In explaining how an STI may have been contracted, the dentist or hygienist who uses clinical terms might be regarded by the patient as too “medical,” and the patient might not understand the terminology. The patient might also find the topic to be embarrassing. A soft voice and touch, eye contact, active listening techniques, and body posture can all assist in communicating a caring and nonjudgmental attitude.

There is considerable variation in the symptoms of and treatment options for STIs. The following information is a general guide to the major STIs found in the United States. More detailed information is available from the CDC and local public health agencies.

GONORRHEA

Gonorrhea, which is caused by the bacteria *Neisseria gonorrhoeae*, was once the most prevalent STI in the United States. Gonorrhea is one of the most common infectious diseases, with an estimated 677,769 persons in the United States acquiring the disease in 2021, an increase of 45% from 2016 [203]. After a decline in the incidence of the disease from 1975 to 1997, the national rate for gonorrhea has been steadily increasing. This STI is transmitted vaginally, orally, or anally by sexual activity or from the mother to newborn during delivery. The majority of women are asymptomatic early in the disease. When symptoms do occur, they may include burning on urination and increased vaginal discharge. In the oral cavity, the disease manifests as a stomatitis and may exhibit a clinical appearance similar to the oral lesions of erythema multiforme, erosive lichen planus, or herpetic stomatitis [203; 204].

If the infection is in the oral cavity, diagnosis is made via bacteriologic evaluation of smears of the oral lesions. For infections in the genital area, gonorrhea is diagnosed in women with a culture of the cervical area. Both sexual partners should be tested and treated if either has a positive test for gonorrhea. Patients infected with gonorrhea are often co-infected with chlamydia and routinely treated with a regimen effective against both organisms. The recommended treatment of uncomplicated urogenital, anorectal, and pharyngeal *N. gonorrhoeae* infection in the United States is single-dose ceftriaxone 500 mg IM for persons weighing <150 kg. Administer 1 g ceftriaxone for persons weighing ≥150 kg [205]. If ceftriaxone is unavailable, administer either gentamicin 240 mg IM in a single dose, or azithromycin 2 g orally in a single dose, or cefixime 800 mg orally in a single dose [205]. Women should be informed of the need for retesting to verify eradication of the infection.

SYPHILIS

Syphilis is a bacterial STI caused by the spirochete *Treponema pallidum*. Like gonorrhea, syphilis is transmitted vaginally, orally, or anally through sexual activity, and via maternofetal transmission. In some cases, the disease has been acquired by dentists and hygienists providing dental treatment for a patient with syphilis during a contagious stage of the disease. Universal precautions apply, with the routine use of gloves, mask, and eye protection. Although syphilis is not as widespread as gonorrhea, its incidence is on the rise, which is especially ominous because of the harmful effects the untreated bacterium has on the heart, eyes, and central nervous system [203]. An estimated 133,945 cases of syphilis were reported in 2021, up 52% from 2016 [203].

In the first stage of syphilis, a painless, ulcerlike lesion called a chancre appears at the site of the infection, which may include the oral cavity and lips, on average about three weeks after contact with the infectious agent. On the lips, the chancre is often crusted and brownish, while intraoral lesions tend to be covered by a grayish, white membrane [204]. The chancre disappears within a few weeks, but if the syphilis is untreated, the bacteria continue to proliferate within the body. The untreated syphilis may progress through secondary and tertiary stages. During the secondary stage, there can be multiple oral lesions manifesting as painless, grayish-white plaques, most often found on the gingival, tongue, or buccal mucosa. They may have an irregular shape and are extremely contagious. These secondary signs and symptoms will resolve, with or without treatment; however, without treatment, the infection will progress. The tertiary lesions may not develop for a number of years, most frequently affecting the cardiovascular and central nervous systems. In the mouth, tertiary lesions are far more commonly observed than the primary or secondary lesions and are most often manifested by an interstitial or atrophic glossitis. There is a reported predilection for this luetic glossitis to undergo transformation to carcinoma [203; 204].

Darkfield examinations and molecular tests for detecting *T. pallidum* directly from lesion exudate or tissue are the definitive methods for diagnosing early syphilis and congenital syphilis [205]. Treatment includes antibiotics such as penicillin, doxycycline, tetracycline, or azithromycin. The preferred treatment for patients not allergic to penicillin is a single dose of penicillin G at 2.4 million units IM for adults and 50,000 units/kg body weight IM for infants and children [205]. Although syphilis can also be transmitted from an infected mother to her fetus (so-called congenital or prenatal syphilis), this form of the infection is very uncommon today due to routine blood tests conducted as part of prenatal care. In these cases, lesions may occur in any region of the oral cavity and tend to have a pink or red color [204].

HERPES SIMPLEX VIRUSES

Herpes is typically manifested either as a genital or oral viral infection. When it begins in the genital area, the infecting agent has historically been identified as HSV-2, but an increasing proportion of infections have been attributed to herpes simplex virus type 1 (HSV-1) [205]. Most infections are transmitted by persons unaware that they have the infection or who are asymptomatic when transmission occurs [205]. Similar to other STIs, HSV may be transmitted vaginally, orally, or anally through sexual activity and to a newborn during delivery. Herpes is most contagious during active outbreaks of the disease when lesions are present, but cells may be shed at other times. Latex condoms used during genital or oral sex are effective barriers to HSV [203]. Herpes is also commonly spread through kissing, using the same eating utensils, or sharing personal items with an individual infected with the herpes virus ("cold sores"). Parents, or other relatives, frequently infect their children in these ways, not knowing that "cold sores" are manifestations of the herpes virus.

HSV-1 is often found in the oral cavity and presents with signs and symptoms similar to HSV-2. A herpetic infection can be designated as primary in individuals not previously exposed, who have not yet developed antibodies to the virus, or recur-

rent in patients with previous exposure who have antibodies present. The primary infection often presents as a generalized stomatitis. Individual and discreet lesions typically appear after a prodromal sensation reported by many patients six to eight days after infection. Papules appear and develop into blisters that may become extremely painful ulcers. Although the clinical manifestation may heal and disappear, the virus is still present in the patient, often at a location remote to where the lesions occur [203]. Recurring outbreaks may be related to stress, hormonal changes, trauma, exposure to ultraviolet sunlight, or fatigue. Management of HSV should address the chronic nature of the infection rather than focusing solely on treating acute episodes of genital lesions [205].

Diagnosis of HSV-1 and HSV-2 can be difficult because the lesions classically associated with HSV are absent in many infected persons at the time of clinical evaluation [205]. Diagnosis is made by clinical inspection and culture of the sores. Prognosis and counseling depend on which HSV type is present. Type-specific serologic tests can be used to aid in the diagnosis of HSV infection in the absence of genital lesions [205]. Herpes does not have a cure, but antiviral drugs such as acyclovir, (Zovirax), famciclovir (Famvir), and valacyclovir (Valtrex) can help relieve pain, speed healing, and possibly decrease the incidence of outbreaks [21; 24; 177; 205].

CHLAMYDIA

An infection with *Chlamydia trachomatis* is the most common bacterial STI in the United States (with 1.6 million cases in 2020) [21; 85; 102; 203; 206]. Although many infected women are asymptomatic, any one of the following symptoms may occur one to three weeks after contact: frequent, uncomfortable urination; dyspareunia; cervicitis with scant cervical discharge; lower abdominal pain; and/or pelvic inflammatory disease (PID) [21]. The recommended treatment is doxycycline 100 mg orally twice daily for seven days. Alternative regimens include azithromycin 1 g orally in a single dose or levofloxacin 500 mg orally once daily for seven days [21; 177; 205]. Pregnant women should be treated

with azithromycin or amoxicillin, as the members of the tetracycline family (e.g., doxycycline hyclate) should be avoided during the time of fetal tooth development due to the well-known possibility of permanent staining of the teeth.

HUMAN PAPILLOMAVIRUS (HPV)

Human papillomavirus (HPV) causes condyloma (i.e., genital warts). It is the most common viral STI and is highly prevalent among young, sexually active individuals. HPV is transmitted by skin-to-skin contact rather than via the exchange of bodily fluids [207]. More than 150 types of HPV have been identified, and more than 40 can infect the male and female genital tract [205]. High-risk HPV identified in genital cancers include types 6, 18, 45, and 58 [86]. A substantial proportion of cancers and anogenital warts are attributable to HPV in the United States. An estimated 34,800 new HPV-attributable cancers occurred every year during 2012–2016. Before the introduction of HPV vaccines, approximately 355,000 new cases of anogenital warts occurred every year [205].

Women are more susceptible to HPV infection than men because cells in the cervix divide swiftly, facilitating the spread of the virus. Most HPV infection is not visible to the naked eye, but genital warts that appear as small bumps or groups of bumps in the genital area are the most common recognized visible manifestation [86]. Diagnosis is made by inspection, colposcopy, biopsy, or cytology. There is no treatment for the virus, but there are treatments for the diseases that HPV can cause. Patient-applied and provider-applied treatments are available. Factors affecting the choice of treatment include wart size, number, location, morphology, cost, and convenience. Imiquimod 5% cream is used in the treatment of external genital warts. Cryotherapy with liquid nitrogen may also be used in treatment [86; 203; 205]. HPV is preventable by adopting safer sexual practices; women should limit the number of partners and use latex condoms. In addition, it is recommended that all girls and boys 11 to 26 years of age who have not completed the vaccine series receive the HPV vaccine [203; 205].

HUMAN IMMUNODEFICIENCY VIRUS

HIV is the virus that causes acquired immunodeficiency syndrome (AIDS). Safer sexual practices to prevent HIV include limiting the number of partners, avoiding unprotected anal intercourse, and avoiding contact with the blood, semen, or vaginal secretions of others, including via the oral route. Women with HIV infection may experience remissions with medication regimens and improved supportive therapy that make it possible to regain high concentrations of T4/CD4 cells. However, some emerging HIV strains have proven to be resistant to current drug therapies [208].

Kaposi sarcoma, a malignancy that may affect the skin or oral cavity, is a common complication of late-stage AIDS. Oral lesions associated with Kaposi sarcoma most commonly appear on the palate but may manifest anywhere in the mouth [25].

EATING DISORDERS

Eating disorders, such as anorexia nervosa and bulimia nervosa, can significantly impact oral health through a lack of proper nutrition and the effects of repetitive vomiting [209]. Although eating disorders occur more often in women/girls (3% to 4% lifetime prevalence) than men/boys (0.3% to 1.0% lifetime prevalence), they do occur in males in all age groups and in non-Western countries and are a particular concern for oral health [210]. Both anorexia nervosa and bulimia nervosa may carry a five or more times increased risk of mortality [210].

The frequent, self-induced vomiting in conditions like bulimia, typically after periods of binge eating, can have a destructive effect on the teeth. The regurgitated gastric contents can cause decalcification, softening of the enamel, and loss of tooth structure. Most often, this erosion occurs on the maxillary anterior teeth—specifically, on their palatal surfaces. A loss of occlusal anatomy can be observed when the posterior teeth show evidence of damage [211; 212]. In one small study, the prevalence of severe malocclusion was high in women with anorexia and bulimia nervosa and resulted in a negative oral

health-related quality of life [213]. Dental manifestations may not be immediately apparent, most often appearing after about two years of chronic vomiting.

The extent of erosion can vary from one patient to another and is often affected by the extent to which the low pH stomach contents are regurgitated. If these contents are regurgitated fully, the enamel erosion may be limited. Although treatment of the eating disorder is crucial, patients who continue to vomit can use interim measures to neutralize acids and thus reduce damage in the oral cavity (as with hyperemesis gravidarum) [211]. One measure includes postvomiting rinsing with a preparation made with 1 quart of water combined with 1 teaspoon of baking soda. Fluoride rinses may also help to prevent the incidence of caries secondary to the erosion.

Dentists and other dental health professionals may notice other signs of eating disorders. For example, there may be trauma to the pharynx and the oral mucosa membranes related to the rapid intake of food and the abrupt, forceful vomiting that follows. The soft palate can also be affected when fingers or objects like pens are used to trigger vomiting. The parotid glands and, to a lesser degree, the sublinguals tend to swell in the presence of repeated bingeing and purging, seemingly related to numerous vomiting episodes. When salivary gland swelling does occur, it may be associated with cholinergic stimulation of the glands that occurs during regurgitation [214; 215; 216; 217].

Dental care professionals often are the first to see the signs of eating disorders (e.g., dental erosion, traumatized oral mucosal membranes) that indicate appropriate referrals for medical or psychiatric care. Although the role of dental care professionals in this regard is well established, research has indicated that many lack knowledge about the oral and physical cues of anorexia and bulimia. A study of 576 dental care providers randomly selected from the American Dental Association and the American Dental Hygienists' Association indicated low scores concerning the providers' knowledge about the oral and physical cues of anorexia and bulimia [212]. A

study that explored the beliefs, attitudes, and experiences of dentists regarding eating disorder-specific secondary prevention behaviors found that training, network, and dental professional contingencies were areas of potential influence for increasing the prevention capacity of dental professionals [217].

Early identification of eating disorders is critical because they can cause significant complications (e.g., dehydration, abnormal heart function, GI complications) and are potentially fatal. Early identification, referral, and treatment of eating disorders may also help reduce the likelihood that the disorders will become fully developed [212; 214; 218].

DOMESTIC VIOLENCE

Unfortunately, domestic violence, including emotional, psychologic, and physical abuse, is common. Dental health professionals may be the first health-care providers that a victim encounters. Therefore, they may play a critical role in identifying a battered woman. For this reason, they should be aware of the signs and symptoms associated with domestic violence.

The obvious signs are the physical ones, including the loss of or injury to teeth. Injuries may also range from bruises, cuts, black eyes, concussions, broken bones, and miscarriages, to permanent injuries, such as damage to joints, partial loss of hearing or vision, and scars from burns, bites, or knife wounds. Typical injury patterns include contusions or minor lacerations to the head, face, neck, breast, or abdomen. These are often distinguishable from accidental injuries, which are more likely to involve the periphery of the body. In one hospital-based study, domestic violence victims were thirteen times more likely to sustain injury to the breast, chest, or abdomen than accident victims. Abused women are also more likely to have multiple injuries than accident victims. When this pattern of injuries is seen in a woman, particularly in combination with evidence of an old injury, physical abuse should be suspected [219; 220; 221].

In addition to physical signs and symptoms, battered women also exhibit psychologic clues that resemble an agitated depression. As a result of prolonged stress, these women often manifest various psychosomatic symptoms that generally lack an organic basis. For example, they may complain of backaches, headaches, and digestive problems. They often describe fatigue, restlessness, insomnia, or loss of appetite. Anxiety, guilt, depression, post-traumatic stress, or dysphoria are also typical [222; 223; 224; 225].

As difficult as it may be to ask patients about domestic violence, as many as 30% of female trauma patients will report that they have been battered when asked directly about how an injury occurred [226]. Obviously, some women will not admit to a history of being battered. However, any trauma that seems incompatible with a history of the injury is suggestive of battering and indicative of the need for gentle questioning about how things are at home.

After identifying a victim, dentists and other health-care professionals should immediately implement a plan of action that may include providing a referral to a local domestic violence shelter to assist the victim and the victim's family. The acute situation should be referred immediately to local law enforcement officials. Other resources in an acute situation include crisis hotlines and rape relief centers. After a victim is introduced into the system, counseling and follow-up are generally available with counselors who specialize in the care of battered women and their spouses and children. These counselors may include social workers, psychologists, psychiatrists, other mental health workers, and community mental health services. The goals are to make the resources accessible and safe and to enhance support for women who are unsure of their options [225; 227].

CONCLUSION

Although dentists, dental hygienists, and dental assistants are concerned primarily about oral health, they can also play an important advisory role in the overall health of their female patients. The oral health of women (as well as men) cannot be separated from their total health, and by offering information, support, and community resources, the dental professional can and should be an integral part of the healthcare team.

This course has reviewed many of the key health concerns that female patients may be encountering. By taking a leadership role in promoting primary prevention, healthy lifestyles, and prompt and appropriate treatment, both in and out of the dentist's chair, your patients may lead longer, higher quality lives. You can make a difference in making progress toward improving women's health.

RESOURCES

American Cancer Society

<https://www.cancer.org>

**American Congress of Obstetricians
and Gynecologists**

<https://www.acog.org>

American Dental Association

<https://www.ada.org>

American Dental Hygienists' Association

<https://www.adha.org>

American Heart Association

<https://www.heart.org>

Centers for Disease Control and Prevention

<https://www.cdc.gov>

National Cancer Institute

<https://www.cancer.gov>

Bone Health and Osteoporosis Foundation

<https://www.bonehealthandosteoporosis.org>

Office on Women's Health

<https://www.womenshealth.gov>

Women's Health Initiative

<https://www.whi.org>

SELECTED GLOSSARY OF TERMS

Bone densitometry: Bone densitometry gives a quantitative measure of the bone mass by calculating a mean value with a standard deviation. This diagnostic test allows the clinicians to estimate the client's risk of fractures and determine whether treatment is needed to prevent further osteoporosis and risk of fractures.

Dietary calcium: Dairy products are the most common source of calcium in the American diet. Skim milk, 1 cup, has 302 mg of calcium; yogurt, low-fat, 8 ounces, has 415 mg of calcium; and cheddar cheese, 1½ ounces, has 306 mg of calcium.

Dysmenorrhea: Severe uterine pain usually occurring at or one day prior to the onset of menstruation and decreasing during the menstrual cycle.

Endometriosis: A condition in which endometrial cells implant on other parts of the body (e.g., bladder, rectum, ovaries, outside surface of the uterus), causing symptoms that include pain and pelvic heaviness.

Hormone replacement therapy (HRT): Combined estrogen and progesterone treatment for women who have reached or passed menopause.

Human immunodeficiency virus (HIV): The virus that causes AIDS.

Mammography: An x-ray of the breast used to identify suspicious or malignant tissue and locate the spread of cancer.

Menarche: The first menstrual period.

Menopause: The cessation of menstruation resulting from depletion of ovarian follicles and declining estrogen levels.

Oral contraceptives (OC): Birth control pills that provide supplemental hormone therapy and contraceptive benefit until a woman is postmenopausal.

Osteoporosis: Decreased density or thinning of the bone over time.

Papanicolaou (Pap) test: A test for the early detection of cervical cancer cells.

Perimenopause: The years preceding menopause when a woman can experience significant physical and emotional changes as she goes from a reproductive state to a postreproductive state. Perimenopause begins with the onset of menopausal symptoms and ends one year after the permanent cessation of menses. The terms female climacteric and "change of life" often are used to describe this time.

Postmenopause: The period of time after 12 consecutive months without any menstrual bleeding.

Premenstrual syndrome (PMS): A cluster of symptoms that occurs two to three days before the onset of menstruation and lasting for the first few days of the menstrual period.

Sexually transmitted infection (STI): An infection acquired during sexual activity, usually during sexual intercourse with an infected individual.

Unopposed estrogen: This is a term applied to the administration of estrogen alone. Unopposed estrogen therapy should be used only in women who do not have a uterus. For women who have a uterus, unopposed estrogen therapy may cause endometrial hyperplasia, which can lead to endometrial cancer.

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