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Sexually transmitted infections: Issues specific to adolescents

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INTRODUCTION

This topic will focus on aspects of sexually transmitted infections (STIs) that are particularly relevant in adolescents. Details about clinical manifestations, diagnosis, and treatment of individual infections are discussed separately.

- *Chlamydia trachomatis* (see "Clinical manifestations and diagnosis of Chlamydia trachomatis infections" and "Treatment of Chlamydia trachomatis infection")
- *Neisseria gonorrhoeae* (see "Clinical manifestations and diagnosis of Neisseria gonorrhoeae infection in adults and adolescents" and "Treatment of uncomplicated Neisseria gonorrhoeae infections" and "Disseminated gonococcal infection")
- Syphilis (see "Syphilis: Epidemiology, pathophysiology, and clinical manifestations in patients without HIV" and "Syphilis: Screening and diagnostic testing" and "Syphilis in pregnancy" and "Syphilis: Treatment and monitoring")
- HIV (see "Acute and early HIV infection: Clinical manifestations and diagnosis" and "Acute and early HIV infection: Treatment")
- Herpes simplex virus (see "Epidemiology, clinical manifestations, and diagnosis of genital herpes simplex virus infection" and "Treatment of genital herpes simplex virus infection" and "Genital herpes simplex virus infection and pregnancy")
- Chancroid (see "Chancroid")
- Pubic lice (see "Pediculosis pubis and pediculosis ciliaris")
- *Trichomonas vaginalis* (see "Trichomoniasis")
- Condylomata acuminata (see "Condylomata acuminata (anogenital warts) in adults: Epidemiology, pathogenesis, clinical features, and diagnosis" and "Condylomata acuminata (anogenital warts): Treatment of vulvar and vaginal warts" and "Condylomata acuminata (anogenital warts): Management of external condylomata acuminata in men")
- *Mycoplasma genitalium* (see "Mycoplasma genitalium infection in men and women")
- Lymphogranuloma venereum (see "Lymphogranuloma venereum")

ADOLESCENT SEXUAL DEVELOPMENT

Normal adolescent psychosocial development encompasses a desire for autonomy and an increase in risk-taking behaviors, making adolescents particularly vulnerable to STIs. (See "Adolescent sexuality", section on 'Adolescent development'.)

Early adolescence begins during the first years of the second decade and is marked by rapid physical growth and attainment of secondary sex characteristics.

Middle adolescence begins at approximately age 14 years, ends around age 17 to 18 years, and is marked by maturation of the reproductive systems and achievement of adult physical stature. Increased sexual interest and noncoital sexual behaviors are characteristic of middle adolescence. The average age of first coitus is approximately 16 years among American adolescents, but the age is lower in certain populations, such as inner city youth.

Late adolescence ends with the transition into young adulthood and is associated with high levels of sexual activity and acquisition of STIs.

EPIDEMIOLOGY

STIs are common in adolescents. Surveillance in the United States suggests that approximately 50 percent of all new STIs occur in adolescents and young adults (age 15 to 24 years) and that approximately 25 percent of sexually active adolescent females have had an STI [1-3].

Rates of genital gonorrhea decreased among female adolescents (age 15 to 19 years) between 2017 and 2018 (from 557 to 548 cases per 100,000 population) [3]. During the same time period, rates of genital chlamydia increased among female adolescents (from 3265 to 3307 cases per 100,000), and rates of syphilis (primary and secondary) increased among male and female adolescents (from 10.1 to 10.9 and 3.2 to 4.3 cases per 100,000 population, respectively).

Repeated acquisition of STIs is common: As many as 40 percent of the annual incidence of chlamydial or gonococcal disease occurs in adolescents previously infected with the causative organisms, and this proportion may be increasing [4]. Many adolescents are reinfected within a few months of an index infection [5,6]. (See 'Reinfection' below.)

Repeated acquisition of STIs is a risk factor for subsequent development of HIV infection. In a retrospective cohort of 75,273 high school students who participated in an STI screening program between 2003 and 2010, 248 students (0.3 percent) tested positive for HIV [7]. The risk of HIV infection was at least three times higher in students with multiple gonococcal infections than students with no history of gonorrhea (incidence rate ratio [IRR] 3.5, 95% CI 1.9-6.4 for girls and IRR 5.1, 95% CI 3.6-7.1 for boys). Among HIV-positive students, there was at least one year between the first STI and positive HIV test for 86 percent of girls and 96 percent of boys, suggesting a window of opportunity for preventive interventions.

Among adolescents, HIV infection is primarily transmitted sexually, although it may be transmitted by other routes (eg, injection drug use, blood products). Adolescent HIV is discussed separately. (See "The adolescent with HIV infection".)

RISK FACTORS

Behavioral — Behavioral factors have been linked to the increased risk of acquisition of STIs among adolescents, but biologic factors also may play a role.

Behavioral factors that have been associated with acquisition of STIs in adolescents include [6,8-12]:

- Time elapsed since first intercourse, particularly for human papillomavirus (HPV). In an observational study of urban females (14 to 17 years at enrollment), 25 percent were diagnosed with an STI within one year of first intercourse [6]. Repeated infections were common. These findings highlight the need for initiation of STI screening within one year of first intercourse and of retesting individuals who have been infected every three to four months. (See "Screening for sexually transmitted infections" and "Treatment of Chlamydia trachomatis infection", section on 'Retesting' and "Treatment of uncomplicated Neisseria gonorrhoeae infections", section on 'Retesting'.)
- Sexual activity within early and middle adolescence, particularly for *C. trachomatis* infection; 29 percent of sexually active inner city adolescent females in one study tested positive for chlamydia, with 14-year-old adolescents having the highest age-specific prevalence.
- Multiple partners, new partners, or partners with multiple other partners.
- For male or transgender female adolescents: having sex with a person with a penis.
- Inconsistent use of condoms, especially with established partners.
- Alcohol and other drug consumption (although this factor may be associated with poor contraceptive use or multiple partners rather than serving as an independent marker of risky behavior).
- Rectal douching or enemas in preparation for receptive anal sex (may break down the rectal mucosal barrier) [13].
- Receiving or sending sexually explicit messages ("sexting") is reported by approximately 20 percent of youth in the United States [14] and linked to sexual activities such as new partner acquisition and sex without a condom [15]; however, sexting has not been directly linked to increased STI risk.

Surveys of high school students in the United States indicate that the prevalence of sexual experience and most risk behaviors declined between 2001 and 2019, but fewer students reported using a condom during their last intercourse [16,17]. In the 2019 Youth Risk Behavior Survey, 38 percent of students reported that they ever had sexual intercourse (compared with 46 percent in 2001); 27 percent reported that they were currently sexually active (compared with 33 percent in 2001); 9 percent reported sexual intercourse with ≥4 persons during their life (compared with 12 percent in 2001); and 54 percent of those who were currently sexually active reported using a condom during their last intercourse (compared with 58 percent in 2001) [17].

Biologic — Several biologic factors have been hypothesized to influence the susceptibility of adolescents to acquisition of STIs. One such factor is cervical ectopy or cervical immaturity, which refers to the area of ectocervix that is covered by columnar epithelium after puberty. Young women

with immature cervical epithelium have higher levels of several cervicovaginal and regulatory cytokines and chemokines than women with mature cervical epithelium [18]. Columnar epithelium is thought to be more susceptible than squamous epithelium (that replaces columnar epithelium upon maturation) to sexually transmitted organisms such as *N. gonorrhoeae*, *C. trachomatis*, and HPV [19], although one study could not demonstrate an independent association of cervical ectopy with STIs among adolescent women [20].

Adolescents' STI susceptibility may also be influenced by the composition of the cervical and vaginal microbiome. Vaginal microbiota play an important role in vaginal immune and inflammatory responses [21]. This microbiota – especially in terms of populations of various species of *Lactobacillus* – may be particularly variable after puberty and first sexual experiences [22,23].

Other risk factors — Other risk factors for acquisition of STIs in adolescents include [24]:

- Residing in a detention facility
- Mood disorders (which may increase the risk of substance use)
- Adverse childhood experiences, including maltreatment, sexual abuse, and sexual trafficking [25]

SPECIFIC CONCERNS IN ADOLESCENTS

Although the evaluation and treatment of STIs in adolescents are similar to the diagnosis and treatment of STIs in adults, a number of specific concerns are particular to adolescents, including [26]:

- **Consent and confidentiality**
  - Self-consent for diagnosis and treatment of STIs is recognized in all 50 states and the District of Columbia. However, state laws vary in terms of the specific infections defined as sexually transmitted. (See "Consent in adolescent health care", section on 'Sexually transmitted infections'.)
  - Concerns about privacy and confidentiality are important barriers to seeking medical care among adolescents with possible STIs [27]. Specific discussion of the meaning and limits of confidentiality increases disclosure of sensitive information about symptoms, sexual activity, sexual partners, and preventive behaviors [28]. (See "Confidentiality in adolescent health care".)
  - Patient portals in electronic health records and explanation of benefits are particular risks to adolescents' confidentiality for STI-related care. STI tests and results may be seen by parents unless systems are in place to limit access to adolescents only [29].
  - Pharmacists or other medical personnel may inadvertently compromise confidentiality. A study from Indiana University shows that 30 percent of pharmacists would call parents about a prescription for antibiotics used to treat STIs [30]. (See "Confidentiality in adolescent health care", section on 'Potential threats to confidentiality'.)
- **Pregnancy** – Pregnancy or fear of pregnancy sometimes motivates care-seeking with a chief complaint of genital symptoms. (See "Pregnancy in adolescents", section on 'Diagnosis of pregnancy'.)
- **Sexual minoritized youth** – STIs in sexual minoritized (eg, lesbian, gay, bisexual, gender variant) youth are discussed separately. (See "Lesbian, gay, bisexual, and other sexual minoritized youth: Epidemiology and health concerns", section on 'Sexually transmitted infections'.)
- **Mandatory reporting in the United States**
  - Most states have "age of consent" laws that require notification of child protection authorities if sexual activity is identified, especially if there are large discrepancies in the partners' ages. Ages vary among the states. Large age discrepancies (>5 years) between partners are seen in approximately one-third of adolescents with first sexual intercourse very early in adolescence (ie, ages 11 or 12 years) and in approximately one-tenth of adolescents who have their first intercourse in middle or late adolescence [31]. (See "Confidentiality in adolescent health care", section on 'Consensual sexual activity'.)
  - Reporting of some STIs is mandatory in all states, although the specific organisms vary. Syphilis, gonorrhea, and HIV/AIDS are reportable diseases in every state [32].
  - Iowa requires parental notification for HIV infection [33]; the remaining states do not require parental notification, although notification is not expressly forbidden. (See "Confidentiality in adolescent health care", section on 'Sexually transmitted infections'.)
- **Dating violence** – In surveys, physical and sexual violence from dating partners are reported by as many as 20 percent of adolescent girls [34,35]. However, such acts are infrequently reported to clinicians; questions regarding physical and sexual dating violence should be included in clinical assessments of sexual behavior and STI risk [36].

SEXUAL HISTORY

Routine assessment of sexual activity is an essential element of STI-related care [37]. The sexual history (table 1) should be straightforward and nonjudgmental, with appropriate counseling regarding risk-taking behaviors as recommended by the United States Preventive Services Task Force [24,38]. An assurance of confidentiality is an important aspect of obtaining an accurate sexual history in adolescents; additional aspects are discussed separately. (See "Confidentiality in adolescent health care" and "Adolescent sexuality", section on 'Issues for the health care provider'.)

SCREENING FOR STIs

Screening for STIs in **asymptomatic** adolescents and young adults is discussed separately. (See "Screening for sexually transmitted infections", section on 'Screening recommendations' and "Society guideline links: Sexually transmitted infections".)

EVALUATION FOR STIs

Adolescents with symptoms of STI should be evaluated for STI with examination and/or diagnostic tests. The components of the examination depend upon the suspected infection.

Examination — An external genital examination is indicated for evaluation of genital lesions that may be caused by genital herpes, primary syphilis, or human papillomavirus (HPV). Oral and anal/rectal examinations for signs of STI also are indicated based upon exposure risk.

Speculum and bimanual pelvic examinations may cause anxiety and/or discomfort and are not always necessary in the evaluation of suspected STI. Indications for speculum and bimanual pelvic examination in the evaluation of suspected STI include [39]:

- Abdominal and pelvic pain and tenderness
- Obtaining specimens for STI testing, although urine or other patient-collected (eg, vaginal swabs) specimens are effective and often are preferred by adolescents [40-47]
- Associated menstrual irregularities (eg, amenorrhea unrelated to pregnancy, prolonged or heavy vaginal bleeding)
- Evaluation of vaginal discharge if vaginal foreign body is suspected (eg, forgotten tampon, condom fragments, other objects)
- Cervical cancer screening (not routinely recommended for adolescents <21 years unless they are immune compromised) (see "Screening for cervical cancer in resource-rich settings", section on 'Age <21')

The pelvic examination is discussed in detail separately. (See "The gynecologic history and pelvic examination", section on 'Pelvic examination'.)

STI clinical patterns — The pattern of presenting symptoms and signs guides the clinical approach to the patient with suspected STI. However, asymptomatic or minimally symptomatic presentations are common.

Discharge syndromes — Urethral or vaginal discharge and dysuria are the hallmarks of the following STIs:

- Gonorrhea – (See "Clinical manifestations and diagnosis of Neisseria gonorrhoeae infection in adults and adolescents" and "Treatment of uncomplicated Neisseria gonorrhoeae infections" and "Disseminated gonococcal infection".)
- Chlamydia – (See "Clinical manifestations and diagnosis of Chlamydia trachomatis infections" and "Treatment of Chlamydia trachomatis infection".)
- Trichomonas – (See "Trichomoniasis".)
- Bacterial vaginosis – (See "Bacterial vaginosis: Clinical manifestations and diagnosis" and "Bacterial vaginosis: Treatment".)
- Candidiasis – (See "Candida vulvovaginitis: Clinical manifestations and diagnosis" and "Candida vulvovaginitis: Treatment".)

M. genitalium infections are increasingly recognized as causes of sexually transmitted discharge syndromes in adolescents and young adults [48]. (See "Mycoplasma genitalium infection in men and women".)

Genital herpes is sometimes associated with dysuria and a scant, mucoid urethral discharge, but nearly always in association with other genital lesions. (See "Epidemiology, clinical manifestations, and diagnosis of genital herpes simplex virus infection" and "Treatment of genital herpes simplex virus infection" and "Genital herpes simplex virus infection and pregnancy".)

Characteristics of the discharge, such as color (eg, clear, mucoid, yellow, green), are unreliable indicators of the etiology. (See "Approach to

females with symptoms of vaginitis".)

Genital ulcer syndrome — Clinical features do not reliably distinguish the various cause of genital ulcer syndrome (GUS). The features of the infections associated with GUS overlap, and mixed infections occur in as many as 10 percent of cases [49].

- **Causes** – In the United States, genital herpes (picture 1) is the most common cause of GUS among adolescents. Symptomatic genital herpes may be caused by herpes simplex virus (HSV) type 1 in addition to the more common HSV type 2. (See "Approach to the patient with genital ulcers" and "Epidemiology, clinical manifestations, and diagnosis of genital herpes simplex virus infection".)

  Primary syphilis is another diagnostic consideration in patients with genital ulcers (picture 2A-C), especially in young men who have sex with men and in the setting of commercial sex work or methamphetamine or cocaine use. (See "Syphilis: Epidemiology, pathophysiology, and clinical manifestations in patients without HIV", section on 'Clinical manifestations'.)

  Less common causes of GUS in the United States, and extremely rare in adolescents, include chancroid, lymphogranuloma venereum (LGV, which occurs primarily in young men who have sex with men), and granuloma inguinale (*Klebsiella granulomatis*). (See "Chancroid" and "Lymphogranuloma venereum" and "Approach to the patient with genital ulcers".)

  Genital ulcers are not always due to sexually transmitted organisms. Nonsexually acquired vulvar ulcers (sometimes called Lipschütz ulcers, virginal ulcers, or aphthous ulcers) may occur in association with viral illness, Crohn disease, vasculitis, and Behçet syndrome (picture 3). (See "Acute genital ulceration (Lipschütz ulcer)" and "Overview of vulvovaginal complaints in the prepubertal child".)

- **Evaluation** – Most adolescents with GUS should be evaluated for syphilis and HSV; they should also be tested for HIV, gonorrhea, and chlamydia because patients with an ulcerative STI are at increased risk for coinfection with other STIs. Testing for chancroid, LGV, or granuloma inguinale may be indicated in patients with risk factors. (See "Approach to the patient with genital ulcers", section on 'Diagnostic testing'.)

Pelvic inflammatory disease — Pelvic inflammatory disease (PID) refers to acute infection of the upper genital tract structures (eg, uterus, fallopian tubes, ovaries). PID encompasses a wide spectrum of clinical presentations and may be challenging to diagnose. It should be suspected in sexually active adolescents who present with pelvic discomfort, though subclinical infection may also occur. (See "Pelvic inflammatory disease: Clinical manifestations and diagnosis" and "Pelvic inflammatory disease: Pathogenesis, microbiology, and risk factors".)

PID is a common sequela of genital gonorrhea and chlamydia infections. Douching may increase the risk, especially when performed frequently [50]. Regular douching is reported by 15 percent of adolescent women, with substantially higher proportions in some ethnic groups [51].

Dermatologic syndromes — The most common STI with a dermatologic presentation is genital warts (condylomata acuminata) caused by HPV. HPV types 6 and 11 are the most common causes of genital warts. Anogenital warts and the epidemiology of HPV are discussed separately. (See "Human papillomavirus infections: Epidemiology and disease associations" and "Condylomata acuminata (anogenital warts) in adults: Epidemiology, pathogenesis, clinical features, and diagnosis".)

Other STI and infections that can be transmitted by sexual activity that may present with skin rash include:

- Secondary syphilis (picture 4) (see "Syphilis: Epidemiology, pathophysiology, and clinical manifestations in patients without HIV", section on 'Secondary syphilis')
- Disseminated gonococcal infection (picture 5) (see "Disseminated gonococcal infection")
- Pediculosis pubis (picture 6), caused by the crab louse (see "Pediculosis pubis and pediculosis ciliaris" and "Scabies: Epidemiology, clinical features, and diagnosis")
- Scabies (picture 7A-B) (see "Pediculosis pubis and pediculosis ciliaris" and "Scabies: Epidemiology, clinical features, and diagnosis")

Oral lesions — Sexually transmitted infections with oral manifestations include:

- Syphilis – Chancres are the initial manifestation of primary syphilis. They usually occur on the genitalia (picture 2A-C) but may occur on the lips, tongue, and tonsils. (See 'Genital ulcer syndrome' above and "Syphilis: Epidemiology, pathophysiology, and clinical manifestations in patients without HIV", section on 'Primary syphilis (chancre)'.)

  Mucous patches (condyloma lata), a manifestation of secondary syphilis, are characterized by large, raised gray to white lesions involving warm, moist areas such as the mucous membranes of the mouth (picture 8A-B) or perineum (picture 9). Secondary syphilis is uncommon in adolescents unless they belong to high-risk sexual networks (eg, commercial sex work, cocaine or methamphetamine users). Secondary syphilis in adolescents typically reflects delayed care-seeking for chancres. (See "Syphilis: Epidemiology, pathophysiology, and clinical manifestations in patients without HIV", section on 'Dermatologic findings'.)

- *N. gonorrhoeae* – Gonococcal pharyngitis is usually acquired by oral sexual exposure. Although most patients with gonococcal pharyngitis are asymptomatic, clinical manifestations include sore throat, pharyngeal exudates, and/or cervical lymphadenitis. (See "Clinical manifestations and diagnosis of Neisseria gonorrhoeae infection in adults and adolescents", section on 'Pharyngitis'.)
- Human papillomavirus – (See "Human papillomavirus infections: Epidemiology and disease associations", section on 'Epidemiology of oropharyngeal infection'.)
- Herpes simplex virus – (See "Epidemiology, clinical manifestations, and diagnosis of herpes simplex virus type 1 infection", section on 'Oral infections'.)

Diagnostic testing for STI — Adolescents who are tested for STI should also receive testing and counseling for HIV infection [52]. This provides an opportunity for risk reduction education, as well as diagnosis of HIV infection. (See "Screening and diagnostic testing for HIV infection".)

Diagnostic testing for specific STIs is discussed separately.

- *C. trachomatis* (see "Clinical manifestations and diagnosis of Chlamydia trachomatis infections", section on 'Diagnosis of chlamydial infections')
- *N. gonorrhoeae* (see "Clinical manifestations and diagnosis of Neisseria gonorrhoeae infection in adults and adolescents", section on 'Diagnostic approach')
- Syphilis (see "Syphilis: Screening and diagnostic testing")
- HIV (see "Acute and early HIV infection: Clinical manifestations and diagnosis", section on 'Diagnosis')
- HSV (see "Epidemiology, clinical manifestations, and diagnosis of genital herpes simplex virus infection", section on 'Diagnosis')
- Chancroid (see "Chancroid", section on 'Diagnosis')
- Pubic lice (see "Pediculosis pubis and pediculosis ciliaris")
- *T. vaginalis* (see "Trichomoniasis", section on 'Diagnosis')
- Condylomata acuminata (see "Condylomata acuminata (anogenital warts) in adults: Epidemiology, pathogenesis, clinical features, and diagnosis", section on 'Diagnosis')
- Bacterial vaginosis (see "Bacterial vaginosis: Clinical manifestations and diagnosis", section on 'Diagnosis')
- Vaginal candidiasis (see "Candida vulvovaginitis: Clinical manifestations and diagnosis", section on 'Office evaluation')

Counseling — Adolescents who undergo diagnostic testing for STI should be counseled about safer sex [53]. They also should be instructed to practice abstinence while waiting for definitive test results (whether or not they receive empiric therapy). Those who are being treated for a STI (other than HIV) should be instructed to avoid sexual intercourse until they and their partner(s) have completed antimicrobial therapy [24]. (See "Prevention of sexually transmitted infections", section on 'Prevention counseling'.)

TREATMENT

Almost no clinical trials of STI-related medications include participants younger than 16 years of age, and relatively few include 16- to 17-year-olds. Most data regarding safety and efficacy are extrapolated from late adolescents and young adults. Guidelines for the treatment of specific STIs are regularly updated by the Centers for Disease Control and Prevention (CDC) [24]; those for gonorrhea were updated in 2020 [54].

Additional issues related to the treatment of STIs that are particularly relevant in adolescent patients (eg, confidentiality, parental notification) are discussed above. (See 'Specific concerns in adolescents' above.)

Challenges to treatment

Self-treatment — Self-treatment with topical medications, antibiotics, or vaginal or rectal douching may delay treatment [13,55]. Symptomatic adolescent females take approximately 10 days on average to seek care compared with only approximately 6 days for symptomatic males [55].

Poor adherence — Single-dose observed therapy is preferable when available, particularly for adolescents treated in the emergency department. In observational studies, approximately 30 to 40 percent of adolescents treated for STI in the emergency department failed to fill their prescriptions [56,57].

Partner notification — Many adolescents prefer to notify partners themselves [58]. However, this strategy means that a substantial number of partners are never notified. Because many adolescents have additional sexual contact with these partners, clinician counseling to reinforce the

importance of notification and expedited partner therapy may be useful [59-61].

Expedited partner therapy — Expedited partner therapy (EPT) refers to the provision of appropriate antibiotics to patients with STIs for delivery to partners. EPT is endorsed by the Society for Adolescent Health and Medicine and the American Academy of Pediatrics as a strategy for ensuring partner treatment [62]. Additional information is available through the CDC. EPT is permissible or potentially allowable in the majority of states and the District of Columbia, prohibited in few states, and varies by the type(s) of STIs covered. The Guttmacher Institute maintains a current list of state laws and policies.

Reinfection — A high prevalence of *C. trachomatis* and *N. gonorrhoeae* (reinfection rather than treatment failure) is observed in patients who were treated for STIs in the preceding months [63-66]. To avoid reinfection, patients and sexual partners who are being treated for an STI other than HIV should abstain from sexual activity until they have been adequately treated [24]. (See "Prevention of sexually transmitted infections", section on 'Prevention counseling'.)

Women and men recently treated for chlamydia or gonorrhea should be retested approximately three months after treatment is completed and whenever they next seek medical care within the following 3 to 12 months (whether or not the patient thinks that the partner was treated) [24]. (See "Treatment of Chlamydia trachomatis infection", section on 'Retesting' and "Treatment of uncomplicated Neisseria gonorrhoeae infections", section on 'Retesting'.)

PREVENTION

Prevention of STIs is discussed in detail separately. (See "Prevention of sexually transmitted infections".)

Routine and catch-up immunization against human papillomavirus (figure 1) and catch-up immunization (if necessary) against hepatitis B and hepatitis A (table 2) are important components of STI prevention in adolescents. (See "Standard immunizations for children and adolescents: Overview".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Sexually transmitted infections" and "Society guideline links: HIV infection in adolescents" and "Society guideline links: Adolescent sexual health and pregnancy".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or email these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient education" and the keyword[s] of interest.)

- Basics topics (see "Patient education: Teen sexuality (The Basics)")
- Beyond the Basics topics (see "Patient education: Adolescent sexuality (Beyond the Basics)")

SUMMARY

- Sexually transmitted infections (STIs) are common in adolescents. Approximately 50 percent of all new STIs occur in adolescents and young adults (age 15 to 24 years) and approximately 25 percent of sexually active adolescent females have had an STI. (See 'Epidemiology' above.)
- Although the evaluation and treatment of STIs in adolescents are similar to the diagnosis and treatment of STIs in adults, a number of specific concerns are particular to adolescents (eg, consent and confidentiality, mandatory reporting of sexual activity and/or STI, dating violence, and challenges to optimal treatment and prevention). (See 'Specific concerns in adolescents' above.)
- Routine assessment of sexual activity is an essential element of STI-related care for adolescents. The sexual history (table 1) should be straightforward and nonjudgmental. (See 'Sexual history' above.)

- The pattern of presenting symptoms and signs of STIs can guide the need for additional information from the history, examination, and/or laboratory. (See 'STI clinical patterns' above.)
  - STIs associated with urethral or vaginal discharge include gonorrhea, chlamydia, trichomonas, bacterial vaginosis, vulvovaginal candidiasis, *Mycoplasma genitalium*, and occasionally herpes simplex virus (HSV). (See 'Discharge syndromes' above.)
  - STIs associated with genital ulcers in adolescents generally include HSV and primary syphilis (picture 2A). However, patients with ulcerative STI are at risk for coinfection, so most adolescents with genital ulcers should be tested for syphilis, HSV, HIV, gonorrhea, and chlamydia. (See 'Genital ulcer syndrome' above.)
  - Pelvic inflammatory disease refers to acute infection of the upper genital tract structures (eg, uterus, fallopian tubes, ovaries). It should be suspected in sexually active adolescents who present with pelvic discomfort, although infection can be subclinical. (See 'Pelvic inflammatory disease' above.)
  - STIs associated with skin lesions include genital warts caused by human papillomavirus (HPV), primary syphilis (picture 2A-C), secondary syphilis (picture 4), disseminated gonococcal infection (picture 5), pediculosis pubis, and scabies (picture 7A-B).
  - STIs associated with oral lesions include syphilis (picture 8A-B), gonorrhea, HPV, and HSV. (See 'Oral lesions' above.)
- Guidelines for the treatment of specific STIs are regularly updated by the Centers for Disease Control and Prevention; those for gonorrhea were updated in 2020. (See 'Treatment' above.)

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REFERENCES

1. Forhan SE, Gottlieb SL, Sternberg MR, et al. Prevalence of sexually transmitted infections among female adolescents aged 14 to 19 in the United States. Pediatrics 2009; 124:1505.
2. Satterwhite CL, Torrone E, Meites E, et al. Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2008. Sex Transm Dis 2013; 40:187.
3. Centers for Disease Control and Prevention. Sexually transmitted disease surveillance 2018. US Department of Health and Human Services, At lanta, 2018. Available at: https://www.cdc.gov/std/stats18/default.htm (Accessed on October 09, 2019).
4. Wikström E, Bloigu A, Ohman H, et al. An increasing proportion of reported Chlamydia trachomatis infections are repeated diagnoses. Sex Transm Dis 2012; 39:968.
5. Fortenberry JD, Brizendine EJ, Katz BP, et al. Subsequent sexually transmitted infections among adolescent women with genital infection due to Chlamydia trachomatis, Neisseria gonorrhoeae, or Trichomonas vaginalis. Sex Transm Dis 1999; 26:26.
6. Tu W, Batteiger BE, Wiehe S, et al. Time from first intercourse to first sexually transmitted infection diagnosis among adolescent women. Arch Pediatr Adolesc Med 2009; 163:1106.
7. Newbern EC, Anschuetz GL, Eberhart MG, et al. Adolescent sexually transmitted infections and risk for subsequent HIV. Am J Public Health 2013; 103:1874.
8. Kahn JA, Rosenthal SL, Succop PA, et al. Mediators of the association between age of first sexual intercourse and subsequent human papillomavirus infection. Pediatrics 2002; 109:E5.
9. Burstein GR, Gaydos CA, Diener-West M, et al. Incident Chlamydia trachomatis infections among inner-city adolescent females. JAMA 1998; 280:521.
10. Fortenberry JD. Adolescent substance use and sexually transmitted diseases risk: a review. J Adolesc Health 1995; 16:304.
11. Leigh BC. Alcohol and condom use: a meta-analysis of event-level studies. Sex Transm Dis 2002; 29:476.
12. Niccolai LM, Ethier KA, Kershaw TS, et al. New sex partner acquisition and sexually transmitted disease risk among adolescent females. J Adolesc Health 2004; 34:216.
13. Hassan A, Blumenthal JS, Dube MP, et al. Effect of rectal douching/enema on rectal gonorrhoea and chlamydia among a cohort of men who have sex with men on HIV pre-exposure prophylaxis. Sex Transm Infect 2018; 94:508.
14. Patchin JW, Hinduja S. The Nature and Extent of Sexting Among a National Sample of Middle and High School Students in the U.S. Arch Sex Behav 2019; 48:2333.
15. Rice E, Craddock J, Hemler M, et al. Associations Between Sexting Behaviors and Sexual Behaviors Among Mobile Phone-Owning Teens in Los Angeles. Child Dev 2018; 89:110.
16. Grunbaum JA, Kann L, Kinchen SA, et al. Youth risk behavior surveillance--United States, 2001. MMWR Surveill Summ 2002; 51:1.

17. Szucs LE, Lowry R, Fasula AM, et al. Condom and Contraceptive Use Among Sexually Active High School Students - Youth Risk Behavior Survey, United States, 2019. MMWR Suppl 2020; 69:11.
18. Hwang LY, Scott ME, Ma Y, Moscicki AB. Higher levels of cervicovaginal inflammatory and regulatory cytokines and chemokines in healthy young women with immature cervical epithelium. J Reprod Immunol 2011; 88:66.
19. Kleppa E, Holmen SD, Lillebø K, et al. Cervical ectopy: associations with sexually transmitted infections and HIV. A cross-sectional study of high school students in rural South Africa. Sex Transm Infect 2015; 91:124.
20. Hwang LY, Ma Y, Moscicki AB. Biological and behavioral risks for incident Chlamydia trachomatis infection in a prospective cohort. Obstet Gynecol 2014; 124:954.
21. Hickey RJ, Zhou X, Pierson JD, et al. Understanding vaginal microbiome complexity from an ecological perspective. Transl Res 2012; 160:267.
22. Hickey RJ, Zhou X, Settles ML, et al. Vaginal microbiota of adolescent girls prior to the onset of menarche resemble those of reproductive-age women. MBio 2015; 6.
23. Jespers V, Hardy L, Buyze J, et al. Association of Sexual Debut in Adolescents With Microbiota and Inflammatory Markers. Obstet Gynecol 2016; 128:22.
24. Workowski KA, Bolan GA, Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2015. MMWR Recomm Rep 2015; 64:1.
25. London S, Quinn K, Scheidell JD, et al. Adverse Experiences in Childhood and Sexually Transmitted Infection Risk From Adolescence Into Adulthood. Sex Transm Dis 2017; 44:524.
26. Alderman EM, Breuner CC, COMMITTEE ON ADOLESCENCE. Unique Needs of the Adolescent. Pediatrics 2019; 144.
27. Santelli JS, Klein JD, Song X, et al. Discussion of Potentially Sensitive Topics With Young People. Pediatrics 2019; 143.
28. Gilbert AL, Rickert VI, Aalsma MC. Clinical conversations about health: the impact of confidentiality in preventive adolescent care. J Adolesc Health 2014; 55:672.
29. Society for Adolescent Health and Medicine, Gray SH, Pasternak RH, et al. Recommendations for electronic health record use for delivery of adolescent health care. J Adolesc Health 2014; 54:487.
30. Conard LA, Fortenberry JD, Blythe MJ, Orr DP. Pharmacists' attitudes toward and practices with adolescents. Arch Pediatr Adolesc Med 2003; 157:361.
31. Leitenberg H, Saltzman H. A statewide survey of age at first intercourse for adolescent females and age of their male partners: relation to other risk behaviors and statutory rape implications. Arch Sex Behav 2000; 29:203.
32. American College of Obstetricians and Gynecologists Committee on Adolescent Health Care. ACOG Committee Opinion #301: Sexually transmitted diseases in adolescents. Obstet Gynecol 2004; 104:891.
33. Guttmacher Institute. State laws and policies: Minors' access to STI services. Available at: https://www.guttmacher.org/state-policy/explore/minors-access-sti-services (Accessed on December 30, 2019).
34. Silverman JG, Raj A, Mucci LA, Hathaway JE. Dating violence against adolescent girls and associated substance use, unhealthy weight control, sexual risk behavior, pregnancy, and suicidality. JAMA 2001; 286:572.
35. Wilson KM, Klein JD. Opportunities for appropriate care: health care and contraceptive use among adolescents reporting unwanted sexual intercourse. Arch Pediatr Adolesc Med 2002; 156:341.
36. Shrier LA, Pierce JD, Emans SJ, DuRant RH. Gender differences in risk behaviors associated with forced or pressured sex. Arch Pediatr Adolesc Med 1998; 152:57.
37. Barrow RY, Ahmed F, Bolan GA, Workowski KA. Recommendations for Providing Quality Sexually Transmitted Diseases Clinical Services, 2020. MMWR Recomm Rep 2020; 68:1.
38. US Preventive Services Task Force, Krist AH, Davidson KW, et al. Behavioral Counseling Interventions to Prevent Sexually Transmitted Infections: US Preventive Services Task Force Recommendation Statement. JAMA 2020; 324:674.
39. Braverman PK, Breech L, Committee on Adolescence. American Academy of Pediatrics. Clinical report--gynecologic examination for adolescents in the pediatric office setting. Pediatrics 2010; 126:583.
40. Cohen DA, Nsuami M, Martin DH, Farley TA. Repeated school-based screening for sexually transmitted diseases: a feasible strategy for reaching adolescents. Pediatrics 1999; 104:1281.
41. Wiesenfeld HC, Lowry DL, Heine RP, et al. Self-collection of vaginal swabs for the detection of Chlamydia, gonorrhea, and trichomoniasis: opportunity to encourage sexually transmitted disease testing among adolescents. Sex Transm Dis 2001; 28:321.
42. Serlin M, Shafer MA, Tebb K, et al. What sexually transmitted disease screening method does the adolescent prefer? Adolescents' attitudes toward first-void urine, self-collected vaginal swab, and pelvic examination. Arch Pediatr Adolesc Med 2002; 156:588.
43. Tebb KP, Paukku MH, Pai-Dhungat MR, et al. Home STI testing: the adolescent female's opinion. J Adolesc Health 2004; 35:462.

44. Schoeman SA, Stewart CM, Booth RA, et al. Assessment of best single sample for finding chlamydia in women with and without symptoms: a diagnostic test study. BMJ 2012; 345:e8013.
45. Stewart CM, Schoeman SA, Booth RA, et al. Assessment of self taken swabs versus clinician taken swab cultures for diagnosing gonorrhoea in women: single centre, diagnostic accuracy study. BMJ 2012; 345:e8107.
46. Hobbs MM, van der Pol B, Totten P, et al. From the NIH: proceedings of a workshop on the importance of self-obtained vaginal specimens for detection of sexually transmitted infections. Sex Transm Dis 2008; 35:8.
47. Fang J, Husman C, DeSilva L, et al. Evaluation of self-collected vaginal swab, first void urine, and endocervical swab specimens for the detection of Chlamydia trachomatis and Neisseria gonorrhoeae in adolescent females. J Pediatr Adolesc Gynecol 2008; 21:355.
48. Tosh AK, Van Der Pol B, Fortenberry JD, et al. Mycoplasma genitalium among adolescent women and their partners. J Adolesc Health 2007; 40:412.
49. DiCarlo RP, Martin DH. The clinical diagnosis of genital ulcer disease in men. Clin Infect Dis 1997; 25:292.
50. Ness RB, Soper DE, Holley RL, et al. Douching and endometritis: results from the PID evaluation and clinical health (PEACH) study. Sex Transm Dis 2001; 28:240.
51. Merchant JS, Oh K, Klerman LV. Douching: a problem for adolescent girls and young women. Arch Pediatr Adolesc Med 1999; 153:834.
52. Petsis D, Min J, Huang YV, et al. HIV Testing Among Adolescents With Acute Sexually Transmitted Infections. Pediatrics 2020; 145.
53. Miller MK, Pickett ML, Reed JL. Adolescents at Risk for Sexually Transmitted Infection Need More Than the Right Medicine. J Pediatr 2017; 189:23.
54. St Cyr S, Barbee L, Workowski KA, et al. Update to CDC's Treatment Guidelines for Gonococcal Infection, 2020. MMWR Morb Mortal Wkly Rep 2020; 69:1911.
55. Fortenberry JD. Health care seeking behaviors related to sexually transmitted diseases among adolescents. Am J Public Health 1997; 87:417.
56. Schneider K, Byczkowski T, Reed J. Treatment Compliance Among Asymptomatic Adolescents With Sexually Transmitted Infections. JAMA Pediatr 2015; 169:1065.
57. Lieberman A, Badolato GM, Tran J, Goyal MK. Frequency of Prescription Filling Among Adolescents Prescribed Treatment for Sexually Transmitted Infections in the Emergency Department. JAMA Pediatr 2019; 173:695.
58. Oh MK, Boker JR, Genuardi FJ, et al. Sexual contact tracing outcome in adolescent chlamydial and gonococcal cervicitis cases. J Adolesc Health 1996; 18:4.
59. Fortenberry JD, Brizendine EJ, Katz BP, Orr DP. Post-treatment sexual and prevention behaviours of adolescents with sexually transmitted infections. Sex Transm Infect 2002; 78:365.
60. Fortenberry JD, Brizendine EJ, Katz BP, Orr DP. The role of self-efficacy and relationship quality in partner notification by adolescents with sexually transmitted infections. Arch Pediatr Adolesc Med 2002; 156:1133.
61. Niccolai LM, Ickovics JR, Zeller K, et al. Knowledge of sex partner treatment for past bacterial STI and risk of current STI. Sex Transm Infect 2005; 81:271.
62. Burstein GR, Eliscu A, Ford K, et al. Expedited partner therapy for adolescents diagnosed with chlamydia or gonorrhea: a position paper of the Society for Adolescent Medicine. J Adolesc Health 2009; 45:303.
63. Kjaer HO, Dimcevski G, Hoff G, et al. Recurrence of urogenital Chlamydia trachomatis infection evaluated by mailed samples obtained at home: 24 weeks' prospective follow up study. Sex Transm Infect 2000; 76:169.
64. Whittington WL, Kent C, Kissinger P, et al. Determinants of persistent and recurrent Chlamydia trachomatis infection in young women: results of a multicenter cohort study. Sex Transm Dis 2001; 28:117.
65. Oh MK, Cloud GA, Fleenor M, et al. Risk for gonococcal and chlamydial cervicitis in adolescent females: incidence and recurrence in a prospective cohort study. J Adolesc Health 1996; 18:270.
66. Thomas JC, Weiner DH, Schoenbach VJ, Earp JA. Frequent re-infection in a community with hyperendemic gonorrhoea and chlamydia: appropriate clinical actions. Int J STD AIDS 2000; 11:461.

Topic 115 Version 59.0

GRAPHICS

The five Ps: Partners, prevention of pregnancy, protection from STIs, practices, and past history of STIs

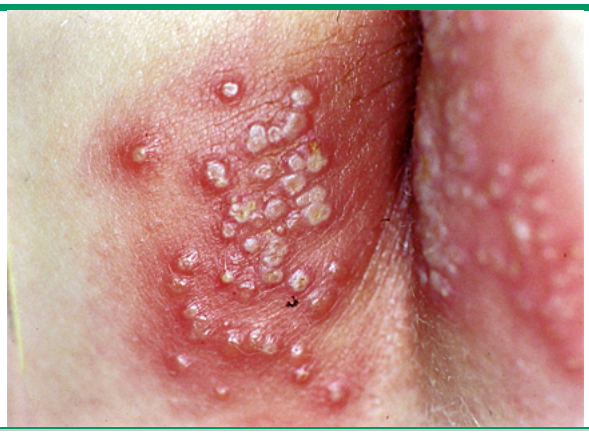
Partners
Do you have sex with men, women, or both?
In the past 2 months, how many partners have you had sex with?
In the past 12 months, how many partners have you had sex with?
Is it possible that any of your sex partners in the past 12 months had sex with someone else while they were still in a sexual relationship with you?
Prevention of pregnancy
What are you doing to prevent pregnancy?
Protection from STIs
What do you do to protect yourself from STIs and HIV?
Practices
To understand your risks for STIs, I need to understand the kind of sex you have had recently.
Have you had vaginal sex, meaning "penis-in-vagina" sex?
If yes:
Do you use condoms: never, sometimes, or always?
Have you had anal sex, meaning "penis-in-rectum/anus" sex?
If yes:
Do you use condoms: never, sometimes, or always?
Have you had oral sex, meaning "mouth-on-penis/vagina"?
For condom answers:
If never:
Why do you not use condoms?
If sometimes:
In what situations (or with whom) do you not use condoms?
Past history of STIs
Have you ever had an STI?
Have any of your partners had an STI?
Additional questions to identify HIV and viral hepatitis risk:
Have you or any of your partners ever injected drugs?
Have you or any of your partners exchanged money or drugs for sex?
Is there anything else about your sexual practices that I need to know about?

STI: sexually transmitted infection; HIV: human immunodeficiency virus.

Adapted from: Workowski KA, Berman SM. Sexually transmitted diseases guidelines, 2015. MMWR Recomm Rep 2015; 64:1.

Graphic 61677 Version 8.0

Primary genital herpes simplex infection



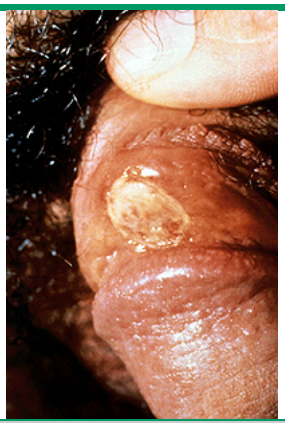
Primary perianal HSV infection.

HSV: herpes simplex virus.

Courtesy of Lynne J Margesson, MD.

Graphic 61107 Version 2.0

Primary syphilis: Penile chancre

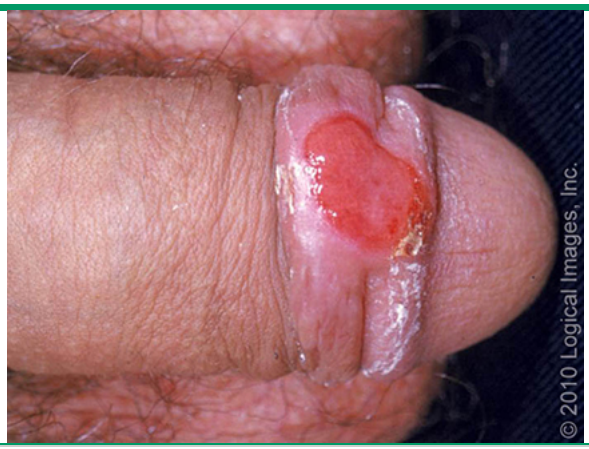


A chancre due to syphilis is an ulcerative lesion that is often painless and has an indurated character. Chancres arise at the site of initial inoculation of the organism.

Courtesy of Charles B Hicks, MD.

Graphic 75291 Version 3.0

Penile chancre of primary syphilis



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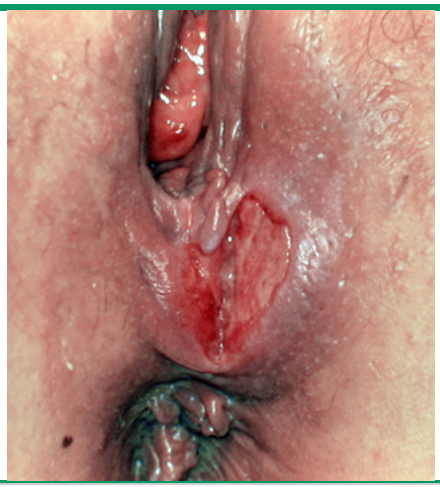
Graphic 57637 Version 4.0

Chancre



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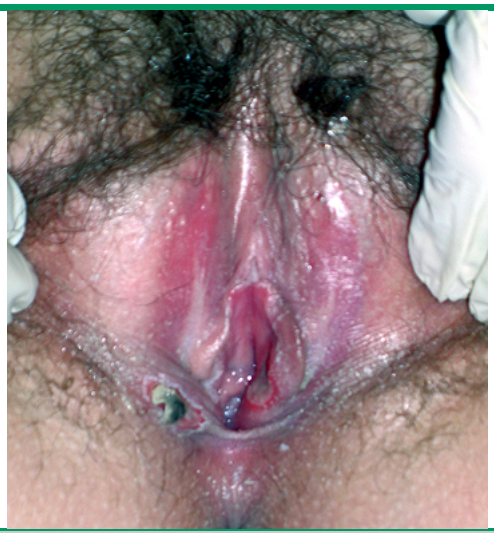
Graphic 73119 Version 2.0

Vulvar ulcers



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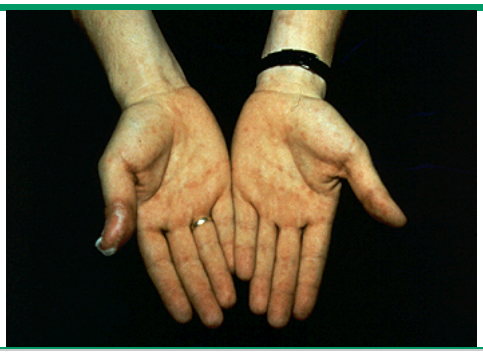
Graphic 68284 Version 16.0

Secondary syphilis: Rash

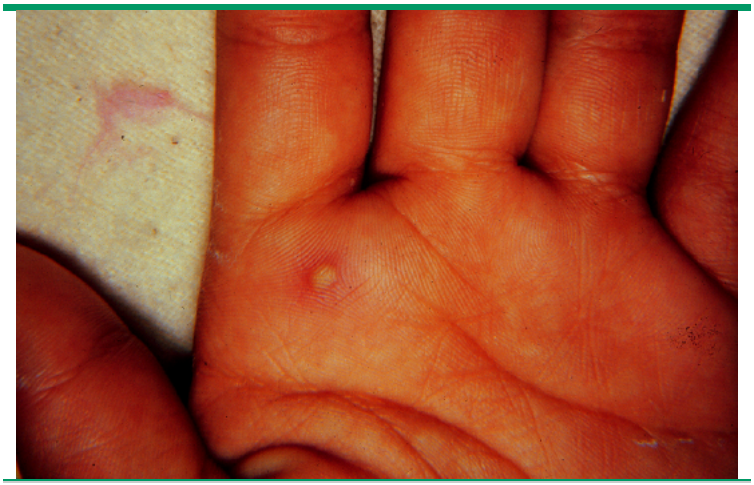


The rash of secondary syphilis characteristically involves the palms and soles. It may have a variety of appearances but is usually pigmented and macular.

Courtesy of Charles B Hicks, MD.

Graphic 68877 Version 4.0

Skin lesions in disseminated gonococcal infection

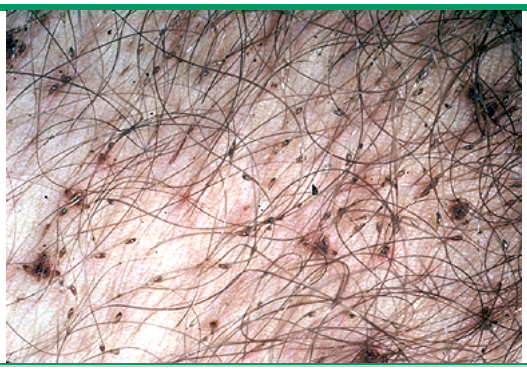


Typical small pustular skin lesion in a patient with disseminated gonococcal infection.

Courtesy of Don L Goldenberg, MD.

Graphic 71303 Version 3.0

Pediculosis pubis

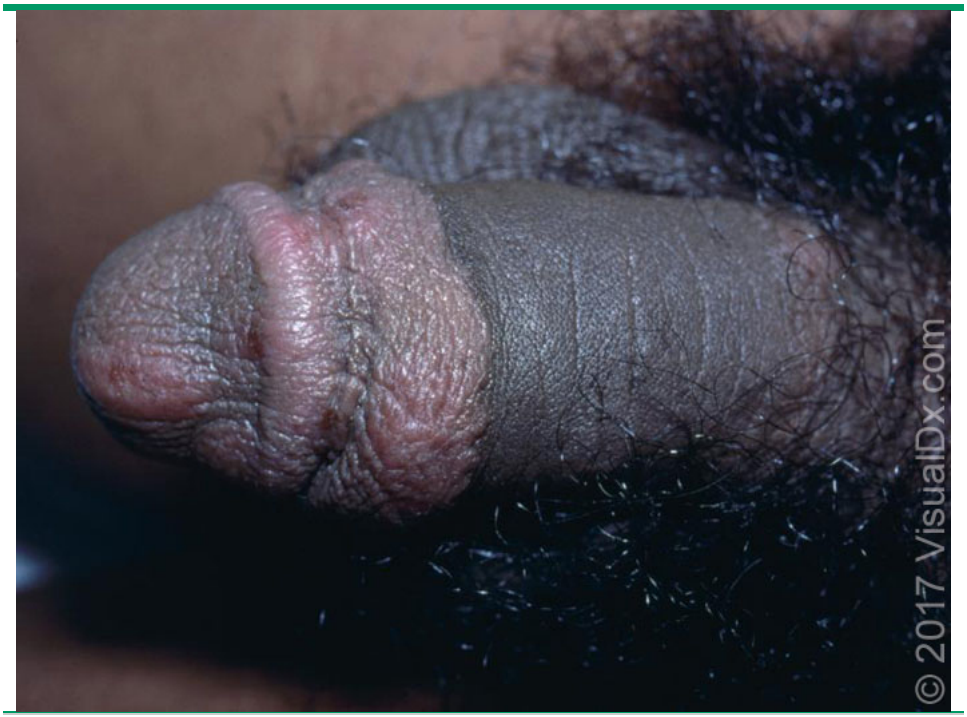


Numerous lice and nits located around the pubic hair.

Courtesy of John T Crissey, MD.

Graphic 55191 Version 1.0

Scabies



Erythematous papules on the distal penis.

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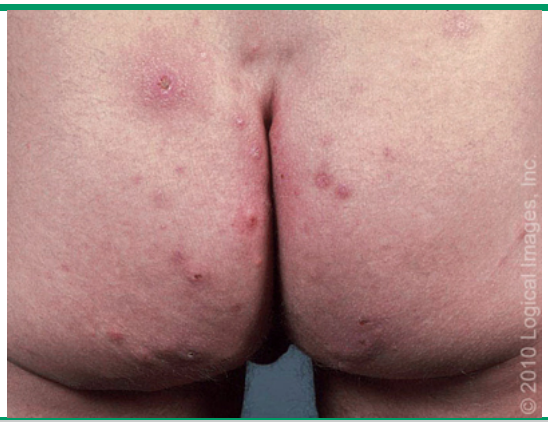
Graphic 114534 Version 2.0

Scabies



Erythematous papules and nodules on the buttocks.

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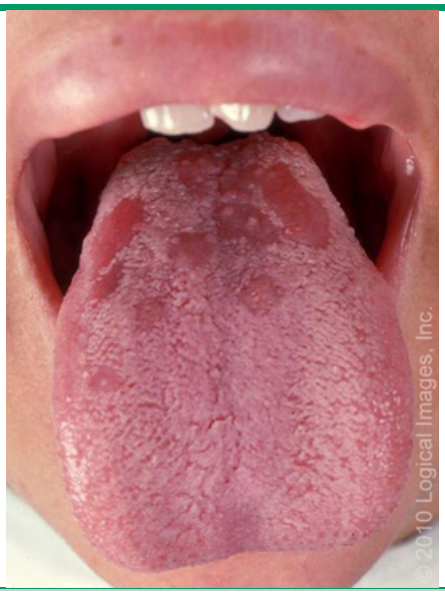
Graphic 75169 Version 9.0

Secondary syphilis



Multiple erosions (mucous patches) are present on the tongue in this patient with secondary syphilis.

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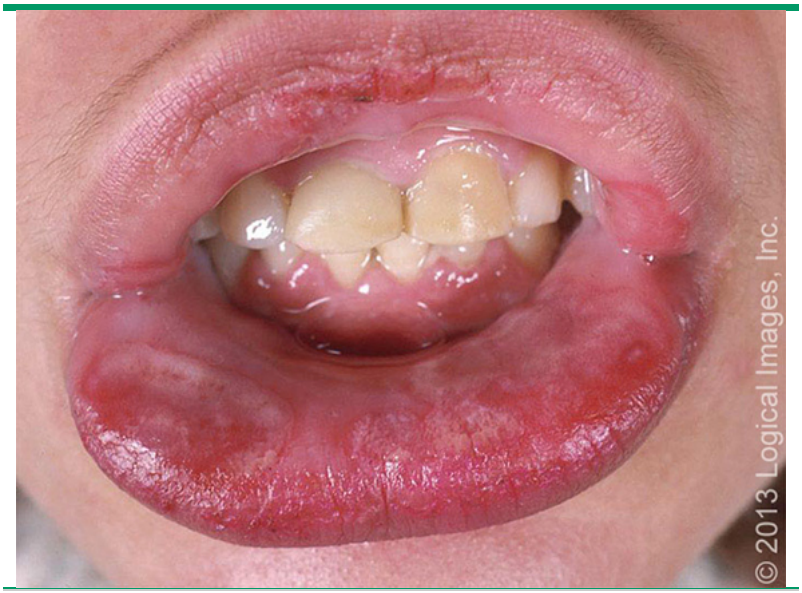
Graphic 52729 Version 5.0

Secondary syphilis: Mucous patch



The mucous patches of secondary syphilis may appear on a variety of mucous membranes. They are teeming with organisms and are therefore highly infectious.

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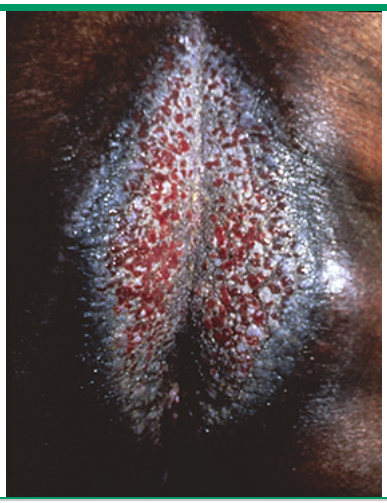
Graphic 66087 Version 11.0

Condyloma lata in the perineal region of a woman with secondary syphilis

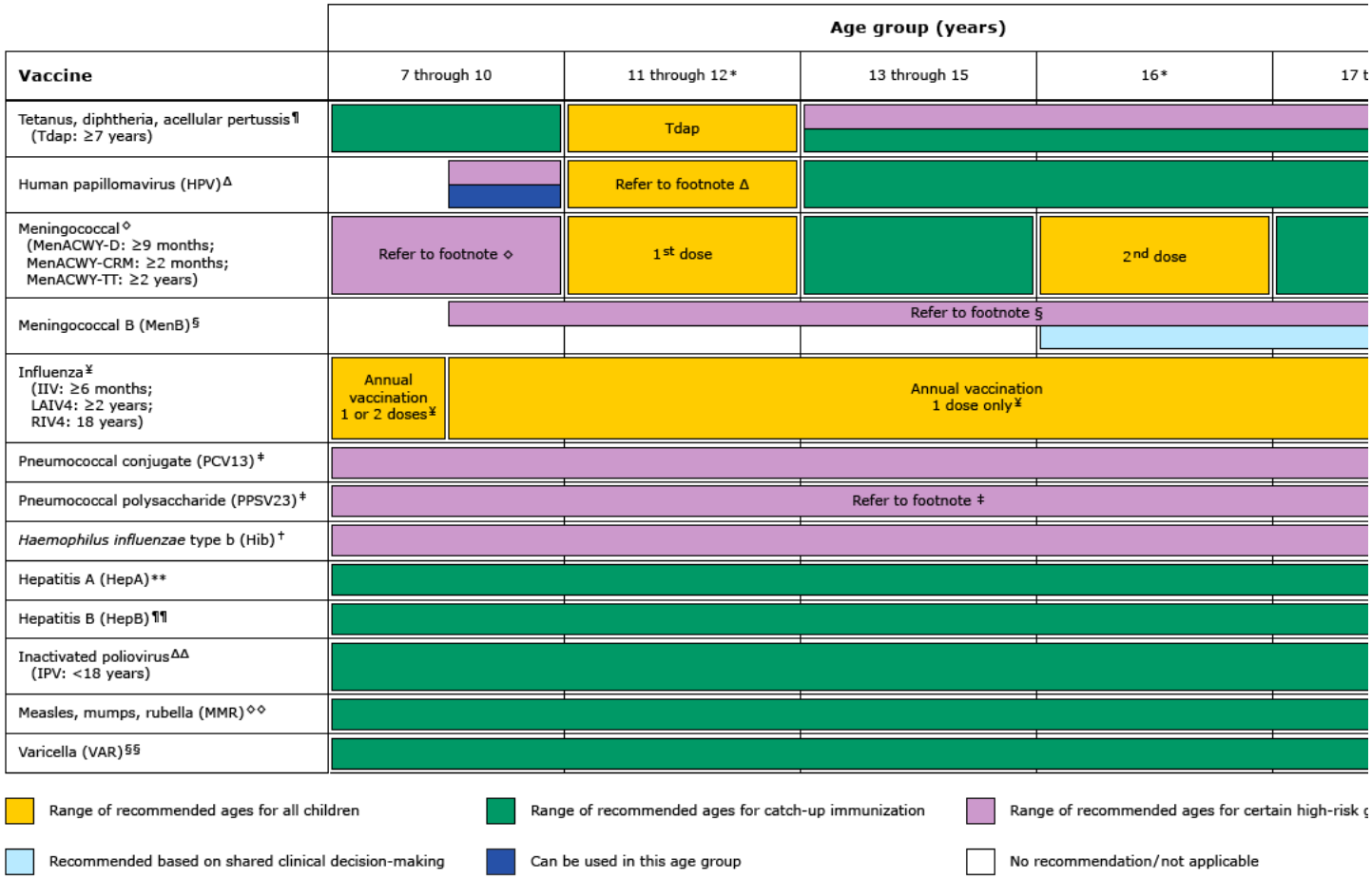


Numerous organisms are generally present in these lesions, which makes them highly infectious.

Courtesy of Charles Hicks, MD.

Graphic 63924 Version 1.0

Recommended immunization schedule for children and adolescents age 7 through 18 years - United States, 2021 (for those who fall behind or start late, refe content related to the catch-up schedule)



This schedule is recommended by the Advisory Committee on Immunization Practices (ACIP) and approved by the Centers for Disease Control and Prevention, American Academy of Pediatrics, Am Family Physicians, American College of Obstetricians and Gynecologists, American College of Nurse-Midwives, American Academy of Physician Assistants, and National Association of Pediatric Nu

- Consult relevant ACIP statements for detailed recommendations.
- When a vaccine is not administered at the recommended age, administer at a subsequent visit.
- Use combination vaccines instead of separate injections when appropriate.
- Report clinically significant adverse events to the Vaccine Adverse Event Reporting System (VAERS) online at https://vaers.hhs.gov or by telephone, 800-822-7967.
- Report suspected cases of vaccine-preventable diseases to your state or local health department.
- For information about precautions and contraindications, refer to https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.
- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.

MMRV: combined measles, mumps, rubella and varicella; MMWR: *Morbidity and Mortality Weekly Report*.

* Adolescent vaccine age groups.

¶ Tetanus and diphtheria toxoids, and acellular pertussis (Tdap) vaccination

(Minimum age: 11 years for routine vaccination; 7 years for catch-up vaccination)

- Adolescents age 11 through 12 years: 1 dose Tdap.
- Pregnancy: 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27 through 36.
- Tdap may be administered regardless of the interval since the last tetanus- and diphtheria-toxoid-containing vaccine.

Δ Human papillomavirus (HPV) vaccination

(Minimum age: 9 years)

- **Routine vaccination:**
  - HPV vaccination routinely recommended at age 11 through 12 years (can start at age 9 years) and catch-up HPV vaccination recommended for all persons through age 18 years if not adequately vaccinate
  - Two- or 3-dose series depending on age at initial vaccination:
    - Age 9 through 14 years at initial vaccination: 2-dose series at 0 and 6 to 12 months (minimum interval: 5 months; repeat dose if administered too soon).
    - Age 15 years or older at initial vaccination: 3-dose series at 0, 1 to 2 months, and 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 12 weeks; dose 1 to dose 3: 5 months; repea too soon).
  - Interrupted schedules: If vaccination schedule is interrupted, the series does not need to be restarted.
  - No additional dose recommended after completing series with recommended dosing intervals using any HPV vaccine.
- **Special situations:**
  - Immunocompromising conditions, including HIV infection: 3-dose series as above.
  - History of sexual abuse or assault: Start at age 9 years.
  - Pregnancy: HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant; pregnancy testing not needed before vaccination.

◊ Meningococcal serogroup A, C, W, Y (MenACWY) vaccination

(Minimum age: 2 months for MenACWY-CRM [Menveo]; 9 months for MenACWY-D [Menactra]; 2 years for MenACWY-TT [MenQuadfi])

- **Routine vaccination:**
  - Two-dose series at 11 through 12 years and 16 years.
- **Special situations:**
  - Refer to UpToDate content related to meningococcal vaccines and immunization in the specific high-risk group, and the ACIP recommendations. High-risk conditions include anatomic or functional asplen disease); HIV infection; persistent complement component deficiency; complement inhibitor (eg, eculizumab, ravulizumab) use; travel in countries with hyperendemic or epidemic meningococcal disease, the African meningitis belt or during the Hajj (refer to wwwnc.cdc.gov/travel); first-year college students who live in residential housing (if not previously vaccinated at age 16 years or older); and military r

§ Meningococcal serogroup B (MenB) vaccination

(Minimum age: 10 years for MenB-4C [Bexsero] or MenB-FHbp [Trumenba])

- Adolescents not at increased risk age 16 through 23 years (preferred age 16 through 18 years) based on shared clinical decision-making:

- Bexsero: 2-dose series at least 1 month apart.
- Trumenba: 2-dose series at least 6 months apart; if dose 2 is administered earlier than 6 months, administer a third dose at least 4 months after dose 2.

▪ **Special situations:**
- Anatomic or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use:
  - Bexsero: 2-dose series at least 1 month apart.
  - Trumenba: 3-dose series at 0, 1 to 2, and 6 months.

▪ **NOTE:** Bexsero and Trumenba are not interchangeable; the same product should be used for all doses in a series.
▪ For additional information, refer to UpToDate content on meningococcal vaccines and immunization in the specific high-risk group and the ACIP recommendations.

¥ **Influenza vaccines**
(Minimum age: 6 months for inactivated influenza vaccine [IIV]; 2 years for live attenuated influenza vaccine [LAIV4]; 18 years for recombinant influenza vaccine [RIV4])
▪ Use any influenza vaccine appropriate for age and health status annually (refer to UpToDate content on influenza vaccination in children and ACIP recommendations):
- 2 doses, separated by at least 4 weeks, for children age 6 months through 8 years who have received fewer than 2 influenza vaccine doses before July 1, 2020, or whose influenza vaccination history is unk
even if the child turns 9 between receipt of dose 1 and dose 2).
- 1 dose for children age 6 months through 8 years who have received at least 2 influenza vaccine doses before July 1, 2020.
- 1 dose for all persons age 9 years or older.

▪ For the 2021-2022 season, see the 2021-2022 ACIP influenza vaccine recommendations.

‡ **Pneumococcal vaccination**
(Minimum age: 6 weeks for 13-valent pneumococcal conjugate vaccine [PCV13]; 2 years for 23-valent pneumococcal polysaccharide vaccine [PPSV23])
▪ **Special situations:**
- Refer to UpToDate content on pneumococcal vaccines and immunization in the specific high-risk group, and the ACIP recommendations. High-risk groups include chronic heart disease (particularly cyano
disease and cardiac failure); chronic lung disease (including asthma treated with high-dose, oral corticosteroids); diabetes mellitus; cerebrospinal fluid leak; cochlear implant; sickle cell disease and other h
anatomic or functional asplenia; congenital or acquired immunodeficiency; HIV infection; chronic kidney failure; nephrotic syndrome; malignant neoplasms, leukemias, lymphomas, Hodgkin disease, and
associated with treatment with immunosuppressive drugs or radiation therapy; solid organ transplantation; multiple myeloma; chronic liver disease; and alcoholism.
- When both PCV13 and PPSV23 are indicated, administer PCV13 first. PCV13 and PPSV23 should not be administered during the same visit.

† ***Haemophilus influenzae*** **type b (Hib) vaccination**
(Minimum age: 6 weeks)
▪ **Special situations:**
- Refer to UpToDate content related to Hib vaccination and immunization in the specific high-risk group, and the ACIP recommendations. Special situations and high-risk groups include chemotherapy or ra
hematopoietic cell transplant, anatomic or functional asplenia (including sickle cell disease), elective splenectomy, HIV infection, immunoglobulin deficiency, and early component complement deficiency.

** **Hepatitis A (HepA) vaccination**
(Minimum age: 12 months for routine vaccination)
▪ **Routine vaccination:**
- 2-dose series (minimum interval: 6 months) beginning at age 12 months.
- Adolescents 18 years or older may receive the combined HepA and HepB vaccine, Twinrix, as a 3-dose series (0, 1, and 6 months) or a 4-dose series (0, 7, and 21 to 30 days, followed by a booster dose at

▪ **International travel:** Persons traveling to or working in countries with high or intermediate endemic hepatitis A:
- Unvaccinated age 12 months or older: Administer dose 1 as soon as travel is considered.

¶¶ **Hepatitis B (HepB) vaccination**
(Minimum age: Birth)
▪ Unvaccinated persons should complete a 3-dose series at 0, 1 to 2, and 6 months.
▪ Adolescents 11 through 15 years of age may use an alternative 2-dose schedule, with at least 4 months between doses (adult formulation Recombivax HB only).
▪ Adolescents 18 years or older may receive a 2-dose series of HepB (Heplisav-B) at least 4 weeks apart.
▪ Adolescents 18 years or older may receive the combined HepA and HepB vaccine, Twinrix, as a 3-dose series (0, 1, and 6 months) or 4-dose series (0, 7, and 21 to 30 days, followed by a dose at 12 months).
▪ **Special situations:**
- Revaccination is not generally recommended for persons with a normal immune status who were vaccinated as infants, children, adolescents, or adults.
- Revaccination may be recommended for certain populations, including infants born to HBsAg-positive mothers, hemodialysis patients, and other immunocompromised persons. Refer to MMWR hepatiti
recommendations for detailed vaccination recommendations

ΔΔ **Inactivated poliovirus (IPV) vaccination**
(Minimum age: 6 weeks)
▪ A dose of IPV is indicated if all previous doses were administered at <4 years or if the third dose was administered <6 months after the second dose.
▪ IPV is not routinely recommended for United States residents age 18 years or older.

◊◊ **Measles, mumps, and rubella (MMR) vaccination**
(Minimum age: 12 months for routine vaccination)
▪ **Routine vaccination:**
- Unvaccinated children and adolescents: 2-dose series at least 4 weeks apart.
- The maximum age for use of MMRV vaccine is 12 years.

▪ **International travel:**
- Unvaccinated children 12 months or older: 2-dose series at least 4 weeks apart before departure.

§§ **Varicella (VAR) vaccination**
(Minimum age: 12 months)
▪ Ensure persons 7 through 18 years without evidence of immunity (refer to MMWR Recomm Rep 2007; 56(RR04):1) have a 2-dose series.
- Ages 7 through 12 years: Routine interval: 3 months (a dose administered after a 4-week interval may be counted).
- Ages 13 years or older: Routine interval: 4 to 8 weeks (minimum interval: 4 weeks).
- The maximum age for use of MMRV vaccine is 12 years.

Adapted from: Centers for Disease Control and Prevention. Immunization schedules. Available at: www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html (Accessed on March 1, 2021).

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Catch-up immunization schedule for children and adolescents age 7 through 18 years who start late or who are more than 1 month behind - United States, 2021

Vaccine	Minimum age for dose 1	Minimum interval between doses		
		Dose 1 to dose 2	Dose 2 to dose 3	Dose 3 to dose 4
Tetanus, diphtheria (Td); tetanus, diphtheria, and acellular pertussis (Tdap)*	7 years*	▪ 4 weeks	▪ 4 weeks if first dose of DTaP/DT was administered before the first birthday ▪ 6 months (as final dose) if first dose of DTaP/DT or Tdap/Td was administered at or after the first birthday	▪ 6 months if first dose of DTaP/DT was administered before the first birthday
Human papillomavirus (HPV)¶	9 years	▪ Routine dosing intervals are recommended¶		
Hepatitis A (HepA)Δ	Not applicable	▪ 6 months		
Hepatitis B (HepB)◊	Not applicable	▪ 4 weeks	▪ 8 weeks **and** at least 16 weeks after first dose	
Inactivated poliovirus (IPV)§	Not applicable	▪ 4 weeks	▪ 6 months • A fourth dose is not necessary if the third dose was administered at age 4 years or older and at least 6 months after the previous dose	▪ A fourth dose of IPV is indicated if all previous doses were administered at <4 years or if the third dose was administered <6 months after the second dose
Meningococcal serogroups A, C, W, Y (MenACWY)¥	Not applicable	▪ 8 weeks		
Measles, mumps, rubella (MMR)‡	Not applicable	▪ 4 weeks		
Varicella (VAR)†	Not applicable	▪ 3 months if younger than age 13 years ▪ 4 weeks if age 13 years or older		

The above table provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use this table in conjunction with its footnotes and related UpToDate content regarding the schedule of recommended childhood immunizations for children 7 through 18 years of age in the United States. This schedule is recommended by the Advisory Committee on Immunization Practices (ACIP) and approved by the Centers for Disease Control and Prevention, American Academy of Pediatrics, American Academy of Family Physicians, American College of Obstetricians and Gynecologists, American College of Nurse-Midwives, American Academy of Physician Assistants, and National Association of Pediatric Nurse Practitioners.

- Consult relevant ACIP statements for detailed recommendations.
- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid and should be repeated as age-appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval. For further details, refer to ACIP's General Best Practice Guidelines for Immunization.
- For information about precautions and contraindications, refer to https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.
- Report clinically significant adverse events to the Vaccine Adverse Event Reporting System (VAERS) online at https://vaers.hhs.gov or by telephone, 800-822-7967.
- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.

DTaP: diphtheria and tetanus toxoids, and acellular pertussis vaccine; DT: diphtheria and tetanus toxoids vaccine; MMWR: *Morbidity and Mortality Weekly Report*; MMRV: combination measles, mumps, rubella, and varicella vaccine.

*** Tetanus and diphtheria toxoids, and acellular pertussis (Tdap) vaccination**

- Adolescents age 13 through 18 years who have not received Tdap: 1 dose Tdap, then Td or Tdap booster every 10 years.
- Persons age 7 through 18 years not fully vaccinated with DTaP: 1 dose Tdap as part of the catch-up series (preferably the first dose); if additional doses are needed, use Td or Tdap. Full vaccination with DTaP is defined by 5 valid doses of DTaP or 4 valid doses of DTaP if dose 4 was administered at age 4 years or older.
- Tdap administered at 7 through 10 years:
  - Children age 7 through 9 years who receive Tdap should receive the routine Tdap dose at age 11 through 12 years.
  - Children age 10 years who receive Tdap do not need the routine Tdap dose at age 11 through 12 years.
- DTaP inadvertently administered at or after age 7 years:
  - Children age 7 through 9 years: DTaP may count as part of catch-up series. Administer routine Tdap dose at age 11 through 12 years.
  - Children age 10 through 18: Count dose of DTaP as the adolescent Tdap booster.

¶ Human papillomavirus (HPV) vaccination

- HPV vaccination routinely recommended at age 11 through 12 years (can start at age 9 years) and catch-up HPV vaccination recommended for all persons through age 18 years if not adequately vaccinated.
- Two- or 3-dose series depending on age at initial vaccination:
  - Age 9 through 14 years at initial vaccination: 2-dose series at 0 and 6 to 12 months (minimum interval: 5 months; repeat dose if administered too soon).
  - Age 15 years or older at initial vaccination: 3-dose series at 0, 1 to 2, and 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 12 weeks; dose 1 to dose 3: 5 months; repeat dose if administered too soon).
- Interrupted schedules: If vaccination schedule is interrupted, the series does not need to be restarted.
- No additional dose recommended after completing series with recommended dosing intervals using any HPV vaccine.
- **Special situations:**
  - Immunocompromising conditions, including HIV infection: 3-dose series as above.
  - History of sexual abuse or assault: Start at age 9 years.
  - Pregnancy: HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant; pregnancy testing not needed before vaccination.

Δ Hepatitis A (HepA) vaccination

- Unvaccinated persons through age 18 years should complete a 2-dose series (minimum interval: 6 months).
- Persons who previously received 1 dose at age 12 months or older should receive dose 2 at least 6 months after dose 1
- Adolescents age 18 years or older may receive the combined HepA and HepB vaccine, Twinrix, as a 3-dose series (0, 1, and 6 months) or a 4-dose series (0, 7, and 21 to 30 days, followed by a dose at 12 months).

◊ Hepatitis B (HepB) vaccination

- Unvaccinated persons should complete a 3-dose series at 0, 1 to 2, and 6 months.
- Adolescents age 11 through 15 years of age may use an alternative 2-dose schedule, with at least 4 months between doses (adult formulation Recombivax HB only).
- Adolescents age 18 years or older may receive a 2-dose series of HepB (Heplisav-B) at least 4 weeks apart.
- Adolescents age 18 years or older may receive the combined HepA and HepB vaccine, Twinrix, as a 3-dose series (0, 1, and 6 months) or 4-dose series (0, 7, and 21 to 30 days, followed by a dose at 12 months).
- Revaccination may be recommended for certain populations including:
  - Hemodialysis patients

- Other immunocompromised persons

§ **Inactivated poliovirus (IPV) vaccination**

- IPV vaccine is not routinely recommended for United States residents 18 years or older.
- **Series containing oral polio vaccine (OPV),** *either mixed OPV-IPV or OPV only series:*
  - Total number of doses needed to complete the series is the same as that recommended for the United States IPV schedule. Refer to MMWR Morb Mortal Wkly Rep 2017; 66:23.
  - Only trivalent OPV (tOPV) counts toward the United States vaccination requirements.
    - Doses of OPV administered before April 1, 2016, should be counted (unless specifically noted as administered during a campaign).
    - Doses of OPV administered on or after April 1, 2016, should not be counted.
    - For guidance to assess doses documented as "OPV," refer to MMWR Morb Mortal Wkly Rep 2017; 66:180.

¥ **Meningococcal serogroup A, C, W, Y (MenACWY) vaccination**

- Age 13 through 15 years: 1 dose now and booster at age 16 through 18 years (minimum interval 8 weeks).
- Age 16 through 18 years: 1 dose.
- For catch-up guidance for persons with high-risk conditions and other persons at increased risk of disease, refer to UpToDate content related to the routine immunization schedule, meningococcal vaccination, and immunization in the specific high-risk condition, and the ACIP recommendations. High-risk conditions and conditions that increase the risk of disease include anatomic or functional asplenia (including sickle cell disease); HIV infection; persistent complement component deficiency; complement inhibitor (eg, eculizumab, ravulizumab) use; travel in countries with hyperendemic or epidemic meningococcal disease, including countries in the African meningitis belt or during the Hajj (refer to wwwnc.cdc.gov/travel); first-year college students who live in residential housing (if not previously vaccinated at age 16 years or older); and military recruits.

‡ **Measles, mumps, and rubella (MMR) vaccination**

- Unvaccinated children and adolescents: 2 doses at least 4 weeks apart.
- The maximum age for MMRV is 12 years.

† **Varicella (VAR) vaccination**

- Ensure persons age 7 through 18 years without evidence of immunity (refer to MMWR Recomm Rep 2007; 56(RR04):1) have 2-dose series:
  - Age 7 through 12 years: Routine interval: 3 months (a dose administered after a 4-week interval may be counted).
  - Ages 13 years or older: Routine interval: 4 through 8 weeks (minimum interval: 4 weeks).
  - The maximum age for use of MMRV is 12 years.

Adapted from: Centers for Disease Control and Prevention. Immunization schedules. Available at: www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html (Accessed on March 1, 2021).

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