Abstract:
Rates of chlamydia and gonorrhea infection are at an all-time high among adolescents. Because many infections are asymptomatic, the Centers for Disease Control and Prevention recommend at least yearly screening in sexually active female adolescents and all sexually active male adolescents if in high-prevalence clinical settings or in populations with high burden of infection. Adolescents often access the emergency department for care, many of whom are at high risk, making the emergency department a strategic setting to screen for sexually transmitted infections. Nucleic acid amplification testing is the Centers for Disease Control and Prevention–recommended test for chlamydia and gonorrhea. Empiric treatment should be considered carefully and initiated if indicated. Partner treatment is also important, and expedited partner therapy may be an option.

Keywords:
adolescents; emergency department; chlamydia; gonorrhea; sexually transmitted infections

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1522-8401
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Diagnosis and Treatment of Sexually Transmitted Infections in the Emergency Department

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Sexually transmitted infections (STIs) have reached record high numbers, disproportionately affecting adolescents.[1] Adolescents often seek care in the emergency department (ED) and are comfortable receiving sexual health care in the ED setting.[2-4] This chapter will focus on ED-based screening and treatment of chlamydia and gonorrhea, the 2 most commonly reportable infections.

STI BURDEN IN ADOLESCENTS

STIs reached an all-time high in 2017, with adolescents bearing the burden of infection.[1] Although adolescents account for only a quarter of the sexually active population, they comprise *half* of the 20 million STIs diagnosed annually.[1] Some of the largest increases in infection rates have been in 15- to 19-year-olds, among whom chlamydia rates increased by 7.5% and gonorrhea rates increased by 12.8% in 2017 from the prior year.[1]

WHY SCREEN IN THE ED?

Screening for STIs would ideally be conducted during health maintenance examinations with primary care clinicians. However, few adolescents visit their primary provider, and when they do, less than 25% report confidential time alone with providers to discuss sensitive health topics.[5,6] However, approximately 15 million adolescents use the ED, and more than 1 million high-risk adolescents access the ED as their usual source of health care.[2,3] Adolescents who seek care in the ED report early sexual debut, multiple partners, and infrequent condom use.[7,8] Given these high-risk behaviors and frequent use of EDs by adolescents, it is imperative to optimize STI detection and treatment in this patient population.

Although gonorrhea and chlamydia can present with genitourinary symptoms, such as penile or vaginal discharge or dysuria, most infections are asymptomatic. The overall prevalence of STIs among *symptomatic* adolescents who present to the ED is as high as 26%.[9] Therefore, any adolescent in the ED with symptoms suggestive of an STI should be appropriately tested and empirically treated (Table 1). The prevalence of STIs among *asymptomatic* adolescents presenting to the ED for non–STI-related complaints is 5-10%.[10-12] Because asymptomatic infection among adolescents seeking care in the ED setting is so prevalent, implementation of ED-based STI screening programs should be strongly considered.

The Centers for Disease Control and Prevention (CDC) recommends that females <25 years old should be screened at least annually if sexually active. The screening recommendations for sexually active men are testing if in high-prevalence clinical settings or in populations with high burden of infection.[13] Given these recommendations and the rising rates of chlamydia and gonorrhea, innovative approaches for the detection and treatment of STIs in the ED (a nontraditional setting for routine STI care) are critically needed.

CHLAMYDIA AND GONORRHEA DIAGNOSIS

The CDC recommends the nucleic acid amplification test (NAAT) as the first-line test for chlamydia and gonorrhea detection in both men and women.[13] The NAAT, with a sensitivity of 90-99% and specificity of 97-100%, has superior test characteristics to the traditionally used culture.[14,15] It can also provide more timely diagnosis and is more cost-effective than culture in preventing the sequelae of STI.[13,15]

When testing for symptoms related to the vagina or penis, the optimal source is a vaginal swab in females and a first-catch urine in men.[13,15] Self-collected vaginal swabs are as sensitive and specific as clinician-collected vaginal swabs.[13,16-18] Self-collected vaginal swabs are also highly acceptable among women.[19,20] The CDC states that first-catch urine is an option for women; however, up to 10% of cases might be missed.[19,21,22] However, for asymptomatic screening in the ED, first-void urine is most appropriate. Oropharyngeal and rectal swabs should be considered in adolescents engaging in receptive anal or oral sex.[13] Self-collected rectal swabs have comparable performance compared to clinician-collected swabs and are highly acceptable among patients.[13,23]

UNCOMPLICATED CHLAMYDIA AND GONORRHEA TREATMENT

Timely and appropriate treatment for gonorrhea and chlamydia is critical for the prevention of adverse sequelae and continued transmission (Table 1). Untreated infections can lead to complications such as pelvic inflammatory disease (PID), infertility, and increased susceptibility of human immunodeficiency

TABLE 1. CDC treatment guidelines for uncomplicated chlamydia or gonorrhea.

	Recommended	Alternative
Chlamydia	Azithromycin 1 g orally once	Erythromycin base 500 mg orally 4×/d for 7 d
		Erythromycin ethylsuccinate 800 mg orally 4×/d for 7 d
	OR	Levofloxacin 500 mg orally daily for 7 d
		Ofloxacin 300 mg orally twice a day for 7 d
	Doxycycline 100 mg orally twice a day for 7 d	
Gonorrhea	Ceftriaxone 250 mg intramuscularly once	Cefixime 400 mg orally once PLUS azithromycin 1 g orally once
		Gemifloxacin 320 mg orally once PLUS azithromycin 2 g orally once
	PLUS	Gentamicin 240 mg intramuscularly once PLUS azithromycin 2 g orally once
	Azithromycin 1 g orally once	

virus.[13] The recommended treatment for uncomplicated chlamydia infection is 1 dose of azithromycin 1 g orally which can be given in the ED.[13] An alternative regimen is doxycycline 100 mg orally twice a day for 7 days.[13] Azithromycin is preferred because of greater compliance, as it is only 1 dose and can be given in the ED. However, doxycycline may have greater efficacy for rectal chlamydia.[13] Dual therapy with azithromycin 1 g orally once and ceftriaxone 250 mg intramuscularly once is the recommended treatment for gonorrhea.[13] There is increasing concern for gonococcal resistance to cephalosporins; thus, dual therapy is based on the premise that using 2 antimicrobials with different mechanisms of action may slow the emergence and spread of resistance.[13] If ceftriaxone is unavailable, the alternative is cefixime 500 mg orally in a single dose.[13] Patients should abstain from sex for 7 days after treatment, and clinicians should use the opportunity to discuss safer sex (such as condoms).

Treatment of chlamydia and gonorrhea in the ED can be challenging. At this time, reliable point-of-care testing for these infections is not readily available. Therefore, clinicians must decide whether to treat empirically during the ED visit or delay treatment until NAAT results are available, which may require 3 to 4 days. Both options provide benefits and disadvantages. The benefit of empiric care is that it ensures that the patient is treated. However, unnecessary antibiotic exposure can lead to antibiotic resistance. Gonorrhea is now resistant to fluoroquinolones, the once-recommended treatment, and there is increasing concern of cephalosporin resistance. Although there have not been verified clinical treatment failures to cephalosporins in the United States, there have been cephalosporin failures in other parts of the world.[13,24] Overtreatment rates for chlamydia and gonorrhea in adolescents in the ED are approximately 21%; however, in studies of adolescents and adult women, overtreatment was as high as 86%.[25,26] The sensitivity and specificity for clinician judgment for presumptive treatment of chlamydia or gonorrhea for adolescents in the ED are low at 68% and 55%, respectively.[27]

Delaying treatment until NAAT results are available has disadvantages as well. If treatment is delayed, the patient needs to be notified, which poses the challenge of obtaining accurate contact information while maintaining the confidentiality of a mature minor. The second challenge is the need for the patient to return to the ED for treatment or proceed to a pharmacy, which may be difficult for a teen. Additionally, if an adolescent does have chlamydia or gonorrhea but is not treated until results confirm infection and the patient is contacted, the sexually active teen may unknowingly spread the infection prior to treatment. Delaying treatment may lead to undertreatment, which was found to range from 32% to 43%.[25,27] The primary benefit of delaying treatment is that it avoids unnecessary antibiotic use. Thus, clinicians must weigh the benefits and risks of empiric treatment on a case-by-case basis and consider developing ED-based systems to improve result notification and treatment if therapy occurs after patient discharge.

Partner Treatment

Pivotal to chlamydia and gonorrhea treatment and infection control is the treatment of partners. It is essential that partners are treated to avoid reinfection of the patient and other partners. Ideally, infected patients should inform their partners, who should then seek care for testing and treatment (known as *standard referral*). However, when it is unlikely that the partner(s) will comply with this plan of care, "expedited partner therapy," or EPT, is an option. EPT allows the clinician to treat the partner(s) of patients with certain STIs without an evaluation of the partner(s). Three randomized controlled trials of adolescents and adults, recruited from various clinics and EDs, have demonstrated decreased reinfections with EPT compared to standard referral.[28-30] Chlamydia reinfection in women in the EPT arm was 12% compared to 15% in the standard referral arm in one study, and in another study of both heterosexual men and women, reinfection was 11% in the EPT arm compared to 13% in the standard referral arm.[28,29] Gonorrhea reinfection was 3% in the EPT arm compared to 11% in the standard referral arm.[28] Finally, chlamydia or gonorrhea reinfection in heterosexual men was lower in the EPT group (14%) compared to the standard referral group (24%).[30]

The 2 most common forms of EPT are: (1) prescription EPT, in which the patient is provided a prescription to give to his/her partner(s), and (2) medication EPT, also described as "patient-delivered partner therapy," in which medication is dispensed directly to the patient to give to his/her partner(s). The CDC supports EPT for chlamydia and gonorrhea and have endorsed it for heterosexual partners since 2006,[31] but state laws vary for which infections EPT is allowed. At time of publication, EPT is strictly prohibited in 2 states,[32] whereas it is permissible in 42 states and the District of Columbia. EPT is characterized as "potentially allowable" in the remaining states and Puerto Rico.[32] With legal statutes in constant change, it is important for clinicians to be familiar with individual state EPT laws.

Pelvic Inflammatory Disease

PID is a complication of untreated cervicitis, chiefly due to chlamydia and gonorrhea, but other

TABLE 2. PID diagnosis criteria.

Minimum Criteria	Additional Criteria
Cervical motion tenderness	Temperature >38.3°C
Uterine tenderness	Abnormal cervical mucopurulent discharge or cervical friability
Adnexal tenderness	Presence of abundant numbers of white blood cells on saline microscopy of vaginal fluid
	Elevated erythrocyte sedimentation rate
	Elevated C-reactive protein
	Laboratory documentation of cervical infection with chlamydia or gonorrhea

organisms may be implicated.[13] Diagnosis of PID can be difficult because of the wide variation and nonspecific character of symptoms. Sexually active female adolescents who present with pelvic or lower abdominal pain should be presumed to have PID if there is cervical motion tenderness, uterine tenderness, or adnexal tenderness on examination and if no other cause can be identified.[13] The sensitivity of diagnosis is increased if additional criteria are present, including fever, abnormal cervical mucopurulent discharge or cervical friability, elevated acute phase reactants, abundant white blood cells on vaginal fluid microscopy, or confirmed gonorrhea or chlamydia infection by laboratory testing. Diagnostic criteria are summarized in Table 2.

Untreated PID can lead to significant morbidity and mortality including chronic pain, infertility, and death. Therefore, clinicians should maintain a low threshold for treatment. Inpatient or outpatient treatment depends on specific patient characteristics. Patient hospitalization is recommended for: (1) surgical emergencies that cannot be excluded; (2) presence of tubo-ovarian abscess; (3) the patient is pregnant; (4) severe illness, nausea and vomiting, or high fever; (5) inability to tolerate or follow outpatient oral regimen; and/or (6) failed outpatient treatment. Treatment of PID requires a longer course than uncomplicated chlamydia or gonorrhea cervicitis.[13] If outpatient treatment is appropriate, women should be treated with ceftriaxone 250 mg intramuscularly once and doxycycline 100 mg orally twice a day for 14 days, with or without metronidazole 500 mg orally twice a day for 14 days.[13] Parenteral regimens are listed in Table 3.

TABLE 3. Parenteral antimicrobial regimens for PID.

Recommended regimens

Cefotetan 2 g intravenously every 12 h PLUS
Doxycycline 100 mg orally or intravenously every 12 h

Cefoxitin 2 g intravenously every 6 h PLUS
Doxycycline 100 mg orally or intravenously every 12 h

Clindamycin 900 mg intravenously every 8 h PLUS
Gentamicin loading dose intravenously or intramuscularly (2 mg/kg), followed by a maintenance dose (1.5 mg/kg) every 8 h

Alternative regimens

Ampicillin/sulbactam 3 g intravenously every 6 h PLUS
Doxycycline 100 mg orally or intravenously every 12 h

SUMMARY

STI rates are rising, and adolescents carry the burden of infection. Patients are most often asymptomatic. Given the dire consequences of untreated infection, it is important to follow CDC guidelines and implement STI screening programs in nontraditional settings. The ED is uniquely positioned to provide such screening, as high-risk patients access care in the ED, and this clinical setting is often an adolescent patient's only health care contact. NAATs are the recommended test for diagnosis. Vaginal swabs are the best source for testing females; however, first-catch urine is also acceptable for STI screening. First-catch urine samples for males are the recommended specimen for both screening and testing. Oropharyngeal and rectal swabs should be considered depending on the type of sexual contact. Empiric treatment should be considered, accounting for risks and benefits of presumptive therapy. Finally, treatment of a patient's partner(s) is essential. If it is unlikely that partners will seek care, EPT or expedited partner therapy may be a viable option but requires knowledge of local policy.

CONFLICT OF INTEREST

Authors have no conflicts of interest to disclosure.

ACKNOWLEDGEMENT

Pickett: National Cancer Institute, National Institutes of Health, Grant Number R01 CA181047-S2 Diversity Supplement.

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