



NCC Pediatrics Continuity Clinic Curriculum: Adolescent III *Faculty Guide*

Overall Goal:

Identify key adolescent health issues and become comfortable interviewing an adolescent.

Pre-Meeting Preparation:

- Managing Adolescent Acne: A Guide for Pediatricians (PIR)
- Diagnosis & Management of STDs Among Adolescents (PIR)
- Changes in the 2010 STD Guidelines (Feb 2011)—*full guidelines in Extra Credit*
- **What's in that product?** Select a common non-prescription acne product and determine what its active component(s) are and what its mechanism of action should be (*e.g. Proactiv, Stridex, Clearasil, Neutrogena skinID*).

Conference Agenda:

- Complete Adolescent III Quiz & Case Studies
- **What's in that product?** Share your findings with your continuity group.

Post-Conference: Board Review Q&A

Extra Credit:

- [STD Fact Sheets \(CDC\)](#): *useful patient handouts*
- [MMWR 2010 STD Treatment Guidelines](#): *also in pdf, [here](#)*
- [HPV Vaccine Fact Sheet & CDC Links](#)
- **iPLEDGE**: restricted-distribution program for **Accutane** for severe, recalcitrant nodular acne. If you think your patient is eligible, **place consult to see Dr. Hutchinson or Dermatology** (only authorized providers at WR-B). If female patient, **place on OCPs 1st**, as iPLEDGE requires a 30 day window of “effective contraception” before initiating isotretinoin.

Managing Adolescent Acne: A Guide for Pediatricians

Daniel P. Krowchuk, MD*

Author Disclosure
Dr Krowchuk did not disclose any financial relationships relevant to this article.

Objectives After completing this article, readers should be able to:

1. Review the epidemiology and causes of adolescent acne.
2. Recognize the types of acne lesions and assess the severity of acne.
3. Design an appropriate treatment plan for adolescents who have acne.
4. Discuss the indications for use and adverse effects of topical and systemic agents employed in acne therapy.

Introduction

Acne vulgaris, known simply as “acne,” is a chronic condition that may last for years and cause emotional distress and permanent scarring. Although acne has no cure, medications can control the disease and limit or prevent scar formation.

Epidemiology

Acne is the skin disease most commonly treated by physicians. It is estimated that 17 million Americans have acne, including 85% of adolescents ages 15 to 17 years. In 2000, the most recent year for which data are available, there were an estimated 14.5 million visits to physicians made by adolescents for acne treatment.

Adolescent acne correlates best with pubertal stage, although lesions may become evident before secondary sexual characteristics appear. Early in puberty, blackheads and whiteheads predominate, and the midface (midforehead, nose, and chin) typically is involved. Later, inflammatory lesions become more prevalent, and the lateral cheeks, lower jaw, back, and chest are affected.

Pathogenesis

Acne is a disorder of the pilosebaceous unit, comprised of a follicle or pore, sebaceous gland, and rudimentary or vellus hair. These specialized follicles are concentrated on the face, chest, and back, which explains why acne occurs in these areas. Although the pathogenesis of acne has not been defined, clearly multiple factors contribute (Fig. 1). Designing appropriate treatment requires an understanding of these factors.

Hormones and Sebum Production

Androgens play an integral role in causing acne. At age 8 or 9 years, prior to the appearance of secondary sexual characteristics, adrenarche results in increased adrenal production of dehydroepiandrosterone sulfate (DHEAS). Rising levels of DHEAS, perhaps after conversion to more potent androgens such as testosterone and dihydrotestosterone, cause sebaceous glands to enlarge and produce more sebum. Sebum secretion peaks during adolescence and declines after age 20 years. In general, acne severity correlates with the rate of sebum secretion. Of note, sebum from patients who have acne is deficient in linoleic acid, a factor that may alter the keratinization process and contribute to follicular obstruction.

Despite the importance of androgens in causing acne, most males have normal hormone levels. For females, the picture is more complex: Hormone levels usually are normal, but free testosterone and DHEAS concentrations may be elevated, and sex hormone-binding globulin (SHBG) may be reduced.

*Departments of Pediatrics and Dermatology, Wake Forest University School of Medicine and Brenner Children's Hospital, Winston-Salem, NC.

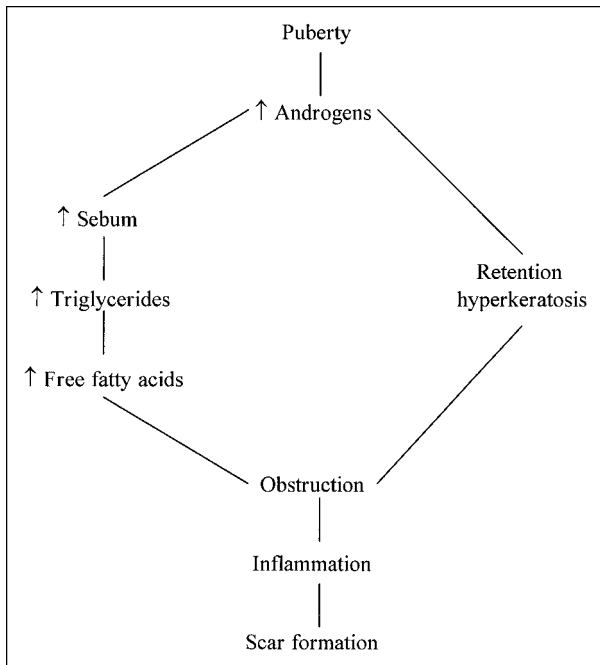


Figure 1. Pathogenesis of acne.

Bacteria

Propionibacterium acnes is an anaerobic, gram-positive diphtheroid that colonizes pilosebaceous follicles following increases in sebum production. Although *P acnes* is a normal inhabitant of the skin, its numbers are higher in patients who have acne than in those who are unaffected. *P acnes* produces chemoattractant factors that cause polymorphonuclear neutrophils (PMNs) to enter pilosebaceous follicles. As PMNs ingest *P acnes*, hydrolytic enzymes are released that damage the follicle wall. Follicular contents then enter the surrounding tissue, where they incite inflammatory reactions that are manifested clinically as erythematous papules, pustules, or nodules. *P acnes* also produces lipases that hydrolyze triglycerides to free fatty acids (FFA), a factor that may contribute to the inflammatory process and follicular obstruction.

Abnormal Keratinization

In acne, epithelial cells lining the follicle are not shed properly and become more cohesive. The result is a collection of cells and sebum that accumulates within the follicle. Termed “comedogenesis,” this process is central to the development of acne lesions. Although the trigger for comedogenesis has not been identified, proliferation or adhesion of keratinocytes, cytokine production, and the effects of androgens may be responsible.



Figure 2. Open comedones in the external ear and on the face. Reprinted from Krowchuk DP, Lucky AW. Managing adolescent acne. *Adolesc Med.* 2002;12:355–374 with permission of Hanley & Belfus.

Genetics

Familial trends are well recognized in patients who have acne, but an exact pattern of inheritance has not been defined. Because the disease is common and modified by external factors, it is not possible to predict the severity of disease in an individual patient based on family history.

Clinical Manifestations

The pathologic processes previously described have clinical correlates. Patients who have acne may exhibit obstructive or inflammatory lesions, scars, or cysts.

Obstructive Lesions (Comedones)

Obstruction within the follicle initially is microscopic; such lesions are termed microcomedones. As comedones enlarge, they become apparent clinically as open comedones (blackheads) or closed comedones (whiteheads). Open comedones represent follicles that have widely dilated orifices (Fig. 2). The black color of these lesions does not represent dirt; rather, it may result from oxidation of melanin, interference with transmission of light



Figure 3. Closed comedones, small white papules without surrounding erythema, located on the forehead.

through compacted epithelial cells, or the presence of certain lipids in sebum. Closed comedones are small white papules that have no surrounding erythema (Fig. 3). They represent follicles that have become dilated with cellular and lipid debris but possess only a microscopic opening to the skin surface.

Inflammatory Lesions

Inflammatory acne is characterized by erythematous papules, pustules, or nodules. Papules and pustules are small, measuring less than 5 mm in diameter (Fig. 4). Nodules measure more than 5 mm in diameter and often involve more than one follicle. As inflammatory lesions resolve, erythematous or hyperpigmented macules may remain for as long as 12 months; these often are mistaken for scars.

Scars

Some patients who have acne develop scars as inflammatory lesions resolve. In general, scarring is most likely in patients who have large papules or nodules. On the face, acne scars appear as small pits; on the trunk, they usually are small hypopigmented spots. Rarely, patients develop hypertrophic or keloidal scars. Because scars may be irreversible, their presence should prompt the clinician to be aggressive in the selection of therapeutic agents active against the inflammatory component of the disease. True cysts, compressible nodules that lack overlying inflammation, also may be observed in patients who have acne.

Evaluation

The first step in evaluation is to gather a history. Some helpful questions and their rationale are presented in Table 1. The physical examination should include the



Figure 4. Inflammatory papules and pustules located on the back of a patient who has severe acne. Reprinted from Krowchuk DP, Lucky AW. Managing adolescent acne. *Adolesc Med.* 2001;12:355–374 with permission of Hanley & Belfus.

skin of the face, chest, and back. Examination of other systems is dictated by findings from the history. To facilitate later comparison, a diagram of the face (Fig. 5) can be used to record the approximate number of inflammatory lesions and open and closed comedones. The clinician also can estimate the numbers and types of lesions present on the back and chest. This process can be accomplished quickly and provides an objective method of monitoring the patient's progress. In addition to this lesion count, it is helpful to make a global assessment of acne severity (eg, mild [Fig. 6], moderate [Fig. 7], or severe [Fig. 8]) that represents a synthesis of the number, size, and extent of lesions as well as the presence of scarring (Table 2).

Differential Diagnosis

Conditions that may mimic adolescent acne are presented in Table 3.

Table 1. Key Elements of the Acne History*

Question	Rationale
For all patients	
How long has the patient had acne? When did it begin? Which medications have been tried?	Early- or late-onset acne may indicate androgen excess. Which medications have been successful; which have not? Did treatment failures result from improper technique or insufficient duration of use? Did adverse effects occur?
Is the patient using other products to treat acne?	Many nonprescription acne preparations (eg, abrasive soaps) are irritating and may limit the patient's ability to tolerate more effective therapies.
Is the patient receiving other medications?	Topical or oral corticosteroids (including anabolic-androgenic steroids) may cause acne lesions. Lithium, isoniazid, hydantoin, and rifampin may worsen acne.
Does the patient use cosmetics or hair greases?	Cosmetics containing lanolin or oil or hair greases may cause or worsen acne.
Does the patient have recreational or occupational activities that may worsen acne?	Pressure applied by helmets, chin straps, shoulder pads, or tight occlusive garments may worsen acne. Oils or greases inadvertently applied to the skin as part of one's occupation can cause obstructive lesions.
Is there a history of other medical problems?	Adolescents who have a history of atopic dermatitis or those who report "sensitive" skin may not tolerate topical medications that dry or irritate skin.
For females	
Is the patient menstruating? Are there premenstrual flares? Is there a history of oligomenorrhea or hirsutism?	Premenstrual flares are common in women who have acne. The presence of oligomenorrhea or hirsutism, coupled with the presence of acne, may suggest androgen excess caused by polycystic ovarian disease or late-onset congenital adrenal hyperplasia.
Is the patient sexually active?	Patients who are sexually active require effective contraception during treatment with isotretinoin.
Does the patient use hormonal contraception?	Certain hormonal contraceptives may worsen acne (see text). Women using oral contraceptives may require a secondary form of contraception if oral antibiotics are being used to treat acne (see text).
*Adapted from Krowchuk DP, Lucky AW. Managing adolescent acne. <i>Adolesc Med.</i> 2001;12:355-374	

Laboratory Findings

Laboratory evaluation (eg, measurement of free testosterone, DHEAS, 17-hydroxyprogesterone) should be reserved for females who have early- or late-onset acne, acne associated with other evidence of androgen excess (eg, irregular menses, hirsutism, alopecia, or clitoromegaly), or acne unresponsive to conventional therapy.

Management

The successful management of acne depends on an understanding of the types of lesions present, the severity of disease, and the mechanism of action and possible adverse effects of available medications. Although there is no standardized treatment plan, rational guidelines exist (Table 4). Realistic goals of treatment are to reduce the number and severity of lesions and prevent scarring.

Patient Education

The first step in management is to describe briefly the causes of acne and attempt to dispel commonly held myths:

- Acne is not caused by dirt, and frequent washing will not improve the condition. In fact, frequent washing or the use of harsh soaps may irritate the skin and limit a patient's tolerance for topical medications. To control oily skin, patients may be advised to wash once or twice daily using a mild nondrying soap or cleanser.
- For most adolescents, diet plays no role in acne. Occasionally, a patient may observe an apparent relationship between a particular food and a flare-up. In such instances, common sense dictates limiting the intake of this food.

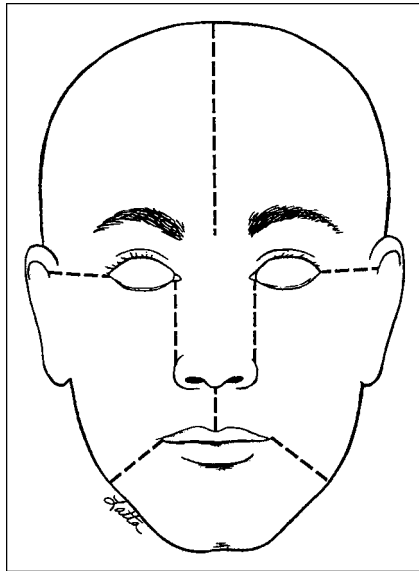


Figure 5. In each region, the physician records the number of open comedones (OC), closed comedones (CC), and inflammatory lesions (IL). Redrawn with permission from Merck & Co. The original appeared in Lucky AW, et al. A multirater validation study to assess the reliability of acne lesion counting. *J Am Acad Dermatol.* 1966;35:559–565 and was used with permission of Elsevier Science.

The patient should be counseled about factors that may worsen acne. The information contained in Table I may help guide this discussion:

- Picking at, wearing athletic gear over, or otherwise traumatizing acne lesions may increase inflammation, prolong resolution of lesions, and increase the likelihood of scar formation.
- Cosmetics, sunscreens, and moisturizers, particularly those containing oils, may worsen acne. Advise the adolescent to select products that are labeled non-comedogenic or nonacnegenic.



Figure 6. Mild acne. A few small inflammatory lesions are present. Reprinted from Krowchuk DP, Lucky AW. Managing adolescent acne. *Adolesc Med.* 2001;12:355–374 with permission of Hanley & Belfus.



Figure 7. Moderate acne. Many inflammatory lesions are present. Reprinted from Krowchuk DP, Lucky AW. Managing adolescent acne. *Adolesc Med.* 2001;12:355–374 with permission of Hanley & Belfus.

- A variant of cosmetic acne, known as pomade acne (Fig. 9), may occur when greases used to style hair are applied inadvertently to the skin. Pomade acne occurs almost exclusively in African-Americans and is characterized by the presence of comedones located on the forehead and temporal areas. To prevent such lesions, patients can be advised to avoid placing hair care products on the skin.
- Young women often experience premenstrual exacerbations that may be caused by androgenic effects of progesterone, which is dominant during the second half of the menstrual cycle.
- Environmental factors may exacerbate acne among young people who come into contact with grease at work. Despite this, patients may be unwilling or unable to alter employment to accommodate concerns about acne.

Patients should be advised that acne treatment is a long-term process; often 6 to 8 weeks or longer are required to see improvement. Additionally, once lesions resolve, treatment may need to be continued until it is clear that new lesions are not appearing.

Topical Therapies

Commonly employed topical preparations include benzoyl peroxide, antibiotics, retinoids, and salicylic acid.

BENZOYL PEROXIDE. Benzoyl peroxide (BP) primarily has an antibacterial effect and is useful in controlling



Figure 8. Severe acne. Numerous large inflammatory lesions and scarring are present. Reprinted from Krowchuk DP, Lucky AW. Managing adolescent acne. *Adolesc Med.* 2001;12:355–374 with permission of Hanley & Belfus.

inflammatory acne. It also may decrease the formation of FFA, thereby improving obstructive (comedonal) disease. These two actions make it an excellent drug in the management of patients who have mild inflammatory or mixed (eg, inflammatory and comedonal) acne. Because BP also prevents the emergence of antibiotic resistance among *P acnes*, it may be used adjunctively for patients receiving long-term oral or topical antibiotic therapy.

BP is available with or without a prescription in concentrations ranging from 2.5% to 10%. Over-the-counter products include creams, lotions, washes, and gels. Prescription forms generally employ a gel vehicle, a factor that enhances efficacy. A single daily application of a product containing a 5% concentration is adequate for most patients. Increasing the concentration to 10% does not enhance the therapeutic effect greatly, but does increase the likelihood of drying, erythema, and burning. BP usually is applied once daily, although twice-daily use may be beneficial for some patients.

As with all topical medications, BP is applied as a thin coat to all acne-prone areas rather than to individual lesions. When the entire face is to be treated, the patient may

be instructed to dispense an amount the size of a pea onto a finger tip. To distribute the medication, the finger is touched to each side of the forehead, each cheek, and the chin. The medication then is spread to cover the entire face, avoiding areas prone to irritation, such as the corners of the eyes, the alar folds, and the angles of the mouth. To treat larger areas, such as the back or chest, a BP wash applied during a bath or shower may be used, although greater efficacy may be achieved by applying the gel formulation and allowing it to remain in place for several hours (eg, overnight).

Adverse reactions associated with BP use include stinging after application and drying, redness, and peeling of the skin. These reactions may be prevented or limited by selecting an emollient or water-based gel, reducing the concentration of BP, or decreasing the frequency of application. Contact dermatitis is an unusual complication characterized by erythema, small papules, and pruritus. Patients should be advised that BP may bleach clothing and bedding. It is classified as pregnancy category C by the United States Food and Drug Administration (FDA), meaning that risk to the fetus cannot be ruled out.

TOPICAL ANTIBIOTICS. Topical antibiotics reduce concentrations of *P acnes*, inflammatory mediators, and possibly, FFA. As a result, these agents are most useful in treating mild-to-moderate inflammatory acne. The practical difficulties and cost associated with applying topical antibiotics to large areas limit their use to patients who have facial acne. In the United States, products containing clindamycin or erythromycin are available and have comparable efficacy. However, concerns about antibiotic resistance limit their use. Sodium sulfacetamide, with or without sulfur, also is available. Topical antibiotics are

Table 2. Grading Scale for Severity of Facial Acne*

Severity	Clinical Characteristics
Mild	—About one fourth of the face is involved —There are few to several papules or pustules, but no nodules or scarring
Moderate	—About one half of the face is involved —There are several to many papules or pustules and a few to several nodules. A few scars may be present
Severe	—Three quarters or more of the face is involved —There are many papules and pustules and many nodules. Scarring often is present

*Adapted from Pochi PE, Shalita AR, Strauss JS, et al. Report of the consensus conference on acne classification. *J Am Acad Dermatol.* 1991;24:495–500 and Allen BS, Smith JG. Various parameters for grading acne vulgaris. *Arch Dermatol.* 1982;118:23–25.

Table 3. Some Conditions That May Mimic Adolescent Acne

Condition	Description	Differentiating Features
Adenoma sebaceum	Erythematous papules or nodules that appear in the nasolabial folds or on the cheeks of individuals who have tuberous sclerosis.	Lesions often appear during childhood (earlier than the lesions of acne); comedones are absent.
Acne rosacea	Erythematous papules, pustules, and scaling that involve the central face.	Typically occurs in adults; comedones are absent.
Gram-negative folliculitis	Sudden appearance of papules, pustules, and nodules in a patient being treated with oral antibiotics for acne.	Sudden worsening of acne in a patient who has been receiving long-term antibiotic treatment for acne vulgaris.
Keratosis pilaris	Small, rough-feeling, skin-colored or erythematous papules centered about follicles. A keratin plug emerging from the follicular orifice can be observed or palpated.	The presence of a central keratin plug differentiates keratosis pilaris from acne. Lesions also may be located on the upper outer arms, thighs, or buttocks.
Pityrosporum folliculitis	Erythematous papules and pustules that occur on the chest, shoulders, and upper back.	Lesions spare the face; a potassium hydroxide preparation performed on a pustule roof demonstrates budding yeast.
Steroid acne	Dome-shaped erythematous papules appearing on the face and trunk weeks after systemic corticosteroids have been begun.	Lesions have a monomorphous appearance (eg, only papules without comedones). There is a temporal relationship between the onset or worsening of acne and corticosteroid therapy.
Steroid rosacea	Erythematous papules or pustules that appear around the mouth and eyes. Often occurs in individuals who have applied potent topical corticosteroids to the face or have used inhaled corticosteroids.	Lesions are concentrated around the mouth (or eyes), and comedones are absent.

available in a variety of vehicles. As with other topical agents, lotions and creams are less drying than solutions or gels.

Products that combine agents enhance the therapeutic effect. For example, combinations of BP 5% and clindamycin or erythromycin are more effective than either drug alone. Beyond this, the inclusion of BP also prevents the development of antibiotic resistance. The primary disadvantage of combination preparations is the significantly greater cost. If cost is an issue, some clinicians provide separate prescriptions for the generic forms of BP and clindamycin and advise patients to apply the medications simultaneously.

An area of concern related to the use of topical or systemic antibiotics is the emergence of resistant forms of *P. acnes*. Between 1991 and 1996, the percent of patients attending a dermatology clinic in the United Kingdom carrying antibiotic-resistant organisms rose from 34.5% to 60%. In 1996, 47%, 41%, and 26% of these patients harbored strains of *P. acnes* that were resistant to erythromycin, clindamycin, or tetracycline, respectively. The majority of strains resistant to erythromycin exhibited cross-resistance to clindamycin and other macrolide antibiotics. Multiple drug resistance was observed in 18% of

isolates. Among propionibacteria resistant to tetracyclines, the degree of resistance to tetracycline is greater than that to doxycycline, which exceeds that to minocycline. An association between carriage of erythromycin-resistant propionibacteria and poor clinical response to oral treatment with this agent has been demonstrated. With this issue in mind, some clinicians do not prescribe oral erythromycin for acne or they use it only for previously untreated patients who are unlikely to harbor resistant organisms. Similarly, the use of topical erythromycin or clindamycin as monotherapy (ie, not combined with benzoyl peroxide) may be ineffective due to bacterial resistance.

TOPICAL RETINOIDS. Patients who have numerous blackheads and whiteheads will benefit from a topical retinoid. These agents normalize the keratinization process within follicles and reduce obstruction and the risk for follicular rupture. Tretinoin is the best known topical retinoid and is available in creams (0.025%, 0.05%, 0.1%), gels (0.01%, 0.025%), and a liquid (0.05%). The vehicle affects efficacy; creams are less potent than gels, which are less potent than the liquid. Newer formulations appear to be as effective but less irritating than

Table 4. Management Options for Facial Acne

Acne Severity	Lesion Type	Initial Treatment	If No Response
Mild	Comedonal	Benzoyl peroxide or topical retinoid ¹	If benzoyl peroxide is used initially, substitute with or add topical retinoid ¹ once daily
	Inflammatory	Benzoyl peroxide (or topical combination preparation ²)	Increase benzoyl peroxide application to twice daily or substitute combination product ² or oral antibiotic ³
	Mixed (ie, comedones and inflammatory lesions)	Benzoyl peroxide (or topical combination product ²) alone or with topical retinoid ¹ (could substitute azelaic acid as monotherapy)	If benzoyl peroxide is used initially, add topical retinoid ¹ once daily (for comedonal component) or substitute topical combination product ² or oral antibiotic ³ (for inflammatory component)
Moderate	Comedonal	Topical retinoid ¹	Increase strength of topical retinoid ¹
	Inflammatory	Topical combination product ² (or oral antibiotic ^{3,4})	If topical combination product ² is used, add or substitute an oral antibiotic ^{3,4} and add topical retinoid
Severe	Mixed (ie, comedones and inflammatory lesions)	Topical combination product ² (or oral antibiotic ^{3,4}) and topical retinoid ^{1,5} ; could substitute azelaic acid as monotherapy	Increase strength of topical retinoid ^{1,5} (for comedonal component); if combination product ² is used alone, substitute oral antibiotic ^{3,4} (for inflammatory component) and add topical retinoid
	Comedonal	Topical retinoid ¹ once daily	Increase strength of topical retinoid ¹ or refer to dermatologist
	Inflammatory Mixed (ie, comedones and inflammatory lesions)	Oral antibiotic ^{3,4} and topical retinoid ^{1,5} Oral antibiotic ^{3,4} and topical retinoid ¹	Consider alternate antibiotic ^{3,4} or refer to dermatologist Consider increasing strength of topical retinoid ¹ (for comedonal component) or alternate antibiotic ^{3,4} (for inflammatory component) or refer to dermatologist

¹For example, tretinoin cream 0.025%

²For example, clindamycin or erythromycin combined with benzoyl peroxide (clindamycin and erythromycin used alone are not favored due to potential antibiotic resistance)

³For example, tetracycline (or possibly erythromycin) 250 to 500 mg twice daily

⁴Some experts advise the use of benzoyl peroxide for patients treated with oral antibiotics to prevent the emergence of antibiotic-resistant *P. acnes*

⁵Even in the absence of clinically apparent blackheads and whiteheads, most experts advise the use of a topical retinoid in conjunction with an oral antibiotic for patients who have moderate or severe inflammatory acne



Figure 9. Pomade acne, characterized by multiple closed comedones on the forehead

traditional varieties. Tretinoin also is available in generic form.

Adolescents who use tretinoin often experience irritation, redness, or dryness. For persons of color, this inflammation may result in hypo- or hyperpigmentation that can persist for months. To prevent or limit adverse effects, therapy often is begun with a low-strength preparation (eg, tretinoin cream 0.025%). Patients should be advised to dispense a small amount (a pea-sized dab is sufficient to cover the entire face) and to apply the medication every third night, progressing as tolerated over 2 to 3 weeks to nightly application. Tretinoin may cause an apparent temporary worsening of acne 2 to 3 weeks after treatment has begun and increased sensitivity to sunlight likely caused by skin irritation.

Because tretinoin is nearly identical in chemical structure to isotretinoin, some have raised concern about potential teratogenicity. However, there have been no reports of malformations occurring in infants born to women who used tretinoin during pregnancy. Nevertheless, tretinoin is classified as pregnancy category C, and for this reason, its use is avoided during pregnancy. Because BP inactivates tretinoin, the two drugs should not be applied simultaneously. Rather, BP may be applied in the morning and tretinoin at night.

Other retinoids also are available. Adapalene in a 0.1% gel formulation has been shown to be as effective as tretinoin gel 0.025% but less irritating. It is available as a 0.1% alcohol-free gel, cream, and solution or as pledgets. The principles of use and potential adverse effects are analogous to those of tretinoin. Like tretinoin, it is classified as pregnancy category C. Tazarotene is formulated in 0.05% and 0.1% gels and creams. Although proven effective in clinical studies, it is much more expensive and may be more irritating than other retinoids, and due to concerns about teratogenicity, it is contrain-

dicated in pregnancy. For these reasons, it is not prescribed widely for the treatment of acne.

SALICYLIC ACID. Salicylic acid reduces the formation of obstructive lesions; it is less effective than topical retinoids but less irritating. It is useful in the management of obstructive acne involving the face for patients who cannot tolerate retinoids or in the treatment of comedones on the trunk (where it may be impractical and too costly to apply a retinoid).

AZELAIC ACID. Azelaic acid 20% is both antibacterial and anticomedonal. It is applied twice daily and appears to be well tolerated, although some patients experience pruritus, burning, stinging, tingling, or erythema. No systemic toxicity has been reported. In one controlled trial, azelaic acid was as effective as BP 5%, tretinoin 0.05%, or erythromycin 2%. It is an alternative for patients who have mild-to-moderate inflammatory and comedonal acne or for those who have obstructive lesions who cannot tolerate tretinoin.

Systemic Therapies

ORAL ANTIBIOTICS. Oral antibiotics possess greater efficacy than topical preparations; thus, they are prescribed for patients who have moderate-to-severe acne or inflammatory disease involving the trunk as well as the face. They exert their anti-inflammatory effect by decreasing bacterial colonization and inhibiting neutrophil chemotaxis; they also reduce the concentration of FFA in sebum.

Tetracycline and erythromycin are the oral antibiotics prescribed most often for the treatment of acne; both have been proven effective and are inexpensive. However, as discussed previously, bacterial resistance to erythromycin may limit its usefulness. Depending on disease severity and the patient's weight, each is initiated at a dose of 250 to 500 mg twice daily, although the higher dose usually is favored. Both are available in liquid form for patients who cannot swallow pills or capsules. Tetracycline may cause gastrointestinal disturbances. To assure absorption, it should not be taken with milk or other dairy products and should be taken on an empty stomach (eg, 30 min before or 2 h after a meal). Tetracycline should not be used during pregnancy or for patients younger than 9 years of age due to potential discoloration of teeth. Because tetracycline occasionally has caused esophageal ulceration, patients should be advised to take the medication with a large glass of water and to avoid reclining immediately after ingesting a dose. Other adverse effects include photosensitivity, vulvovaginal

candidiasis, and uncommonly, pseudotumor cerebri, hyperpigmentation, and onycholysis. The primary adverse effect of erythromycin is gastrointestinal upset that may be avoided by taking the medication with food.

For those who fail to respond to or cannot tolerate tetracycline or erythromycin, doxycycline often is effective. It is begun at a dose of 50 to 100 mg twice daily and can be taken with food. Unfortunately, doxycycline is even more likely than tetracycline to induce photosensitivity reactions. An alternative to doxycycline is minocycline, which is considered highly effective, particularly when *P. acnes* resistance is suspected. Minocycline is initiated at a dose of 50 to 100 mg bid; the latter dose is recommended when patients are suspected of harboring tetracycline-resistant propionibacteria. It is more expensive than other antibiotics and has uncommon but significant adverse effects, including pigmentation of the skin, teeth, or mucosa or autoimmune syndromes (eg, a serum sickness-like reaction, a hypersensitivity syndrome, lupus erythematosus-like reaction, and hepatitis). Several other oral antibiotics have been used in the treatment of acne but have not been studied well, including ampicillin, amoxicillin, cephalexin, and trimethoprim-sulfamethoxazole.

As with other acne therapies, 6 to 8 weeks often are required before oral antibiotics produce a significant clinical effect. Once the appearance of new lesions has ceased or been reduced satisfactorily, the dose may be tapered gradually or withdrawn.

Concern often is raised that oral antibiotics may diminish oral contraceptive efficacy by decreasing enterohepatic recirculation of contraceptive steroids, enhancing their hepatic degradation, or increasing their renal or fecal excretion. Research fails to support a systematic interaction between antibiotics used to treat acne (eg, tetracyclines or ampicillin) and oral contraceptives. However, it is possible that occasional oral contraceptive users experience declines in plasma ethinyl estradiol and progesterin concentrations during antibiotic treatment that could reduce contraceptive efficacy. Although this risk is very low, the Council on Scientific Affairs of the American Medical Association concluded that the use of an additional nonhormonal method of contraception or alternate contraceptive method be considered for women receiving long-term antibiotic therapy, particularly if they experience diarrhea or breakthrough bleeding. Clinicians should counsel patients about this concern, although the issue may be moot for adolescents because those using hormonal contraception are advised routinely to use a condom during all sexual encounters to protect against sexually transmitted infections.

ISOTRETINOIN. Isotretinoin is an oral analog of vitamin A that is highly effective for the treatment of severe recalcitrant acne. Despite its efficacy, oral isotretinoin therapy may be associated with important adverse reactions, the most serious of which is teratogenicity. For this reason, the drug should be prescribed only by physicians who have experience in its use. Presently, all isotretinoin prescriptions require that a qualification sticker be affixed. To obtain these stickers, physicians must have read educational materials provided by the manufacturer and signed a letter of understanding regarding isotretinoin use and its potential adverse effects on a fetus. Informed consent is required of all patients for whom isotretinoin is being prescribed.

Reports to the FDA have raised concern that isotretinoin use, through mechanisms unknown, may predispose patients to the development of depression or suicide. Although an association has not been demonstrated, clinicians caring for patients who are receiving isotretinoin should remain alert to the presence or development of mental health disorders, including depression and suicidal ideation.

HORMONAL THERAPY. Combined oral hormonal contraceptives (OCs), those containing an estrogen and progestin, may improve acne. Estrogen increases SHBG that, in turn, decreases biologically active free testosterone. OCs also suppress gonadotropin secretion, thereby reducing ovarian androgen production. Recent placebo-controlled trials document that OCs containing ethinyl estradiol (35 mcg) and the progestin norgestimate or ethinyl estradiol (20 mcg) and levonorgestrel improve acne. It is likely, however, that other OCs also have a beneficial impact on acne. Despite this, these agents are not viewed as primary therapy for acne but as an adjunct to standard medications.

Acne may be exacerbated by endocrine disorders such as polycystic ovarian syndrome or the metabolic syndrome (ie, insulin resistance, obesity, hypertension, and dyslipidemia). Use of long-acting progestin implants or depot medroxyprogesterone acetate may be associated with worsening acne.

Complementary and Alternative Therapies

A number of complementary and alternative therapies have been advocated for the treatment of acne, but efficacy and safety have not been established for most. One agent that has received attention is tea tree oil, a mixture of terpenes and related alcohols that has antibiotic and antifungal properties. In a single-blind trial of 124 patients who had mild-to-moderate acne, a 5%

water-based gel formulation of tea tree oil was as effective as BP 5% water-based lotion. Although considered safe when used topically, it may cause contact dermatitis and, if applied undiluted, may induce comedogenesis. In young children, inadvertent ingestion of small amounts of tea tree oil has produced confusion, ataxia, and drowsiness.

Guggul (derived from the resin of the tree *Commiphora mukul*) was compared with tetracycline in patients who had inflammatory acne. After 3 months of therapy, patients in both groups experienced similar reductions in the numbers of lesions.

Therapies that have been employed and that are believed to be safe (but of unproven efficacy) include aloe vera (for acne scars), witch hazel (used as an astringent), calendula (marigold) tea (used as a compress), and lemon juice or cider vinegar (used as a face wash).

Synthesis

Deciding which medication(s) should be prescribed for an adolescent who has acne is based on a synthesis of several factors, including the types and numbers of lesions present, the clinician's impression of the severity of disease, the extent of acne, the patient's experiences with medications, and personal preferences. Information contained in Table 4 is designed to help develop treatment plans. Beyond this, however, there is an art to treating acne, and two clinicians may differ in their approach to the same patient. Therapeutic choices also may be governed by formulary restrictions. In some states, for example, prescription topical acne medications are not approved for Medicaid reimbursement.

Follow-up

A return visit typically is scheduled for 2 months after therapy has been initiated. However, patients should be encouraged to contact the office sooner with questions

or concerns regarding the use of their medications or possible adverse effects. At the follow-up visit, the clinician can assess compliance, determine the patient's impression of response to treatment, note the occurrence of adverse effects, and assess the effect of therapy. Using this information, the clinician can maintain or revise the therapeutic plan.

Summary

Acne is the most common dermatologic disorder affecting adolescents. Although acne has no cure, clinicians can offer therapy that may limit the emotional consequences of the disease and prevent or reduce the likelihood of physical scarring.

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Diagnosis and Management of Sexually Transmitted Diseases Among Adolescents

Gale R. Burstein, MD,
MPH,* Pamela J. Murray,
MD, MPH[†]

Objectives After completing this article, readers should be able to:

1. List biologic and physiologic reasons for the disproportionate adolescent sexually transmitted disease susceptibility.
2. Describe clinical and laboratory findings on examination of a female who has mucopurulent cervicitis.
3. Describe the causative pathogens and etiologic evaluation for vaginitis.
4. List the criteria for diagnosis of pelvic inflammatory disease.
5. Describe the documentation and management of urethritis.

Introduction

Sexually transmitted diseases (STDs) are a major health problem among adolescents. The highest reported rates of gonorrhea and chlamydia are found among adolescents and young adults.

Adolescent susceptibility to STDs reflects both their biologic and behavioral stages of development. The adolescent cervix is more susceptible to infection compared with the adult cervix because of the presence of cervical ectopy. The young female introitus is small and subject to more trauma and exchange of body fluids during intercourse. Adolescents who have not been sexually active for an extended period of time are less likely to have any partial protective immunity against chlamydia from prior infections. Young adolescents' cognitive developmental stage may limit their ability to plan ahead for condom use. The adolescent personal fable, a belief of uniqueness and invulnerability, contributes to denial of STD risks.

Evaluation and management of an adolescent presenting with symptoms suggestive of an STD are acute care problems that can be addressed in the pediatric office. In this article, we describe the epidemiology, clinical presentation, and management of common STDs among adolescents.

Mucopurulent Cervicitis

Epidemiology

Mucopurulent cervicitis (MPC) is characterized by mucopurulent discharge from an inflamed cervix. *Chlamydia trachomatis* and *Neisseria gonorrhoeae* can cause MPC, but in most cases neither organism can be isolated. Other possible infectious pathogens include herpes simplex virus and *Trichomonas vaginalis*.

Clinical Presentation and Examination

The adolescent who has MPC may present with complaints of vaginal discharge, vaginal itching, irregular vaginal bleeding (especially after sexual intercourse), and dyspareunia. Pelvic inflammatory disease (PID) must be considered if there is lower abdominal pain.

Purulent or mucopurulent discharge from the cervical os, easily induced endocervical bleeding (ie, friability), and edema and erythema of the cervical zone of ectopy are found on physical examination. The presence of yellow mucus collected from the endocervix and evident on a white swab is indicative of MPC. Friability alone does not constitute

*Centers for Disease Control and Prevention, Atlanta, GA.

[†]Children's Hospital, Pittsburgh, PA.

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MPC. Findings of lower abdominal tenderness, cervical motion tenderness, or adnexal tenderness suggest an upper genital tract infection.

Differential Diagnosis

Diagnoses to consider upon findings of an inflamed cervix on examination include vaginitis, endometritis, PID, an inflamed ectropion due to allergies, trauma, or a foreign body, such as a tampon.

Laboratory Evaluation

Nucleic acid amplification tests (NAATs) are the gold standard for diagnosing gonorrhea or chlamydial infection as causes of MPC. NAATs are the most sensitive and specific combination gonorrhea and chlamydia test. Diagnostic tests to evaluate for STD coinfection should be performed, including tests for causes of vaginitis and syphilis. An human immunodeficiency virus (HIV) antibody test should be offered.

Management

MPC is not a sensitive predictor of gonorrhea or chlamydia, and most gonorrhea- and chlamydia-infected females do not have MPC. Therefore, the Centers for Disease Control and Prevention (CDC) recommend basing treatment of patients in whom gonorrhea or chlamydial infection is suspected on sensitive *C trachomatis* and *N gonorrhoeae* laboratory test results, unless there is a high prevalence of gonorrhea or chlamydia in the patient population or the patient is unlikely to return for follow-up. Table 1 lists CDC-recommended MPC treatment regimens. Fluoroquinolones have not been recommended for use among persons younger than 18 years because they damage articular cartilage in juvenile animal models. However, no joint damage attributable to fluoroquinolone therapy has been observed among children treated with the drugs. Patients should avoid sex with all partners until 7 days after beginning therapy.

Follow-up

Patients should return for diagnostic laboratory test results. All partners from the past 60 days of females who have MPC should be notified, evaluated, and treated for the suspected or identified STD.

Vaginitis

Epidemiology

Vaginitis is inflammation of the squamous epithelial tissues lining the vagina. Three conditions cause most cases of adolescent vaginitis: vulvovaginal candidiasis, bacterial vaginosis (BV), and trichomoniasis. All three treatable

Table 1. The Centers for Disease Control and Prevention Recommended Treatment Regimens for Mucopurulent Cervicitis

Azithromycin 1 g orally in a single dose
OR
Doxycycline 100 mg orally twice daily for 7 days
PLUS
Cefixime* 400 mg orally in a single dose
OR
Ciprofloxacin[†] 500 mg orally in a single dose
OR
Ofloxacin[†] 400 mg orally in a single dose
OR
Levofloxacin[†] 250 mg orally in a single dose
OR
Ceftriaxone 125 mg IM in a single dose

Adapted from the Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51(No. RR-6):1–80.

*In July 2002, Wyeth Pharmaceuticals (Collegeville, PA) discontinued manufacturing cefixime in the United States. No other pharmaceutical company manufactures or sells cefixime tablets in the United States.

[†]Fluoroquinolones should not be used for treatment of gonorrhea if the infection was acquired in Asia, the Pacific islands (including Hawaii), or California because the prevalence of fluoroquinolone-resistant *N gonorrhoeae* is high in those areas.

conditions can be diagnosed by examination of vaginal secretions during an office visit.

Vaginal complaints in the postpubertal female are common, accounting for more than 10 million office visits annually. The presence of sexual activity influences the differential diagnosis, with trichomoniasis and BV more common in the sexually experienced adolescent. In the nonsexually active teenager, candidiasis remains the major cause of vaginal complaints and inflammation. Vaginitis also may be caused by local chemical or allergic irritants, such as douches and scented panty liners. Other less frequent causes include herpes simplex virus, bacterial infections caused by *Streptococcus* or *Staphylococcus* sp, trauma, and secondary bacterial infections from retained foreign bodies, most commonly tampons and condoms. Vaginitis may be observed rarely in cases of toxic shock syndrome in which the mucous membranes may be ulcerated.

Clinical Presentation and Examination

The adolescent who has vaginitis may present with complaints of vaginal discharge, which may be profuse or

foul-smelling; vaginal pruritus; or irritation (Table 2). A history of vaginal discharge from a sexually active adolescent should trigger an evaluation for cervicitis.

The physical examination plays an important role in the diagnostic evaluation (Table 2). A thick, adherent, “cottage cheese-like” discharge suggests candidiasis. The clinician also may find erythema, edema, and excoriation of the vagina in a female who has candidiasis. A thin, homogeneous, gray-white, foul-smelling discharge suggests BV. A purulent, profuse, irritating, frothy green-yellow discharge often accompanies trichomoniasis.

Diagnosis

Although the standard bedside vaginitis evaluation offers the advantages of fast results and low cost, microscopy can present a logistic challenge if Clinical Laboratory Improvement Amendments (CLIA) or state licensing limits point-of-care testing. New diagnostic tools can substitute for microscopy and improve diagnostic sensitivity, but they increase cost and time to test results.

The bedside evaluation includes description of the vaginal discharge, measurement of vaginal pH, performance of a “whiff” test, and microscopic examination (Table 2). Care should be taken to obtain a vaginal swab that is not contaminated with alkaline cervical secretions. The vaginal pH can be determined by rubbing the specimen over a pH paper strip and matching the resulting color to the color chart. A specimen diluted in a drop of 10% potassium hydroxide (KOH), referred to as the “whiff test,” has a “fishy” odor with BV and sometimes with trichomoniasis.

Microscopy is critical to the diagnostic process (Table 2). On the wet preparation, the clinician should look for: 1) an excess number of white blood cells (WBCs) (>1:1 WBC:epithelial cell ratio or >10 cells per high-power field), which is evidence of inflammation often found with trichomoniasis and candidiasis; 2) motile or static trichomonads, which is diagnostic of trichomoniasis; and 3) budding yeast and pseudohyphae, which are diagnostic of candidiasis. Warming the solution to body temperature may improve identification of trichomonads and pseudohyphae. Because normal vaginal bacteria may be confused with yeast forms, the clinician should look for pseudohyphae to help identify true yeast. Adding 10% KOH solution to the vaginal fluid lyses other cells and bacteria and often improves pseudohyphae visualization.

Alternative diagnostic strategies can aid or substitute for the conventional evaluation just described. For BV, the FemExam[®] pH and Amines Test Card[™] and the PIP Activity Test Card[™] (Quidel[®] Corp, San Diego, CA) can substitute for the pH paper, the “whiff” test, and micro-

Table 2. Clinical and Laboratory Features of Vaginitis

Infection	Symptoms	Vaginal Discharge	Whiff Test	Microscopic Findings	pH	% Identified By Direct Microscopy	Enhanced Diagnosis
Bacterial Vaginosis	Foul-smelling discharge, ↑ after intercourse	Thin, homogeneous, gray-white	Positive	> 20% clue cells	> 4.5	> 90%	Gram stain Affirm VP III ^{®*}
Trichomoniasis	Frothy, foul-smelling discharge, pruritus, dysuria	Purulent, profuse, irritating, frothy, green-yellow	Variably positive	↑ WBCs Trichomonads	> 4.5	~ 50% to 70%	Diamond media culture Inpouch TV Culture ^{®†} Affirm VP III ^{®*}
Vulvovaginal Candidiasis	Pruritus, burning, discharge	Thick, adherent, white	Negative	↑ WBCs Budding yeast Pseudohyphae	4 to 4.5	~ 50% to 60%	Affirm VP III ^{®*}

WBC = white blood cell.
^{*}Becton Dickinson, Sparks, MD.
[†]BioMed Diagnostics, San Jose, CA.

Table 3. The Centers for Disease Control and Prevention Recommended Treatment Regimens for the Most Common Causes of Vaginitis

Bacterial Vaginosis	Vulvovaginal Candidiasis	Trichomoniasis
Metronidazole 500 mg orally twice daily for 7 days OR Metronidazole gel, 0.75%, one applicator (5 g) intravaginally once a day for 5 days OR Clindamycin cream, 2%, one applicator (5 g) intravaginally once a day for 7 days	Topical azole preparations OR Fluconazole 150 mg orally in a single dose	Metronidazole 2 g orally in a single dose

Adapted from the Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51(No. RR-6):1–80.

scopic examination on a vaginal specimen by detecting an elevated vaginal pH, trimethyl amines generated by BV-associated anaerobic bacteria, and an enzyme displayed by *Gardnerella vaginalis*. Although rarely performed as part of an office-based vaginitis evaluation, a Gram stain of vaginal fluid can provide a quantitative assessment (Nugent score) of BV-associated organisms.

For trichomoniasis, the InPouch TV Culture[®] (BioMed Diagnostics, San Jose, CA) is an office-based self-contained culture kit. The clinician inoculates a culture medium-filled pouch with a vaginal fluid specimen from females or a first-void urine specimen from males and examines the contents for trichomonads by microscopy. The clinician can incubate and repeatedly examine the transparent culture pouch under the microscope for up to 5 subsequent days. The InPouch TV Culture[®] can be a valuable adjunct because the standard culture technique with Diamond medium usually is not performed by most clinical laboratories.

For offices that do not have microscopy available, a

professional laboratory that offers the Affirm VP III Microbial Identification Test[®] (Becton Dickinson, Sparks, MD) provides a diagnostic option. The Affirm VP III[®], a DNA probe performed on vaginal fluid specimens, offers the advantage of diagnosing BV, candidiasis, and trichomoniasis. Correlation with clinical symptoms and elevated vaginal pH is recommended.

Management

Treatment depends on the etiologic diagnosis of vaginitis based on information obtained from the history, physical examination, and laboratory tests (Table 3). Sexual partners of persons who have trichomoniasis need to be notified and treated. However, treatment is not indicated for sex partners of females diagnosed as having candidiasis or BV because partner treatment does not alter the risk of recurrence. Metronidazole-treated patients should avoid alcohol for 24 hours because of its disulfiramlike effect. Metronidazole can be used during pregnancy. Females who have recurrent vulvovaginal candidiasis may require longer treatment and continued prophylaxis.

Pelvic Inflammatory Disease (PID)

Epidemiology

PID is a serious consequence of STDs and an important cause of infertility, ectopic pregnancy, and chronic pelvic pain. It is a clinical syndrome caused by the spread of microorganisms from the lower genital tract (vagina or endocervix) to the upper genital tract (endometrium, fallopian tubes, and adjacent structures). PID is a polymicrobial infection. Sexually transmitted organisms, particularly *C trachomatis* and *N gonorrhoeae*, often are implicated. The alteration in vaginal flora that occurs with BV often can be found in the upper genital tracts of women in whom PID is diagnosed, implicating BV as an important cofactor in the development of PID (Table 4). No pathogen is identified in many PID cases. Adolescents have the highest rates of PID.

Clinical Presentation and Examination

PID is diagnosed on the basis of history and clinical findings. Specific genitourinary symptoms may include lower abdominal pain or cramping that is worse with movement and sexual intercourse, vaginal discharge, irregular vaginal bleeding, or dysuria. Although infrequent, systemic signs may be present and include anorexia, nausea, vomiting, fever, or generalized malaise.

Findings on abdominal examination may include lower abdominal tenderness, peritoneal signs (eg, rebound tenderness and guarding in severe cases), or right

Table 4. Organisms Implicated in the Pathogenesis of Pelvic Inflammatory Disease

Sexually transmitted pathogens

- *Chlamydia trachomatis*
- *Neisseria gonorrhoeae*

Bacterial vaginosis-associated pathogens

- *Mycoplasma hominis*
- *Ureaplasma urealyticum*
- *Escherichia coli*
- *Gardnerella vaginalis*
- *Streptococcus* sp, including enterococci, and *Haemophilus influenzae*
- Anaerobes (anaerobic streptococci and staphylococci, *Bacteroides* sp, *Actinomyces* sp)

upper quadrant pain with associated perihepatitis (Fitz-Hugh–Curtis syndrome). Findings on pelvic examination may include abnormal cervical or vaginal discharge, uterine tenderness, adnexal tenderness, or cervical motion tenderness. Fever also may be present if the patient is severely ill.

Diagnosis

According to the CDC, lower abdominal tenderness, adnexal tenderness, or cervical motion tenderness is required to establish the diagnosis of PID (Table 5). Most affected females have mucopurulent cervical discharge or evidence of WBCs on a microscopic evaluation of a vaginal fluid saline preparation. If cervical discharge appears normal and no WBCs are found on the wet preparation, the diagnosis of PID is unlikely, and alternative causes of pain should be sought.

Laboratory Evaluation

Laboratory evaluations are used to support the clinical diagnosis and assist with management. Laboratory studies can help rule out pathology in the pelvis and abdomen that may be considered in the differential diagnosis (Table 6).

A test for genital gonorrhea and chlamydia should be performed, although negative test results are common because the specimen is not from the site of inflammation—the upper genital tract. Gonorrhea and chlamydia NAATs minimize the risk of a false-negative test result. Tests for other STDs should be performed because the patient is at high risk of having a coinfection. A pregnancy test should be performed because PID

Table 5. Pelvic Inflammatory Disease (PID) Diagnostic Criteria

Minimal requirements:

- Uterine or adnexal tenderness (unilateral or bilateral)
OR
- Cervical motion tenderness

Additional criteria to increase specificity:

- Presence of white blood cells (WBCs) on saline microscopy of vaginal secretions
- Oral temperature >101°F (38.3°C)
- Elevated erythrocyte sedimentation rate or C-reactive protein
- Gram-negative intracellular diplococci evident in Gram stain of endocervix
- Laboratory evidence of *N gonorrhoeae* or *C trachomatis* at cervix
- Abnormal cervical or vaginal mucopurulent discharge

Adapted from the Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51(No. RR-6):1–80.

during pregnancy is an indication for hospital admission, and ectopic pregnancy can mimic PID.

Other optional tests that may help support the diagnosis include tests for elevated acute-phase reactants, such as WBCs, erythrocyte sedimentation rate, or C-reactive protein. Ultrasonography may be helpful if either the diagnosis is in question, ectopic pregnancy is a strong consideration, or tuboovarian abscess (TOA) is considered. Laparoscopy is not recommended routinely, although it may be required for evaluation of treatment failures, to exclude surgical emergencies, or if a TOA ruptures or does not respond to medical management within 48 to 72 hours.

Table 6. Differential Diagnosis for Pelvic Inflammatory Disease

- Ectopic pregnancy
- Ovarian cyst (with or without torsion)
- Acute appendicitis
- Endometriosis
- Pyelonephritis
- Septic or incomplete abortion
- Pelvic thrombophlebitis
- Functional pain

Table 7. The Centers for Disease Control and Prevention Recommended Treatment Regimens for Pelvic Inflammatory Disease

Inpatient Regimens (one of the following):

- Cefotetan 2 g IV every 12 h OR Cefoxitin 2 g IV every 6 h PLUS Doxycycline 100 mg IV or PO every 12 h
- Clindamycin 900 mg IV every 8 h PLUS Gentamicin loading dose IV or IM (2 mg/kg body weight), followed by a maintenance dose (1.5 mg/kg) every 8 h
- Parenteral therapy may be discontinued 24 h after clinical improvement
 - Doxycycline 100 mg PO twice a day OR Clindamycin 450 mg PO four times a day continued for 14 days of total therapy
 - For tuboovarian abscess, addition of Metronidazole 500 mg PO twice a day, Doxycycline, or use of Clindamycin 450 mg PO four times a day provides better coverage against anaerobes

Outpatient Regimens (one of the following):

- Ofloxacin 400 mg PO twice a day or Levofloxacin 500 mg PO every day for 14 days WITH or WITHOUT Metronidazole 500 mg PO twice a day for 14 days
- Ceftriaxone 250 mg IM single dose OR Cefoxitin 2 g IM with Probenecid 1 g PO in a single dose once OR Other parenteral third-generation cephalosporin (Ceftizoxime or Cefotaxime) PLUS Doxycycline 100 mg PO twice a day for 14 days WITH or WITHOUT Metronidazole 500 mg po twice a day for 14 days

Adapted from the Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51(No. RR-6):1–80.

Management

Antibiotic treatment for PID generally is empiric and must be broad-spectrum. All regimens should be effective against *N gonorrhoeae* and *C trachomatis*, even when endocervical test results are negative. Providing coverage against anaerobes and other gram-negative organisms is also important. A clinical diagnosis of PID presumes a bacterial infection of the pelvic deep soft tissue. Treatment should be initiated as soon as a presumptive diagnosis is made. Initiation of antibiotic treatment should not be delayed until laboratory results are available because this can affect long-term outcomes adversely. Table 7 lists the CDC-recommended antibiotic treatment regimens for PID. The addition of metronidazole or

Table 8. Causes of Urethritis in Adolescents

Principal Bacterial Pathogens

- No pathogen identified
- *Chlamydia trachomatis*
- *Neisseria gonorrhoeae*

Other Pathogens

- *Ureaplasma urealyticum*
- *Mycoplasma genitalium*
- *Mycoplasma hominis*
- Herpes simplex virus
- *Trichomonas vaginalis*

clindamycin to the oral doxycycline regimen improves anaerobic coverage at the risk of decreasing compliance.

PID often is treated in the outpatient setting. Indications for hospitalization include suspicion of a surgical emergency such as appendicitis or ovarian torsion, severe illness, pregnancy, TOA, and inability to tolerate or failure to respond to outpatient therapy.

Follow-up

Close follow-up of an adolescent in whom PID is diagnosed is essential. A repeat visit within 48 to 72 hours is necessary to ascertain adequate clinical improvement versus need for hospitalization. Sexual partners of patients who have PID should be evaluated and treated to reduce the risk of reinfection.

Urethritis

Epidemiology

Urethritis is an STD syndrome characterized by inflammation of the urethra. It is diagnosed more commonly in older adolescent and young adult males, but it may be an STD complication or primary infection site in adolescent females. Asymptomatic infection is common.

N gonorrhoeae and *C trachomatis* are the clinically important bacterial pathogens of adolescent urethritis that warrant diagnostic evaluation (Table 8). Specific diagnostic tests for less common pathogens usually are not performed. Nongonococcal urethritis (NGU) refers to urethritis caused by pathogens other than *N gonorrhoeae*; *C trachomatis* is the pathogen identified most frequently. However, the proportion of NGU cases caused by chlamydia has been declining over the past decade. Most NGU diagnostic evaluations do not identify a pathogen, especially in geographic areas that have active chlamydia control programs.

Table 9. Diagnostic Criteria for Urethral Inflammation

Inflammation must be documented by at least one of the following:

- Observation of mucoid or purulent urethral discharge
- First-void urine positive leukocyte esterase test or microscopic examination demonstrating 210 white blood cells per high-power field
- At least 5 white blood cells per high-power field or gram-negative intracellular diplococci on Gram stain

Adapted from the Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51 (No. RR-6):1–80.

Complications of urethritis among males (eg, epididymitis and Reiter syndrome) are less severe and occur far less frequently compared with sequelae of mucopurulent cervicitis among females. Evidence for a causal association between urethritis from an STD pathogen and male infertility is lacking.

Clinical Presentation and Examination

Males who have symptoms usually report urethral discharge, urethral itching, dysuria, and urinary burning and frequency. However, screening of sexually active adolescent males with urine-based NAATs identifies many asymptomatic infections. On examination, mucoid or purulent urethral discharge is the classic finding. Applying gentle pressure along the urethra from the base to the meatus three to four times and examination after a long interval without voiding (at least 2 h) increases the likelihood of finding urethral discharge.

Diagnosis

Objective clinical or laboratory evidence of urethral inflammation must be demonstrated to diagnose urethritis (Table 9). Patient complaint without objective examination or laboratory findings does not fulfill diagnostic requirements. However, highly sensitive NAATs identify STD pathogens in asymptomatic males who do not meet the diagnostic criteria for urethritis. Clinicians, therefore, should consider the possibility of a urethral infection with STD pathogens in asymptomatic sexually active males.

The CDC recommends testing of all males who meet the diagnostic criteria for urethritis for gonorrhea and chlamydial infection. NAATs for gonorrhea and chla-

mydia can be performed on a single urine or urethral specimen. Because of a high STD coinfection risk, tests for syphilis and HIV also should be performed.

Management

Treatment should be provided as soon as possible after diagnosing urethritis. However, empiric gonorrhea and chlamydia treatment of symptomatic patients in whom urethritis has not been documented by physical examination or laboratory testing is recommended only for males at risk for infection who are unlikely to return for a follow-up evaluation.

If possible, males who meet diagnostic criteria for urethritis (Table 9) should be tested for gonorrhea with a Gram stain in the office to differentiate between gonococcal urethritis and NGU. If gonorrhea is not ruled out at the office visit, patients should be treated for both gonorrhea and chlamydia. Patients who have NGU should be treated with either a single 1-g dose of azithromycin or doxycycline 100 mg twice daily for 7 days. Patients who have a positive gonorrhea or chlamydia test should be treated according to CDC recommendations (<http://www.cdc.gov/nchstp/dstd/dstdp.html>). All sexual partners of infected patients must be notified and treated. Patients and partners should abstain from sexual intercourse until 7 days after therapy initiation.

Patients should be instructed to return for evaluation if symptoms persist or recur after completion of therapy. Patients who have persistent or recurrent urethritis should be retreated with the initial regimen if noncompliance or re-exposure from an untreated partner is a possibility. If noncompliance or re-exposure is unlikely, a test for *Trichomonas vaginalis* should be performed and patients treated for recurrent/persistent urethritis (Table 10).

Arthritis Associated With STDs

Disseminated gonorrhea infection (DGI), the most common systemic complication of acute gonorrhea, occurs in 0.5% to 3% of patients who have untreated gonorrhea. More commonly diagnosed in females, DGI usually presents with arthritis, most often involving the wrist, metacarpophalangeal, ankle, or knee joints; tenosynovitis; and dermatitis presenting as papules, petechiae, pustules with a hemorrhagic component, and necrotic lesions. Although cultures from blood, joint fluid, and skin lesions are only positive in 20% to 30% of DGI cases, genital or pharyngeal cultures often reveal an asymptomatic gonococcal infection. Recommendations for parenteral therapy can be found in the CDC Guidelines for the Treatment of STDs.

Reiter syndrome, a reactive arthritis associated with *C trachomatis* infection, as well as certain enteric infec-

Table 10. Centers for Disease Control and Prevention Recommended Treatment for Recurrent/Persistent Urethritis

Metronidazole 2 g orally in a single dose PLUS Erythromycin base 500 mg orally 4 times a day for 7 days
OR
Erythromycin ethylsuccinate 800 mg orally 4 times a day for 7 days

Adapted from the Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51(No. RR-6):1–80.

tions, is more common among males and patients who have human leukocyte antigen-B27 haplotypes. The pathogenesis is understood poorly, but most likely is immunologically mediated. Reiter syndrome manifestations of urogenital (urethritis, cervicitis), joint (tendonitis, synovitis, arthritis), ocular (conjunctivitis, uveitis), and mucocutaneous inflammation (balanitis, keratoderma blennorrhagica, painless ulcers) may not present simultaneously. Urethritis usually precedes other manifestations by 1 to 4 weeks. Blood and synovial cultures are usually negative. Most episodes resolve within 2 to 6 months, with a 15% risk of recurrence.

Resources

Clinician Information

The Center for Young Women's Health, Children's Hospital, Boston, MA
<http://www.youngwomenshealth.org>

Patient Information

ETR Associates for patient information brochures
831/438-4060
<http://www.etr.org>

American Social Health Association (ASHA) for patient information brochures, STD and AIDS Hotline telephone number, and online STD and HIV information
800/783-9877
<http://www.ashastd.org>

Adolescent-appropriate STD information Web Sites

<http://www.iwannaknow.org>
<http://www.itsyoursexlife.com>
<http://www.teenwire.com>
<http://www.kidshealth.org>

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Suggested Reading

Centers for Disease Control and Prevention. 2002 Guidelines for treatment of sexually transmitted diseases. *Morb Mortal Wkly Rep MMWR*. 2002;51(No. RR-6):1–80
Holmes KK, Sparling PF, Mardh PA, et al, eds. *Sexually Transmitted Diseases*. 3rd ed. New York, NY: McGraw Hill; 1999

Changes in the 2010 STD Treatment Guidelines: What Adolescent Health Care Providers Should Know

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Gale Burstein, MD, MPH, FAAP, FSAHM¹ Amanda Jacobs, MD, FAAP,² Dmitry Kissin, MD, MPH,³ Kimberly Workowski, MD, FACP⁴

1. Society for Adolescent Health and Medicine; 2. American Academy of Pediatrics; 3. American College of Obstetricians and Gynecologists, 4. Centers for Disease Control and Prevention

On behalf of the National Chlamydia Coalition

Over 19 million cases of sexually transmitted diseases (STDs) occur in the United States each year, with a disproportionate share among young people and racial and ethnic minority populations. The estimated annual direct medical costs of treating STDs and their sequelae are \$17.0 billion. Left untreated, STDs can cause serious health problems ranging from infertility to increased risk of HIV infection.

To stop these silent epidemics, the *2010 STD Treatment Guidelines*¹, which update the *2006 Guidelines*, advise health-care providers, who play a critical role in preventing and treating STDs, on the most effective treatment regimens, screening procedures, and prevention and vaccination strategies for STDs. The recommendations are developed in consultation with public and private sector professionals knowledgeable in the treatment of patients with sexually transmitted infections. CDC revises the *Guidelines* periodically, approximately every three to four years, using a scientific, evidence-based process.

In this article we will highlight changes that are important for clinicians who care for adolescents.

Special Populations:

The CDC *Sexually Transmitted Diseases (STD) Treatment Guidelines* addresses STD screening and management needs for specific populations that may be at risk. Below are summary of several of the changes found in the *2010 Guidelines*.

Adolescents

Prevalence rates of many sexually acquired infections are highest among adolescents. CDC updated recommendations for screening and prevention of asymptomatic adolescents. Recommendations include:

Screening

- Annual *C. trachomatis* screen all sexually active females aged ≤ 25 years. Clinicians may consider screening adolescent/young adult males in clinical settings associated with high chlamydia prevalence (e.g., adolescent clinics, correctional facilities, and STD clinics).
- Annual *N. gonorrhoeae* screen all sexually active females at risk for infection. Females aged < 25 years are at highest risk for gonorrhea infection.
- Discuss HIV screening with all adolescents and encourage testing for those who are sexually active and who use injection drugs.
- Routinely screening adolescents who are asymptomatic for certain STDs (e.g., syphilis, trichomoniasis, BV, HSV, HPV, HAV, and HBV) is not recommended. However, young men who have sex with men and pregnant adolescent females might require more thorough evaluation.
- Cervical cancer screening should begin at age 21 years

Prevention

- Encourage immunizations, including human papillomavirus, and hepatitis A and B virus.
- Provide information regarding HIV infection, testing, transmission, and implications of infection to all adolescents as part of health care.
- Integrate sexuality education into clinical practice. The U.S. Preventive task Force Services recommends high-intensity behavioral counseling to prevent STDs for all sexually active adolescents.

Persons in Correctional Facilities

CDC added a new section to present recommendation for “Persons in Correctional Facilities.”. Persons entering correctional facilities have high STDs rates, especially chlamydia and gonorrhea among females less than 35 years. Testing for gonorrhea and Chlamydia facilitates identification and treatment of persons with undetected infections and reduces prevalence among detainees who are released back into the local community. Therefore, chlamydia and gonorrhea screening for all females up to age 35 years is recommended. Syphilis screening recommendations should be based on local area and institutional syphilis prevalence.

Women Who Have Sex with Women

The CDC Guidelines point out that sexual identity, sexual behaviors, sexual practices, and risk behaviors of women who have sex with women (WSW) are diverse. Most self-identified WSW (53%--99%) report having had sex with men. Adolescent WSW and females with both male and female partners, might be at increased risk for STDs and HIV.

Since syphilis transmission (likely through oral sex) between female sex partners can occur and recent data suggest that *C. trachomatis* infection among WSW might be more common than previously thought, providers should consider screening all females for chlamydia and syphilis, regardless of reported same sex behavior. In addition, since HPV transmission can occur from skin-to-skin or skin-to-mucosa contact during sex between females or males, all females, regardless of sexual preference or practices should be offered routine cervical cancer screening and HPV vaccine in accordance with current guidelines.

Gonorrhea and Chlamydia

New *C. trachomatis* and *N. gonorrhoeae* laboratory specimen testing options are highlighted in the 2010 Guidelines. Nucleic acid amplification tests (NAATs) are the most sensitive tests to detect *C. trachomatis* and recommended by CDC. NAATs are Food and Drug Administration (FDA)-cleared for use with urine, cervical, and urethral specimens. Some NAATs are cleared for use with either provider- or patient-collected vaginal swab specimens. Although NAATs are not FDA-cleared for use with rectal or oropharyngeal swab specimens, some laboratories have met Clinical Laboratory Improvement Amendments (CLIA) requirements and have validated gonorrhea and chlamydia NAAT testing on rectal swab specimens and gonorrhea NAAT testing on oral swabs.

When considering treatment, it is important to realize that gonococcal antimicrobial resistance remains an issue in the United States. Penicillin, tetracycline or quinolones are no longer gonorrhea treatment options. The recommended treatment for uncomplicated gonococcal infections of the cervix, urethra, and rectum is dual therapy with ceftriaxone 250 mg intramuscularly in a single dose PLUS either azithromycin 1g orally in a single dose OR doxycycline 100 mg twice daily for 7 days. If ceftriaxone is not an option, dual therapy with cefixime 400 mg orally plus azithromycin 1 gram in a single dose or doxycycline 100 mg twice daily for 7 days is an option. Although cefixime is administered orally, there is limited efficacy of cefixime for pharyngeal infection, if infection at this site is suspected. CDC has made a recommendation for dual therapy for gonococcal infections at all anatomic sites, due to concerns about the possible emergence of cephalosporin resistance gonorrhea in the United States.

Since chlamydia or gonorrhea reinfection rates are high due to persons treated for chlamydia and/or gonorrhea from resuming sex with untreated partners, chlamydia and/or gonorrhea-infected females and males should be retested approximately 3 months after treatment whenever persons next present for medical care, regardless of whether they believe that their sex partners were treated.

Vaginitis

Vaginitis diagnostic evaluation can be challenging. Bacterial vaginosis (BV) can be diagnosed by the use of clinical criteria (i.e., Amsel's Diagnostic Criteria) or Gram stain. However, Gram stain and even microscopy and pH paper are often not available in the primary care provider's office. The sensitivity of microscopic examination of vaginal secretions immediately after the slide preparation for *T. vaginalis* is only 60%–70%. Clinical Laboratory Improvement Act (CLIA) - waived, more sensitive, point of care, vaginal tests include the OSOM Trichomonas Rapid Test (Genzyme Diagnostics, Cambridge, Massachusetts), an immunochromatographic capillary flow dipstick technology, and the OSOM BVBLUE Test (Genzyme Diagnostics, Cambridge, Massachusetts) that detects elevated vaginal fluid sialidase activity, an enzyme produced by bacterial pathogens associated with Bacterial Vaginosis including *Gardnerella*, *Bacteroides*, *Prevotella* and *Mobilincus*. Both rapid test results are available in 10 minutes. The Affirm™ VP III (Becton Dickinson, San Jose, California), a nucleic acid probe test, which tests for *T. vaginalis*, *G. vaginalis*, and *C. albicans*, is a CLIA - moderate complexity test with results available within 45 minutes. A Pap test should not be routinely used as a trichomonas screening test. An FDA approved *T. vaginalis* nucleic acid amplification test is available and has demonstrated enhanced sensitivity and specificity.

Two new alternative BV treatment regimens are Tinidazole 2 g orally once daily for 2 days or Tinidazole 1 g orally once daily for 5 days are options for patients who do not tolerate metronidazole or have difficulty with compliance.

Because of the high *T. vaginalis* reinfection rates of among patients diagnosed and treated for trichomoniasis, rescreening for *T. vaginalis* at 3 months following initial infection can be considered for sexually active females with trichomoniasis. No data support rescreening for males diagnosed with *T. vaginalis*.

Pelvic Inflammatory Disease (PID)

Azithromycin has demonstrated short term effectiveness in one randomized trial and in combination with ceftriaxone 250 mg IM in a single dose (azithromycin 1 g orally once a week for 2 weeks). Clinicians who use an alternative PID treatment regimen should consider adding metronidazole because anaerobic organisms are suspected in the etiology and metronidazole will also treat BV.

As a result of the emergence of quinolone-resistant *Neisseria gonorrhoeae*, regimens that include a quinolone agent are no longer recommended for PID treatment.

Human Papillomavirus (HPV)

CDC reinforces HPV vaccination for adolescents and young adults as indicated to prevent disease caused by HPV.

In addition, a new external genital warts patient-applied therapy treatment option is Sinecatechins 15% ointment. Sinecatechin ointment, a green-tea extract with an active product (catechins), should be applied three times daily (0.5-cm strand of ointment to each wart) using a finger to ensure coverage with a thin layer of ointment until complete clearance of warts for up to 16 weeks. The medication should not be washed off after use. Sexual (i.e., genital, anal, or oral) contact should be avoided while the ointment is on the skin. The most common side effects of sinecatechins 15% are erythema, pruritis/burning, pain, ulceration, edema, induration, and vesicular rash. This medication is not recommended for HIV-infected persons, immunocompromised persons, or persons with clinical genital herpes because the safety and efficacy of therapy in these settings has not been established. The safety of sinecatechins during pregnancy also is unknown.

Scabies

A new first line scabies treatment option is Ivermectin 200ug/kg orally that should be repeated in 2 weeks. Ivermectin is not recommended for pregnant or lactating patients and the safety of ivermectin in children who weigh less than 15 kg has not been determined.

Sexual Assault and STDs: Adults and Adolescents

Changes for recommended sexual assault STD testing at initial examination include NAATs for *C. trachomatis* and *N. gonorrhoeae* recommended as the preferred diagnostic tests for evaluation of sexual assault victims, regardless of the sites of penetration or attempted penetration. For *T. vaginalis* infection testing, in addition to a wet mount or culture, a point-of-care testing of a vaginal-swab specimen may be used. The following prophylactic regimen is suggested as preventative therapy against chlamydia , gonorrhea, and trichomonas (ceftriaxone 250 mg IM in a single dose or cefixime 400 mg orally in a single dose plus azithromycin 1 g orally in a single dose or doxycycline 100 mg orally twice a day for 7 days plus metronidazole 2 g orally in a single dose)

Sexual Assault or Abuse of Children

Changes for recommended sexual assault STD testing at initial examination provide an option for NAATs to be used for detection of *C. trachomatis* in vaginal specimens or urine from girls. No data are available regarding the use of NAATs in boys or for extragenital specimens (e.g., those obtained from the rectum) in boys and girls. Culture remains the preferred method for extragenital sites. Data on use of NAATs for detection of *N. gonorrhoeae* in children are limited, and performance is testdependent. Clinicians should consult with an expert before using NAATs in this context to minimize the possibility of cross-reaction with nongonococcal *Neisseria* species and other commensals. For girls, NAATs can be used as an alternative to culture with vaginal specimens or urine, whereas culture remains the preferred method for urethral specimens or urine from boys and for extragenital specimens (pharynx and rectum) from all children. All positive *C. trachomatis* or *N. gonorrhoeae* specimens should be retained for additional testing.

Expedited Partner Therapy (EPT)

The 2010 STD Treatment Guidelines emphasize the important role of partner management for STD prevention. Partner treatment not only directly benefits the infected individual, but also prevents re-infection of the index case and disrupts STD transmission networks. As previously, the guidelines highlight the importance of expedited partner therapy (EPT) – the clinical practice of treating the sex partners of patients diagnosed with STD without previous medical evaluation of the partners.. According to the STD treatment guidelines and CDC EPT guidance, EPT should be considered for the treatment of gonorrhea and chlamydia in heterosexual partners when other management strategies are impractical or unsuccessful. Since 2006, many more states made EPT legally permissible (27 states and 1 city as of January 11, 2011), and many state health departments developed guidelines for EPT implementation. In addition, EPT has been endorsed by many professional organizations, such as American Medical Association, Society for Adolescent Health and Medicine, American Academy of Pediatrics and American Bar Association. The 2010 STD Treatment Guidelines also discuss the new evidence supporting the use of internet to facilitate partner notification.

More Information

The complete treatment guidelines, as well as information on webinars, ordering information regarding Guidelines hard copies, wall charts, and pocket guides and downloading iPhone and eBook versions can be viewed and downloaded at cdc.gov/std/treatment/2010 or contact CDC-INFO at 800-CDC-INFO (800-232-4636), 24 hours/day, or e-mail cdcinfo@cdc.gov.

¹Centers for Disease Control and Prevention. Sexually Transmitted Diseases Treatment Guidelines, 2010. MMWR. 2010; 59(RR12);1-110. Available at: <http://www.cdc.gov/std/treatment/2010>.

Adolescent Quiz—Part III:

1. Match the following 2010 CDC screening recommendations with the correct STD:

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. <i>C. trachomatis</i> – A 2. <i>N. gonorrhoeae</i> – A 3. HIV – D 4. Syphilis – B/E 5. Trichomoniasis/BV – B/E 6. Cervical cancer – C | <ol style="list-style-type: none"> A. All sexually active females aged <25 years annually B. Routine screening of adolescents who are asymptomatic not recommended C. Screening should begin at age 21 years D. Discuss screening and encourage testing for those who are sexually active and who use injection drugs E. Young men who have sex with men and pregnant adolescent females require more thorough evaluation |
|---|---|

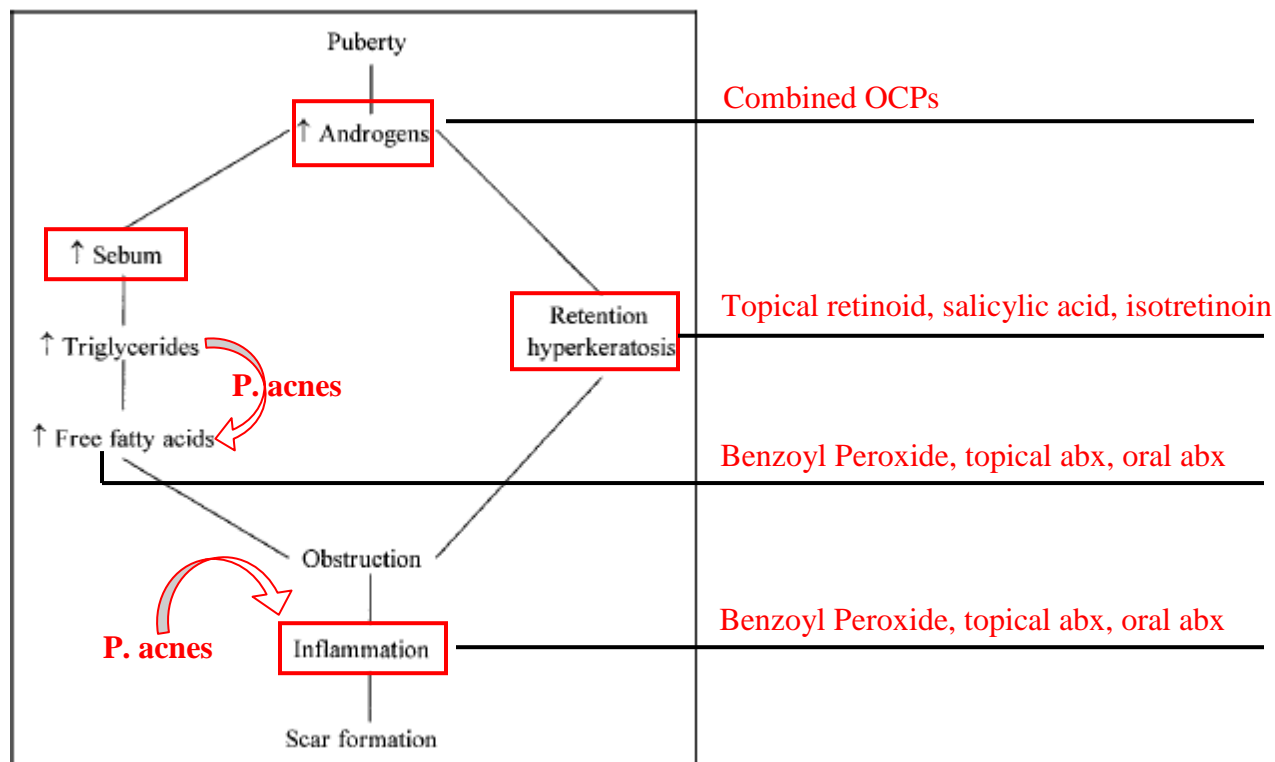
2. The recommended treatment for uncomplicated gonococcal infections is:

- A. ceftriaxone 250 mg IM and azithromycin 1 gm PO
- B. ceftriaxone 250 mg IM and doxycycline 100 mg PO bid for 7 days
- C. cefixime 400 mg PO and azithromycin 1 gm PO
- D. cefixime 400 mg PO and doxycycline 100 mg PO bid for 7 days
- E. all of the above**

3. **NAAT** are the most sensitive tests to detect *C. trachomatis*. Chlamydia and/or gonorrhea-infected female and males should be retested **3** months after treatment. The WR-B lab **(is/is not)** approved to screen NAAT rectal and oral samples, with handwritten order.

4a. Complete the following diagram related to the **pathogenesis of acne**. Which key pathogenic factor is missing and at what stages does it work?

4b. Indicate which **medications** address each component of the pathogenesis.



Adolescent Cases—Part III:

Case 1:

15 year-old twins Jack and Jill present to you with a shared chief complaint of “acne not going away, per mom”. **What do you want to know?** (*see Table 1, PIR article*)

- How long have they had acne?
- What medications (OTC, prescription, or alternative) have they tried? Compliant?
- Any other medications? Other PMHx?
- Any irritating exposures (e.g. cosmetics, hair creases, helmets, occlusive garmets)?
- For Jill— Menstrual history? Sexually active? Hormonal contraception?
- Is TODAY a “good day”, “bad day”, or “average day” for their skin?

You decide to interview Jack and Jill separately—and with their mother out of the room— so that you can also complete a HEADSS exam as part of your history. You find out the following:

Jack

- Has had acne since age 12
- Has tried Clearasil face wash.
- Denies other meds or drugs, including steroids
- h/o atopic dermatitis, for which he uses a “moisturizer”
- competitive wrestler (wears a “uni” and a face-guard helmet)
- Today is an “average skin day . . . it’s not really a big deal”

Jill

- Has had acne since age 10
- Has tried tea-tree oil, Neutrogena, Clean & Clear, and Proactiv. Intermittently compliant.
- Denies other meds or drugs, including steroids
- Uses MAC cosmetics (“I never go out without cover up and foundation”). Competitive cheerleader (“and I have to wear stage make-up for competitions”)
- Menses at age 13. “Irregular” (2-6 mo between periods, last 2-10 days, light to moderate flow). “Hooks up” (she defines as “everything but” intercourse). Not on OCPs.
- Today is a “bad skin day . . . a horrible, horrible day”.

You complete a physical exam on both twins, focusing on the skin. You observe the following:

Jack: ½ of the face involved. Many papules and pustules. No nodules. Multiple small pits and scars. Lesions on chest and back.

Jill: ¼ of the face is involved. Mostly blackheads and whiteheads. 1-2 papules. No lesions on chest and back.



How would you characterize the twins' acne and what is your initial treatment? Which of these products do we have on formulary at WR-B?

- **Jack: moderate-to-severe mixed** (comedonal & inflammatory).
 - Start with topical combination product (BP + abx) AND topical retinoid.
 - Counsel him to wash his face and his face-mask after every wrestling practice.
 - Switch to oil-free moisturizer if continued use for atopic dermatitis is needed.
- **Jill: mild comedonal.**
 - Start with topical benzoyl peroxide.
 - Counsel her to use non-comedogenic make-up products and avoid wearing during exercise, whenever possible.
 - Would also consider OCPs given higher risk behaviors.

Additional Notes:

* Products come in *creams, lotions, washes, and gels*. Gels and washes are generally more efficacious than creams and lotions but have increased side-effects (e.g. redness & drying).

* Products come in *different potencies* (e.g. BP—2.5% to 10%; topical retinoid—0.025% to 1%). Generally speaking, start at lower potency and increase to effect

How will you counsel Jack & Jill to use these products? What side-effects should they anticipate? When should they see an effect? When do you want to follow up?

(a) Topical Benzoyl Peroxide:

- Apply a thin coat to all acne-prone areas, rather than individual lesions. (Pea-size amt).
- A single daily application of a 5% product is adequate for most patients.
- May experience drying, erythema, peeling (especially at higher concentrations). Avoid areas prone to irritation (corners of eye, alar folds, angles of the mouth).
- May bleach clothing and bedding, so use in AM or sleep with towel on pillow.

(b) Topical Combination:

- (See Topical BP guidance, above)
- Products that combine BP + abx are more effective than either drug alone; in addition, BP prevents development of antibiotic resistance (to either topical or PO abx).

(c) Retinoid:

- Spread pea-sized dab over entire face. Start q3 nights and progress as tolerated over 2-3 weeks to qHS. Side effects are irritation, redness, and dryness.
- May cause a temporary worsening of acne 2-3 weeks after treatment has begun and increased sensitivity to sunlight.
- BP inactivates tretinoin, so do NOT apply simultaneously. Recommend using BP qAM and tretinoin qHS.

Patients should be advised that acne treatment is a long-term process; often 6-8 weeks or longer are required to see improvement. Additionally, once lesions resolve, treatment may need to be continued until it is clear that new lesions are not appearing.

Jack and Jill pledge to follow your instructions and be patient with the results. 6 weeks later, you find them on your schedule. Jill tells you, "Things are not getting any better, and we couldn't wait any longer!" Jack reports that his acne worsened 3 weeks after your visit, and it has got

only slightly better from baseline since then. Jill admits that she has more “good skin days” now, but she is distressed by her persistent break-outs.

Now what?

First, assess **compliance**. Then, see [Table 4](#) for Management Options; “If No Response”:

Jack:

Add PO antibiotic*

Increase retinoid strength

Continue BP

Consider Accutane

Jill:

Add retinoid

Counsel not to use at same time as BP

* Good for moderate-severe acne or inflammatory disease involving the trunk and the face. **Tetracycline** and **erythromycin** are most prescribed (250-500 mg BID). Counsel Jack that tetracycline should be taken on an empty stomach and NOT with dairy products (to ensure absorption) and with large glass of water (to avoid esophageal ulceration). **Doxycycline** or **Minocycline** (50-100 mg BID) are other options and CAN be taken with food.

Case 2:

A 17 year-old female presents for routine physical. You note a well-developed, well-nourished female wearing a fitted sweater, plaid skirt, and Ugg boots. She has no past medical history and has no complaints at this visit. Vital signs are within normal limits and physical exam is unremarkable. During your HEADSS exam, you learn that she is sexually active with one partner for the past 7 months and has never used condoms.

How do you counsel your patient? What tests would you offer? Do any require consent?

* Counsel patient on **safe sex practices** (see [Adolescent I Module](#) for contraception options) and risk of STDs and pregnancy with unprotected sex. *Faculty—Consider role-play with residents demonstrating how to deliver this sensitive counseling.*

* Consider the following **tests**: urine beta hCG, NAAT GC/Chlamydia, RPR (rapid plasma reagin) for syphilis [*the TPHA (treponema pallidum hemagglutination) test is a reflex if RPR is positive*], and HIV. You may obtain Hep B and C serologies if prior infection or high suspicion.

* None of these tests, including HIV, require consent; however, you do want to obtain assent (i.e. let your patient know what you will be testing for). Remember, **in MD all minors ≥12 may be tested for STIs** and physicians “may, but are not required” to inform parents.

After being counseled on risk of unplanned pregnancy, she states that she could not possibly get pregnant because her partner is a female. **How can you avoid being placed in this awkward situation in the future?**

* When asking about sexual practices, stay gender neutral (e.g. “are you in a relationship with anybody”). Then, get more specific: “do you like men, women, or both?”

* Remember that the CDC Guidelines point out that sexual identity and practices of WSW (women who have sex with women) are diverse, with **most (53-99%) reporting having had sex with men**. Therefore, it is important to ask females who identify as WSW whether they have ever had sex with men. Also ask about sharing toys or devices, as this increases risk of STDs.

As you move on to discuss STD testing, your patient admits that she does in fact have some vaginal itching and vaginal discharge. **What is your differential diagnosis?**

- **Vaginitis:** *T. vaginalis*, bacterial vaginosis (BV), candidal vulvovaginitis ([see Table 2](#))
- **Cervicitis:** *C. trachomatis*, *N. gonorrhoeae*
- **Urethritis** (typically assoc with cervicitis): gonococcal or NGU ([see Table 8](#))

Now what?

This patient requires a complete pelvic examination (sexually active + vaginal discharge).

You quickly refresh AHLTA and see that your next patient is a “NO-SHOW”, so you will have sufficient time to do her pelvic exam. Unfortunately, you cannot find Nurse Kira to help you set up your room. **What supplies do you need and where can you find them in the WR-B clinic?**

- Speculum, light, [Gen-Probe NAAT](#), test tube, saline, and lubricant.
- You can find these in Adolescent Exam Rms 5-6. *Ask Adolescent Staff for assistance!*

The patient’s pelvic exam showed normal external genitalia without any skin lesions. On speculum exam, you note no cervical motion tenderness but observe mucopurulent discharge from the endocervix, which you collect on a swab. Bimanual exam shows no uterine tenderness; you are unable to palpate the ovaries.

What is your working diagnosis? How would you manage the patient?

* **Mucopurulent cervicitis (MPC):** may present with c/o vaginal discharge, vaginal itching, irregular vaginal bleeding and dyspareunia. The presence of mucopurulent discharge from the endocervix is diagnostic.

* Can be caused by *N. gonorrhoeae*, *C. trachomatis*, *T. vaginalis*, and **HSV**; although in most cases an organism is not identified.

* An **NAAT** (nucleic acid amplification test) is the gold standard for diagnosing gonorrhea or chlamydial infection as causes of MPC. Diagnostic tests to evaluate for **STD coinfection** should also be performed (e.g. cause of **vaginitis**—see [Table 2](#), syphilis, and HIV Ab).

* [See Table 1 for treatment guidelines:](#) **azithromycin 1 gm PO OR doxycycline 100mg PO BID for 7 days AND cefixime 400mg PO OR ciprofloxacin 500mg PO OR ceftriaxone 125mg IM.**

How will you follow-up? . . . Are there any other treatment considerations?

* According to the 2010 CDC Treatment Guidelines, since Chlamydia or gonorrhea re-infection rates are high, infected females and males should be **re-tested 3mo after treatment.**

* [Expedited Partner Therapy \(EPT\):](#) All partners from the past 60 days — male and female! — should be evaluated and treated for the suspected or identified STD. **However, there is no EPT in the military.** Encourage non-military dependent partners to seek medical care.

* Encourage **immunizations**, including Hep A, Hep B, and HPV.

* [Additional note:](#) MD statutory rape requires a 4-year age difference and patient < 16 years-old.

Adolescent Board Review—Part III:

1. A 14-year-old boy requests treatment for his acne. He is using no medications and has no known drug allergies. Physical examination of the face reveals a few small inflammatory papules and numerous blackheads and whiteheads; there is no scarring. No acne lesions are present on the chest and back.

Of the following, the MOST appropriate treatment is

- A. benzoyl peroxide topically
- B. benzoyl peroxide topically and tetracycline orally
- C. benzoyl peroxide topically and tretinoin topically**
- D. clindamycin topically
- E. tretinoin topically

Acne affects 85% or more of adolescents and is the skin disorder most often treated by physicians. Multiple factors contribute to acne, including bacteria (that induce an inflammatory response, leading to erythematous papules and pustules, androgens (that cause increased sebum production), and abnormal follicular keratinization (that causes blockage within pores, resulting in blackheads and whiteheads). The treatment of acne depends on the types of lesions present (eg, blackheads/whiteheads, inflammatory, or both), the extent of disease (face versus face and trunk), and the severity of disease (more severe disease involves scarring and the presence of numerous and larger inflammatory lesions).

The patient described in the vignette has facial acne characterized by a few small inflammatory lesions and numerous obstructive lesions (ie, blackheads and whiteheads). As a result, he requires treatment with two agents, one to control inflammatory lesions and one to control obstructive lesions. Because the inflammatory component of his acne is mild and limited to the face, it may be treated topically with benzoyl peroxide applied each morning.

Alternatives might include a topical combination product (eg, benzoyl peroxide combined with either clindamycin or erythromycin) or possibly a topical antibiotic alone (although bacterial resistance to these agents when they are used without benzoyl peroxide is common).

Although benzoyl peroxide may be of some benefit in mild comedonal acne, the numerous lesions described for the patient indicate the need for a topical retinoid (eg, tretinoin or adapalene). Beyond this, many experts believe that topical retinoids are an essential part of any acne treatment program (regardless of lesion type observed) because they normalize the keratinization process and prevent new lesion formation. To avoid skin irritation, the patient is advised to apply the medication sparingly (a pea-sized amount is sufficient to cover the entire face) and use it every second or third night, progressing to nightly application as tolerated.

Benzoyl peroxide inactivates tretinoin and, therefore, should not be applied simultaneously (ie, it is applied in the morning and tretinoin at night). Systemic antibiotics such as tetracycline, erythromycin, doxycycline, minocycline, and others are indicated in the management of severe or widespread inflammatory acne or inflammatory disease that does not respond to appropriate topical therapy. Using topical clindamycin alone would not address the obstructive component of the patient's disease, just as tretinoin used alone may be insufficient to control inflammatory lesions.

2. A 16-year-old girl requests treatment for acne. She has used a nonprescription medication containing benzoyl peroxide without significant benefit. Physical examination reveals inflammatory lesions and open and closed comedones on the face and inflammatory lesions on the chest and back; there is no scarring. She has no known allergies to medications.

Of the following, the MOST appropriate treatment is

- A. benzoyl peroxide topically and tretinoin topically
- B. clindamycin topically
- C. doxycycline orally and tretinoin topically**

- D. isotretinoin orally
- E. tretinoin topically

Acne affects 85% or more of adolescents and is the skin disorder most often treated by physicians. Multiple factors contribute to acne, including bacteria (that induce an inflammatory response, leading to erythematous papules and pustules), androgens (that cause increased sebum production), and abnormal follicular keratinization (that causes blockage within pores, resulting in blackheads and whiteheads). The treatment of acne depends on the types of lesions present (eg, blackheads/whiteheads, inflammatory, or both), the extent of disease (face versus face and trunk), and the severity of disease (more severe disease is characterized by scarring and the presence of numerous and larger inflammatory lesions).

The girl described in the vignette has widespread inflammatory acne involving the face and trunk and comedones on the face. Therefore, she requires therapy with an oral antibiotic (to control inflammatory papules and pustules) and a topical retinoid (to treat the blackheads and whiteheads). Because she has inflammatory lesions on the face, chest, and back, the use of a topical antimicrobial agent such as benzoyl peroxide or clindamycin is impractical. Using a topical retinoid as monotherapy would not have a significant impact on the inflammatory component of the girl's disease.

When inflammatory acne is severe (ie, associated with numerous or large lesions or when scarring is present), extensive, or unresponsive to topical antibiotics, an oral antibiotic should be employed. As with other acne therapies, 6 to 8 weeks may be required before a significant clinical effect is observed. Once the appearance of new lesions has ceased or been satisfactorily reduced, the dose may be tapered gradually or withdrawn.

Although many antibiotics have been used to treat acne, those for which data regarding efficacy are most compelling are tetracycline, erythromycin, doxycycline, and minocycline. Tetracycline and erythromycin often are used as first-line agents at a dose of 250 to 500 mg twice daily (the higher dose usually is favored). Although both agents are well-tolerated by most patients, clinicians should be aware of dosing requirements (eg, tetracycline must be taken without food) and adverse effects (eg, erythromycin may cause gastrointestinal upset) that may affect their effective use. An additional concern about erythromycin is the high prevalence of bacterial resistance.

For those who have more severe disease or who fail to respond to or cannot tolerate tetracycline or erythromycin, doxycycline or minocycline often are effective. Both are initiated at a dose of 50 to 100 mg twice daily (the higher dose usually is favored). Again, clinicians should be aware of potential adverse effects of each agent. For example, doxycycline may cause photosensitivity reactions, and both agents may produce gastrointestinal upset, esophagitis, or pseudotumor cerebri. Minocycline also may cause dizziness or uncommon but significant adverse effects that can include pigmentation of the skin, teeth, or mucosa or autoimmune syndromes (eg, a serum sickness-like reaction, a hypersensitivity syndrome, lupus erythematosus-like reaction, and hepatitis). For patients who have severe inflammatory acne that does not respond to oral antibiotics, oral isotretinoin should be considered.

3. A 16-year-old boy comes to your clinic with complaints of a penile discharge and dysuria. He reports no fever or scrotal tenderness. On physical examination, he is afebrile. He has a thick yellowish discharge at the penile meatus, but no genital rashes or lesions, no scrotal tenderness or swelling, and no inguinal adenopathy.

Of the following, the MOST likely causative organism for his symptoms is

- A. herpes simplex 2
- B. human papillomavirus
- C. *Neisseria gonorrhoeae***
- D. *Treponema pallidum*
- E. *Trichomonas vaginalis*

The symptoms of mucopurulent or purulent penile discharge with dysuria and urinary frequency described for the boy in the vignette are indicative of urethritis. Urethritis may be separated based on infectious etiology into gonococcal (due to *Neisseria gonorrhoeae*) and nongonococcal forms. Nongonococcal urethritis (NGU) can be caused by *Chlamydia trachomatis*, *Ureaplasma urealyticum*, *Mycoplasma genitalium*, *Trichomonas vaginalis*, herpes simplex virus,

adenovirus, and enteric bacteria. Enteric bacteria (eg, *Salmonella*, *Shigella*) can be associated with penetrative anal sexual activity.

Although no symptoms or signs reliably distinguish between gonococcal urethritis and NGU, infection with *N gonorrhoeae* usually is characterized by copious purulent discharge, as exhibited by the boy described in the vignette. In NGU, the urethral discharge typically is more scant and mucoid. The absence of vesicles or ulcers makes herpes simplex infection less likely. NGU caused by *T vaginalis* accounts for approximately 2% to 5% of all NGUs. Balanitis and cutaneous lesions of the penis also are characteristic of *T vaginalis* infection. Primary infection with *Treponema pallidum* manifests as a chancre and tender inguinal adenopathy, and secondary stage infection is characterized by rash or condyloma lata. Exophytic lesions, not urethral discharge, signal infection with human papillomavirus.

4. An 18-year-old young man comes to your office with complaints of burning pain with urination over the past 24 hours. He has seen a small amount of yellowish discharge from his penis during this time. He also complains of some lower back pain over the past 48 hours. He denies fever or rashes, but his eyes are a little irritated. He is sexually active and uses condoms "most of the time." On physical examination, he is afebrile, his palpebral and bulbar conjunctivae are mildly injected, and his back is tender at the lower lumbar area, but there is no costovertebral angle tenderness. Genital examination reveals no scrotal tenderness and scant yellow discharge at the urethral orifice.

Of the following, the MOST likely cause of this patient's symptoms is

- A. *Chlamydia trachomatis*
- B. *Gardnerella vaginalis*
- C. *Neisseria gonorrhoeae*
- D. *Treponema pallidum*
- E. *Trichomonas vaginalis*

Urethritis can have infectious and noninfectious causes. Symptoms include mucopurulent or purulent discharge, dysuria, and urethral pruritus. Several organisms, including *Neisseria gonorrhoeae* and *Chlamydia trachomatis*, cause urethritis. *Ureaplasma urealyticum*, *Mycoplasma genitalium*, *Gardnerella vaginalis*, herpes simplex virus, adenovirus, and *Trichomonas vaginalis* are implicated in nonchlamydial, nongonococcal urethritis (NGU), but they are more difficult to detect than *N gonorrhoeae* and *C trachomatis*.

The constellation of conjunctivitis, urethritis, and arthritis reported for the young man in the vignette represents the classic symptoms of a form of reactive arthritis once called Reiter syndrome. The term reactive arthritis refers to rheumatic disorders that appear after an infection, but in which the responsible pathogen is not detected in the affected joint. *C trachomatis* is the only genital pathogen commonly accepted to be a cause of reactive arthritis.

N gonorrhoeae can cause septic arthritis or disseminated gonococcal infection (ie, a rash and tenosynovitis) but does not produce reactive arthritis. Although *T vaginalis* and *G vaginalis* may cause urethritis, they do not produce the other symptoms exhibited by the boy described in the vignette. Syphilis, caused by infection with *Treponema pallidum*, may affect bones congenitally (osteochondritis) or in late stages of the disease (with gummas, granulomatous lesions that involve bones as well as soft tissue or viscera) but does not produce urethral discharge or conjunctivitis.

Reactive arthritis caused by *C trachomatis* is treated with a single 1-g oral dose of azithromycin or with 100 mg doxycycline orally twice a day for 7 days, after testing for both *N gonorrhoeae* and *C trachomatis* is completed. This is also the recommended regimen for all NGUs. First-line treatment of uncomplicated gonococcal urethritis is accomplished with ceftriaxone 125 mg intramuscularly or cefixime 400 mg orally, both in a single dose.

5. A 17-year-old boy comes to your office from a homeless shelter with complaints of a penile discharge. He denies pain with urination, skin rashes, or joint pain. He claims to use condoms most of the time. On physical examination, he is afebrile and has no skin rashes or testicular or epididymal tenderness or swelling, but he has copious purulent urethral discharge. Results of testing for sexually transmitted infections will not be available for 2 days.

Of the following, the MOST appropriate presumptive treatment is

- A. acyclovir 400 mg orally TID for 7 to 10 days
- B. azithromycin 1 g orally in a single dose plus cefixime 400 mg orally in a single dose**
- C. benzathine penicillin 2.4 million units intramuscularly in a single dose
- D. doxycycline 100 mg orally BID for 7 days plus clindamycin 300 mg twice a day for 7 days
- E. metronidazole 2 g orally in a single dose

Urethritis is characterized by inflammation of the urethra and may be caused by infectious and noninfectious agents. Young men who have urethritis commonly are asymptomatic or they may complain of a mucopurulent or purulent discharge, dysuria, or urethral pruritus. *Neisseria gonorrhoeae* and *Chlamydia trachomatis* are common infectious causes of urethritis, and both may be present. The Centers for Disease Control and Prevention (CDC) *Sexually Transmitted Diseases Treatment Guidelines, 2006* recommend that all patients who have confirmed or suspected urethritis be treated for both gonorrhea and chlamydia. Further testing to determine the specific causative pathogens is recommended because both gonorrhea and chlamydia are reportable infections, and a specific diagnosis might enhance partner notification as well as treatment adherence. Culture, nucleic acid hybridization tests, and nucleic acid amplification tests can detect both of the organisms, and amplification tests can be performed on urine specimens.

Nongonococcal urethritis (NGU) is diagnosed when microscopy shows inflammation without the presence of gram-negative intracellular diplococci. *C trachomatis* is the etiologic agent in 15% to 55% of cases, but the cause of most cases of nonchlamydial NGU is unknown. Other infectious agents implicated in NGU include *Ureaplasma urealyticum*, *Mycoplasma genitalium*, *Trichomonas vaginalis*, herpes simplex virus, adenovirus, and enteric bacteria (that might be associated with penetrative anal sexual activity). Diagnostic testing and treatment for these organisms are reserved for when specific infections are suspected (such as with known partner contact) or when NGU is not responsive to therapy.

Recommended treatment for urethritis includes a single 1-g oral dose of azithromycin or doxycycline 100 mg orally twice a day for 7 days. Both are highly effective for chlamydial urethritis, but infections with *M genitalium* may respond better to azithromycin, and single-dose therapy is preferred both for adherence and for the ability to conduct direct observed treatment. The recommended treatment for *N gonorrhoeae* is ceftriaxone 125 mg intramuscularly or cefixime 400 mg orally as single-dose therapy. Because the young man in the vignette is homeless and diagnostic testing results will be unavailable for several days, empiric treatment of his urethritis is advisable. Because of increasing fluoroquinolone resistance in the United States and Canada, the CDC no longer recommends using these antimicrobials for the treatment of uncomplicated gonococcal urethritis and advises that all patients be treated with either cefixime or ceftriaxone, regardless of the patient's travel history or sexual behavior. Acyclovir, benzathine penicillin, clindamycin, or metronidazole is not recommended for empiric therapy.

6. A 16-year-old sexually active girl presents with lower abdominal pain of 2 days' duration. She finished her last menstrual period a few days ago and notes that it was heavier and more painful than usual. On physical examination, she is afebrile, has normal vital signs, and exhibits diffuse lower abdominal tenderness with no rebound or guarding. Bimanual examination elicits pain on movement of her cervix and palpation of her adnexa, with no palpable masses.

Of the following, the MOST appropriate next step is to obtain a

- A. complete blood count and erythrocyte sedimentation rate
- B. Gram stain of any cervical discharge
- C. pelvic ultrasound
- D. test for *Neisseria gonorrhoeae* and *Chlamydia trachomatis***
- E. urine and blood culture

Pelvic inflammatory disease (PID) is difficult to diagnose because of the spectrum of symptoms and signs. Many women have mild or nonspecific symptoms or signs. Laparoscopic examination is the most precise method to make the diagnosis but is invasive and not indicated for most patients. In a woman complaining of lower abdominal pain, the minimum criterion to make the diagnosis on pelvic examination is cervical motion tenderness, uterine tenderness, or adnexal tenderness. The girl described in the vignette meets the criterion for PID. Additional criteria used to support the diagnosis include an oral temperature greater than 38.4°C, mucopurulent cervical discharge, presence of numerous

white blood cells on saline microscopy of vaginal secretions, an elevated erythrocyte sedimentation rate, elevated C-reactive protein value, and laboratory documentation of cervical infection with *Neisseria gonorrhoeae* or *Chlamydia trachomatis*.

To reduce damage to the reproductive tract, empiric treatment for PID should be initiated in sexually active young women at risk for sexually transmitted infections if they are experiencing pelvic or lower abdominal pain, no cause of the illness other than PID can be identified, and they have the minimum criteria outlined previously.

The identification of *N gonorrhoeae* or *C trachomatis* from a cervical specimen would support the diagnosis of PID in the girl described in the vignette. Newer tests, employing nucleic acid amplification of DNA or RNA from these organisms, are more sensitive than cultures and are specific. In addition to cervical swab specimens, these tests can be performed on urine and vaginal swab specimens. Transcription-mediated amplification also can be used to test self-obtained vaginal swabs for *C trachomatis* and *N gonorrhoeae*.

Findings on complete blood count and erythrocyte sedimentation rate are nonspecific. Pelvic ultrasonography generally is performed if the diagnosis of PID is in question or a complication is suspected. Ultrasonography may yield normal findings, particularly early in the disease process, or reveal thickened or fluid-filled fallopian tubes, with or without free fluid in the pouch of Douglas. Pelvic ultrasonography also can identify a tubo-ovarian complex, suggesting pelvic infection. Gram stain of cervical discharge to detect gonococcal infection provides nonspecific information because gram-negative diplococci may represent *N vaginalis*, part of the normal flora. Urine and blood cultures are only helpful to rule out other diagnoses.

7. A 17-year-old young woman comes to your clinic after having been diagnosed with pelvic inflammatory disease the preceding day. She was prescribed doxycycline 100 mg orally twice a day for 14 days and given ceftriaxone 250 mg intramuscularly in a single dose at the time of diagnosis. Since this visit, she vomited the doxycycline, has been unable to retain any fluids, has developed a fever, and has had worsening abdominal pain. External genital examination findings are normal.

Of the following, the MOST appropriate next step is to

- A. administer a repeat dose of the oral doxycycline and send the patient home
- B. administer benzathine penicillin G 2.4 million units intramuscularly in a single dose and send the patient home
- C. change the oral medication to azithromycin 1 g given in a single dose and send the patient home
- D. hospitalize the patient and begin intravenous cefotetan 2 g plus doxycycline 100 mg every 12 hours**
- E. hospitalize the patient for observation and add acyclovir 400 mg orally TID for 7 to 10 days

Pelvic inflammatory disease (PID) treatment regimens must provide broad-spectrum coverage of likely pathogens, including *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. Oral therapy can be used for women who have mild-to-moderately severe acute PID; the Centers for Disease Control and Prevention (CDC) report that clinical outcomes of women treated with oral therapy are similar to those seen in women treated with parenteral therapy. The young woman described in the vignette was treated appropriately as an outpatient, but subsequently was unable to tolerate an outpatient regimen and did not appear to respond clinically to an oral regimen (eg, doxycycline and azithromycin). In addition, a single dose of benzathine penicillin is not adequate therapy for PID.

These are two of the criteria suggested by the CDC that indicate the need for hospitalization of women who have PID. Other criteria for hospitalization include when surgical emergencies (such as appendicitis) cannot be excluded; the patient is pregnant; the patient has a severe illness, nausea and vomiting, or high fever; and the patient has a tuboovarian abscess. Although many practitioners may prefer to hospitalize adolescents who have PID, no available evidence exists to support this strategy. Younger women who have mild-to-moderate acute PID have similar outcomes in response to outpatient or inpatient therapy, and clinical response to outpatient treatment is similar for older and younger women. The CDC states that the decision to hospitalize adolescents who have acute PID should be based on the same criteria, as stated above, used for older women. Because the patient has no signs or symptoms of herpes simplex virus infection, oral acyclovir with hospitalization is not indicated.

8. A 16-year-old girl comes to your office with complaints of a thick white vaginal discharge. She is sexually active with one partner with whom she always uses condoms. She has no complaints of fever or abdominal pain, but she reports external "burning" of the vaginal area when she urinates. On physical examination, she is afebrile. Pelvic examination reveals fiery red labia majora and minora and an adherent white discharge on the vaginal walls, with a moderate amount of white discharge in the vaginal vault. The speculum examination is uncomfortable for her, but there is no cervical motion, uterine, or adnexal tenderness, and the cervix shows no friability or discharge.

Of the following, the MOST likely pathogen responsible for this patient's symptoms is

- A. *Candida albicans*
- B. *Chlamydia trachomatis*
- C. group A *Streptococcus*
- D. *Neisseria gonorrhoeae*
- E. *Trichomonas vaginalis*

Candidal vulvovaginitis is a common problem for young women and usually is caused by *Candida albicans*, although other candidal species also may be involved. Typical symptoms of vulvovaginal candidiasis include a thick, white, creamy vaginal discharge; pruritus; vaginal discomfort; dyspareunia; and external dysuria. The diagnosis is suggested clinically by the previously noted symptoms and the presence of vulvar swelling, erythema, and fissures or erosions, as described for the girl in the vignette. The diagnosis may be confirmed by a wet preparation or Gram stain showing pseudohyphae or yeasts or by culture.

Chlamydia trachomatis and *Neisseria gonorrhoeae*, both of which may present with abnormal vaginal discharge, produce cervical, not vaginal infections. *C trachomatis* and *N gonorrhoeae* infections can be asymptomatic, but they often present with a yellowish purulent or mucopurulent endocervical discharge, friability of the endocervix, and cervical motion tenderness; vulvar inflammation does not occur. Group A *Streptococcus* (*S pyogenes*) is a respiratory pathogen that can cause vaginitis in prepubertal girls, but rarely causes vaginal discharge in the adolescent. Infection with *Trichomonas vaginalis* usually causes a diffuse, malodorous, yellow-green vaginal discharge with vulvar irritation, although some affected women can have minimal or no symptoms.

9. A 15-year-old girl complains of vaginal pruritus and a discharge that has worsened over the past 2 weeks. Past medical history reveals a recent urinary tract infection that was treated with an antibiotic. She says she has a monogamous relationship with her boyfriend, so they do not use condoms, and he has no symptoms. Physical examination reveals normal-appearing external genitalia and a discharge visible at her introitus. On speculum examination, she has a frothy discharge in her vagina and a normal-appearing cervix. Results of her bimanual examination are normal. You obtain a normal saline wet mount of the discharge which shows a motile organism.

Of the following, the MOST important next step, in addition to prescribing medications, is to

- A. discuss treatment for the boyfriend
- B. encourage the practice of douching
- C. repeat the urine culture
- D. notify the public health department
- E. obtain pelvic ultrasonography

Vaginitis in the adolescent, unlike the prepubertal child, usually has a specific cause. A vaginal discharge may be the presenting symptom for cervicitis or a vaginitis and usually is related to a sexually transmitted infectious agent. The characteristics of the discharge for the patient described in the vignette and the results of the microscopic examination of vaginal secretions suggest that she has a ***Trichomonas vaginalis* infection**.

A physiologic discharge, which is the result of increasing estrogen concentrations during puberty, is whitish and mucoid and occurs without other symptoms. The characteristics of the discharge change during the menstrual cycle, becoming more copious and watery at mid-cycle and stickier and scantier in the second half of the cycle. *T vaginalis* causes a white or yellow frothy discharge and, occasionally, punctuate hemorrhages on the cervix. It may be associated with pruritus. *Candida* vaginitis results in a milky-to-curdy discharge that also is associated with pruritus. Bacterial

vaginosis, which may not be sexually transmitted, results in a malodorous, grayish discharge. Rarely, a foreign body, such as a retained tampon, may be the cause of a discharge that is foul-smelling and bloody. Cervicitis results in a visible discharge at the external cervical os and typically is caused by *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, or herpes simplex virus.

Because most of these conditions are sexually transmitted, an important part of the treatment plan is the need to treat the patient's partner. Many sexually transmitted infections, including *Chlamydia*, gonorrhea, and syphilis, require notification of the local public health department when the laboratory results are obtained, but this is not universally so for *T vaginalis*. The practice of douching should be discouraged because it alters the vaginal pH and the normal flora, increasing the risk of acquiring infections. Pelvic ultrasonography may help in the staging of pelvic inflammatory disease, but it is not otherwise helpful for diagnosing vaginitis or cervicitis. A change in vaginal pH and the presence of clue cells are two of the diagnostic criteria for bacterial vaginosis. The presence of white blood cells indicates an infection and is common with a trichomonal infection; hyphae indicate a candidal infection. Cystitis is common after the onset of sexual activity. One previous infection, however, does not warrant a follow-up culture.

10. You are seeing a 16-year-old girl for complaints of a malodorous vaginal discharge. She has no abdominal pain or urinary or gastrointestinal symptoms. Results of routine screening for gonorrhea and chlamydia were negative 3 months ago, and she has not been sexually active since that time. She explains that she douches regularly. On pelvic examination, you note a homogenous gray discharge coating the vaginal walls, normal-appearing cervix, and no uterine or adnexal tenderness on bimanual examination. The pH of her vaginal secretions is 4.8. You obtain a saline wet mount which shows clue cells.

Of the following, the MOST likely diagnosis is

- A. bacterial vaginosis**
- B. chemical vaginitis
- C. chlamydial cervicitis
- D. physiologic leukorrhea
- E. vaginal candidiasis

The patient described in the vignette has bacterial vaginosis, based on the presence of three of the four Amstel diagnostic criteria. The four criteria are: a thin, homogenous, gray-white discharge uniformly adherent to the vaginal walls; a vaginal pH greater than 4.5; a positive whiff test (fishy or amine odor on addition of 10% potassium hydroxide); and more than 20% clue cells on microscopic examination. Clue cells are epithelial cells that are coated with bacteria, creating a granular appearance. The presence of three or more of the criteria indicates the presence of bacterial vaginosis.

Bacterial vaginosis is not sexually transmitted, although it is associated with sexual activity. Because it is not inflammatory, no white blood cells are seen on microscopy. It is caused by overgrowth of several anaerobic bacterial species (eg, *Mobiluncus* and *Gardnerella vaginalis*) and a decrease in hydrogen peroxide-producing *Lactobacillus*. Although often asymptomatic, affected patients may complain of a malodorous discharge. Douching may increase the risk of bacterial vaginosis by causing changes in the vaginal flora and disturbing the vaginal protective systems, which are based on hydrogen peroxide-producing lactobacilli. Such disruption of the vaginal microbiology permits overgrowth of the anaerobic and aerobic bacteria responsible for bacterial vaginosis. Because bacterial vaginosis has been linked to the acquisition of human immunodeficiency virus, preterm delivery, pelvic inflammatory disease, and other adverse effects, douching could play an important role in multiple health problems among sexually active women.

When examining a patient who complains of a vaginal discharge, it is important to view the cervix. Purulent discharge at the cervical os and easy bleeding of the cervix when swabbed (friability) suggests cervicitis rather than vaginitis. Cervicitis is caused by *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and herpes simplex virus. Vaginal candidiasis usually presents as a pruritic, thick, white or milky discharge. Physiologic discharge, (leucorrhea) is asymptomatic and associated with normal findings on microscopy. Contact of the vaginal mucosa with certain chemicals (eg, soaps or bubble baths) may result in complaints of vaginal burning or swelling. These symptoms also may be related to an allergic reaction (eg, to latex) or to irritation as with tight clothing.