Sexually Transmitted Infections in the United States: Overview and Update

How recent findings and new guideline recommendations might affect your practice.

OVERVIEW: Sexually transmitted infections (STIs) are the most common infectious diseases in the United States. They have enormous human consequences, including severe reproductive complications, neonatal injury, and death; and because STIs are associated with social stigma, they also have substantial psychological impact. The economic consequences are also enormous: it's estimated that STIs cost the nation about $16 billion in annual health care costs. All communities are affected, although significant racial, ethnic, and other disparities persist. Nurses play a critical role in educating patients on STIs, screening for disease, and providing treatment. Nurses can also help minimize the impact of social stigma by providing informed, confidential, and sensitive care, and by promoting sexual health. This article provides an overview of the symptoms, screening methods, and treatment recommendations for the most common STIs in the United States and describes the most recent relevant findings in order to inform nursing practice.

Keywords: chlamydia, gonorrhea, herpes simplex virus, HIV, human papillomavirus, sexually transmitted infections, syphilis, trichomoniasis

Sexually transmitted infections (STIs) are the most common infectious diseases in the United States, with a nationwide prevalence of more than 110 million cases; nearly 20 million new cases occur every year.[1] Health care costs have been estimated at approximately $16 billion annually.[2] STIs disproportionately affect young people, racial and ethnic minorities, and men who have sex with men (MSM).[3] For instance, young people between the ages of 15 and 24 years account for 50% of all new cases.[3] STIs have numerous serious health implications, including infertility, an increased risk of HIV transmission and acquisition, cervical cancer, and pregnancy complications.[3]

As first-line providers who have frequent contact with patients and know the local communities well, nurses are well positioned to help prevent STIs. Through intake and risk assessment, nurses can identify patients who need prevention education or early treatment (or both), provide information, offer support, give vaccinations, and facilitate partner notification. NPs can screen patients for STIs and provide treatment.

This article provides an overview of the epidemiology, screening, diagnosis, and treatment recommendations for the most common STIs in the United States, which are presented by decreasing order of prevalence. It also describes the most recent findings relevant to

Lena Solow teaches sixth graders how to prevent STIs in her sex education classes at the Rafael Hernandez Dual Language Magnet School in the Bronx, New York. A teacher for 10 years, Solow doesn't shy away from discussing issues like the dangers of sexting and tolerance for others' sexual preferences. "One of my biggest goals as a sex educator is to be sex-positive," she says. Photo by Christopher Gregory.

nursing practice. Such findings include the rise of antibiotic-resistant gonorrhea, the burden of human papillomavirus (HPV)–related cancers and the impact of the HPV vaccine, the development of nucleic acid amplification tests (NAATs) for many STIs, the increasing rate of syphilis among MSM, and the relationship between STIs and HIV acquisition and transmission.

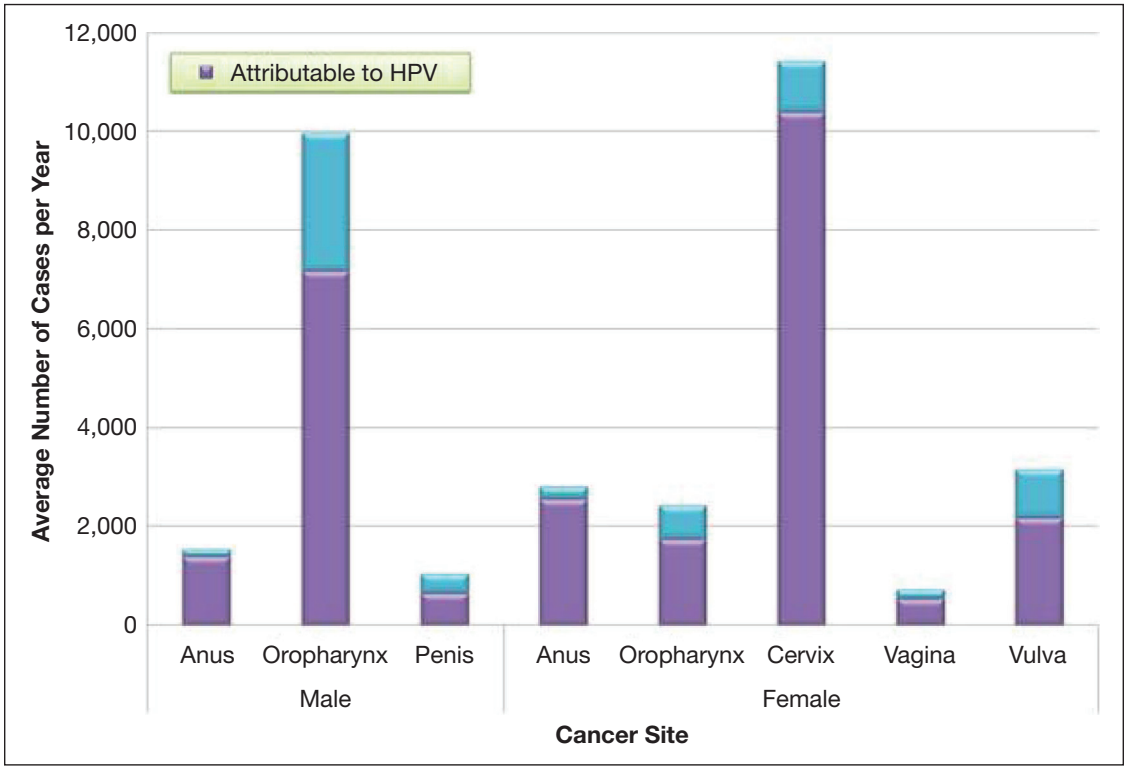
HUMAN PAPILLOMAVIRUS

Epidemiology. Over the last two decades, new findings about HPV have dramatically changed what we know about the development and prevention of cervical, anal, and oropharyngeal cancer. Both the causal relationship between HPV and cancer and the transient nature of HPV infection are better understood. And there have been two major technological advances. In 2003, the U.S. Food and Drug Administration (FDA) approved the first DNA test for HPV[4]; and in 2006 and 2009, it approved the HPV vaccine for females and males, respectively.[3]

HPV is the most common STI in the United States.[3] It belongs to a family of viruses called papillomavirus, which affect the skin and mucosa in various parts of the body, including the mouth, throat, cervix, anus, fingernails, and feet. There are over 100 strains of HPV; of these, only about 40 strains affect the anogenital areas, and only about 13 strains are considered oncogenic.[3,5] Most sexually active people will acquire HPV at some point in their lives, with the highest prevalence (as high as 54%) found among young women between the ages of 20 and 24 years.[6,7] Rates of cervical cancer have decreased markedly in the United States during the past 20 years—a drop largely attributed to the effectiveness of Pap smear screening—and this trend has continued among most racial and ethnic groups. But the incidence rates of other HPV-associated cancers have been increasing in many groups, including cancer of the vulva in white and black women, oropharyngeal cancer in white men and women, and anal cancer in white and black men and women.[8]

HPV strains are divided into two categories: high-risk strains, which cause malignancies; and low-risk strains, which cause benign lesions. Although most strains do not cause symptoms, the clinical expression

Figure 1. HPV-Attributable Cancers for Years 2006–2010



HPV = human papillomavirus.
Reprinted from the Centers for Disease Control and Prevention.[10]

of HPV may include laryngeal and respiratory papillomatosis and genital, anal, and cutaneous warts. Low-risk strains cause almost all genital warts and most respiratory papillomas.[9] High-risk strains cause virtually all cervical cancers, about 90% of anal cancers, and more than half of vaginal, vulvar, penile, and oropharyngeal cancers.[10] (See Figure 1.[10]) About 90% of cervical HPV infections will clear on their own within a few years without any clinical manifestations, while 5% will persist for more than a few years.[11] With the latter, there is a greater than 40% risk of developing high-grade precancerous cervical lesions.[11] Symptoms of genital and anal cancers include bleeding, pain, itching, discharge, swollen lymph nodes, and change in bowel patterns. Symptoms of oropharyngeal cancer include persistent sore throat; difficulty swallowing; vocal changes; and a lump in the mouth, throat, or neck.

Screening and diagnosis. Screening for HPV in general clinical practice became possible with the development of HPV DNA testing, which permits distinction between low- and high-risk strains of the virus. Current cervical cancer screening guidelines recommend HPV testing, along with cervical cytology, for women ages 30 to 65 years.[12] If both results are negative, the guidelines recommend repeating both tests every five years; if the HPV test is positive, repeat both tests after one year. Because in younger women HPV usually clears quickly, and given the relatively slow development of most cervical cancers, HPV testing isn't recommended for women younger than age 30.

There are no clear screening guidelines for other HPV-associated cancers (including cancers of the vulva, vagina, penis, anus, and oropharynx). That said, anal cytology testing for high-risk groups (such as HIV-positive MSM) has been recommended by some experts.[13]

Treatment. There are currently no antiviral drugs that target HPV infection. Treatment of low-risk infections often involves either no treatment or physical removal of the lesions. Anogenital warts are treated mainly to alleviate discomfort. Untreated, such warts may resolve spontaneously, remain the same, or increase in size or number. Treatment options include patient-applied or provider-administered medication regimens. Treatment may reduce, but does not eliminate, infectivity.[5, 14] The treatment of HPV-related cancers depends on factors such as the stage of the cancer when diagnosed, its location, and the age and fertility status of the patient, and may include surgery, chemotherapy, or radiation.

HERPES SIMPLEX VIRUS

Epidemiology. Herpes simplex virus type 1 (HSV-1) and herpes simplex virus type 2 (HSV-2) are members of the herpesvirus family; infection is very common among adults. New findings that are relevant for nurses include a better understanding of the synergistic relationship between infection with HSV-2 and HIV acquisition and transmission, the high frequency of asymptomatic infections and reactivations, and the increasing proportion of cases of genital herpes caused by HSV-1.

Both HSV-1 and HSV-2 cause chronic, lifelong infection. Upon infection, the virus establishes itself in the sacral or trigeminal ganglia. Periods of latency are interrupted by frequent reactivation. Trend data on the seroprevalence of the herpes simplex viruses have been best documented by the National Health and Nutrition Examination Survey (NHANES), which assesses the health and nutritional status of a nationally representative sample of adults and children in the United States. According to one analysis of recent NHANES data, during the period 2005 through 2010, seroprevalence among people ages 14 to 49 years was 54% for HSV-1 and 16% for HSV-2.[15]

HSV-1 has historically been associated with orolabial infection and HSV-2 with genital infection, but that has changed. HSV-1 now accounts for an increasing proportion of newly diagnosed genital herpes, particularly among young people and MSM.[16] In the past, most HSV-1 cases resulted from childhood exposure to the virus; and once an orolabial infection has been established, individuals are generally protected from contracting a genital HSV-1 infection. But as fewer people now contract HSV-1 during childhood, more are being exposed for the first time through oral–genital contact and are acquiring genital HSV-1 infections.

HSV-2 infection increases the risk of HIV acquisition up to threefold in people who are HIV negative,[18] and that people who are dually infected have an increased risk of HIV transmission.[19] The mechanisms for enhanced HIV acquisition and transmission in the presence of HSV-2 are similar to those seen with any STI. These include macro- and microulcerations in the epithelium, which provide portals for viral entry; the persistent presence of dendritic cells, macrophages, and other inflammatory cells in the genital tract, which act as HIV-receptive targets; and increased HIV-1 replication as well as increased genital and plasma viral loads, which increase the likelihood of transmission.[19]

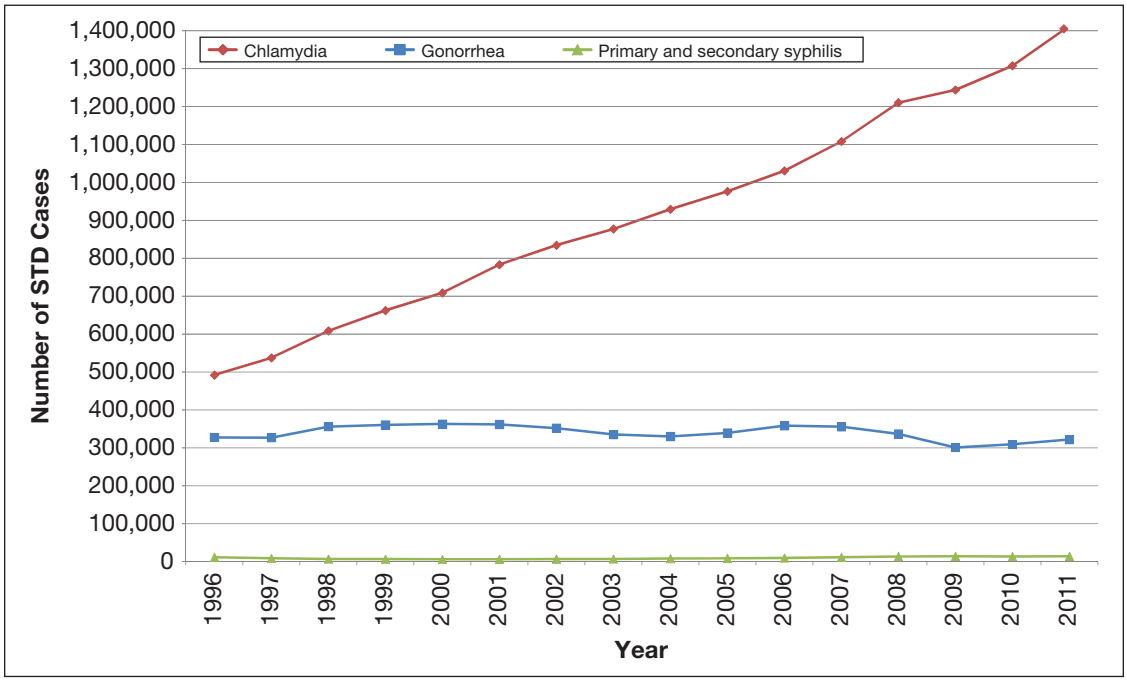
This changing epidemiology has important implications for estimating the prevalence of genital herpes and for educating patients. Historically, when a patient tested positive for HSV-1, a provider could be reasonably confident that this was a case of orolabial disease. But because HSV-1 now causes a large proportion of genital herpes cases, a positive HSV-1 test is more difficult to interpret; and HSV-2 seroprevalence no longer serves as a reasonable guide in estimating the "disease burden" of genital herpes.[16]

And while it was once thought that all cases of oral or genital herpes manifested with obvious symptoms, it's now known that most cases are subclinical and go undiagnosed. Another analysis of NHANES survey data found that, among those who were seropositive for HSV-2 during 1999 through 2004, only 14% reported having been diagnosed with genital herpes.[20] Among immunocompetent adults, symptoms may vary from none to frequent episodic ulcerative lesions at the site of infection. Among vulnerable populations such as immunocompromised people and neonates, the clinical manifestations vary substantially from

Neonatal herpes is one of the most severe complications of HSV infection. Among neonates with disseminated disease the mortality rate is 29%.

Transmission of HSV-2 occurs during close contact with someone who is shedding virus, most often in genital or oral secretions. Shedding can occur during both symptomatic and latent periods; it's impossible for an infected person to know when transmission might happen. Recent research found that among people who are HSV-2 seropositive, those who are asymptomatic shed virus on about 10% of days, whereas those who are symptomatic shed virus on about 20% of days.[17] It's important to know that asymptomatic infection to severe disease, including blindness and encephalitis.[20] Reasons for the different presentations of HSV are mostly unknown, although viral type (HSV-1 or HSV-2) and host immune system status are known to affect the frequency and severity of recurrences.[21] Infection with HSV-2 tends to produce more frequent recurrences than infection with HSV-1, and people who are immunocompromised often have more severe outbreaks than those with healthy immune systems.[16, 21] Neonatal herpes is one

Figure 2. Trends in Selected Sexually Transmitted Diseases, 1996–2011



STD = sexually transmitted disease.

Graph based on data from the CDC WONDER Online Database: STD morbidity for selected STDs by age, race/ethnicity, and gender, 1996–2011, archive request: http://wonder.cdc.gov/std-v2011-race-age.html. Accessed on July 8, 2015.

of the most severe complications of HSV infection. Although the use of high-dose acyclovir has dramatically improved outcomes in neonatal herpes, among neonates with disseminated disease the mortality rate is 29%.[22]

Screening and diagnosis. Clinical diagnosis of genital herpes based on physical examination and patient history alone is frequently inaccurate.[14] The Centers for Disease Control and Prevention (CDC) recommends cell culture, polymerase chain reaction (PCR) testing, or HSV type–specific serologic testing for persons with genital ulcers.[14] Because the sensitivity of viral culture is low, especially once lesions heal, PCR assays are increasingly used in many settings. Although serologic testing isn't recommended for the general population, the CDC's *Sexually Transmitted Diseases Treatment Guidelines, 2015* indicate that it should be considered for people presenting for evaluation for sexually transmitted diseases (STDs), people with HIV infection, and MSM at higher risk for HIV.[14] (*Editor's note:* For more on the newest CDC guidelines, see *The CDC's 2015 Treatment Guidelines: What's Changed?*[14] and visit www.cdc.gov/mmwr/pdf/rr/rr6403.pdf.)

Treatment. There is no cure for HSV, but antiviral treatment reduces symptoms and the likelihood of transmission. People who have recurring outbreaks may be treated with either suppressive or episodic therapy. Daily suppressive therapy has been shown to reduce the risk of HSV-2 transmission to sexual partners by 48%.[23] Patient counseling should stress the importance of daily adherence to the regimen in effectively reducing such risk.

TRICHOMONIASIS

Epidemiology. Trichomoniasis is caused by the protozoan *Trichomonas vaginalis*. It's the most common nonviral STI, and is more common in women than in men. In the United States, an estimated 3.7 million people have the infection.[24] The most recent NHANES data on trichomoniasis, from 2001 through 2004, indicate an overall prevalence of 3%.[3] A more recent study of more than 7,500 women ages 18 through 89 years who had undergone screening for chlamydia and gonorrhea found an overall trichomoniasis prevalence of about 9%.[25]

Up to 70% of those infected do not have symptoms.[24] When symptomatic, women may experience inflammation of the cervix, vagina, and urethra with copious vaginal discharge; men may experience urethritis or dysuria.[26] Trichomoniasis is associated with increased acquisition of HIV and adverse pregnancy outcomes.[27, 28]

Screening and diagnosis. Although new diagnostic tests with increased sensitivity and specificity are refining the diagnosis of trichomoniasis, there are currently

no screening, treatment, or control programs. The CDC recommends that all women seeking care for vaginitis be tested for *T. vaginalis*, and annual screening is recommended for all HIV-infected women.[14] Interestingly, studies among pregnant women have found that treatment doesn't significantly alter perinatal morbidity rates, though it does produce "parasitologic cure" and symptom relief.[29] Thus, pregnant women are not routinely screened for the infection.

The first NAAT for *T. vaginalis* was approved by the FDA in 2011.[26] NAATs can be used with both genital secretions and urine, and have substantially better sensitivity than the wet-mount microscopic examination, which had been the most common diagnostic technique. Rapid point-of-care tests that can detect *T. vaginalis* infection within 30 minutes have also been developed.[26] Such point-of-care tests offer the advantage of allowing treatment to be prescribed immediately.

Treatment. Trichomoniasis is treated with nitroimidazoles, either metronidazole 2 g or tinidazole 2 g, given in a single dose.[14] Spontaneous resolution has been known to occur in men.[26] Treatment of all partners of those infected is recommended. Because the risk of reinfection is high, retesting within three months of treatment is recommended for all sexually active women.[30] Retesting with NAATs can occur as early as two weeks after treatment.[14] There are no effective alternative treatments for trichomoniasis. Desensitization therapy may be effective with patients who are hypersensitive to nitroimidazoles.[31]

CHLAMYDIA

Epidemiology. Chlamydia, gonorrhea, and syphilis require mandatory reporting to the CDC, and incidence is tracked. (See Figure 2.) Chlamydia, caused by the bacterium *Chlamydia trachomatis*, is the most common reportable communicable disease in the United States,[3] and is a major cause of genital tract and ocular infections worldwide. In 2013, more than 1.4 million cases of chlamydia infection were reported to the CDC.[3] The highest rates of infection are seen in adolescents and young adults ages 15 to 24. In this population, between 2000 and 2011 the reported infection rates increased steadily. Such increases may have reflected rising incidence, but may also have reflected increased screening rates and the advent of highly sensitive NAATs. During 2012 and 2013, the overall infection rate decreased 1.5%, which is the first time since national reporting began that a decrease has occurred.[3]

Chlamydia is transmitted through vaginal, oral, or anal sex with someone who is infected, and can be transmitted to a neonate as the baby passes through the birth canal. Most cases are asymptomatic.[32] When clinical manifestations appear in women, they can include cervicitis, urethritis, and pelvic inflammatory disease. Chlamydia and gonorrhea infections account for one-third to one-half of all cases of pelvic inflammatory disease, which occurs in about one-quarter of women treated for chlamydia. One analysis found that nearly half of cases of tubal factor infertility were caused by chlamydia.[33] Men are somewhat more likely to be symptomatic, and manifestations can include urethritis, epididymitis, prostatitis, and proctitis.[32] Complications in men are unusual and rarely result in reproductive problems. As is the case with other STIs, untreated infection increases the risk of HIV acquisition.[32]

Screening and diagnosis. Because chlamydia is often asymptomatic and the impact of untreated infection can be substantial, regular screening is critical. Both the CDC and the U.S. Preventive Services Task Force recommend annual screening for all sexually active women younger than 25 years, as well as for older women with risk factors such as a new sexual partner.[34,35] The CDC also recommends "at least" annual urethral screening for MSM who have insertive intercourse and rectal screening for those who have receptive anal intercourse.[14] Evidence suggests that current screening practices for MSM are inadequate and that many extragenital infections are missed.[36]

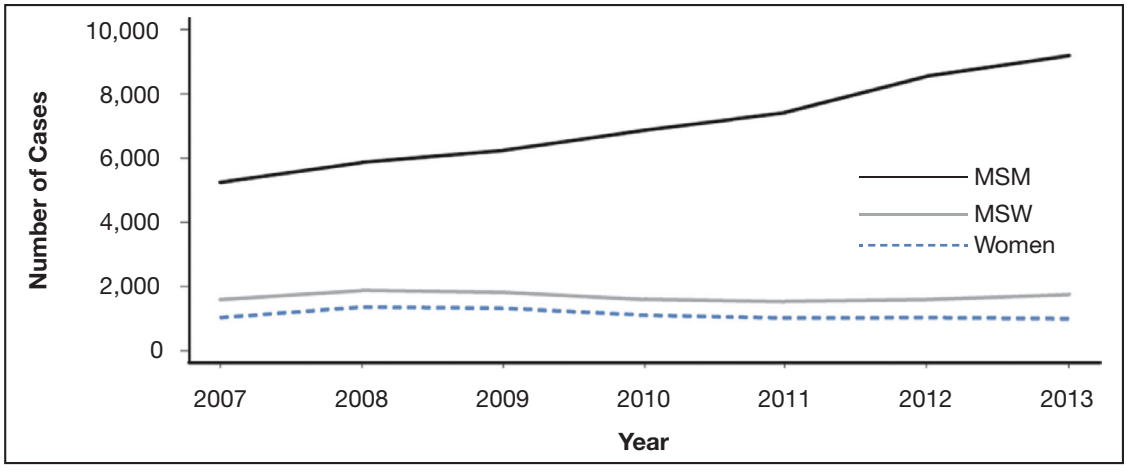
Historically, culture was considered the gold standard in diagnostic testing for chlamydia; now NAATs, which provide superior sensitivity and specificity for diagnosing chlamydia, are the preferred method.[32] Other methods include antigen detection and unamplified genetic probes, but these are less sensitive and specific than NAATs. In testing men for chlamydia

The CDC's 2015 Treatment Guidelines: What's Changed?

In June, the Centers for Disease Control and Prevention released *Sexually Transmitted Diseases Treatment Guidelines, 2015*,[14] which updates the previous version issued in 2010. The following are among the more notable changes.

- Cefixime is no longer recommended as a first-line regimen for the treatment of gonorrhea.
- Nucleic acid amplification tests are now preferred for the diagnosis of trichomoniasis.
- Podophyllin resin is no longer recommended as an alternative treatment for external genital warts.
- Retesting for *Trichomonas vaginalis* is recommended for all sexually active women within three months after initial treatment.
- A 9-valent vaccine that protects against nine strains of human papillomavirus (HPV) has been added as an option for HPV vaccination.
- Hepatitis C screening is now recommended for all people born between 1945 and 1965.

Figure 3. Primary and Secondary Syphilis—Reported Cases by Sex and Sexual Behavior, 33 Areas,[a] 2007–2013



MSM = men who have sex with men; MSW = men who have sex with women only.
[a]Thirty-two states and Washington, DC, reported sex-of-partner data for 70% or more of the reported cases of primary and secondary syphilis for each year during 2007–2013.
Reprinted from the Centers for Disease Control and Prevention.[3]

and gonorrhea, urine is the preferred specimen for NAATs; for women, a self-collected vaginal swab is preferred.[37] Both urine testing and the use of self-collected vaginal discharge specimens are becoming increasingly standard in practice.[32] The use of self-collected rectal swabs has also been shown to be highly acceptable to both women and MSM.[38] Because the use of NAATs for extragenital infections has not been cleared by the FDA, laboratories must establish performance specifications to meet regulatory requirements.[37] Several rapid point-of-care tests for chlamydia have been approved by the FDA, but lack sensitivity compared with NAATs.[39] Other, more promising rapid tests are currently under development.

Treatment. Chlamydia is typically treated with either azithromycin 1 g (single dose) or doxycycline 100 mg twice daily for seven days.[14] Both treatments are equally effective, but azithromycin is much more expensive. In choosing a treatment, providers should consider the ability of the patient to adhere to the regimen. Alternative seven-day regimens include erythromycin base 500 mg four times daily, erythromycin ethylsuccinate 800 mg four times daily, levofloxacin 500 mg once daily, and ofloxacin 300 mg twice daily. The CDC recommends rescreening women and men with chlamydia about three months after treatment is complete to rule out reinfection.[14]

GONORRHEA

Epidemiology. Gonorrhea is caused by the bacterium *Neisseria gonorrhoeae*, which grows and multiplies easily in the mucosa and can infect the cervix, uterus, fallopian tubes, urethra, mouth, throat, and anus. It's the second most common reportable communicable disease in the United States.[3] In 2009, the U.S. infection rate reached a low of 98.1 cases per 100,000 people; since then, the rate has risen slightly to 106.1 cases per 100,000 people in 2013.[3] Gonorrhea is frequently asymptomatic, but symptoms can manifest as dysuria, urethral or vaginal discharge, and bleeding from the site of infection. Undiagnosed and untreated gonorrhea can result in significant complications, particularly among women, in whom it can lead to pelvic inflammatory disease.[3]

Screening and diagnosis. As with chlamydia, both the CDC and the U.S. Preventive Services Task Force recommend annual screening for all sexually active women younger than 25 years, as well as for older women with risk factors such as a new sexual partner.[14, 34, 35]

Among MSM, "at least" annual pharyngeal screening for those who have receptive oral intercourse, urethral screening for those who have insertive intercourse, and rectal screening for those who have receptive anal intercourse are recommended.[14] There are no routine screening recommendations for extragenital infections among other populations and risk groups.

The importance of testing extragenital sites for gonorrheal infection was illustrated in a study of MSM who visited a California STD clinic from 1997 through 2003.[40] During this seven-year period, 11% of urethral or urine tests, 10% of rectal tests, and 4% of pharyngeal tests were positive. Had the clinic used only urethral or urine tests, it would have missed 33% of the total gonorrhea cases.

The use of NAATs is the preferred method of diagnostic testing for gonorrhea. As with chlamydia, NAATs are not FDA approved for rectal or pharyngeal screening, but may be used by laboratories that have met the regulatory requirements.[14] As NAATs are becoming more widely used, the use of culture to confirm gonorrheal infection is in decline but remains critical for monitoring antimicrobial resistance and determining susceptibility.

Treatment. Since the 1940s *N. gonorrhoeae* has developed resistance to sulfanilamides, penicillins, tetracyclines, and most recently to fluoroquinolones.[41] Currently only one class of antibiotics, the third-generation cephalosporins, can effectively treat gonorrhea. Recent surveillance has documented a rapid decrease in the bacterium's susceptibility to these cephalosporins, particularly in the western United States and among MSM, mirroring geographic and demographic patterns previously seen in fluoroquinolone-resistant strains.[42] There is a pressing need for new antibiotics to treat gonorrhea.

The current recommended treatment involves a combination of a single intramuscular injection of ceftriaxone 250 mg plus a single oral dose of azithromycin 1 g.[14,42] The rationale for the combined therapy is that this regimen also treats chlamydia, a frequent coinfection, and has demonstrated improved efficacy in treating pharyngeal gonorrhea.[43] It's thought that it might also slow the development of resistance.[43] Re-screening for infection three months after treatment is recommended.

SYPHILIS

Epidemiology. Syphilis is caused by the bacterium *Treponema pallidum*. In 2013, the overall rate of reported primary and secondary syphilis in the United States was 5.5 cases per 100,000 people—roughly twice the historic low, which was recorded in 2000. The greatest burden is on MSM, followed by blacks and other ethnic minorities.[3] In both clinical and serologic diagnosis, syphilis is categorized into stages, which can overlap.[14] Primary infection is characterized by an ulcer or chancre at the infection site. Secondary infection may include rash, lymphadenopathy, and mucocutaneous lesions. Tertiary infection may include cardiac or gummatous (granulomatous) lesions. Latent infections (which lack clinical symptoms) are divided into early (acquired within the last 12 months) or late (acquired earlier, or of unknown duration). Moreover, neurologic infection, which can occur at any stage, may be characterized by cranial nerve dysfunction and altered mental status. Untreated, syphilis can eventually cause heart problems, blindness, central nervous system damage, and death; in pregnant women it can lead to perinatal death. There is no immunity from prior infection, and reinfection is not uncommon.[44]

A recent study among MSM found that between 2005 and 2008, those who were black, Hispanic, or younger (ages 15 to 29 years) accounted for an increasing proportion of primary and secondary syphilis cases in this country.[45] And CDC surveillance data from 2007 through 2013 showed that MSM accounted for approximately 75% of primary and secondary syphilis cases.[3] Transmission also occurs among men who have sex with women.[3] (See Figure 3.[3]) Moreover, overall incidence varies by region, with 14 states and the District of Columbia accounting for 70% of primary and secondary syphilis cases.[3] Since the beginning of the HIV–AIDS epidemic, there have been high syphilis coinfection rates. It's been estimated that overall, about 20% of people infected with syphilis in the United States are also HIV infected.[46] Recent CDC surveillance data indicate that this coinfection rate is much higher (52%) among MSM, but lower among men who have sex with women (10%) and women (5%).[3]

Screening and diagnosis. For patients in any stage, *T. pallidum* is identified by serologic PCR

Important Patient Teaching Points

- A substantial majority of the population will be infected with a sexually transmitted infection (STI) at some point in their lives.
- Because most STIs are asymptomatic, most people with STIs don't know they are infected.
- Some STIs (such as human papillomavirus [HPV]) resolve without treatment, while others (such as herpes simplex virus type 1 and herpes simplex virus type 2) are chronic, lifelong infections.
- The consistent, correct use of latex condoms remains highly effective in preventing the acquisition and transmission of chlamydia, gonorrhea, and trichomoniasis, as well as HIV.
- Such use of latex condoms also reduces the risk of acquiring genital herpes, syphilis, and HPV, although protection is limited to sites of infection or exposure.
- In adolescents and young adults, the HPV vaccine is highly effective in preventing two oncogenic strains of HPV, and two that cause genital warts.
- Routine annual screening for chlamydia and gonorrhea is recommended for women younger than 25 years and older women with risk factors.
- Routine annual screening is recommended for all sexually active gay, bisexual, and other men who have sex with men.

testing, though the quantity of bacteria (treponemes) in blood is highest during the secondary stage.[47] Both nontreponemal and treponemal tests are required to confirm diagnosis. Historically, most screening began with a nontreponemal test; syphilis was confirmed in reactive samples using a treponemal test. But recently many laboratories have shifted to a reverse screening algorithm. This algorithm uses automated treponemal tests (such as enzyme and chemiluminescence immunoassays) first because they're easier to use and less costly. Reactive samples are then tested with a nontreponemal test.

Treatment for primary, secondary, or early latent syphilis is a single intramuscular injection of 2.4 million units of benzathine penicillin G.[14] For people with tertiary or late latent syphilis, recommended treatment is three weekly doses of 2.4 million units. For those with neurologic infection, recommended treatment is a course of 18 to 24 million units of aqueous crystalline penicillin G daily administered as 3 to 4 million units IV every four hours or continuous infusion, for 10 to 14 days. Treatment with doxycycline or tetracycline is recommended for nonpregnant patients who are allergic to penicillin.[14]

PREVENTION

The mainstays of STI prevention are behavior change and treatment, with the goal of limiting the spread of disease. Strategies include education and counseling (see *Important Patient Teaching Points*); identification and treatment of infected individuals (whether symptomatic or not); evaluation, treatment, and counseling of sex partners of infected individuals; and when possible, preexposure vaccination. The consistent, correct use of male latex condoms provides substantial protection from chlamydia, gonorrhea, and trichomoniasis, as well as HIV.[48] It also reduces the risk of contracting genital herpes, HPV, and syphilis, although such protection is limited to the infected site or site of exposure. Innovative strategies in STI prevention include circumcision, HPV vaccination, and expedited partner therapy.

Primary prevention. *Circumcision.* During the last decade, many studies have investigated the impact of circumcision on STI acquisition. A review of several African trials found that male circumcision reduced heterosexual acquisition of HSV-2 and HPV among men and "genital ulcer disease," HPV, and trichomoniasis among female partners.[49] Moreover, three trials found that male circumcision reduced HIV acquisition among heterosexual men by 53% to 60%.[49] (Although the review authors focused on African studies, they also noted supporting evidence in U.S. trials.) The effect of male circumcision on HIV acquisition in MSM has not been demonstrated, but it may be protective in MSM who practice primarily insertive anal sex.[49, 50]

In light of such findings, in 2007 the World Health Organization issued a policy statement in support of male circumcision[51]; and in 2012, the American Academy of Pediatrics revised its policy statement in favor of the procedure, stating that the health benefits outweigh the risks.[52]

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Preexposure HPV vaccination. Three HPV vaccines currently exist.[14] A quadrivalent vaccine (Gardasil) confers immunity against two oncogenic strains (HPV 16 and 18) that together account for 70% of cervical cancers, and two strains (HPV 6 and 11) that together cause 90% of genital warts. A bivalent vaccine (Cervarix) protects against the acquisition of HPV 16 and 18, but doesn't prevent genital warts. In 2014, the FDA approved a 9-valent vaccine (Gardasil 9) that protects against HPV 6, 11, 16, and 18, as well as five more strains that together cause about 20% of cervical cancers.[14, 53] The 9-valent vaccine reportedly has "the potential to prevent approximately 90% of cervical, vulvar, vaginal, and anal cancers."[53] All three are approved for use in girls and young women, and the quadrivalent and 9-valent vaccines are approved for use in boys and young men.[14]

All of the vaccines are given in a three-dose series. Ideally, both girls and boys should receive the first dose at age 11 or 12 years, or before they become sexually active.[54, 55] Vaccination is recommended for females through age 26 and for males through age 21. Vaccination is also recommended through age 26 for MSM and people who are immunocompromised. The duration of vaccine protection and the need for booster doses remain unknown.

HPV vaccination coverage remains below target levels. According to data from the National Immunization Survey–Teen, among 13-to-17-year-olds, the percentage of girls who had received at least one dose increased from 25% in 2007 to 57% in 2013, but in 2013, only 38% of girls had received all three recommended doses.[55] The percentage of boys who had received at least one dose increased from 8% in 2011 to 35% in 2013, but in 2013 only 14% of boys had

received all three doses. One-third of parents of girls and over half of parents of boys reported that their clinician had failed to recommend the vaccine, a troubling finding.[55]

Secondary prevention. *Expedited partner therapy* is a crucial strategy. Because many STIs are asymptomatic, it's not unusual for a person to be unaware that her or his partner has tested positive for an infection. Expedited partner therapy involves having the patient deliver medication or a prescription for medication to her or his sexual partners, without the partners' receiving medical evaluation.[56] Developed in part to reduce reinfection rates, expedited partner therapy was endorsed by the CDC in 2006 as an effective management option.[57] In a recent meta-analysis, expedited partner therapy was found to be more effective than simple patient referral in reducing reinfection in patients with chlamydia, gonorrhea, or nongonococcal urethritis.[56] Barriers have included questions of legality, funding, and provider and patient acceptance.[58] As of March of this year, expedited partner therapy was legal in 37 states and illegal in four.[59] Funding is available in some states but not others. Studies have indicated that both index patients and their partners find expedited partner therapy acceptable.[58] Nurses need to be aware of this option and its legal status in their practice area. Nurses should further counsel patients not only to deliver medication to their partners, but also to tell them about their STI and provide written materials about the infection, signs of complications, and the medication being given to treat or prevent it.

IMPLICATIONS: A SUMMARY

Nurses can have a significant impact on STI infection and reinfection rates by providing thorough education on STI prevention, treatment adherence, partner services, and follow-up care. When necessary, they should refer patients to the appropriate health departments to discuss partner notification and HIV testing and counseling. NPs should regularly screen patients for STIs and HIV-transmission risk behaviors and ensure that patients whose symptoms recur receive follow-up testing and care. All providers should evaluate their patients' risk for cervical and anal cancer, and provide appropriate screening and follow-up care. And all providers can be involved in prevention campaigns and encourage the use of latex condoms, HPV vaccination, and other preventive measures. ▼

For three additional continuing nursing education activities about sexually transmitted infections, go to www.nursingcenter.com/ce.

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