Pelvic Inflammatory Disease

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Practice Gaps

1. The U. S. Centers for Disease Control and Prevention (CDC) provides evidence-based, expert-driven guidelines for effective management of pelvic inflammatory disease (PID); however, clinician adherence to the guidelines has been problematic.
2. PID practice guideline adherence is an international problem, as evidenced by a 2012 audit in the United Kingdom demonstrating that 55.5% of patients with PID did not receive care according to the British Association of Sexual Health and HIV treatment recommendations. Clinician behavior can be enhanced with the use of institutionally driven protocols, especially those that include onsite dispensing of a full course of medications.
3. Women seeking infertility services who report a history of unexplained and untreated abdominal pain are significantly more likely to have tubal infertility than women without such history; therefore caution should be used in dismissing mild symptoms (mild non-specific abdominal pain, vaginal discharge, bleeding or dyspareunia) among sexually active patients who may be at risk for PID.

Objectives

After completing this article, readers should be able to:

1. Describe the epidemiology and pathogenesis of pelvic inflammatory disease (PID).
2. Recognize the clinical features of PID.
3. Develop a management strategy for adolescent patients who have PID.
4. Carefully weigh the options for the disposition of patients who have PID.

Abbreviations:

CDC:	Centers for Disease Control and Prevention
CPP:	chronic pelvic pain
CT:	computed tomography
IM:	intramuscular
IUD:	intrauterine device
IV:	intravenous
KOH:	potassium hydroxide
NAAT:	nucleic acid amplification testing
PEACH:	Pelvic Inflammatory Evaluation and Clinical Health
PID:	pelvic inflammatory disease
STI:	sexually transmitted infection

Prologue

Justine is a 17-year-old girl who presents for evaluation of lower abdominal pain that has been increasing over the past few days. Earlier today she was eating and drinking, but has developed some nausea in the past couple of hours without vomiting. She has had soft, regular bowel movements that are free of blood and mucus. She denies dysuria, but has had some light vaginal discharge that started about 1 week ago. Justine continues to have regular periods. She also recently started having sex with her boyfriend of 9 months. The couple uses condoms about 60% of the time. She reports that when they had sex 2 days ago it was painful. Her partner does not have any symptoms.

Her mom is aware that she is having sex, though not happy about it. The HEADSSS assessment (*H*ome/Environment, *E*ducation/Employment/Eating, *A*ctivity, *D*iet/*D*rugs, *S*exuality, *S*uicide/Depression, *S*afety/Exposure to Violence) reveals that Justine is an adolescent from a 2-parent, working-class family. She is a cheerleader and a soloist in her church choir. She tried alcohol once at a party, but otherwise does not engage in any alcohol, tobacco, or drug use. She is a strong student with plans to attend college to become a nurse. Her mother is in the waiting room.

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On clinical examination, the patient's temperature is 100.1°F, blood pressure 110/65 mm Hg, heart rate is 78 beats per minute, respirations 24/minute, and BMI 21. Clinical examination is remarkable for a soft abdomen with bowel sounds, but marked pain on light and deep palpation in the left lower quadrant with rebound tenderness and guarding. Pelvic examination reveals female genitalia without external lesions and a sexual maturity rating of Tanner V. On the speculum examination, there is discharge in the vault and covering the cervix. There is no frank pus emerging from the os. On bimanual examination, she has cervical and left adnexal tenderness. There is no palpable adnexal fullness, enlargement, or mass.

Pregnancy testing is negative. Urine dipstick shows a specific gravity of 1.020, pH of 5, small amount of blood and trace leukocytes without nitrites. Urine is sent for culture and endocervical specimens are collected for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* nucleic acid amplification testing (NAAT). Vaginal swabs are obtained for a wet prep, potassium hydroxide (KOH) prep, and NAAT testing for *Trichomonas vaginalis*. Vaginal pH is 5.5. Office-based wet prep reveals red blood cells and sheets of white blood cells, but no evidence of bacterial vaginosis (clue cells) or *T vaginalis* infection. KOH prep is negative.

Clinical Problem

This patient meets the current diagnostic criteria for a presumptive diagnosis of pelvic inflammatory disease (PID). Although there are problems with following epidemiologic trends for PID as a nonreportable sexually transmitted infection (STI), available data suggest that prevention efforts have reduced the rates of PID in the United States through asymptomatic STI screening and early treatment. Currently, an estimated 800,000 cases occur annually. (1) Despite the reduction in overall cases, PID rates remain disproportionately higher among adolescent girls and minority women. (2)(3) As an example, the general risk of acquiring salpingitis for a 15-year-old sexually active girl is 1 in 8, whereas that for a 24-year-old woman is 1 in 80. (4)

PID is of particular clinical and public health importance because it is associated with significant short- and long-term sequelae. Short-term sequelae include the development of tubo-ovarian abscesses requiring triple antibiotic therapy, perihepatitis, periappendicitis, and protracted hospitalization. Long-term sequelae include ectopic pregnancy, chronic pelvic pain (CPP), and tubal infertility because of scarring. Further, each episode of PID increases the risk of these long-term complications.

Available international data have shown that the impact of PID among women in developing countries also is significant. For example, hospitalization data from sub-Saharan Africa indicate that PID accounts for 17% to 40% of all gynecologic admissions, that 80% of infertility is associated with previous PID, and that 30% to 50% of women of reproductive age are infertile. (5) Future fertility is of cross-cultural value to adolescents and their families (6)(7) and the pediatric clinician's ability to diagnose and treat adolescent patients who have PID appropriately is critical for fertility preservation and prevention of long-term sequelae.

Pathogenesis

The term PID refers to a spectrum of clinical disorders of the upper reproductive tract, including endometritis, salpingitis, tubo-ovarian abscesses, and pelvic peritonitis. These health states are caused when organisms ascend from the lower reproductive tract (vagina/cervix) into the endometrium, fallopian tubes, and related structures. Although PID is classified as a sexually transmitted infection and occurs rarely in female patients who have never initiated intercourse, the polymicrobial etiology of PID may include STIs, genital flora, enteric organisms, and agents typically causing respiratory infections. The role of *N. gonorrhoeae* and *C trachomatis* as causative agents in PID has been well established in the literature; however, new data from women clinically diagnosed as having mild-moderate PID indicates that almost 70% of patients have non–*C trachomatis*/non-*N. gonorrhoeae* PID. (8)

Although recommended laboratory testing for patients suspected of having PID still centers on *C trachomatis* and *N. gonorrhoeae* testing, *Mycoplasma genitalium* and *Ureaplasma urealyticum* have long been associated with laparoscopically confirmed PID and tubal infertility. Organisms recovered from the upper genital tract of women who have PID include *Gardnerella vaginalis, Actinomyces israelii, Prevotella bivia, Escherichia coli, Campylobacter fetus*, and group B-D streptococci, staphylococci, *Bacteroides* species, and *Peptostreptococcus* species. Respiratory organisms recovered in patients who have PID have included *Haemophilus influenzae, Streptococcus pneumoniae*, and group A streptococcus. The development of abscesses and pelvic peritonitis are late clinical events resulting from the mix of anaerobic and facultative bacteria that often cause infection in conjunction with STIs.

Clinical factors associated with the ascension of microbes from the lower reproductive tract include frequency of intercourse, bacteriospermia (bacteria in semen), menstrual timing, diagnostic and therapeutic surgical procedures that disrupt the normal cervical barrier (e.g., abortion, intrauterine device [IUD] insertion, hysterosalpingogram), nonuse of hormonal contraceptives, hygiene practices (e.g., douching), and disturbance of normal vaginal flora from bacterial vaginosis.

Hormonal contraceptive users generally have a lower risk for the development of PID. Use of hormonal contraceptives increases the cervical mucus barrier and reduces the frequency and amplitude of subendometrial myometrial contractions, compared with those observed with ovulatory cycles. Although it has been noted that diagnostic and therapeutic surgical procedures account for up to 12% of PID cases, the risk of PID associated with the IUD is limited primarily to the first 20 days after insertion. Postsurgical infection rates have led to protocols for STI screening before or during placement of IUDs and the prescription of prophylactic antibiotics following surgical procedures (e.g., abortion) are standard of care. (9)

Diagnosis

The clinical diagnosis of PID is notoriously imprecise, but the use of surgical procedures that allow for greater precision (such as laparoscopy) are no longer considered a part of standard assessment. To complicate matters further, patients often do not present with the classically described PID presentation. An acute presentation with severe lower abdominal pain resulting in a shuffling gait or the "chandelier sign" on clinical examination is rare. The heterogeneity of infectious agents now causing PID is thought to contribute to the varied clinical presentations for which symptoms can range from mild to severe. Although infertility as an adverse outcome has been well documented in patients who have PID both prospectively and in retrospective studies of women with infertility, there is an additional subset of infertile women who experience the sequelae of PID without the classic findings.

Women seeking infertility services who report a history of unexplained and untreated abdominal pain were significantly more likely to have tubal infertility than women without such a history. (10) Thus, caution should be used in dismissing mild symptoms (mild nonspecific abdominal pain, vaginal discharge, bleeding, or dyspareunia) among sexually active patients who may be at risk for PID.

Patients without the classic features of PID who are at risk for an STI and who have positive STI screening (*N. gonorrhoeae*/*C trachomatis*) or bacterial vaginosis are significantly more likely to have histopathology consistent with endometritis. (11) As a result, nonclassical "silent" or subclinical infection has emerged as an important phenomenon in clinical practice.

Over time, the diagnostic criteria for PID in the Centers for Disease Control and Prevention (CDC) Sexually Transmitted Disease Treatment Guidelines (Table 1) have broadened to account for these observations and to increase the sensitivity of the clinical examination. The CDC currently recommends that empiric treatment for PID should be initiated for sexually active women at risk for STIs who present with lower abdominal or pelvic pain and who meet the minimum criteria of having uterine, adnexal, or cervical motion tenderness without an alternative explanation for their symptoms.

Additional supportive criteria include fever (>38.3°C), abnormal cervical or vaginal mucopurulent discharge, white blood cells on saline microscopy, an elevated sedimentation rate or C-reactive protein, and existing documentation of *C trachomatis* or *N. gonorrhoeae* infection at the time of clinical assessment (Table 1). (12)

Laboratory evaluation of the patient suspected of having PID should be sufficiently broad to detect other common medical conditions that might be contributing

Table 1. Diagnostic Criteria for Pelvic Inflammatory Disease Based on the Centers for Disease Control (CDC) Guidelines

Sexually Active Female Patients At Risk for Sexually Transmitted Infections Pelvic or Lower Abdominal Pain No Other Cause Identified

Minimum diagnostic criteria
- **Uterine tenderness OR**
- **Adnexal tenderness OR**
- **Cervical motion tenderness**

Supportive clinical findings
- **Fever (>38.3°C)**
- **Abnormal cervical or vaginal mucopurulent discharge**
- **White blood cells on saline microscopy**
- **Elevated sedimentation rate and/or C-reactive protein**
- **Known positivity for Gonococcus (*N. gonorrhoeae*) or *C trachomatis***

Workowski KA, Berman S, Centers for Disease Control and Prevention (CDC). Sexually transmitted diseases treatment guidelines, 2010. *MMWR Recomm Rep.* 2010;59:1–110.

to the patient's clinical status. Specimen collection for screening asymptomatic patients has become increasingly easy in nonclinical settings, given the availability of vaginal and urine-based NAAT testing. However, it is still important that the pediatric clinician be prepared and equipped to perform a complete and thorough evaluation, including a speculum examination for visualization of the cervix and vagina and collection of endocervical and vaginal specimens, followed by a bimanual examination.

It is critical also for pediatricians to conduct a sufficiently detailed, nonjudgmental, confidential, and adolescent-centered clinical history. This evaluation should include a 12-point review of systems, sexual and reproductive history, and psychosocial assessment to reduce the imprecision involved in diagnosing PID, while enhancing clinical decision making.

Useful laboratory tests include a pregnancy test, endocervical *N. gonorrhoeae/C trachomatis* screening, wet prep and KOH prep, vaginal pH, urinalysis, and urine culture. A pregnancy test is important to determine if the patient's discomfort may derive from an intrauterine or ectopic pregnancy and to aid decision-making for the final disposition of the patient (need for hospitalization, medications prescribed). The complete blood count and erythrocyte sedimentation rate or C-reactive protein may be useful in determining the degree of inflammation and severity of illness. A wet prep with KOH is useful for determining the presence of red blood cells, white blood cells, clue cells (bacterial vaginosis), *T vaginalis* organisms, or yeast. The vaginal pH may be elevated and the whiff test can be positive if the patient has bacterial vaginosis. A small subset of patients may have a concurrent urinary tract infection; so collection of a clean-catch urine specimen for urinalysis (and culture if urinalysis is positive) will allow for appropriate antibiotic coverage to treat 1 or both infections. In addition to the listed testing, pelvic sonography is indicated for individuals suspected of having an ectopic pregnancy, tubo-ovarian abscess, or other severe illness.

In patients who also report having experienced sexual assault or abuse at the time of the PID assessment, it will be important to obtain bacterial cultures simultaneously for confirmation of positive NAATs. The NAATs are not approved for use in legal cases despite their high sensitivity and specificity in diagnosing *N. gonorrhoeae/C trachomatis* infection.

More specific diagnostic tests for PID include laparoscopy, endometrial biopsy to assess histopathology for evidence of endometritis, and transvaginal sonography or magnetic resonance imaging to assess for thickened, fluid-filled tubes and free pelvic fluid or tubo-ovarian abscesses. Doppler imaging studies can help to determine the presence of tubal hyperemia suggestive of pelvic infection. Given the proximity of the bowel and bladder to the uterus and contiguous structures, the differential diagnosis of PID is quite extensive (Table 2). Additional radiologic or consultative services may be required to exclude other serious conditions or PID-related complications.

Short-term complications of PID include perihepatitis (Fitz-Hugh-Curtis syndrome) and periappendicitis. Although the pathogenesis of perihepatitis is unclear, up to 15% of patients who have PID will experience this finding. Patients usually present with mild to severe right upper quadrant abdominal pain, and examination reveals tenderness to palpation, guarding, and mild enlargement of the liver. In these cases, abdominal ultrasound and chest radiography may be indicated to assess for liver/gall bladder disease and pleural effusions, respectively. Transaminases may be slightly elevated but usually are within normal limits. Perihepatitis is most often associated with

Table 2. Differential Diagnosis of Acute Pelvic Pain by Systems

System	Condition
Gynecologic	Pelvic inflammatory disease • Endometritis • Salpingitis • Perihepatitis • Periappendicitis • Tubo-ovarian abscess Ectopic pregnancy Intrauterine pregnancy Endometriosis Hemorrhagic ovarian cyst Ovarian cyst Ovarian tumor Ovarian torsion Tubal torsion Septic abortion Vaginal foreign bodies Hematometrocolpos Chemical irritants
Urinary	Urinary tract infection Acute pyelonephritis
Gastrointestinal	Acute appendicitis Acute cholecystitis Mesenteric lymphadenitis
Heme/Vascular	Pelvic thrombophlebitis
Other	Functional abdominal pain Sexual assault Sexual abuse

a *N. gonorrhoeae* or *C trachomatis* infection, which will further solidify the diagnosis of PID when frank genital symptomatology is not present.

Patients who have acute salpingitis are also at risk for developing periappendicitis. Most diagnoses of periappendicitis are diagnosed postoperatively in patients found to have tubal abnormalities intraoperatively, positive STI testing, and the absence of an inflammatory mass consistent with a true appendicitis. If appendicitis is suspected, however, blood work to assess inflammation, computed tomography (CT), and surgical consultations are warranted. In this instance, patients should have ultrasonography before CT to assess for other ovarian causes, such as ectopic pregnancy, tubal or ovarian torsion, and tubo-ovarian abscess, particularly if they are at low risk for appendicitis. CT is notoriously poor for diagnosing reproductive health problems involving ovarian structures and this stepwise approach prevents unnecessary radiation exposure.

It is also recommended highly that patients who have PID be tested for syphilis and HIV infection. Because many patients may be seen in urgent care or emergency department settings that do not perform HIV testing, it will be important for clinicians to counsel and test patients for HIV during the post-PID reassessment visit. Now that the burden for the consent process has been improved in many regions of the country, performing HIV testing while the patient is getting other blood work drawn during the baseline evaluation is easier. Many adolescent-focused practices now offer confidential rapid oral or serum HIV testing, which may enhance acceptance of HIV testing.

Management

The CDC provides evidence-based, expert-guided recommendations for both inpatient and outpatient treatment approaches based on the illness severity. Although older CDC STD treatment guidelines indicated that all adolescents with PID should be hospitalized for treatment, 2010 guidelines recommend hospitalization for patients presenting with surgical emergencies, pregnancy, lack of response to antimicrobial therapy, inability to follow or tolerate an outpatient regimen, severe illness (e.g., fever, nausea/vomiting), or suspected or confirmed tubo-ovarian abscess.

The antibiotic regimens for PID treatment have not changed in recent years and efficacy has been demonstrated in both laboratory and clinical studies. It is important to note that in 2007, the CDC recommended discontinuation of fluoroquinolones for PID treatment because of *N. gonorrhoeae* resistance. Although there are also general concerns about *N. gonorrhoeae* resistance to available cephalosporins, the CDC maintains the use of these strategies as the optimal approach to medication management. The currently recommended treatment regimens per the CDC are outlined in Table 3. (12)

For patients having more complicated infections, such as a tubo-ovarian abscess, additional anaerobic coverage with antibiotics, such as clindamycin, is indicated. In this instance, clindamycin should be continued at discharge to complete 14 days of therapy using the oral preparation. (12) Most patients who have an IUD in place can be

Table 3. Recommended Medication Regimens for Treatment of Pelvic Inflammatory Disease

Parenteral treatment
Regimen A
Cefoxitin 2 g IV every 6 h OR Cefotetan 2 g IV every 12 h
Doxycycline 100 mg po BID × 14 d ±
Metronidazole 500 mg po BID × 14 d
Regimen B
Clindamycin 900 mg IV+
Gentamicin loading dose IV or IM (2 mg/kg), followed by a maintenance dose (1.5 mg/kg) every 8 h OR
Gentamicin single daily dosing (3–5 mg/kg/d)
Alternate regimen
Ampicillin/sulbactam 3 g IV every 6 h +
Doxycycline 100 mg po BID × 14 d
Oral treatment
Regimen A
Ceftriaxone 250 mg IM (single dose) +
Doxycycline 100 mg po BID × 14 d ±
Metronidazole 500 mg po BID × 14 d
Regimen B
Cefoxitin 2 g IM + Probenecid 1 g po (single dose)
Doxycycline 100 mg po BID × 14 d ±
Metronidazole 500 mg po BID × 14 d
Alternate regimen
Other parenteral third-generation cephalosporin (eg, ceftizoxime or cefotaxime) +
Doxycycline 100 mg po BID × 14 d ±
Metronidazole 500 mg po BID × 14 d

BID=twice a day, d=day(s), h=hour(s), IM=intramuscular, IV=intravenous, po=by mouth.
Workowski KA, Berman S, Centers for Disease Control and Prevention (CDC). Sexually transmitted diseases treatment guidelines, 2010. *MMWR Recomm Rep.* 2010;59:1–110

treated effectively using the antibiotics without removing the IUD.

In addition to the antibiotic regimens, the CDC recommends that all patients who have PID be reassessed within 72 hours of initiating therapy. Outpatients who are not clinically well or at least improving by 72 hours may require additional evaluation and/or hospitalization for parenteral therapy. (12) The clinician should suspect a tubo-ovarian abscess, peritonitis, or other cause for the pelvic pain. In this instance, a repeat bimanual examination and ultrasonography are important next steps in management. Adolescent medicine or gynecologic consultation also may be indicated to assist with management of patients on a general pediatric service.

Does Outpatient Treatment Work for Adolescents?

Although much of what we know about PID and its complications has been gleaned from the work of Weström in Lund, Sweden, (13) the PEACH (*P*elvic Inflammatory Disease *E*valuation *a*nd *C*linical *H*ealth) Trial has provided seminal data on the microbiology, histopathology, clinical management, and longitudinal outcomes for women who have PID in the United States. This trial has greatly influenced the decision to treat adolescents with mild to moderate disease in the outpatient setting. Even so, it remains to be seen whether or not this approach is optimal for adolescents who may find self-management in the outpatient setting challenging.

The trial examined primarily whether or not women with mild to moderate PID receiving antibiotics in the hospital for a few days followed by outpatient therapy did better than those receiving oral antibiotics in the outpatient setting. Because women in the inpatient and outpatient treatment arms appeared to have similar outcomes, the study and the cost-effectiveness analyses that emerged using PEACH trial data concluded that it would not be cost-effective to treat patients of any age with mild to moderate disease as inpatients. (14)

Although this may be true given the low-cost nature of outpatient treatment with doxycycline, there are several issues that the pediatrician must consider when interpreting the data in the context of managing adolescent patients:

1. The PEACH trial was an efficacy trial and not an effectiveness trial, which means that data is unavailable on those who were unable to undergo the rigors of the trial (eg, endometrial biopsy), were ineligible, or refused to participate. Patients were also called every 3 months for 7 years to assess trial outcomes, which may have influenced patient behaviors following PID. Translational studies to evaluate effectiveness of outcomes among "all comers" in a real world context have yet to be performed.
2. In the STD treatment guidelines, the CDC indicates there are no differences for younger patients with PID. However, further analysis of the PEACH trial data indicates that although the study was open to adolescents as young as 14 years, the mean age of the 208 patients younger than 19 years who actually enrolled in the trial was 17.8 (SD 1) years. (15) This observation suggests that the findings may not be applicable to early and middle adolescents who have PID.
3. Overall, women in the PEACH trial did not fare well over the course of the 7 years: 21% had PID again, 19% experienced infertility, and 43% experienced CPP. (15,16) Adolescents had a shorter time to pregnancy and recurrent disease than adult women(15) and those who had recurrent PID were 5 times more likely to experience CPP. (17)
4. Finally, many adolescents hospitalized in pediatric centers with adolescent care units often receive additional clinical services beyond intravenous (IV) antibiotics. Such enhanced care often includes nursing education and support, assistance disclosing the PID diagnosis to parents or guardians, social work consultation, risk reduction counseling, assistance with partner notification and treatment, and scheduling of outpatient follow-up appointments before hospital discharge. It is simply unclear how this adolescent-specific standard of care approach or inclusion of a short evidence-based STI risk reduction intervention during hospitalization may have changed the longitudinal outcomes for patients in the trial.

Despite these considerations and the fact that adolescents represent only about one fourth of all patients diagnosed as having PID, universal inpatient hospitalization with an optimized evidence-based behavioral intervention is unlikely to reemerge as a standard treatment recommendation. Still, pediatricians must realize that the responsibility for final disposition is theirs. Use of inpatient therapy for adolescents who have PID who by CDC standards have mild-moderate disease and are "unable to follow or tolerate" an outpatient management plan or have severe disease should be admitted for short-term management. Based on these criteria, some institutions have created guidelines supporting admission of

adolescents <15 years of age because of concerns about the developmental capacity of early adolescents to follow an outpatient treatment plan without adult support. (18)

Another major problem affecting both adolescents and adult women facing a PID diagnosis in the outpatient setting is inadequate treatment by clinicians. A single-center study demonstrated that 40% of adolescent patients with PID in a large academic center received inadequate care per CDC guidelines in 2005. (19) Additional analyses published in 2011 using the National Hospital Ambulatory Survey have since shown that the problem is even more pervasive for all women in the United States, and that 70% of patients receive inadequate care for PID based on CDC guidelines. Most notable was that the prescribed antibiotic regimens were problematic, and that many women received neither antibiotics nor analgesia for treatment. Among all women, adolescents fared the worst. (20)

Sadly, adherence to guidelines is an international problem. A 2012 audit in the United Kingdom demonstrated that 55.5% of patients who had PID did not receive care according to the British Association of Sexual Health and HIV treatment recommendations. (21) Fortunately, clinician behavior can be enhanced with the use of institutionally driven treatment protocols, especially those that include onsite dispensing of full courses of medications. (18)(22)

An additional consideration for pediatricians is that management of PID in the outpatient setting requires several critical behaviors by patients to be most effective. An adolescent girl will need to (1) take the antibiotics twice daily for 14 days; (2) return for follow-up care within 72 hours; (3) notify her partner so that he can be treated while she is being treated; (4) temporarily abstain from sexual intercourse until both she and her partner are treated; and (5) make lifestyle changes to prevent a future episode of PID through enhanced partner communication and condom use.

Even if the clinician prescribes a course of treatment consistent with the CDC recommendations and the adolescent professes the self-efficacy for following the recommendations, adolescents often do not adhere without support. Many adolescents with PID have already had an STI or pregnancy and few are using contraception; (23) so the 72-hour visit becomes a critical time to ensure PID recovery and engage in STI risk reduction and family planning counseling.

Fortunately, some brief interventions for PID have been devised that improve the rates of partner treatment and can be administered in any setting through which patients can access a computer. The 6-minute PID Outreach video was developed by using the tenets of the Health Belief Model and has been found in a randomized controlled trial to increase partner treatment. (23) The video intervention is publically accessible at the following Internet address: http://www.youtube.com/watch?v=lGuXF8vpujQ

Research on easier alternative treatment strategies is promising. One Brazilian trial has demonstrated that ceftriaxone 250 mg intramuscularly (IM) plus 1 g of azithromycin given orally at baseline and repeated in 2 weeks is as effective in 14-day cure rates as the standard CDC-recommended regimen of ceftriaxone 250 mg IM plus oral doxycycline 100 mg twice daily for 14 days. (24) There have been no confirmatory studies, and longitudinal outcomes using this method have not been explored. If proven to be clinically effective, this approach may improve adherence for adolescents who struggle with medication completion and enhance adherence to the 72-hour follow-up visit.

Prognosis

The prognosis for PID is highly dependent on the ability of adolescents to seek and receive timely care and to prevent future episodes of STI or PID. Each episode (and its degree of severity) contributes to the potential development of sequelae, such as infertility. (25)(26) Sexually active adolescents who have had PID must not only engage in active biannual screening for STIs to reduce the risk for developing another episode of PID, but also make a commitment to consistent condom use. For those who have recurrent STIs or PID, the mean time to the next diagnosis is about 1 year. (27) Use of evidence-based interventions that support and empower adolescents to negotiate sexual decision-making and use of condoms may be important adjuncts to clinical practices that better allow for successful outpatient treatment of adolescents with PID.

Epilogue

Justine is diagnosed with PID and is given ceftriaxone 250 mg IM and 100 mg of doxycycline orally with a plan for her to complete 14 days of twice-daily oral doxycycline. In addition to the testing for *N. gonorrhoeae* and *C trachomatis*, she also has syphilis and HIV testing. While waiting for her prescriptions, she is counseled on partner notification and treatment, afforded the opportunity to watch the PID outreach video online to aid in self-management at home, and scheduled for a follow-up visit

within 72 hours. She discloses her diagnosis to her mother, who is upset but extremely supportive. As Justine is leaving the office, she vomits and small pill fragments are seen in the emesis. Given her inability to tolerate outpatient therapy, Justine is admitted to the hospital's adolescent unit for short-term management with IV antibiotics.

You realize that her boyfriend, who came to visit her during the hospitalization, also is your patient. You arrange to screen him for STIs and treat him for urethritis during the visit, pending the results of her STI testing. Her STI testing is positive for *C trachomatis*. You counsel them both individually and together about the risks for PID and provide condoms at the end of your conversations. Justine makes the anticipated rapid recovery within 72 hours of initiating IV antibiotics. You reinforce the importance of completing all medications to clear the infection. You make arrangements to see Justine 3 days after discharge in your office to reassess her clinical status, provide risk reduction and family planning counseling, and follow-up on pending laboratory results.

Summary

- Pelvic inflammatory disease (PID) is a common upper reproductive health disorder disproportionately affecting adolescents.
- Common adverse reproductive health consequences associated with PID include tubal infertility, chronic pelvic pain, and ectopic pregnancy
- Centers for Disease Control and Prevention (CDC) provides evidence-based and expert-driven treatment guidelines for effective management of PID, but clinician adherence to the guidelines has been poor.
- Clinicians should determine carefully the need for inpatient versus outpatient dispositions based on severity of illness and the adolescent's ability to tolerate an outpatient treatment regimen.

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PIR Quiz

This quiz is available online at http://www.pedsinreview.aappublications.org. NOTE: Learners can take *Pediatrics in Review* quizzes and claim credit online *only*. No paper answer form will be printed in the journal.

New Minimum Performance Level Requirements

Per the 2010 revision of the American Medical Association (AMA) Physician's Recognition Award (PRA) and credit system, a minimum performance level must be established on enduring material and journal-based CME activities that are certified for *AMA PRA Category 1 Credit™*. In order to successfully complete 2013 *Pediatrics in Review* articles for *AMA PRA Category 1 Credit™*, learners must demonstrate a minimum performance level of 60% or higher on this assessment, which measures achievement of the educational purpose and/or objectives of this activity.

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1. You counsel a 16-year-old girl who has fever and cervical motion tenderness on pelvic examination. You note on review of her medical chart that this is the third episode with a similar presentation. In addition to treating her acute condition, you are MOST likely to discuss her risk for
   A. Appendicitis
   B. Ectopic pregnancy
   C. Menorrhagia
   D. Septic shock
   E. Vaginitis

2. A 17-year-old girl presents with lower abdominal pain, fever, and adnexal tenderness. Testing for gonococcus and *Chlamydia trachomatis* is negative. She eats lunch without difficulty while waiting for laboratory results. You are MOST likely to tell her that she
   A. Does not have a serious infection
   B. Needs abdominal magnetic resonance imaging
   C. Should be hospitalized for intravenous antibiotics.
   D. Should take antibiotics to treat a pelvic inflammatory infection
   E. Will be admitted for laparoscopy

3. An 18-year-old woman has fever, moderate lower abdominal pain, vaginal discharge, and adnexal tenderness. Although uncomfortable, she has been keeping down solid foods, as well as the ibuprofen tablets she has taken for her pain. An office pregnancy test is positive. Appropriate management of this patient would be
   A. Immediate computed tomographic scanning
   B. Hospital admission for further evaluation and therapy
   C. Injection of ceftriaxone after cultures are obtained
   D. Outpatient antibiotic therapy that is safe during pregnancy
   E. Urgent blood work to assess inflammation

4. A 14-year-old girl has severe right upper quadrant abdominal pain, and examination reveals tenderness to palpation and guarding. Abdominal ultrasonography shows no gallbladder disease. She is most likely to also have

   A. Ascites
   B. Jaundice
   C. Liver failure
   D. Mild hepatomegaly
   E. Pancreatitis

5. An 18-year-old woman has fever, lower abdominal pain, vaginal discharge, and adnexal tenderness. She is able to eat without emesis. You elect to treat her with antibiotics as an outpatient. She has no allergies to medications. You give her an injection of ceftriaxone and a prescription for doxycycline. In addition, you are MOST likely to prescribe

   A. Amoxicillin
   B. Ciprofloxacin
   C. Erythromycin
   D. Metronidazole
   E. Repeat dose of ceftriaxone in 24 hours

Corrections

In the December 2012 article "Hypertension" (Brady T. Pediatr Rev. 2012;33(12):541–552), figure 1's caption should include, "Reprinted from Feld LG, Corey H. Hypertension in childhood. Pediatr Rev. 2007;28(8):283–298) and Adapted from The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. Pediatrics. 2004;114:555–576." The journal regrets this error.

In the January 2013 article "Adolescent Sexuality" (Tulloch T, Kaufman M. Pediatr Rev. 2013;34(1):29–38), there is an error in the table on page 32. The pregnancy rate for the United Kingdom should read 43.0. The journal regrets the error.

Pelvic Inflammatory Disease

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