Treatment Guidelines
from The Medical Letter®

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Treatment Guidelines
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Drugs for Sexually Transmitted Infections

Many infections can be transmitted during sexual contact. The text and tables that follow include recommendations for management of sexually transmitted infections (STIs) other than HIV, viral hepatitis, and enteric infections. Some of the indications and dosages recommended here have not been approved by the FDA.

CHLAMYDIA — A single 1-g dose of azithromycin (*Zithromax*, and generics) or 7 days' treatment with doxycycline (*Vibramycin*, and generics) is effective for treatment of uncomplicated urethral or cervical infection caused by *Chlamydia trachomatis*. Levofloxacin (*Levaquin*, and generics) for 7 days is an effective alternative. Erythromycin can also be effective, but gastrointestinal adverse effects are common and can lead to poor compliance and treatment failure.

Pregnancy – Azithromycin is the drug of choice for treatment of chlamydial infection during pregnancy.[1-3] Erythromycin or amoxicillin could be used as alternatives. Erythromycin estolate is contraindicated for use during pregnancy because of an increased risk of cholestatic jaundice. Doxycycline, other tetracyclines, and fluoroquinolones should not be used during pregnancy. Test-of-cure should be performed 3-4 weeks after treatment of all pregnant women.

Infancy – Children born to untreated women with cervical *C. trachomatis* infection are at risk for neonatal conjunctivitis and pneumonia. Prenatal screening and treatment of pregnant women has decreased perinatal chlamydial infection in the US. For newborns with conjunctivitis or pneumonia caused by *C. trachomatis*, treatment with oral erythromycin is recommended. Use of oral erythromycin in infants <6 weeks old has been associated with hypertrophic pyloric stenosis. In one study in 8 infants, a short course of oral azithromycin was effective for treatment of chlamydial conjunctivitis.[4] Ophthalmic antibiotics used for gonococcal prophylaxis do not prevent ocular chlamydial infection in the newborn.

Lymphogranuloma Venereum – Infections with the *C. trachomatis* serovars L1-L3 that cause lymphogranuloma venereum (LGV) present in the US primarily as proctocolitis, typically among men who have sex with men (MSM).[5] The classic presentation of LGV, genital ulcers with lymphadenopathy, is rare now in the US. A 3-week course of doxycycline is recommended for treatment of LGV.

Follow-Up – Test-of-cure is not needed for nonpregnant patients who are treated for chlamydia with a recommended regimen. Rescreening to detect reinfection or late treatment failure is recommended 3 months after treatment for all men and women with chlamydial infection.[2,6]

NONCHLAMYDIAL NONGONOCOCCAL URETHRITIS AND CERVICITIS — The etiology of nongonococcal urethritis (NGU) is often unknown. *Mycoplasma genitalium* causes 15-25% of cases. Other possible pathogens include *Gardnerella vaginalis*, *Trichomonas vaginalis*, herpes simplex virus, and adenovirus.[7] Most cases of NGU respond to treatment with azithromycin or doxycycline.[8] Persistent or recurrent NGU (in an adherent patient who has not been re-exposed to an untreated sex partner) can be treated with doxycycline if azithromycin was used initially, and vice versa; metronidazole (*Flagyl*, and generics) or tinidazole (*Tindamax*, and generics), a nitroimidazole similar to metronidazole, should be added for possible trichomoniasis. Further recurrences could be treated with moxifloxacin *(Avelox)*, which is active against *M. genitalium* that is resistant to azithromycin or doxycycline.

As with NGU, azithromycin or doxycycline is recommended for treatment of cervicitis. Empiric treatment

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Table 1. Drugs of Choice for Some Sexually Transmitted Infections

Type or Stage		Regimen of Choice	Some Alternatives
Chlamydial Infection and Related Clinical Syndromes[1]			
Urethritis or cervicitis (except lymphogranuloma venereum)			
		Azithromycin[2] 1 g PO once	Levofloxacin[3,4,5,6] 500 mg PO once/d x 7d
	OR	Doxycycline[2,4,6,7] 100 mg PO bid x 7d	Erythromycin base[8] 500 mg PO qid x 7d
Infection in Pregnancy			
		Azithromycin 1 g PO once	Amoxicillin 500 mg PO tid x 7d Erythromycin base[8] 500 mg PO qid x 7d
Neonatal Ophthalmia or Pneumonia			
		Erythromycin[9,10] 12.5 mg/kg PO qid x 14d	Azithromycin 20 mg/kg PO once/d x 3d[11]
Lymphogranuloma venereum			
		Doxycycline[4,7] 100 mg PO bid x 21d	Erythromycin base 500 mg PO qid x 21d
Gonorrhea[12]			
Urethral, cervical or rectal			
		Ceftriaxone 250 mg IM once **plus** azithromycin 1 g PO once or doxycycline[4,7] 100 mg PO bid x 7d	Cefixime[13] 400 mg PO once **plus** azithromycin 1 g PO once or doxycycline[4,7] 100 mg PO bid x 7d Azithromycin 2 g PO once[14]
Pharyngeal			
		Ceftriaxone 250 mg IM once **plus** azithromycin 1 g PO once or doxycycline[4,7] 100 mg PO bid x 7d	Azithromycin 2 g PO once[14]
Neonatal ophthalmia			
		Ceftriaxone 25-50 mg/kg IV or IM once (max 125 mg)	
Epididymitis			
		Ceftriaxone 250 mg IM once **plus** doxycycline[7] 100 mg PO bid x 10d	Ofloxacin[3,5,15] 300 mg PO bid x 10d Levofloxacin[3,5,15] 500 mg PO once/d x 10d
Proctitis (acute)			
		Ceftriaxone 250 mg IM once **plus** doxycycline[7] 100 mg PO bid x 7d	
Pelvic Inflammatory Disease			
Parenteral			
		Cefotetan 2 g IV q12h[16] or cefoxitin 2 g IV q6h[16] **plus** doxycycline[4,7] 100 mg PO bid to complete 14d	Ampicillin/sulbactam 3 g IV q6h[16] **plus** doxycycline[4,7] 100 mg PO bid to complete 14d
	OR	Clindamycin 900 mg IV q8h[16] **plus** gentamicin 2 mg/kg IV or IM once, then 1.5 mg/kg IV q8h[16,17] **plus** doxycycline[4,7] 100 mg PO bid to complete 14d[18]	
Oral/IM			
		Ceftriaxone 250 mg IM once **plus** doxycycline[4,7] 100 mg PO bid x 14d **+/-** metronidazole 500 mg PO bid x 14d	Levofloxacin[4,5] 500 mg PO once/d x 14d **+/-** metronidazole 500 mg PO bid x 14d **+/-** azithromycin 2 g PO once[19]
	OR	Cefoxitin 2 g IM once **plus** probenecid 1 g PO once **plus** doxycycline[4,7] 100 mg PO bid x 14d **+/-** metronidazole 500 mg PO bid x 14d	

1. Related clinical syndromes include nonchlamydial nongonococcal urethritis (NGU) and cervicitis.
2. For cases of persistent or recurrent nonchlamydial NGU, azithromycin should be used if initial treatment was with doxycycline and vice versa. Some experts add a single 2-g dose of tinidazole or metronidazole to also treat trichomoniasis. Moxifloxacin is effective for NGU treatment failure due to *Mycoplasma genitalium*.
3. Should be used only if *Neisseria gonorrhoeae* has been excluded.
4. Not recommended during pregnancy or breastfeeding.
5. Fluoroquinolones are generally not recommended for patients <18 years old.
6. Less effective than azithromycin against NGU associated with *Mycoplasma genitalium*.
7. Doxycycline is currently available only in limited supply. Alternatives to doxycycline for some STIs can be found at www.cdc.gov/std/treatment/doxycycline shortage.htm.
8. Erythromycin ethylsuccinate 800 mg may be substituted for erythromycin base 500 mg. Erythromycin estolate is contraindicated during pregnancy.
9. Hypertrophic pyloric stenosis has been associated with use of oral erythromycin in infants <6 weeks old.
10. Erythromycin base or ethylsuccinate.
11. No data available for efficacy in pneumonia.
12. Dual antibiotic therapy is recommended for gonorrhea regardless of the presence of chlamydia infection.
13. Only when treatment with IM ceftriaxone is not possible. Cefixime is not effective for pharyngeal gonorrhea.
14. If severe allergy to penicillin or cephalosporins.
15. For use if infection with enteric gram-negative bacilli is likely. Patients should be tested for gonorrhea and chlamydia.
16. Parenteral therapy can be stopped 24 hours after clinical improvement occurs, and oral doxycycline should be given to complete 14 days' total therapy.
17. A single daily dose of 3-5 mg/kg is likely to be effective, but has not been studied in pelvic inflammatory disease.

Table 1. Drugs of Choice for Some Sexually Transmitted Infections (continued)

Type or Stage		Regimen of Choice	Some Alternatives
Bacterial Vaginosis			
		Metronidazole 500 mg PO bid x 7d	Tinidazole[4] 2 g PO once/d x 2d
	OR	Metronidazole gel 0.75% 5 g intravaginally once/d x 5d	Tinidazole[4] 1 g PO once/d x 5d Clindamycin 300 mg PO bid x 7d
	OR	Clindamycin 2% cream[20] 5 g intravaginally at bedtime x 7d	Clindamycin ovules 100 mg intravaginally at bedtime x 3d[20]
Trichomoniasis[21]			
		Metronidazole 2 g PO once	Metronidazole 500 mg PO bid x 7d[22]
	OR	Tinidazole[4] 2 g PO once	
Syphilis[23]			
Primary, secondary, or early latent (less than one year)			
		Benzathine penicillin G 2.4 MU IM once	Doxycycline[4,7,24] 100 mg PO bid x 14d
Late latent, latent of unknown duration, or tertiary			
		Benzathine penicillin G 2.4 MU IM wkly x 3wks	Doxycycline[4,7,24] 100 mg PO bid x 4wks
Neurosyphilis, including ocular syphilis			
		Aqueous crystalline penicillin G 3-4 MU IV q4h or 18-24 MU continuous IV infusion x 10-14d	Procaine penicillin G 2.4 MU IM once/d x 10-14d **plus** probenecid 500 mg PO qid x 10-14d Ceftriaxone[24] 2 g IV or IM once/d x 10-14d
Chancroid			
		Azithromycin 1 g PO once	Ciprofloxacin[4,5] 500 mg PO bid x 3d
	OR	Ceftriaxone 250 mg IM once	Erythromycin base 500 mg PO tid x 7d
Genital Warts[25]			
Provider-administered			
		Trichloroacetic acid once/wk until resolved	Surgical removal
	OR	Bichloroacetic acid 80-90% once/wk until resolved	Laser surgery
	OR	Cryotherapy with liquid nitrogen or cryoprobe	
Patient-applied			
		Imiquimod 5%[4,20] once/d 3x/wk up to 16 weeks	
	OR	Imiquimoid 3.75%[4,20] once/d up to 8 weeks	
	OR	Podofilox 0.5%[4] bid x 3d, then 4 days rest, repeat up to 4x	
	OR	Sinecatechins 15% ointment[4,20] tid up to 16 weeks	
Genital Herpes			
First Episode			
		Acyclovir 400 mg PO tid x 7-10d	Acyclovir 200 mg PO 5x/d x 7-10d
	OR	Famciclovir 250 mg PO tid x 7-10d	
	OR	Valacyclovir 1 g PO bid x 7-10d	
Episodic Treatment[26,27]			
		Acyclovir 800 mg PO bid x 5d or 800 mg tid x 2d or 400 mg PO tid x 5d	
	OR	Famciclovir 1 g PO bid x 1d or 125 mg PO bid x 5d or 500 mg once, then 250 mg bid x 2d	
	OR	Valacyclovir 500 mg PO bid x 3d or 1 g PO once/d x 5d	
Suppression[28]			
		Acyclovir 400 mg PO bid	
	OR	Valacyclovir 500 mg-1 g PO once/d[29]	
	OR	Famciclovir 250 mg PO bid	

MU = million units

18. Or clindamycin 450 mg oral qid to complete 14 days.
19. Only if IV cephalosporins cannot be administered and *N. gonorrhoeae* infection is unlikely.
20. May weaken latex condoms and diaphragms.
21. HIV-positive women with trichomoniasis should be treated with metronidazole 500 mg PO bid for 7 days.
22. If treatment failure occurs and reinfection is excluded.
23. Syphillis in pregnant women should be treated with penicillin in doses appropriate to the stage of the disease. If allergic to penicillin, desensitization and treatment with penicillin is recommended.
24. Efficacy not established; for use only when patient is truly allergic to penicillin. Compliance must be ensured.
25. Recommendations for external genital warts. Cryotherapy with liquid nitrogen can also be used for vaginal, urethral meatus, and anal warts. Trichloroacetic or bichloroacetic acid can be used for vaginal and anal warts.
26. Antiviral therapy is variably effective for episodic treatment of recurrences; only effective if started early.
27. For recurrent HSV in HIV-positive patients, treat with valacyclovir 1 g bid, famciclovir 500 mg bid or acyclovir 400 mg tid for 5-10 days.
28. Some Medical Letter reviewers recommend discontinuing preventive treatment for 1 to 2 months once a year to reassess the frequency of recurrence.
29. Use 500 mg once daily in immunocompetent patients with <10 recurrences per year and 500 mg bid or 1 g daily in patients with ≥10 recurrences per year. For HIV-infected patients, the dose is 500 mg bid.

for *Neisseria gonorrhoeae* should also be given to women in population groups with high rates of gonorrhea, such as younger women.

GONORRHEA — Over the past several decades, *N. gonorrhoeae* has developed resistance to penicillin, sulfa drugs, tetracyclines, and fluoroquinolones. Recently, gonococci have also demonstrated decreased susceptibility to the oral third-generation cephalosporin cefixime *(Suprax)*, and treatment failures have occurred.[9] The treatment of choice for urethral, cervical, rectal, and pharyngeal gonorrhea now consists of two drugs regardless of the presence of chlamydial infection: an intramuscular (IM) injection of ceftriaxone (*Rocephin*, and generics) plus a single dose of oral azithromycin or 7 days of oral doxycycline.[10] Azithromycin is preferred over doxycycline because of ease of dosing and less gonococcal resistance in the US.

When treatment with IM ceftriaxone is not possible, oral cefixime plus either azithromycin or doxycycline may be used to treat genital or rectal gonococcal infections; oral cephalosporins are not effective for treatment of pharyngeal gonorrhea. In patients with severe penicillin allergy or allergy to cephalosporins, a single oral dose of azithromycin 2 g is an alternative treatment. Azithromycin alone should be used with caution because of decreased susceptibility of *N. gonorrhoeae* in the US.[11] A recent trial found two regimens (IM gentamicin plus oral azithromycin and oral gemifloxacin *[Factive]* plus oral azithromycin) effective in treating gonorrhea, but with a high incidence of adverse effects; they might be an option for patients who cannot take a cephalosporin.[12]

Gonococcal ophthalmia, bacteremia, arthritis or meningitis in adults, and all gonococcal infections in children, are best treated with appropriate doses of a parenteral third-generation cephalosporin such as ceftriaxone.

Pregnancy – Pregnant women should be treated with the recommended regimen of IM ceftriaxone and azithromycin. Doxycycline is contraindicated for use during pregnancy.

Neonatal Ocular Prophylaxis – Ocular prophylaxis can prevent gonococcal ophthalmia and is required by law in most states in the US. Erythromycin 0.5% ophthalmic ointment is the only FDA-approved formulation available for this indication in the US. Its use is recommended for all newborn infants. If it is not available and the infant is at risk for gonococcal ophthalmia (mother with untreated gonorrhea or no prenatal care), a single dose of ceftriaxone 25-50 mg/kg (max 125 mg) can be given IV or IM.

Follow-Up – Test-of-cure is not needed for patients who are treated with ceftriaxone plus either azithromycin or doxycycline. If an alternative regimen is used, the CDC recommends that test-of-cure be performed one week after the end of treatment.[10] Rescreening to detect reinfection or delayed treatment failure is recommended 3 months after treatment for all men and women with gonococcal infection.[2,6]

EPIDIDYMITIS — Acute epididymitis in men <35 years old is frequently caused by *C. trachomatis* or *N. gonorrhoeae*. When sexually acquired epididymitis is suspected, it should be treated with ceftriaxone plus doxycycline. Older men or those who have had urinary tract instrumentation, surgery or obstruction, or are immunosuppressed, may have epididymitis due to enteric gram-negative bacilli. Gram-negative bacilli may also cause urethritis or epididymitis in men who practice insertive anal intercourse; ceftriaxone plus either levofloxacin or ofloxacin is recommended for such patients.

PROCTITIS — Empiric treatment of acute proctitis should include coverage of *C. trachomatis* and *N. gonorrhoeae*. The regimen of choice is a single IM dose of ceftriaxone plus 7 days of oral doxycycline.

PELVIC INFLAMMATORY DISEASE — *C. trachomatis* or *N. gonorrhoeae* can cause acute, nonrecurrent pelvic inflammatory disease (PID), but *M. genitalium*, *M. hominis* and various facultative and anaerobic bacteria may also be involved. Treatment regimens should include broad-spectrum antimicrobial coverage of likely pathogens. Parenteral regimens include cefotetan (*Cefotan*, and generics) or cefoxitin (*Mefoxin*, and generics) plus doxycycline, or clindamycin (*Cleocin*, and generics) plus an aminoglycoside. Parenteral therapy is continued until 24 hours after clinical improvement occurs, and then oral doxycycline is used to complete 14 days' total therapy. An oral alternative regimen for mild-to-moderately severe PID is doxycycline, with or without metronidazole, after a single IM dose of a third-generation cephalosporin such as ceftriaxone. Levofloxacin or ofloxacin, with or without metronidazole, can be considered if use of a parenteral cephalosporin is not feasible and infection with *N. gonorrhoeae* is unlikely.

BACTERIAL VAGINOSIS — In bacterial vaginosis (BV), normal H_2O_2-producing *Lactobacillus* sp. are replaced by overgrowth of various species of bacteria including anaerobic bacteria and *G. vaginalis*, *Ureaplasma* sp., *Mobiluncus curtisii*, *Mycoplasmsa* sp., *Atopobium vaginae* and BV-associated bacterium 1 and 2.[13] It has been associated with an increased risk of STI and HIV acquisition. Oral metronidazole for 7

Table 2. Drugs for Vulvovaginal Candidiasis[1]

	Drug of Choice	Some Alternatives
Uncomplicated	Intravaginal butoconazole, clotrimazole, miconazole, tioconazole, terconazole once/d x 1-14d[2,3]	
OR	Fluconazole 150 mg PO once[4]	Itraconazole 200 mg PO bid x 1d
Recurrent	Topical or oral azole x 7-14d, then fluconazole 150 mg PO once/wk x 6 mos	Clotrimazole 200 mg 2x/wk topically or 500 mg once/wk intravaginally

1. Due to *Candida albicans*. Non-albicans species, such as *C. glabrata* and *C. krusei*, respond to boric acid 600 mg intravaginally daily x 14 days or to topical 17% flucytosine cream (JD Sobel et al, Am J Obstet Gynecol 2003; 189:1297).
2. Duration of treatment varies with drug and formulation.
3. May weaken latex condoms and diaphragms.
4. May be repeated every 72 hours x 3 doses if patient remains symptomatic.

days or vaginal metronidazole or clindamycin are usually effective. Oral tinidazole is an alternative.[14,15]

With any regimen, recurrence is common; retreatment with the same agent or an alternative is usually effective in the short term, but symptomatic recurrences are common. Maintenance suppressive therapy with twice-weekly metronidazole gel reduces the recurrence rate.[16] No male counterpart has been identified and treatment of male sex partners is not recommended. Condom use by male sex partners may reduce the rate of recurrence.

Pregnancy – Bacterial vaginosis has been associated with preterm labor and complications of delivery, but whether treatment of asymptomatic bacterial vaginosis in pregnant women reduces the frequency of adverse pregnancy outcomes is uncertain. Symptomatic bacterial vaginosis in pregnant women should be treated with metronidazole or clindamycin. The safety of tinidazole in pregnancy has not been established.

VULVOVAGINAL CANDIDIASIS — Vulvovaginal candidiasis, typically caused by *Candida albicans*, is not sexually transmitted, but is common in women being evaluated for STIs. Many over-the-counter and prescription drugs are available. Uncomplicated candidiasis of mild to moderate severity in immunocompetent women responds well to intravaginal butoconazole (*Femstat*, and others), clotrimazole (*Gyne-Lotrimin*, and generics), miconazole (*Monistat*, and others), terconazole (*Terazol*, and others) or tioconazole (*Vagistat*, and others).[17] A single oral dose of fluconazole (*Diflucan*, and generics) 150 mg is as effective as 7 days of intravaginal clotrimazole or miconazole and is preferred by many patients; severe episodes may require additional doses of fluconazole. Prophylaxis with oral fluconazole 150 mg once weekly can reduce the number of recurrences, but many women will have recurrent disease once prophylactic therapy is discontinued.[18]

Complicated vulvovaginal candidiasis due to azole-resistant *C. glabrata* or other nonalbicans species, or infection in immunodeficient women, those with poorly controlled diabetes, or pregnant women, often require more aggressive or more prolonged treatment.

ALTERNATIVE TREATMENTS FOR VAGINAL INFECTIONS — Probiotics, such as *Lactobacillus* sp., and dairy products, such as yogurt, are not considered effective for treatment or prevention of bacterial vaginosis or vulvovaginal candidiasis. Douching is not effective for prevention or treatment of vaginal infection; it may lead to upper genital tract infection, is unnecessary for hygiene and should be discouraged.

TRICHOMONIASIS — Oral metronidazole is the treatment of choice for trichomoniasis. Intravaginal treatment with metronidazole gel is not effective. Reinfection is common, but high-level resistance to metronidazole is uncommon.[19] Tinidazole is also effective and may be better tolerated; it is often effective against metronidazole-resistant vaginal infections. Sex partners of patients with *Trichomonas vaginalis* should be treated.

Pregnancy – Trichomoniasis has been associated with adverse pregnancy outcomes.[20] Metronidazole appears to be safe during all stages of pregnancy and should be used to treat symptomatic trichomoniasis in pregnancy. The safety of tinidazole in pregnancy has not been established.

SYPHILIS — Parenteral penicillin G remains the drug of choice for treating all stages of syphilis. Primary, secondary or early latent syphilis (less than one year's duration) should be treated with a single IM injection of benzathine penicillin G, a repository formulation. In patients with severe penicillin allergy, doxycycline or tetracycline is usually effective if compliance is assured. Although azithromycin previously was shown to be effective in the treatment of early syphilis, the emergence of azithromycin-resistant *Treponema pallidum* precludes the use of azithromycin for treatment of syphilis in the US, except possibly in cases where treatment with penicillin or doxycycline is not feasible.[2] For late latent syphilis (more than one year's

duration) or tertiary syphilis (gumma or cardiovascular), treatment with 3 weekly doses of IM benzathine penicillin G is recommended.

Neurosyphilis – Symptomatic neurosyphilis, including ophthalmic infection, requires treatment with high doses of IV aqueous penicillin G or IM procaine penicillin G with probenecid.

Syphilis and HIV – The majority of HIV-infected patients with syphilis respond to standard benzathine penicillin regimens appropriate to the stage of infection. Cerebrospinal fluid abnormalities are common in patients with syphilis and HIV, but the clinical significance of these findings in asymptomatic patients is unclear.[21]

Pregnancy – Syphilis in pregnant women should be treated with parenteral penicillin G in doses appropriate to the stage of the disease. When pregnant women with syphilis are allergic to penicillin, hospitalization, desensitization and treatment with penicillin is recommended. Azithromycin should not be used to treat pregnant women.

Congenital Syphilis – Infants with congenital syphilis should be treated with IV aqueous crystalline penicillin G or IM procaine penicillin G for 10 days.

CHANCROID — Chancroid, caused by *Haemophilus ducreyi*, is currently rare in the US. A single dose of oral azithromycin or IM ceftriaxone is usually effective, but prolonged therapy or retreatment may be required in uncircumcised men and HIV-infected patients. Sex partners should be treated if they have had sexual contact with the infected person within 10 days of symptom onset.

PEDICULOSIS AND SCABIES — *Sarcoptes scabiei* (scabies) and *Phthirus pubis* (pubic lice), which can be found on eyelashes and on axillary, back and leg hairs, as well as in the pubic area, can both be transmitted by intimate exposure. The drugs of choice are topical 1% permethrin (*Nix*, and others) or pyrethrins with piperonyl butoxide (*Rid*, and others) for pubic lice, and 5% permethrin (*Elimite*, and generics) for scabies; all of these can be used during pregnancy. Oral ivermectin *(Stromectol)* is an alternative for treatment of both lice and scabies. It is not recommended for use in pregnant women; animal studies have shown adverse fetal effects.[22] Pediculocides should not be used for infestations of the eyelashes; treatment with petrolatum ointment applied 2-4 times a day for 8-10 days is recommended. Crusted scabies, a serious complication usually seen in patients with HIV or other immunodeficiencies, should be treated with both 5% permethrin and oral ivermectin. Sex partners and those who had close personal contact with the infected person within the last month should be treated.

Table 3. Drugs for Pediculosis and Scabies

	Drug	Adult Dosage
***Phthirus pubis*[1] (pubic lice)**		
Drug of choice:	1% Permethrin[2]	2 applications at least 7d apart
OR	Pyrethrins with piperonyl butoxide[2]	2 applications at least 7d apart
Alternative:	Ivermectin[3]	250 mcg/kg PO 2x at least 7d apart
Scabies		
Drug of choice:	5% Permethrin	2 applications at least 7d apart
Alternative:	Ivermectin[3]	200 mcg/kg PO 2x at least 7d apart

1. Pediculocides should not be used for infestations of the eyelashes. Such infestations are treated with petrolatum ointment applied 2-4x/d x 8-10d.
2. Permethrin and pyrethrin are pediculocidal; retreatment in 7-10d is needed to eradicate the infestation. Some lice are resistant to pyrethrins and permethrin.
3. Ivermectin is pediculocidal, but not ovicidal; more than one dose is generally necessary to eradicate the infestation. Safety of ivermectin in pregnant women remains to be established; animal studies have shown adverse effects on the fetus. Taking ivermectin with a meal increases its bioavailability.

GENITAL WARTS AND HUMAN PAPILLOMAVIRUS INFECTION — External **genital warts** are caused by human papillomavirus (HPV), usually types 6 and 11; other types (16, 18, and others) cause dysplasia and neoplasia of the anogenital tract and oropharynx. No form of treatment has been shown to eradicate the virus or to modify the risk of cervical dysplasia or cancer, and no single treatment is uniformly effective in removing warts or preventing recurrence. Trichloroacetic acid and cryotherapy (with liquid nitrogen or a cryoprobe) remain the most widely used provider-administered treatments for external genital warts. Imiquimod 3.75% cream *(Zyclara)* and 5% cream (*Aldara*, and generics), podofilox 0.5% solution or gel (*Condylox*, and generics), and sinecatechins 15% ointment *(Veregen)* offer the advantage of self-application at home.[23] For all available treatments except surgical removal, the initial response rate is 60-70% and 20-30% of responders will have a recurrence; many of these patients will respond to a different regimen.

No treatment is recommended for **subclinical HPV** infection in the absence of dysplasia or neoplasia. The transient nature of most HPV infections in young women suggests that these infections and the low-grade cervical dysplasia often associated with them should both be treated conservatively because they usually regress spontaneously.

Table 4. Vaccines for Human Papillomavirus (HPV)

Vaccine[1]	Protection Against HPV Types	FDA-Approved Age Range	Dose	Schedule
Cervarix (GSK)	16 and 18	Females 9-25 years old	0.5 mL IM	3 doses (0, 1 and 6 mos)[2]
Gardasil (Merck)	6, 11, 16 and 18	Females and males 9-26 years old	0.5 mL IM	3 doses (0, 2 and 6 mos)[2]

1. Inactivated vaccine.
2. Minimum interval between 1st and 2nd dose is 4 weeks, between 2nd and 3rd dose is 12 weeks, and between 1st and 3rd dose is 24 weeks.

Pregnancy – Imiquimod, podofilox, and sinecatechins are not recommended for use during pregnancy. Topical trichloroacetic acid and cryotherapy are options that can be used during pregnancy.

Prevention – There are two vaccines available in the US for prevention of HPV-related neoplasia. *Cervarix*, the bivalent vaccine, protects against HPV types 16 and 18 and is licensed for use in girls and women 9-25 years old. *Gardasil*, the quadrivalent HPV vaccine, protects against HPV types 6, 11, 16, and 18 and is licensed for males and females 9-26 years old. Routine HPV vaccination is recommended for all boys and girls 11-12 years old.[24-27] Vaccination is also recommended for women 13-26 years old and men 13-21 years old who have not been vaccinated previously. The vaccines do not influence the course of established infection and have no therapeutic role.

GENITAL HERPES — Acyclovir (*Zovirax*, and generics), famciclovir (*Famvir*, and generics) or valacyclovir (*Valtrex*, and generics) taken orally for 7-10 days can shorten the duration of pain, systemic symptoms and viral shedding in initial herpes simplex virus (HSV) genital infection. Episodic treatment of symptomatic recurrent lesions with the same drugs can speed healing if treatment is started immediately upon symptom onset. Continuous suppressive therapy substantially reduces symptomatic recurrences and subclinical shedding. Valacyclovir may be more effective than famciclovir for virologic suppression of recurrent genital herpes.[28] Suppressive therapy with valacyclovir 500 mg daily reduces the frequency of HSV transmission to sex partners.[29]

Pregnancy – First episodes of genital herpes that occur during pregnancy should be treated. Suppressive therapy with acyclovir beginning at week 36 can reduce the risk of recurrence at delivery and possibly the need for caesarean section, but its efficacy in reducing the risk of neonatal herpes infection is unknown.[30] Acyclovir valacyclovir, and famciclovir are all classified as category B (no evidence of risk in humans) for use during pregnancy. Use of acyclovir or valacyclovir during pregnancy, even during the first trimester, has not been associated with an increased risk of congenital abnormalities.[31]

PARTNER TREATMENT — Management of STIs should include evaluation and treatment of the sex partners of infected persons. Ideally, partners should be examined and tested for STIs, but that may be difficult to accomplish.

For uncomplicated gonorrhea and chlamydia in women and heterosexual men, an alternate approach is to treat sex partners without direct examination or counseling, either by prescription or by giving the medication for the partner to the index patient, a practice called expedited partner treatment (EPT).[32,33] Treatment of heterosexual partners of patients with gonorrhea should ideally be with the recommended regimen of intramuscular ceftriaxone plus either oral azithromycin or oral doxycycline; oral cefixime plus azithromycin still remains an EPT option for sex partners not willing to be examined or treated with IM ceftriaxone.[34]

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Upon completion of this program, the participant will be able to:

1. Explain the current approach to the management of patients with sexually transmitted infections.
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Issue 133 Questions

1. A 34-year-old pregnant woman is diagnosed with an uncomplicated cervical infection caused by *Chlamydia trachomatis*. Which of the following would be the drug of choice for treatment of this patient?
   a. famciclovir
   b. ciprofloxacin
   c. azithromycin
   d. ceftriaxone

2. Use of which of the following drugs has been associated with hypertrophic pyloric stenosis in newborns?
   a. oral erythromycin
   b. topical gentamicin
   c. oral ciprofloxacin
   d. oral doxycycline

3. A 30-year-old man is being evaluated for antimicrobial therapy for nongonococcal urethritis (NGU). Which of the following would be a likely cause of the infection?
   a. *Neisseria gonorrhoeae*
   b. *Mycoplasma genitalium*
   c. *Pseudomonas aeruginosa*
   d. *Escherichia coli*

4. Which of the following is not effective for treatment of pharyngeal gonorrhea:
   a. IM ceftriaxone
   b. oral cefixime
   c. oral azithromycin
   d. oral doxycycline

5. A common cause of pelvic inflammatory disease is:
   a. *Chlamydia trachomatis*
   b. *Staphylococcus aureus*
   c. *Mobiluncus curtisii*
   d. *Haemophilus ducreyi*

6. A 28-year-old pregnant woman is diagnosed with symptomatic bacterial vaginosis. She is concerned that this infection could harm the fetus. Which of the following would you tell her?
   a. bacterial vaginosis has been associated with preterm labor
   b. bacterial vaginosis has been associated with complications during delivery
   c. it is unclear if the treatment of bacterial vaginosis reduces the frequency of adverse pregnancy outcomes
   d. all of the above

7. The most common cause of vulvovaginal candidiasis is:
   a. *Candida albicans*
   b. *Lactobacillus* spp.
   c. *Listeria monocytogenes*
   d. *Neisseria gonorrhoeae*

8. Which of the following is the drug of choice for treatment of trichomoniasis?
   a. penicillin G
   b. azithromycin
   c. metronidazole
   d. imiquimod

9. Which of the following is the drug of choice for treating all stages of syphilis?
   a. penicillin G
   b. azithromycin
   c. metronidazole
   d. imiquimod

10. External genital warts are typically caused by:
    a. human papillomavirus (HPV) types 16 and 18
    b. human papillomavirus (HPV) types 6 and 11
    c. *Chlamydia trachomatis*
    d. *Pseudomonas aeruginosa*

11. Which of the following would be a reasonable choice for routine vaccination against HPV types 16 and 18 for an 11-year-old boy?
    a. *Gardasil*
    b. *Cervarix*
    c. *Zyclara*
    d. sinecatechins

12. The practice of expedited partner treatment may be considered for treatment of partners of patients with:
    a. bacterial vaginosis
    b. gonorrhea
    c. lymphogranuloma venereum
    d. epididymitis

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