

Best Practice

TOPICS IN REVIEW

A primary care approach to adolescent health care

Adolescents are generally thought to be healthy, but at least 20% of North American adolescents have a serious health problem.¹ Most adolescent morbidity and mortality are due to intentional and unintentional injuries; alcohol, tobacco, and other drug misuse; depression; unplanned pregnancies; and sexually transmitted infections.² These problems are often rooted in behaviors that are diagnosed not with a laboratory test or a physical examination but through open communication between the physician and the adolescent. In the past few years, several guidelines have been developed for the care of adolescents,³⁻⁶ each emphasizing the importance of psychosocial screening.

Compared with other age groups and relative to their proportion of the population, adolescents in the United States underuse the health care system. Adolescent men are less likely than young women to visit physicians.⁷⁻⁹ They also tend to use emergency departments, free clinics, and family planning clinics as their source of primary care. Adolescents are more likely to be uninsured than any other age group.¹⁰⁻¹³ Physicians' visits with teens are typically short, with a mean duration of 16 minutes. Counseling or education is given to teens on only 50% of visits with their physicians. Adolescents report being more concerned about their physicians' characteristics than characteristics of the site or system. Teens prefer health care professionals who are honest, knowledgeable, and experienced and who wash their hands in the teens' presence. They want physicians who treat all patients equally, who emphasize confidentiality, and who relate well to teens.¹⁴

We describe the approach to adolescent care that we use in training residents and students who rotate through the Venice Family Clinic, Los Angeles, a free clinic with more than 70,000 total visits a year. We train nurse practitioners; pharmacy students; residents from internal medicine, pediatrics, family medicine, and obstetrics and gynecology; and third- and fourth-year medical students. Our goal is to provide trainees with the tools to enable them to feel comfortable and competent interviewing and examining teens. This approach is based on the training we provide, years of practice and teaching, and the literature cited.²

APPROACH TO ADOLESCENTS

If adolescents do not trust their physicians, they will not feel comfortable discussing sensitive health concerns.^{14,15} To earn this trust, the physician must be seen as an ad-

Summary points

- The encounter should begin with the teen and parents discussing the teen's past medical history and parents' concerns
- Parents should be asked to wait in the waiting room and be reassured that they will be invited back in to discuss any remaining issues
- Once alone with the teen, establish ground rules for confidentiality
- The teen's history yields far more information than the physical examination and results of diagnostic tests

vocate for the teen. Issues of consent, confidentiality, and its limits are best discussed early in the visit.^{14,15} A useful beginning is an initial introductory meeting with both the adolescent and parents. During this initial encounter, we establish what the parents' concerns are, obtain a family history, and ask about previous medical problems. This begins the transition from parent to teen as the medical historian. We next ask parents to wait in the waiting room so that we can speak privately with the adolescent. We interview the adolescent alone, perform a physical examination with a chaperone, and then invite the parents back into the room at the conclusion of the visit to discuss our findings.

It is important for teens to establish a separate relationship with the physician. On occasion, parents may express some resistance, and we then stress the importance of an adolescent having a physician with whom the teen can confide and discuss difficult issues that may arise in the future. We reassure parents that at the end of our encounter we will invite them back into the room to discuss any remaining issues.

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Types of minors' consent laws

Consent by nature of the condition:	Consent by virtue of the minor's status
Emergency	Emancipated by age
Sexually transmitted disease prevention, diagnosis and treatment; and/or reportable communicable or contagious disease	Emancipated by judicial decree
AIDS treatment and/or HIV testing	Living away from home and managing own financial affairs
Pregnancy prevention, diagnosis and treatment (excluding sterilization)	Is or has been married
Abortion	Member of the armed forces
Rape, incest, sexual abuse	A parent
Alcohol and/or drug abuse treatment	A high school graduate
Mental health (admission to hospital and/or outpatient treatment)	Mature minor

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If the parents are not present and have not given us explicit permission to treat their child, consent may be implied by virtue of the nature of the condition or the status of the teen (box). Laws about consent vary from state to state and practitioners should become familiar with the law in those states in which they provide care.

Once alone with the adolescent, we explain that our conversations are confidential, to the extent allowed by law.¹⁶ The law requires that only if we discover that an adolescent is in danger of hurting himself or herself or others does such a revelation need to be reported to the appropriate authorities.

During our discussion with the adolescent, we listen carefully to both what is said and what is not said. Conversation begins with a nonthreatening discussion of topics that may be of interest to the adolescent, such as inquiring about extracurricular activities or favorite music. The goal is to assist the adolescent in identifying potentially risky behaviors that may endanger their health and assessing their motivation to change those behaviors. We use the technique of motivational interviewing, which provides adolescents with feedback on risks and promotes a sense of responsibility for their health.¹⁷ Teens want factual information rather than authoritative instruction on what to do. Avoid using slang because most teens will be aware that this is not your customary language. In addition, by the time most physicians have heard of a purported teen expression, it is likely already outdated.

We use five premises that our trainees find useful when caring for adolescents (see shaded box).

In offices or clinic settings with a variety of patients of different ages, scheduling times when only teens will be seen may be helpful. Teens feel more comfortable having other teens in the visiting area. This also provides an opportunity to play educational videotapes, have different devices or materials out for display, or provide educational

brochures that may not be appropriate for younger age groups. Placing sensitive information in individual examination rooms rather than the waiting room gives teens the opportunity to take or read it unobserved by other teens.

We take advantage of an adolescent's visit to our clinic by offering a psychosocial screening examination. A psychosocial assessment tool has been developed to assess issues of home, education, activities, drugs, sexuality, suicide or depression, and safety (HEADSSS).¹⁸ This assessment tool provides an entree to discuss the major psychosocial issues of adolescents (table 1). Although these questions are personal, teens are reported to prefer to discuss these issues with physicians.^{19,20} Assurances of confidentiality increase the number of adolescents who will discuss sensitive information about sexuality, substance misuse, and mental health and those who are willing to seek future health care. For this reason, we avoid administering written questionnaires in the waiting room.

Points to watch for in the HEADSSS assessment

If the adolescent has run away from home or spent long periods of time home alone, more attention needs to be directed to issues related to drug misuse, sexuality, and depression. A sudden, unexplained drop in grades or frequent absences should lead to further exploration of sexuality, drug misuse, family problems, or depression. School failure should be explored as a possible early indication of other risk behaviors in high school students.²¹ Questions about friends, the use of free time, and attendance at parties can provide indirect information about sexual activity, drug misuse, and mental health. We ask about self-image, including body building and associated steroid use and self-perception of weight. Reports suggest that anabolic steroid use is increasing in middle and high school students.²²

The five "F"s

1. Explain **Facts**: adolescents should have a clear understanding of their illness.
2. Explore **Fears** adolescents may have concerning their illness or its effects on their life. They may also be worried about their body image, their identity, their peers, or other interpersonal relationships.
3. Address any **Fables**: adolescents may be misinformed about their illness or about adolescence; eg, the effects of masturbation.
4. Explore the adolescent's relationship with their **Family**. What are communication and trust like within the family unit? How does the teen settle conflicts that arise at home?
5. Ask how the adolescent views the **Future**. We make it clear that we are accessible, and the teen is given a contact phone number.

Table 1 *Assessing issues of home, education, activities, drugs, sex, suicide or depression, and safety*

Issue	Sample question
Home	Where do you live? Who do you live with? Do you share a bedroom? With whom? How do you get along with the people you live with? How much time do you spend at home? What do you and your family argue about? Can you go to your parents with problems? Have you ever run away from home?
Education	What grade are you in? What grades are you earning? Have they changed? What are your best and your worst classes? Why? Do you need extra help in school? Do you work after school or on weekends? Have you ever failed any classes or a grade? Do you ever cut classes?
Activities	What do you do for fun? What activities are you involved in during and after school? Are you active in sports? Do you exercise? Who do you do fun things with? Do you have a best friend? Who do you hang out with? Who are your friends? Who do you go to with problems? What do you do on weekends? Evenings?
Drugs	Do you drink coffee or tea? Do you smoke cigarettes? Have you ever smoked one? Have you ever tasted alcohol? When? What kind and how often? Do any of your friends drink or use drugs? What drugs have you tried? Have you ever injected drugs or steroids? When? How often do you use them? How did you pay for the drugs?
Sexual activity or sexual identity	Have you ever had sex with men? Women? Both? Have you ever had sex unwillingly? How many sexual partners have you had? How old were you when you first had sex? Have you ever been pregnant? Have you ever had an infection resulting from sex? Do you use condoms or another form of contraception or sexually transmitted disease (STD) prevention? (use specific names for STDs). Have you ever traded sex for money, drugs, clothes, or a place to stay? Have you every been tested for the human immunodeficiency virus, or HIV? Do you think it would be a good idea to be tested?
Suicide or depression	How do you feel today on a scale of 0 to 10 (0 being very sad and 10 being very happy)? Have you ever felt less than 5? What made you feel that way? Did you ever think about hurting yourself, that life wasn't worth living, or hope that when you went to sleep you wouldn't wake up again?
Safety	Do you regularly wear seat belts when riding or driving in a car? Do you skateboard or rollerblade, and if so, do you wear protective gear? Does anyone at home own a gun? If so, where is it kept? Does it have a safety latch on it? Has anyone ever hurt you or intentionally destroyed something you value? Do you ever feel unsafe at home, school, or at work or play? How do you and your parents resolve conflicts? Have you ever been hit, pushed, or shoved? Has anyone ever touched you in a private place against your will?

When discussing the topic of alcohol, tobacco, or other substance misuse, remain nonjudgmental. Those who care for adolescents should be familiar with the illicit drugs that are used in the community. Alcohol is still the most commonly misused substance in this age group. Aside from its direct toxic effects, alcohol misuse may lead to harmful

effects such as impaired automobile, bike, or skateboard operation; depression; and other risky behaviors. More than two thirds of teens have had at least one sexual partner by age 18 years, and nearly one quarter have had more than four sexual partners.² The sexual partner of teen girls is usually an older man. In fact, in one study, two thirds of



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teenaged mothers had an adult partner more than four years older.³ It is useful to acknowledge that questions might be embarrassing but that their answers are confidential and that they are being asked to provide them with appropriate health care. We ask questions such as, “Other teenaged girls have told me that they feel pressured to have sex with their boyfriends. Have you ever felt this way?” A frank discussion of condom use, including a demonstration of how to use condoms, is an integral part of a discussion of safe sex. Studies have shown that when physicians take the time to discuss and demonstrate the appropriate use of condoms, teens are more likely to engage in safe sex than those teens who had not had such discussions or demonstrations.²³

By concentrating on risky sexual practices rather than sexual identity, physicians emphasize that the practice is risky, not the individual or their sexual preference. Gay or lesbian teens may not be in a stage of developing their sexual identity and may not feel comfortable being identified as gay or lesbian. Clinicians need to be aware that, in our society, being gay or bisexual is possibly associated with depression; an increased risk of suicide; social stigma; and physical, sexual, or emotional abuse.²⁴⁻²⁶ Assess both past and current feelings of depression and risk for suicide.²⁷ The physician can also discuss other safety measures such as wearing seat belts, fighting with friends, domestic violence, and sexual abuse.²⁸

PHYSICAL EXAMINATION

A physical examination in an otherwise healthy teenager is unlikely to yield much useful information. Some indications for a pelvic examination include a direct request from the patient, the patient is sexually active, or the patient has abdominal or pelvic pain. It does not need to be done routinely on every adolescent woman. There is debate in the adolescent literature about whether urine screening in an asymptomatic adolescent can replace a routine yearly pelvic examination and Papanicolaou smear.²⁹⁻³¹ Most evidence-based guidelines recommend yearly Papanicolaou smears in sexually active teens.

A teen’s first pelvic examination should be done by a physician who is comfortable and experienced in performing pelvic examinations. The examination is best explained to the teen while she is in her street clothes and carried out with a chaperone present, not a parent. We ask teens if they want their parent or someone else in the room for support. The examination should be scheduled with plenty of time for questions. We provide a mirror for the teen so that she may see what we are doing if she so wishes.

It is often more comfortable for a teen’s first pelvic examination to perform the bimanual examination before the speculum examination. To minimize the patient’s anxiety about the examination, begin by touching a neutral area before examining the genitalia, and avoid sudden motions. If a plastic speculum is being used, the teen should be warned that it might make a cracking or clicking sound when opened.

PREVENTION

Many issues related to prevention could be discussed (table 2). Diet, physical appearance, exercise, and anticipatory counseling are topics that have universal appeal. It can be helpful for physicians to discuss the physical and emotional changes that adolescents might expect to go through during the next several years (anticipatory guidance).

Several issues need to be discussed before closing the interview. Before calling the parents back into the consultation room at the end of the visit, consult with the adolescent about what you will discuss and what will remain confidential. Both the adolescent and the parents should be offered a chance to ask questions. The parents may ask to see the physician alone. This can be accomplished most comfortably either while the adolescent is changing in preparation for their physical examination or before beginning the initial discussion with the adolescent. Remember that the teen, not the parent, is your patient.

The care of adolescent patients can be extremely rewarding. At times it can be frustrating and challenging, but following our guidelines, physicians and teens will be able to work together to improve the teens’ health.

Table 2 Prevention counseling

Condition	Background	Interventions
Alcohol and drug abuse	<ul style="list-style-type: none"> ● Most adolescents experiment with alcohol. ● Alcohol and drugs can lead to or be a symbol of emotional problems. ● Adolescents are twice as likely as adults to drive under the influence of alcohol and are considerably more at risk to drive with someone who is under the influence of alcohol. ● Most adolescents are willing to provide accurate information on substance abuse if time is taken to assure confidentiality and the clinician appears interested and non-judgmental. ● Screening tests for drug use are of questionable value in the care of adolescents. 	<ul style="list-style-type: none"> ● Deliver preventive messages at every routine visit. ● Ask about alcohol drug use without parents or guardians present. ● Ask questions nonjudgmentally about substances used, frequency of use, and quantity of use as well as setting in which such use occurs. ● Reinforce that if teens do drink or use drugs, that they take preventive steps such as not driving while under the influence. ● Look for signs of substance abuse, such as aggressive behavior, recent change in personal appearance, personality changes, cutting classes, changes in school performance.
Dental diseases	<ul style="list-style-type: none"> ● Dental and periodontal diseases are common and present long term risks. ● Dental conditions can be disabling, disfiguring, and costly. ● Dental caries, gingivitis, and periodontal disease, although primarily occurring in later life, are preventable. 	<ul style="list-style-type: none"> ● Provide counseling through discussion and printed material. ● Pay particular attention to high risk patients, such as those with diseases such as diabetes, smokers, and those with little access to conventional dental care. ● Counsel teens on preventive oral hygiene, including brushing with fluoride toothpaste, flossing, and limiting dietary intake of sugar. ● Encourage teens to be seen regularly by a dental care provider.
Injuries	<ul style="list-style-type: none"> ● Accidents and unintentional injuries are the leading cause of death in adolescents, including motor vehicle accidents, head injuries, firearms, and drownings. ● Safe practices substantially reduce injuries including seatbelts, helmets (for use on motorcycles, bicycles, skateboards, and roller blades/skates), and the use of flotation devices when playing in water. ● Alcohol and substance misuse often play a key role. 	<ul style="list-style-type: none"> ● Promoting behavior change. ● Discuss injury prevention at each visit to target in depth discussions to high-risk areas. ● Have printed information available. ● Encourage teens to learn to swim or at least learn about water safety. ● Encourage teens to learn CPR and/or appropriate basic safety skills.
Tobacco use	<ul style="list-style-type: none"> ● Most smokers begin to smoke as teenagers. ● Once a teen begins to smoke he or she is likely to continue. ● Nearly a quarter of male teens use smokeless tobacco. ● Smoking often occurs in the context of other risky behaviors. ● Prevention programs have been effective in reducing smoking up to 4 years following the counseling. 	<ul style="list-style-type: none"> ● Clinic and staff should regularly ask about smoking use. ● Effective strategies include stickers on the chart, adding smoking to list of vital signs, and direct questioning. ● When patients do not use tobacco, provide positive reinforcement. ● Enroll a teen who smokes in a smoking cessation program.
Sexual activity	<ul style="list-style-type: none"> ● Teens are sexually active, and many will become pregnant. ● Teen pregnancy poses significant problems, both physical and mental. ● In teens who delay seeking effective prenatal care, pregnancies are at a particularly high risk. ● Progesterone with condoms and oral contraceptives with condoms are equally effective is used as directed, and are well tolerated by teenage women. ● Hormonal contraception (either medroxyprogesterone acetate or oral contraceptive pills) is safe and effective. 	<ul style="list-style-type: none"> ● Begin discussion about pregnancy with teens well before they become sexually curious. ● Regularly discuss sexuality, the prevention of sexually transmitted diseases, sexual orientation. ● Adolescent women should be told about the risks and benefits of emergency contraception. ● Condoms should be available, and staff should feel comfortable showing patients how to use them.
Physical activity	<ul style="list-style-type: none"> ● Physical activity declines during adolescence. ● Physical activity and fitness reduce the risk of mortality, morbidity, coronary artery disease, hypertension, obesity, diabetes, osteoporosis, depression, and anxiety. 	<ul style="list-style-type: none"> ● Ask all patients about their physical activity. ● Provide positive reinforcement for those who are active. ● Emphasize lifetime sports, such as tennis, swimming, jogging. ● Encourage increased daily physical activity. ● Be alert for signs of excessive exercise, steroid use, or eating disorders. ● Work to encourage health education programs and lifetime fitness skills.

CPR = cardiopulmonary resuscitation

Adapted from *Guidelines for adolescent preventive services (GAPS)*. Chicago: Dept. of Adolescent Health, American Medical Association; 1993; Green M, ed. *Bright futures: guidelines for health supervision of infants, children, and adolescents*. Arlington, VA: National Center for Education in Maternal and Child Health; 1994.

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Myths and variations in normal pubertal development

Myths about puberty are common. These misconceptions create needless anxiety, for example, in parents who confuse the isolated development of pubic hair or breasts with true sexual maturation. Even healthcare providers are not immune: some may be unaware of recent data suggesting that in healthy girls puberty may begin earlier than the textbook age of 8 years and others may mistakenly inform parents that only a couple of inches of growth remain for their 10-year-old daughter who has started menstruating. This article discusses common myths that surround the normal variations in pubertal development.

METHODS

Topics chosen for discussion in this article reflect the most common misconceptions about pubertal development en-

Summary points

- The appearance of pubic hair does not necessarily mean that true puberty has started
- The isolated development of breasts in girls younger than 6 years old without other changes is most likely benign premature thelarche
- Breast development is the earliest sign of true puberty and may occur in healthy white girls as early as age 7 and even earlier in African American girls
- Girls with normal early menarche (age 10) will grow an average of 4 inches more
- Boys who are distressed by pubertal delay may be treated with low doses of testosterone to accelerate growth and pubertal development without affecting their final height

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countered in my practice. The evidence presented was obtained from published articles and reviews identified through MEDLINE searches, as well as practice guidelines derived from recent subspecialty meetings, and pediatric endocrinology discussion groups on the Internet.

BENIGN PREMATURE ADRENARCHE

Myth: pubic hair signals the onset of puberty

The reality is that without breast or testicular enlargement, pubic hair (pubarche) and body odor indicate increasing adrenal secretion of weak androgens (adrenarche) rather than activation of the hypothalamic-pituitary-gonadal unit (true puberty). Before 1997, premature adrenarche was defined as pubic hair developing in girls younger than 8 years old and boys younger than 9 years. However, the results of a large, cross-sectional study suggest that the development of pubic hair may be normal in white girls as young as 7 years and in African American girls as young as 6 years.¹

Although the definition of normal puberty, as compared with premature, remains in flux, unquestionably early pubarche is likely to be benign if it meets the criteria in the box. If these criteria are met, then for most children a diagnostic workup can be limited to continued observation. Some physicians order an x-ray film to check that the skeletal age of the child is no more than 2.5 standard deviations (typically about 2 years) above the chronologic age. An abdominal ultrasound scan or blood tests for dehydroepiandrosterone sulfate, 17-hydroxyprogesterone, and testosterone are rarely needed.

BENIGN PREMATURE THELARCHE

Myth: breast development signals the onset of puberty

In reality breast enlargement occurring in isolation in girls younger than 6 years or in infants is more likely to represent benign premature thelarche than true precocious

Characteristics of benign premature thelarche

- Age younger than 6 years
- Increased breast profile
- Minimal or no growth of breast papillae (nipples) or areolae
- No growth of labia minora
- Minimal or no dulling of the vaginal mucosa, which remains shiny and reddish
- No acceleration in growth
- No pubic hair

puberty. The criteria in the box may be useful in making this differential diagnosis. In cases in which true precocious puberty is suspected, sensitive methods of diagnosis include pelvic ultrasound scanning (uterine enlargement confirms that there is an increased effect of estrogens and bilateral ovarian enlargement strongly suggests activation of the central hypothalamic-pituitary axis) and ultrasensitive immunochemoluminometric assays of luteinizing hormone.²

EARLY NORMAL PUBERTY

Myth: girls are starting puberty earlier

The reality is that this may be partially true: although the average age at menarche (12.8 years) has not fallen much in the past 60 years, more recent data suggest that the lower age limit for normal thelarche or pubertal onset is below the threshold of 8 years that is cited in many texts.^{4,3} Recently published guidelines suggest that extensive evaluation is not routinely needed in healthy girls with thelarche or puberty occurring as early as age 7 in white girls or 6 in African American girls.⁴ However, there is disagreement over whether thelarche or puberty occurring in 6 and 7 year olds is normal, and most pediatric endocrinologists still recommend close evaluation and follow up of girls who start thelarche and the progression of puberty at this age. For boys, the lack of new clinical data and the greater chance of disease lead to a continuing recommendation that boys younger than 9 years who have penile enlargement, scrotal thinning, and accelerated growth should be formally evaluated.

Possible reasons for the finding of earlier thelarche or puberty include ascertainment bias; exposure of children to environmental estrogens from plastics, foods, and pesticides; improvements in socioeconomic status; or earlier maturation caused by the rise in the average body weight of children. This last possibility raises interesting questions about the relation between body weight and pubertal onset. For some species the relation is direct: cattle ranchers know that sexual maturity in a heifer depends more on

Characteristics of benign premature adrenarche

- Sparse to moderate development of pubic hair
- Sparse or no growth of axillary hair
- Mild or no acne
- Minimal or no acceleration in growth rate
- Mild apocrine body odor
- No lowering of voice
- No breast or testicular enlargement
- No clitoromegaly

reaching a critical weight than a specific age. For humans, mild obesity is associated with a slight advancement in skeletal age and earlier onset of puberty.⁵ Theories about the action of the hormone leptin and its role in the regulation of body weight and puberty and fertility are evolving rapidly and have implications for conditions such as precocious or delayed puberty, anorexia nervosa, obesity, and anovulation.⁶

Myth: menarche means the end of growth is near

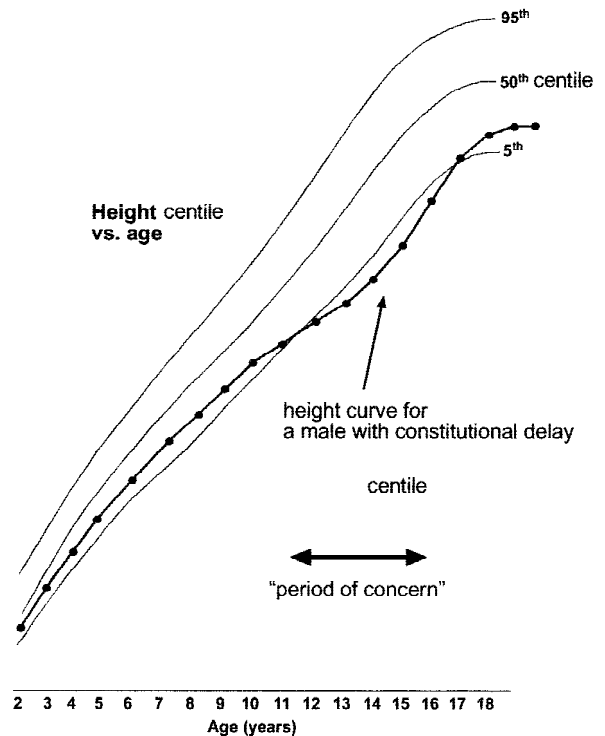
The reality is that the average gain in height after menarche is about 7 cm (3 inches), and it is even greater for girls who menstruate on the early side of normal. Follow-up data from the Fels Longitudinal Study show that girls who start menstruating at age 10 grow, on average, 10 cm (4 inches), while those in whom menarche is delayed until age 15 grow, on average, 5 cm (2 inches).⁷ Additional reassurance is provided by data suggesting that earlier thelarche is associated with a increased interval before menarche: for example, an 8- or 9-year-old girl who has just started developing breasts will have an average time to menarche that is closer to 3 years than 2.⁸ The combination of a longer time before menarche and greater height gain after the start of menstruation may explain why girls who start puberty at about 6 to 8 years old do not end up short as adults. Conversely, the lesser gain in height after menarche and shorter interval between thelarche and menarche in girls with pubertal delay may explain why the pharmacologic delay of puberty (using depot gonadotropin-releasing hormone agonist preparations) has inconsistent and limited effects on increasing their final height.⁹

CONSTITUTIONAL DELAY OF GROWTH AND PUBERTY

Myth: dropping down to a lower centile on a height chart always signifies a pathologic condition

The reality is that in many cases an adolescent who is falling off the growth curve will prove to be healthy but have a constitutional delay of growth and puberty. These late bloomers typically move to a lower height centile sometime before the age of 3 years, then remain on the same height centile throughout most of their childhood. At around 12 to 14 years of age for boys (10 to 12 years for girls), which is the typical period of concern, they again cross downward to a lower height centile (figure), due to the delayed onset of their pubertal growth spurt relative to their peers.

Unfortunately, there is often no certain method to distinguish healthy adolescents who are late bloomers from the rarer few with true disease. A comprehensive



Typical height pattern (plotted on a standard growth chart) for a boy with constitutional delay of growth and puberty. Note the decrease in height centile starting around age 12 years

history and physical examination, emphasizing the detection of dysmorphism or diseases of the central nervous system and gastrointestinal system, is mandatory. Careful interpretation of a bone-age x-ray film, tempered by an understanding of its limitations, allows for an estimate of the adolescent's final adult height and comparison with the calculated mid-parental target height. For the experienced physician with proper tools (for example, a Prader orchimeter to measure testicular size), accurate assessment of pubertal development provides as much informa-

Laboratory investigations that are useful in slowly growing adolescents

- Free thyroxine concentration
- Insulin-like growth factor-1 (somatomedin C) concentration
- Insulin-like growth factor binding protein-3 concentration
- Complete blood count
- Erythrocyte sedimentation rate
- Serum electrolytes, BUN, creatinine
- Urine analysis
- Growth hormone stimulation testing (may be unnecessary in many cases)



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tion as the bone-age x-ray film: the typical male adolescent with no delay in skeletal age has an onset of testicular enlargement (>3 ml volume or >2.5 cm [1 inch] in length) at 11.5 years of age, increasing to 12 ml (corresponding to peak growth velocity) by 14 years of age.¹⁰ The onset of breast development in a girl suggests a skeletal age of 10 or 11 years.

At this point, physicians may take divergent approaches, with some sending the adolescent for laboratory investigations immediately and others preferring to observe height velocity (correlated with skeletal age rather than chronologic age) before embarking on more extensive evaluation. Some laboratory investigations that are useful in evaluating these adolescents are shown in the box.

Myth: testosterone treatment of boys with constitutional delay reduces final adult height

In reality, in boys with constitutional delay and a skeletal age older than 10 years, low-dose testosterone (typically 50 mg monthly intramuscularly for 3-12 months) accelerates growth (often doubling height velocity) and the development of secondary sexual characteristics without decreasing their final adult height.¹¹ The onset of the growth spurt may occur up to a year earlier than without treatment. Low doses of oral anabolic steroids (up to 2.5 mg/day), such as oxandrolone or fluoxymesterone, also increase growth without having negative effects on final height but are used less often because of their potential hepatotoxicity and less satisfying effects on secondary sexual characteristics.^{12,13} At these low doses, testicular enlargement should continue, providing reassurance that the boy has simple constitutional delay and not a more permanent deficit of hypothalamic-pituitary function (hypogonadotropic hypogonadism).¹⁴

At higher doses (particularly those used off-label by athletes), androgens will decrease adult height by promoting maturation of epiphyseal growth plates more rapidly than linear growth. It is critical to clarify the differences between carefully monitored, low-dose testosterone treatment of constitutional delay and anabolic steroid abuse used to gain unfair athletic advantage.

CONCLUSIONS

Adolescents and younger children with benign variants of normal pubertal development—such as premature adrenarche or thelarche, early normal puberty, and constitutional delay—are common in pediatric practice. Recognizing that such variants are normal is an important skill. By refuting the most common myths about these variants and other aspects of normal puberty, providers can greatly relieve the anxiety of parents and children and avoid making unnecessary referrals.

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Should short children who are not deficient in growth hormone be treated?

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There are many causes of short stature during childhood and adolescence.¹ About half of all children referred to pediatric endocrinologists for an evaluation of their growth show normal variants of short stature. This means that their height falls below the conventional cutoff of 2 standard deviations below the mean but they have healthy increments in growth that parallel the growth channels on standard growth charts for the general population.^{1,2} A deficiency in growth hormone is the main endocrinologic cause of pathologically short stature.

A major objective of treatment with growth hormone in children (who typically are prepubertal at the start of treatment) is to accelerate the speed of growth to reduce discrepancies in height with peers during childhood and adolescence and to enable them to reach an adult height that is commensurate with their genetic potential.³ Because the sole source of growth hormone before 1985 was pituitary glands taken from cadavers, there was never enough growth hormone available to meet the needs of children who had a deficiency. The treatment was, therefore, restricted to those with the most severe deficiencies. The hormone became more widely available after biosynthetic growth hormone was manufactured in 1985.

The availability of biosynthetic growth hormone ensures that children who are deficient can have replacement therapy, but it also has created the opportunity to treat children who are short but do not have a deficiency. As time passes, some of these newer, nontraditional applications are becoming accepted as the standard of care in the United States.⁴

The treatment of short children who are not deficient in growth hormone is predicated on the widespread belief that being taller improves children's psychological well being.⁵ Moreover, it is thought that increased height will reduce or eliminate their risk status for the development of problems as adults. The broader use of this comparatively intensive, chronic, and costly hormonal intervention is supported by complaints made by short youths of psychosocial stresses related to their height and society's beliefs about the disadvantages of being short.⁶ In the United States, growth hormone is more frequently prescribed to youths who are not deficient in growth hormone than to those who are.⁴ This aspect of clinical practice remains controversial.^{4, 7} Practice guidelines on the use of growth hormone in children who are short clearly state that decisions regarding "instituting or continuing therapy should be individualized ... and be guided by the goal of improving the quality of life of the child and future adult."⁸ Unfortunately, these recommendations, designed

Summary points

- Growth hormone therapy is increasingly being used to treat youths who are not deficient in growth hormone
- The psychosocial difficulties associated with being short seem to be less severe than assumed, and it is unclear whether treatment offers psychological benefit
- Cost-utility analyses of growth hormone therapy should consider the specific circumstances and the value that children or their parents place on the prediction of increased height

for pediatric endocrinologists, provide no guidance in how to conduct an evaluation of the quality of the child's life. Reviewing the assumptions that are frequently made about the quality of life of short children who are not deficient in growth hormone may help clinicians in making decisions on managing these children.

METHODS

Because of space limitations, this review is selective. The investigations cited should only be considered as examples. Studies were identified on MEDLINE and PsychINFO using the terms "short stature" or "growth hormone" combined with "behavior (childhood or adolescence)." Priority was given to studies with strong research designs. The Cochrane Database of Systematic Reviews does not include a review of growth hormone therapy in the treatment of short children who are not deficient in the hormone.

ASSUMPTIONS ABOUT QUALITY OF LIFE

Short children and chronic psychosocial stress

Early behavioral research on the psychosocial aspects of short stature showed that it was associated with psychosocial stressors such as stigmatization (teasing) and juvenilization (that is, children being treated as if they were younger than they are because of the misperception of their chronological age).⁹ These studies were generally restricted to patients with complex medical conditions (for example, hypopituitarism, Turner syndrome, or chondrodystrophy). It is not clear if these findings are generalizable to the larger population of children with short stature who are being seen by endocrinologists.

Studies of consecutively referred patients, ages 4 to 18 years (some with normal variants of growth patterns and others with pathologic patterns, including those with growth hormone deficiency), have shown that slightly over half of these patients were regularly teased about being

short.^{10,11} The same proportion experienced being treated as if they were younger than their chronologic age. These clinical studies corroborate long standing anecdotal reports that being short is associated with psychosocial stress in childhood and adolescence. But not all short children in these studies shared these experiences and in neither study were the stressors related to the child's relative height.

Short children and problems with psychosocial adaptation

It is commonly assumed that children who are short have more clinically significant behavioral or emotional problems.⁹ This has not been found in studies of patients between 4 and 18 years of age in which selection biases are minimized. There is little or no evidence from the reports of parents or children that youths of short stature that is either a normal variant or pathologic (including growth hormone deficiency) have either low self-esteem or a higher than average amount of behavioral or emotional problems.^{2,10,11}

One report found that before starting growth hormone therapy, more problems were reported by the parents of short patients with sufficient growth hormone than by a normative sample.¹² These were the same norms used for comparison in another study that found relatively few differences between the groups.^{2,11} Several methodologic problems detailed elsewhere, however, complicate the interpretation of data from the study that identified more psychosocial problems among the short patients.¹³

Contrary to earlier reports, which were largely anecdotal or based on poorly designed studies, the psychosocial adaptation of short children, even those who are referred for medical evaluation, seems to be comparable to youths in the general population.

Short youths in the general population and problems with psychosocial adaptation

Although it is rarely articulated, it is often assumed that short children and adolescents who are not referred for a medical evaluation (in fact the majority of those with short stature) are similarly at risk for problems of psychosocial adjustment. The Wessex Growth Study is a longitudinal, noninterventive study that was conducted in the United Kingdom to assess the psychological development of short youths in the general population.¹⁴ All children with a height below the third centile of the norms for their age and sex were compared with a group of pair-matched classmates of average height (10th to 90th centiles for height). In the most recent report on this cohort (at ages 11-13 years), the short children did not differ from classmates on measures of self-esteem, self-concept, or teacher's report of behavioral problems. The short students were, however, more dissatisfied with their height than the control group.

In a recent epidemiologic study in New York (Sandberg DE, Bukowski WM, Fung C, et al, unpublished data), the popularity, friendships, and reputation of short students among peers in grades 6-12 were investigated using techniques of peer nomination in the classroom. Height was unrelated to popularity, the total number of friends, or whether the friendship was reciprocated. In terms of reputation among peers, short youths were distinguished from classmates on only one item ("looking younger"). No other behavioral characteristic differed between the groups.

The social stress of being short and problems in psychosocial adjustment

More than half of the 522 children and adolescents (4 to 18 years) in one study based in a pediatric endocrinology clinic were teased about their height weekly, on average.¹¹ Experiences of juvenilization were also frequently reported. It is commonly assumed that there is a relationship between these negative social experiences and the level of psychological adaptation. If the influence of the child's demographic background was controlled for, the variable "teased" was a statistically significant predictor of increased emotional problems. Because of the large sample size and the high statistical power to detect even small differences in this study, it is important to look beyond P values and consider effect size. The proportion of unique variance in problem scores attributable to teasing was rather small, about 2%. This proportion increases when the frequency of teasing is taken into account: those participants who were teased more often had more problems, and the effect size was between 4% and 5%. Juvenilization, acting independently, combined with teasing to exert a negative influence on psychosocial adaptation. To interpret the clinical significance of these effects, they must be evaluated in the context of the overall level of adaptive and maladaptive functioning in this sample. The reports of both parents and children of the psychological adaptation by short youths were generally comparable to community norms.^{2,11} Thus, stresses relating to height may contribute to variability in adaptation that falls within the normal range.

Increases in growth and height induced by therapy and improved psychosocial adaptation

Only one controlled trial has examined the behavior of short children who were not deficient in growth hormone but had been treated with it.¹⁵ Participants were 12 to 13 years old at the time of follow up. After 5 years of growth hormone treatment, 15 children (of 21 who had started) remained in the clinical trial. This group increased in relative height from 2.4 standard deviations below the mean at the start of the trial to 1.2 standard deviations below the mean at follow up. The average height of the 13 short

children who had been randomly assigned to receive no treatment remained virtually the same (changing from 2.5 standard deviations below the mean at the start to 2.4 standard deviations at follow up). Classmates of average height were also included in the analysis. Across all behavioral measures, there were no significant differences between any of the groups at recruitment or after 3 and 5 years of treatment. Although more studies are needed, it can be tentatively assumed that growth hormone therapy is not associated with changes in behavior during childhood or early adolescence. A study of short adults without growth hormone deficiency who had previously been treated with growth hormone also failed to identify a psychological benefit from treatment.¹⁶

CONCLUSIONS

Healthcare professionals are being asked to make judgments about treatments using cost-utility analyses.¹⁷ Growth hormone therapy is expensive (about \$25,000 per year for a child weighing 36 kg [80 pounds]).⁷ Although it is generally safe, side effects might occur in children who do not have a deficiency and who are treated at doses that are higher than those used for patients with growth hormone deficiency.¹⁸ Less often considered on the cost side is the possibility of negative psychological effects from treatment. Expectations of increased height may outstrip what is generally possible and cause frustration and disappointment (Hunt MA, Hazen RA, Sandberg DE, unpublished data).¹⁹

Is growth hormone therapy useful? Short stature is not a disease, so objective studies of the effectiveness of treatment with growth hormone in youths with sufficient growth hormone are only partially useful in establishing utility.^{7,20} The psychosocial morbidity associated with being short is assumed to be more substantial than the data summarized here would seem to indicate. The preference or value that the patient (and often the parents) ascribes to being taller is what becomes important. The types of behavioral studies summarized here are not directly applicable to children who conclude, or whose parents believe, that their experiences and lifestyle will be hampered by being short. In such cases, clinical management would be facilitated by providing a thorough psychosocial evaluation of the specific stressors experienced by the child. Because of the salience of short stature, clinicians must be watchful of a process of misattribution on the part of the child, parents, or others that may distract attention from other stresses and problems in the child's life and from prescribing effective psychosocial interventions for problems of maladaptive coping.

Identifying adaptive coping strategies as an alternative, or adjunct, to growth hormone therapy should be an additional goal of such an evaluation. Gathering such de-

tailed information is important because patients who are not deficient in growth hormone but are treated with it will reach adults heights that are still below average and in many cases are not significantly different from the predicted adult height.^{7,16,20} In the pediatric endocrine clinic at our hospital, all families bringing their child for an evaluation of short stature receive a brochure on the medical and psychosocial aspects of short stature as part of the routine psychosocial assessment. The guide includes information on practical strategies for coping with being short and for achieving independence both inside and outside the home.²¹ The efficacy of this particular strategy has not been empirically tested but an intervention using cognitive behavioral techniques has shown promise.²²

The psychosocial evaluation should be provided by a mental health professional knowledgeable about the specific psychosocial problems of short stature as well as the medical issues involved. Ideally, this person would be a member of the clinical management team in the pediatric endocrinology clinic. Parents of young children are often concerned about their child's future psychosocial adjustment even if the child currently seems to have adapted successfully. The team member conducting the assessment can offer anticipatory guidance to patients and families, reassuring them that being short does not have to limit their child's happiness in the near term or the child's potential to be productive and successful as an adult. The clinician can confidently state that most healthy short children and adolescents do as well, psychologically and academically, as people of average height. Pediatricians and pediatric endocrinologists can counter negative stereotypes attributed to short stature in our society. The goal is to allay unfounded parental concerns which may be interpreted by the child as evidence that there is something wrong.

And what of those cases in which an informed decision, based on all medical and psychosocial variables, is made to treat the child with growth hormone? These patients and families would still benefit (and adherence to the medical regimen would be improved) by being prepared for the treatment and warned against having unrealistic expectations. A description of such a preparatory protocol is reported elsewhere.¹⁹

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Medical complications occurring in adolescents with anorexia nervosa

Adolescence is a period of psychosocial change that is often perplexing for both teens and their parents. The rapid physical changes that occur at this time lead adolescents to become preoccupied with their body image. Adolescents may become preoccupied with themselves, uncertain about their appearance, compare their bodies with those of other teens, and become increasingly interested in sexual anatomy and physiology.¹ Anorexia nervosa is an eating disorder that disproportionately affects adolescents and has its origin, at least partially, in this preoccupation with body image.

DEFINITION

Anorexia nervosa is an eating disorder characterized by a fierce quest for thinness. The *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, defines patients with anorexia nervosa as having an intense fear of gaining weight, putting undue influence on body shape or weight for self-image, having a body weight which is less than 85% of the weight that would be predicted, and missing at least three consecutive menstrual periods.²

METHODS

Evidence presented in this review was culled from reference sources identified from a MEDLINE current literature search.

Summary points

- Anorexia nervosa has its peak incidence in adolescence
- Effective treatments are available
- Serious endocrine and cardiovascular complications are associated with anorexia nervosa, as are gastrointestinal and dermatological complications
- There is frequently an overlap between athletics and anorexia nervosa in adolescents, which increases the potential for morbidity and mortality
- Many of the dangerous complications of anorexia nervosa develop during the refeeding phase; close medical monitoring is prudent during the early stages of weight restoration

INCIDENCE AND PREVALENCE

Anorexia nervosa most commonly occurs in teenage girls, although boys are also affected, especially in the pre-pubertal age group. The ratio of girls to boys is approximately 10-20:1.³ About 2% to 3% of young women have anorexia nervosa or a clinically important variant of the disorder.⁴ There has been a consistent increase in the incidence of anorexia nervosa over the past 10 years.⁵ The variable performance of questionnaires designed to screen for eating disorders, such as the Eating Attitudes Test and

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the Eating Disorders Inventory, coupled with the difficulty of defining cases and the tendency of patients to hide their illness has made epidemiological studies difficult.⁶⁻⁸ Hsu, in a review of 24 epidemiological studies, reported a prevalence of pure anorexia nervosa of 0.5% in young women in Western cultures.⁶ Reviewing selective studies of case registries, Hsu found that the annual incidence ranged from 14.1 cases/100,000 girls and women aged 10-24 to 43 cases/100,000 girls and women aged 16-24.

Dieting is a major risk factor for eating disorders. The prevalence of eating disorders in a culture parallels the prevalence of dieting behavior.⁴ In non-Western cultures, a low prevalence of both eating disorders and dieting exists, although adolescents of all races who belong to higher socioeconomic groups are at an increased risk. Studies have confirmed that white women in higher socioeconomic classes diet more and are more concerned about their weight than other subgroups of women.⁶ Participation in hobbies and occupations, such as modeling and ballet, that promote the ideal of thinness seems to lead to a higher prevalence of eating disorders.³ Fairburn, in a study of putative risk factors for anorexia nervosa, concluded that perfectionism and negative self-evaluation are common antecedents of both anorexia nervosa and bulimia nervosa.⁹ This study also suggested that a genetic association with parental eating disorders, dieting by other

family members, and negative comments made by other family members about body appearance were risk factors for anorexia nervosa. Other proposed risk factors include substance misuse, affective disorder, obsessive-compulsive disorder, dissatisfaction with body image, and stressful life events (see box).

PROGNOSTIC FACTORS AND OUTCOMES

Anorexia nervosa is associated with the highest mortality of all the psychiatric diseases. Crude mortality ranges from 5% to 10%¹⁰; this increased mortality is most often caused by cardiovascular causes occurring secondary to emaciation. There is also an increased risk of suicide.¹¹ The standardized mortality ratio, or the number of deaths among a similar cohort without anorexia nervosa, ranges from 3.8 to 14.4.¹¹ About 50% of patients recover, 30% improve but continue to struggle with weight issues, and the remaining 20% do poorly. The best predictive factors for recovery are the percentage decrease from ideal body weight and the length of time the patient has been anorexic. For every 10% loss in ideal body weight there is an 18% increase in the risk of poor outcome.¹² Extreme amounts of compulsive exercise and a previous history of difficult social interactions have also been predictive of a poor outcome in an adolescent population.¹³

MEDICAL COMPLICATIONS

Most of the medical complications of anorexia nervosa are the direct result of weight loss and malnutrition. Patients typically complain of intolerance to the cold, dry skin, and

Clues to the existence of anorexia nervosa

- Unexplained weight loss, especially in adolescents
- Failure to gain weight in proportion to height
- Secondary amenorrhea in adolescents or preadolescents
- Participation in hobbies or sports promoting or requiring weight loss (for example, ballet or wrestling)
- Preoccupation with losing additional weight or preoccupation with changing body shape despite thinness
- Low triiodothyronine concentrations and low luteinizing hormone concentrations (however, be sure to differentiate from low luteinizing hormone during normal menstrual cycles)
- Feeling cold compared to peers (often with objective hypothermia)
- Hair loss
- Development of lanugo hair (fine, downy hair on face and back)
- Refusing to eat with others
- Eating slowly and cutting food into small portions
- Eating at odd times

brittle hair and nails. Patients also grow fine, downy hair, known as lanugo hair, on the sides of the face, arms, and back. This is not a sign of masculinization but probably represents an attempt by the body to conserve heat. Patients often have impaired thermoregulation and acrocyanosis of their hands and feet. Laboratory tests are generally normal in patients with anorexia nervosa who do not engage in any purging behaviors until the most severe stages of the illness. Clinically insignificant leukopenia and anemia occur occasionally.¹⁴ The patient can be reassured and encouraged that all of these changes will be reversed when weight is regained.¹⁵ For the primary care physician these changes should not raise much concern.

Gastrointestinal problems

The gastrointestinal tract is a common source of complaints. Most patients with anorexia have a prolongation of gastrointestinal transit time. This causes complaints of abdominal bloating and constipation. Adolescent patients are bothered by these symptoms and often attribute them to food and being fat, which perpetuates their avoidance of food and may precipitate purging behaviors. The constipation is caused by reflex hypofunctioning of the colon due to lack of intake.¹⁶ Encouraging patients to eat smaller meals more frequently, educating them about the cause of these symptoms, and reassuring them that they will resolve over 2 to 3 weeks with regular eating, along with prescribing prokinetic agents, such as cisapride, seem to be ben-

eficial in facilitating the refeeding process. Caution must be observed when this drug is used in treating anorexia nervosa because it can prolong the QT interval, a complication which can occur independently of drug treatment in these patients.

Endocrine problems

For adolescents with anorexia nervosa, the endocrine changes that may occur pose the most danger in the long term if they are not appropriately treated. Amenorrhea is a cardinal manifestation of anorexia nervosa, and it can be either primary or secondary. Puberty may be delayed in adolescents because of a reduction in pulsatile gonadotropin-releasing hormone from the hypothalamus resulting in low serum concentrations of estradiol. About 20% of patients with anorexia nervosa experience amenorrhea before the onset of weight loss. Resumption of menses generally occurs when the patients weigh about 90% of their ideal body weight but amenorrhea may persist when there is a low percentage of body fat or there are unresolved emotional issues.¹⁷

Amenorrhea is an important risk factor for severe osteoporosis. The prevention of osteoporosis is one of the main challenges for primary care physicians. It is at adolescence that most of a person's peak bone mass is acquired.¹⁸ Adolescent patients with anorexia nervosa are therefore less likely to reach their peak bone density and are at risk of premature osteoporosis and fractures, as well



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as being at risk of irreversibly stunting their growth.^{1, 19} Most studies have noted supplementation with estrogen to be protective against osteoporosis in anorexia nervosa.²⁰ This is presumably due to the inability of estrogen replacement therapy to correct other factors assumed to be involved in premature osteoporosis, such as hypercortisolism. The long-term outcome of osteopenia in anorexia nervosa has only recently been elucidated. Trabecular bone seems to be less affected than cortical bone. Studies show that despite the resumption of menses and weight gain, cortical bone mineral density does not return to normal.²¹

Primary care physicians might use densitometry periodically to assess the bone mineral density of adolescents with anorexia nervosa. If osteopenia is detected, early and aggressive attention must be directed toward preventing the pernicious development of further bone loss and osteoporosis. Restoring body weight and resuming menses should be the goals. High-dose calcium (1500 mg/day) and vitamin D (800 IU/day) supplements are important, especially given the possible role of excess cortisol in osteoporosis in anorexia nervosa. In addition, although there is little scientific data to support the use of estrogen alone to attenuate bone loss, it should not be completely ruled out. If, despite these interventions, there is evidence of progressive bone loss, bisphosphonate therapy, with alendronate, should be considered, especially since it has proven efficacy in treating osteoporosis induced by steroids.²² The bone loss associated with anorexia nervosa is profound and occurs early in the course of the illness; it causes premature fractures, and once it is established, it is difficult to restore skeletal integrity.

Other minor endocrine changes seen with anorexia nervosa are the euthyroid sick syndrome manifested by low serum triiodothyronine concentrations, increased reverse triiodothyronine concentrations, and normal concentrations of thyroid stimulating hormone. These adaptive changes are made to conserve calories and should not be treated with thyroid hormone. Diabetes insipidus with reduced concentrating capacity and hyponatremia has also been described. Hypoglycemia is common among adolescent patients; it is usually asymptomatic until the disease is severe. Then, hypoglycemia may become more marked and indicative of a poorer overall prognosis.

Cardiovascular problems

Most deaths in adolescent patients with anorexia nervosa are caused by cardiovascular collapse, which occurs secondary to malnutrition and emaciation. With progressive weight loss there is a decrease in left ventricular mass and stroke volume. As a result, maximal work capacity is markedly diminished.²³ In addition, there is an increased incidence of sudden death. This is presumably a result of autonomic imbalance, a prolonged QT interval, and ar-

rhythmias related to electrolyte abnormalities (especially if patients are purging themselves). Postmortem studies in cases with anorexia have not identified serious atherosclerosis.²⁴ Primary care physicians must be cautious about prescribing any drugs that can prolong the QT interval.

Although bradycardia and hypotension are consistently found in these patients, they are generally benign and related to a reduction in the basal metabolic rate as the body tries to save energy. Thus, these are physiological changes and should not be treated. However, heart rates of less than 30 to 35 beats/minute need to be evaluated and monitored.

A potentially catastrophic syndrome referred to as the refeeding syndrome is related to these cardiac changes. Classically, this refers to severe hypophosphatemia and the inherent complications that develop when any severely malnourished person is refed. Phosphate depletion produces widespread abnormalities at the cellular level mainly due to depletion of compounds such as adenosine triphosphate. This depresses the cardiac stroke volume, which in the setting of a repleted circulatory volume, can promote congestive heart failure. This syndrome is preventable as long as refeeding is started slowly and caloric increases are modest during the first 2 to 3 weeks of refeeding. Checking serum electrolytes and phosphorus concentrations every 2 to 3 days can reduce the risk of these problems. Monitoring the patient's pulse for unexpected increases and checking for edema are important parts of the refeeding treatment plan (see box).²⁵

ATHLETICS AND ANOREXIA

Anorexia nervosa is not uncommon among competitive athletes. Primary care clinicians who treat adolescent patients must remember that their primary obligation is to the athlete and not to the success of the athletic department. For the adolescent with anorexia who has amenorrhea there are no definite guidelines for safely participating in sports. Any athlete who has anorexia and is found to

Strategies to avoid refeeding syndrome

Identify patients at risk (for example, any patient who is chronically malnourished or who has not eaten for 7-10 days)

Measure serum electrolyte concentrations and correct abnormalities before refeeding

Obtain serum chemistry values every other day for the first 7-10 days, then weekly during remainder of refeeding

Attempt to slowly increase daily caloric intake by 200 to 300 kcal every 3-4 days until caloric intake is adequate

Monitor patient carefully for development of tachycardia and edema

have a potentially lethal cardiovascular abnormality, including a prolonged QT interval, should be banned from competitive sports regardless of the athlete's willingness to waive liability.²⁶ Certainly, measurements of bone mineral density should be considered since different sports are associated with varying degrees of risk for fractures. Athletic training in combination with the excessive exercising which is often found in these patients can result in additional weight loss and significant medical morbidity and even mortality.

TREATMENT

Discussion of the many different treatment modalities used in anorexia nervosa is beyond the scope of this paper. Family counseling is valuable especially for patients younger than 18 years. Weight gain must be closely linked to a program of psychotherapy: one without the other is unlikely to be successful regardless of how much patients with anorexia would like to participate in psychotherapy without regaining weight. Psychotherapeutic approaches are often indicated.²⁷ In general, medications are more effective in treating bulimia than anorexia nervosa. Although most adolescent patients with anorexia can be treated as outpatients, inpatient treatment is recommended in certain situations. Hospitalization is recommended for patients whose weight loss has been rapid or who have lost more than 25%-30% of their ideal body weight, as well as for those with cardiovascular arrhythmias.²⁸ Lastly, patients with anorexia nervosa who are more than 20% below their ideal body weight or who have cardiovascular abnormalities should be referred to a specialist who regularly treats patients with anorexia nervosa.

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CORRECTION

The correct author order for the Original Research article on p 16 of the January issue of *wjm* is Karen H Seal, Kristen C Ochoa, Judith A Hahn, Jacqueline P Tulsy, Brian R Edlin, and Andrew R Moss.

Outpatient management of children with diabetes

DIABETES: don't immediately admit before evaluating the entire situation

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There is controversy over whether it is necessary to hospitalize all children who have been newly diagnosed with diabetes mellitus. During the past decade, there has been a fundamental shift from inpatient management to outpatient management of these patients. Outpatient education and management of children who have been recently diagnosed with type 1 diabetes mellitus have been shown to be as safe and effective as inpatient treatment. Long-term glycemic control, as measured by longitudinal glycohemoglobin values, has been shown to be similar both in children who have undergone initial management as inpatients and in those who were initially treated as outpatients.¹ In addition, a significant percentage of children who were managed as outpatients at the time of diagnosis subsequently had lower rates of hospitalization and ketoacidosis than those children who had received inpatient care.² The concept that all children who have recently been diagnosed with type 1 diabetes need to be immediately admitted to the hospital must be revisited. Guidelines for the initial management of children with type 2 diabetes have not yet been developed. This article reviews the presentation, etiology, and outpatient management of children who have recently been diagnosed with diabetes mellitus.

METHODS

This article reflects our clinical practice and is amplified by reviews of the latest literature, culled from MEDLINE. Search terms included diabetes, child and diabetes, adolescent with outpatient, laboratory analysis, classification, etiology, definition, and symptoms. There are no relevant references on this subject available in the Cochrane database.

PRESENTATION

Sustained hyperglycemia produces an increase in serum osmolality and glycosuria, which together lead to water loss by the kidneys. These osmotic changes result in polydipsia, polyuria, nocturnal frequency, and, often, secondary enuresis. Polyphagia (increased appetite) may occur as an attempt by the body to compensate for ongoing catabolism. Blurred vision may result from the reduction of glucose to sorbitol and its subsequent deposition in the lens of the eye, causing reversible osmotic swelling.

Children with type 1 diabetes lose weight through a combination of progressive water loss and catabolism. Lipolysis occurs secondary to insulin deficiency and leads to

Summary points

- Type 1 diabetes is a destructive, autoimmune process; it is cell mediated, involves the pancreatic islets, and causes insulinopenia
- Type 2 diabetes results from insulin resistance and causes a secondary reduction in insulin secretion
- Most children with type 1 diabetes are white, thin, and present with polyuria, polydipsia, and weight loss; biochemical and clinical evidence of ketoacidosis less often present than previously presumed
- Most children with type 2 diabetes are overweight, belong to ethnic minority groups, have a family history of the disease, and have acanthosis nigricans, a cutaneous marker of insulin resistance
- One venous puncture can be used for all laboratory tests: measuring electrolytes and concentrations of insulin or C peptide, serum glucose, autoantibodies to islet cells, thyroid stimulating hormone, and antithyroid antibodies
- Children recently diagnosed with diabetes can be managed as outpatients if they do not have significant abnormalities in electrolytes or acid-base state and are adequately hydrated

the production of acetone, which manifests as a fruity odor on the breath. When this occurs, these children are at risk for dehydration. Acute, life-threatening presentations include severe ketoacidosis and arrhythmia, ileus, nausea, vomiting, and abdominal pain. Deep, rapid breathing (Kussmaul respirations) may occur as the body attempts to excrete carbon dioxide through the lungs to compensate for metabolic acidosis occurring as a result of the build up of ketoacids and lactic acid.³

Presenting symptoms in children with type 2 diabetes mellitus also include polydipsia and polyuria but usually there is no weight loss. Such patients can also present occasionally with symptoms of florid ketoacidosis similar to that seen in children with type 1 diabetes.

Polyuria and polydipsia are the most common presenting features in children who have recently been diagnosed with diabetes mellitus. Weight loss occurs in only 35%, biochemical evidence of ketoacidosis in 25%, and 5% of patients will be comatose. Younger children tend to present with the most severe symptoms. Thus, when a family notes excessive urination, secondary bedwetting, or increased thirst in a child, a search for diabetes mellitus by a primary care physician should ensue. Occasionally, glycosuria is first detected serendipitously in a child during a routine urine analysis.

ETIOLOGY

Type 1 diabetes results from insulin deficiency occurring secondary to cell-mediated autoimmune destruction of the β cells within the islets of the pancreas. There are many genetic factors associated with a predisposition to this autoimmune destruction; it is also related to environmental factors, which are still poorly defined. The known genetic link has been shown to involve alleles that contain regions that control the immune response. The ways in which environmental factors such as drugs, medications, cow's milk, or viruses interact with these genetic risk factors are not understood, and these interactions continue to be debated.⁴ Markers of the destruction of β cells by the immune system include the presence of autoantibodies to islet cells, insulin, glutamic acid decarboxylase, and tyrosine phosphatases. Autoantibodies to islet cells are present in the serum of 60% to 90% of patients newly diagnosed with type 1 diabetes. None of these autoantibodies is believed to contribute to the destruction of β cells; it is thought to be mediated by T-cells. The autoantibodies are simply markers for the disease and are used to assist in the detection of the prediabetic state in family members of patients known to have type 1 diabetes.⁵

The pathophysiology of type 2 diabetes is characterized by primary peripheral insulin resistance with secondary overproduction of hepatic glucose and declining β cell function. Although the specific etiology of this form of diabetes is not known, autoimmunity does not occur. Like their adult counterparts, most children with type 2 diabetes are overweight. The risk of type 2 diabetes mellitus is heightened in people who are not necessarily obese but who have an increased percentage of abdominal body fat. As many as 15% to 20% of all children who are newly diagnosed with diabetes have type 2 diabetes; many are children from Hispanic, African American, and Native American populations. Familial aggregations (especially among females) predominate in this form of the disease. Concordance in identical twins in some studies approaches 100%.³ However, the genetics of this type of diabetes is complex and not clearly defined.²

DIAGNOSIS

Differentiating between the two types of diabetes can be problematic. Children with type 1 diabetes are typically white, thin, and present with polyuria, polydipsia, and weight loss; biochemical or clinical evidence, or both, of frank ketoacidosis occurs less commonly. However, children with type 2 diabetes may also have ketoacidosis if severe hyperglycemia, resulting from the effects of insulin resistance, exerts a toxic effect on the capacity of β cells to produce insulin.

Because of the variability in the presentation of each type of diabetes, the presence of type 1 diabetes is often differentiated by the detection of autoantibodies (markers

To hospitalize or not?

Don't
Immediately
Admit
Before
Evaluating
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of immune destruction) in the serum. Accordingly, at the time of the onset of the disease, we recommend drawing blood to test for the presence of autoantibodies to islet cells or glutamic acid decarboxylase along with simultaneous monitoring of concentrations of insulin (or C peptide if insulin treatment has been initiated) and glucose. Additionally, we recommend measuring concentrations of antithyroid antibodies (or, more specifically, antithyroperoxidase and antithyroglobulin antibodies) and the serum concentration of thyroid stimulating hormone to detect Hashimoto's thyroiditis in children with type 1 diabetes, 20% of whom are at risk for this disorder. The presence of thyroid autoimmunity may be useful as indirect evidence of type 1 diabetes.

The diagnosis of type 2 diabetes is most likely if the serum concentration of insulin or C peptide is raised, there is hyperglycemia, tests for autoantibodies are negative, and there is a family history of adult-onset diabetes. Clinically, these children are usually obese and have varying degrees of acanthosis nigricans, a lesion affecting the skin in flexural areas of the body, such as the axilla, nape of the neck, and the groin. The skin becomes thickened, roughened, darkened, and tags may develop. Nearly 40% of Native American adolescents, 13% of African American, 6% of Hispanic, and <1% of white adolescents have acanthosis nigricans that is clinically apparent. This skin lesion is a clinical surrogate of insulin resistance and a risk factor for type 2 diabetes.⁶

Role of the primary care physician

The primary care physician is invariably the first to identify and diagnose children with diabetes mellitus. If glycosuria is found serendipitously serum glucose concentrations should be measured immediately. If hyperglycemia is equivocal on random testing, a repeat serum glucose test should be obtained two hours after a meal containing a high level of glucose. A fasting blood glucose concentration should not be used because it may be misleading in the early stages of diabetes, giving a falsely normal result. The next step is to obtain serum concentrations of elec-

trolytes, blood urea nitrogen, glucose, ketones, insulin (or C peptide) with glucose, islet-cell autoantibodies, antithyroid antibodies, and thyroid stimulating hormone. If it is necessary to accurately evaluate the acid-base state of a child, a venous blood gas measurement should be obtained; the mean difference between arterial and venous pH values is minimal.⁷ Oxygenation is rarely a problem in patients with ketoacidosis, so an arterial blood gas measurement is rarely needed. Thus, only one venous puncture is needed for all laboratory tests. A glycosylated hemoglobin test is optional; the result will not change the initial course of management but it may give an indication of the duration or severity of the disease process.

After reviewing the initial clinical and laboratory data, the primary care physician must decide whether to immediately send the child to the endocrinologist's office or wait until the next day. Children can wait 24 hours before being seen by a pediatric endocrinologist if they seem well, if laboratory values do not identify a significant electrolyte or acid-base abnormality, and if they are adequately hydrated and can remain so on oral fluids until they are seen. Immediate and mandatory admission to the hospital should only occur in children in whom there is severe acidosis (serum bicarbonate value ≤ 10 mmol/L, altered mental status, recurrent vomiting, severe dehydration, or if there will be difficulty in ensuring adequate follow up, there are significant pre-existing social problems in the household, an unusually high level of anxiety in the family, or if the child is younger than 2 years.

OUTPATIENT MANAGEMENT

If the criteria previously listed are present then it is safe to manage the child as an outpatient. Differentiation between the two types of diabetes should be attempted on clinical and biochemical grounds. If the child meets the criteria for management as an outpatient, neither an intravenous insulin bolus nor a parenteral fluid challenge is required.

The disease process has probably been occurring over a long period but the symptoms are just becoming apparent. The child should be encouraged to drink sugarless fluids in the 24 hours before seeing the pediatric endocrinologist. The family should also change to a meal plan that excludes concentrated sugars.

This management will limit further loss of water and electrolytes, decrease hyperglycemia, and help to maintain appropriate acid-base state. Families should also be counseled to call immediately if the child vomits or develops an altered mental status.

Outpatient management by a pediatric diabetes team should begin within 24 hours; the team should consist of a physician, nurse specialist, dietitian, and psychologist. The physician should discuss the causes of diabetes, nor-

mal and abnormal glucose metabolism, signs and symptoms of hyperglycemia and hypoglycemia, and the rationale for treatment. The nurse specialist should instruct the patient and family about the technical aspects of monitoring blood glucose concentrations and administering medication.

The dietitian should create a meal plan and review the principles of counting carbohydrates. Lastly, the psychologist should assist the child and family in coping with the diagnosis. Once the patient is sent home from the office, close telephone contact with either the nurse specialist or the endocrinologist should be maintained for several weeks to ensure that the family understands and is adhering to the treatment plan. Follow-up office visits are usually scheduled for one week later, one month later, and then quarterly.

CONCLUSION

During the past decade, the concept that all children who have recently been diagnosed with type 1 diabetes need to be hospitalized immediately has been challenged. The alarming increase in the number of adolescents diagnosed with type 2 diabetes mellitus requires a broader understanding of the initial diagnostic criteria, which may necessitate additional laboratory evaluation at the time of presentation.

Further, the initial evaluation of the patient who has recently been diagnosed with diabetes should include an assessment of the degree of dehydration and acidosis to help decide whether initial education and management as an inpatient or outpatient is suitable. Outpatient education and management of diabetes has been proven to be cost effective, safe, and efficacious.^{1, 2} A mnemonic for remembering this is: don't immediately admit before evaluating the entire situation.

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Helping teens who live in violent communities

The murders of children and adolescents, such as the shootings that occurred in schools in Colorado and Oregon, have a lasting impact on the families of the victims and on the nation. In 1998, 4205 children and adolescents were killed by guns.¹ Thousands of other teens were stabbed, assaulted, or shot. These violent events leave victims, their friends and neighbors, and witnesses, at high risk of developing psychological difficulties, particularly post-traumatic stress disorder.²⁻⁵ Support from a caring adult can act as a buffer against the effects of such exposure.^{6,7} Physicians can provide this support by identifying teens who may have been exposed to violence and by intervening to reduce the risk of post-traumatic stress disorder and other complications.

BARRIERS TO ASSESSING AND TREATING EXPOSURE TO VIOLENCE

Many factors stop physicians from adequately assessing and intervening to help teens who may have been exposed to violence. Directors of pediatric residencies and training programs in adolescent medicine identify “violence and weapon carrying” as one of the most poorly covered topics in rotations in adolescent medicine.⁸ Many physicians feel ill prepared to tackle this issue. Many find it hard to believe how many families own guns. Experiencing violence is associated with ease of access to guns at home.⁹ However, one study found that although physicians reported that they thought they should discuss gun ownership with parents, most believed that their patients’ families did not own guns.¹⁰ Only 11% of the parents in this study reported that their child’s physician had discussed gun ownership with them, even though 28% actually owned guns.

Physicians may find it hard to identify teens who have been exposed to violence because the symptoms of psychological distress may be obscured by psychological numbing, denial, and the fact that chronic exposure to violence may have shaped many aspects of an adolescent’s personality.^{2,11} Sociocultural factors, such as biased belief systems, may influence whether any psychological interventions are offered to victims of violence. In a study of adolescents in hospital, victims of shootings, stabbings, and physical assaults were offered significantly fewer psychosocial interventions, such as follow-up psychotherapy, than patients who had tried to commit suicide.¹²

CLASSIFICATION OF EXPOSURE TO VIOLENCE

Homicide is the second most common cause of death among young people aged 15 to 24.¹³ Other types of exposure to violence can also have severe and lasting in-

Summary points

- 4205 children and adolescents were killed by guns in 1998, and thousands of other teens were stabbed, assaulted, or shot
- Violence leaves victims, their friends and neighbors, and witnesses, at high risk of developing post-traumatic stress disorder
- Physicians can act as a buffer against the effects of violence in communities by identifying affected teens and intervening
- Physicians can help adolescents living in violent communities change their lives by talking directly with them about violence empathetically/sympathetically and by working with members of the teen’s existing support system

fluences on young people. Exposure can be direct and nonfatal and can include being shot at, stabbed, or robbed. Witnessing violence can also have an effect. Between 75% and 91% of children and adolescents in neighborhoods that have moderately high levels of community violence will witness an incident of violence, such as a shooting or an assault.^{3,4,14-16} Vicarious exposure occurs when someone the adolescent knows dies as a result of violence or when the adolescent’s sense of safety is threatened by learning of a violent event in school or the neighborhood. For example, nearly half of the 250 adolescents in one study knew someone who had been taken away by the police, and over one third knew someone who had been shot or shot at. Although domestic violence and child abuse are important causes of violence in the lives of teens, this paper focuses on violence in the community. Neighborhoods considered to have high levels of community violence are those in which violence intrudes into teens’ everyday lives, such as when teens regularly hear gunfire, see or hear of shootings or knifings, and witness beatings.

CONSEQUENCES OF EXPOSURE TO COMMUNITY VIOLENCE

Exposure to violence in the community is directly related to emotional distress.^{2-6,11} In areas with high levels of community violence, as many as 58% of adolescents can be diagnosed with post-traumatic stress disorder.^{2,17} The *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, is useful in diagnosing post-traumatic stress disorder, although its use is controversial in the assessment of adolescent patients.¹⁸ The criteria require that a distinct event initiated the symptoms; this event may be difficult for teens to pinpoint if they live in violent communities. Terr’s classification of type trauma (longstanding or re-

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peated exposure to multiple events) may fit these teens better than does type I trauma (unanticipated single events).^{2,19} Post-traumatic stress disorder may manifest differently in adolescents exposed to type II (chronic) trauma than type I (acute) trauma.^{2,19} Victims of an acute event may manifest the full syndrome but those with more chronic exposure typically experience anger, despair, psychic numbing, dissociation, and changes in personality. The symptoms of post-traumatic stress disorder may vary over time.^{2,11}

Violence may have different effects depending on the developmental stage of the child at the time of each exposure.^{2-6,11} For example, a child who experienced violence as an infant may have difficulties developing secure relationships; as a toddler the child might have problems with toileting and developing speech. Teens who have been exposed to violence as children typically have difficulties achieving a strong sense of self-efficacy, experience somatic complaints and sleep disturbances, and find it difficult to regulate their emotions. In adolescents who have been exposed to chronic violence, these problems, which are associated with post-traumatic stress disorder, may mimic other disorders. Teens may show signs of attention deficit hyperactivity disorder, learned helplessness, hopelessness about the future, and emotional numbing. Teens often cope with post-traumatic numbing by engaging in risk-taking behaviors, such as using alcohol, having sex with numerous partners, and developing gang affiliations.^{20,21}

Although diagnosing the disorder is complex, the American Academy of Child and Adolescent Psychiatry recommends that teens be offered psychological services, even if they do not fully meet the criteria for a diagnosis of post-traumatic stress disorder, if their symptoms interfere with at least one area of their life.¹¹ Teens living in neighborhoods considered highly violent can be assumed to have had chronic exposure to violence, and other problems, such as failing in school and engaging in risk-taking behaviors, are likely to be related to post-traumatic stress disorder.²

FACTORS THAT PROMOTE RESILIENCE

Large longitudinal studies have shown that living in poverty, having high levels of stress, and being maltreated place children at high risk of social, emotional, and behavioral maladjustment.²² Some researchers have looked at the factors that protect the “resilient” children who emerge well adjusted from exposure to these stresses.²³ Bronfenbrenner’s bioecological model categorizes these factors as individual, family, or community characteristics.²⁴ Characteristics of the individual that have been associated with positive outcomes include intelligence; involvement in academic and extracurricular activities; and

Assessing the impact of violence: the ViPER mnemonic

Violence exposure: amount and type
Presence of weapons in the home
Emotional sequelae for the adolescent (symptoms of post-traumatic stress disorder)
Resources and support available

personality characteristics such as having a well developed sense of self, appropriate coping skills, an internal locus of control, strong social skills, flexibility, a sense of humor, empathy, and optimism about the future.^{6,9,25-28} Family characteristics include having parents who serve as buffers against a stressful environment by providing stability, supervision, and warm, empathic care.^{9,14,25,27,29-31} In the community, some teens form bonds with caring adults, such as teachers, church members, or relatives, and such bonds can ameliorate the effects of chronic stress.^{6,7,25}

ASSESSMENT

Four important areas to consider in assessing a teen’s exposure to violence in the community can be summarized by the mnemonic ViPER (box). After carefully considering the research evidence, we derived the ViPER mnemonic to help busy primary care physicians remember four crucial areas to assess. Research on violence exposure²⁻⁵ guided our focus on violence subtypes and emotional sequelae (PTSD), while findings from the excellent longitudinal studies on resilience,²² such as the Kauai and Rochester studies, led us to include resources and support. We added weapon possession in response to the public health approach to violence which has been supported by subsequent psychological research.^{10,29} It is important to introduce the topic of violence and normalize it to help adolescents discuss issues that they may not think are related to their health. In addition to asking specific questions, physicians can use standardized measures of exposure and post-traumatic stress disorder.^{32,33} Initiating a discussion about violence during each visit increases the likelihood that the adolescent will reveal information on subsequent visits.³⁴

An example of a possible lead-in might be: “Before we finish today, I wanted to see if anything was going on in your life that might be affecting your health. Many of my teenage patients have seen or experienced frightening or violent things in their neighborhoods or schools. Most of the time these things affect people in ways they don’t even realize. For example, people can lose sleep because of nightmares or they can find it hard to concentrate on school. Other times, people feel really angry or on edge. It happens all the time and, because we actually have some

ways to help teens in these situations, I'd like to take some time to talk with you about this."

Violence exposure: amount and types

It often helps to give examples to encourage a teen to talk about violence: "There are different kinds of violence that may affect teenagers. The first is direct exposure, like if someone is shot at or beaten up. The second kind that also affects teens is, for example, seeing a drive-by shooting or seeing someone get robbed. Even though the violence doesn't happen directly to you, you may have nightmares about it or worry about it happening to you. Sometimes people hear about something violent or scary happening to someone they know and even if they didn't see it, it is still frightening." Generally, teens who have experienced direct exposure have also witnessed violence and had vicarious exposure as well. It is helpful to reflect their feelings in an empathic way, such as by saying, "That sounds really terrifying," or "it seems it is hard to feel safe even at home."

Presence of weapons in the home

If the teenager reports that there are guns in the house, this should be explored further. Physicians could ask, "Where are the guns kept? Do you know how to get to them? Are they loaded? Locked up? Where are the bullets?" Parents often wrongly think that their children are unaware of the presence and location of weapons. If any of these questions are answered in the affirmative, physicians should help adolescents initiate an open discussion with their parents focusing on problem-solving about gun safety issues.

Emotional sequelae

Normalizing symptoms encourages disclosure. For example, physicians could say, "When people have experienced a lot of violent events in their lives, they may not even be aware of the ways these events affect them. There are some common reactions people have, and I'm wondering if you've noticed any of these things in yourself." Giving specific examples of the common reactions is helpful (box).

Adolescents who seem emotionally hardened may believe that violent events do not affect them. Such emotional numbing is the most common symptom of chronic exposure, and it should not be mistaken for a positive coping style.

Resources and support

Participating in school and other activities and communicating well with parents can be effective in protecting an adolescent against post-traumatic stress disorder. Of great



S Beth Adkin *Voices from the Streets: young former gang members tell their stories.* Little, Brown; 1996

est importance, however, is helping the teen to identify a caring and stable adult who can provide support and intervene in the teen's life. The subject can be explored by saying something like, "Sometimes when things get really bad, it helps to have someone to talk with. Is there anyone you feel comfortable going to when you need help?" If there is no one, probing further may help. For example, physicians might say "Many teens who have experienced things like you have feel there is no one to help. Usually we can find at least one person. Let's think about your teachers, people you know from your church or neighborhood, and your relatives. Have you ever thought one of your teachers seemed like a nice person?"

DEVELOPING A PLAN FOR INTERVENTION Components of intervention

There are several crucial features of any intervention plan for treating post-traumatic stress disorder.^{2,11} The direct exploration of violent events and their impact is a key component. To reduce the impact of a violent memory, teens must talk openly about the event in a safe setting and face the emotions associated with it. Parents or other supportive people, or both, should be included in the intervention if possible and if the teen wants them to be included. Several types of psychotherapy have been studied empirically, and no one therapy has emerged as the definitive treatment.¹¹ Similarly, no pharmacological intervention is effective and safe for adolescents, although studies are in progress.¹¹ Finally, symptoms of other disorders should be treated but not to the exclusion of treating the underlying symptoms of post-traumatic stress disorder.

Barriers to intervening

For teens living in violent communities, there may be numerous barriers to treatment. Many teens may be resistant to receiving treatment or not recognize that they need it because the exposure and their emotional response may have persisted for a long time. Others may feel that

Three most common reactions to violence

Avoiding traumatic stimuli (numbing)

- Experiencing emotional numbing
- Feeling cut-off from others
- Lacking enjoyment
- Having negative views of the future

Re-experiencing the trauma

- Having nightmares
- Having flashbacks
- Thinking constantly about the event
- Having bad memories

Feeling on edge

- Having trouble falling asleep or staying asleep
- Being irritable or easily angered
- Being distracted or inattentive
- Being easily startled

psychotherapy is stigmatizing. Individual psychotherapy may not even be available in communities with high levels of violence. Additionally, as teens continue to be exposed and “retraumatized,” treatment gains may prove difficult to maintain. However, longitudinal studies have consistently shown the strong protective effect of a relationship between a teen and one interested and caring adult. Thus, if formal psychotherapy is not available or if the teen must stay in the dangerous environment, physicians can work with the teen’s existing social support system to find an adult willing to meet regularly with the teen to discuss openly violent events and the teen’s reactions. This adult should be encouraged to work with the teen to strengthen factors that promote resilience, such as getting involved in activities and focusing on the future.

CONCLUSION

Treating the consequences of the exposure to violence is complex. Nevertheless, by talking directly with adolescents about violence empathetically and by working with people in the teen’s existing support system, caring physicians may be able to help adolescents in violent communities change the trajectory of their lives.

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Dysuria in adolescents

Dysuria is a frequent and often frustrating complaint of young women. Although it is tempting to equate dysuria with a urinary tract infection, special care must be taken in adolescents to rule out a sexually transmitted infection. Even with a careful history, the difficulty differentiating between a urinary tract infection and a sexually transmitted infection often forces physicians to subject patients to invasive exams and laboratory studies. Many young women receive their first pelvic exam when they experience dysuria; it costs the physician time and causes discomfort to the patient. A review of the literature yields more confusion than clarity regarding the reliability of pelvic exams, urine dipstick tests, and microscopic analysis. However, a few conclusions may be drawn from experience with these tests, and newer tests may make the treatment of adolescent girls with dysuria less daunting and more time and cost effective.

METHODS

The references chosen for this article were obtained by searching MEDLINE and MDConsult, as well as being discovered in the course of general reading. Additional information was provided by lectures given by specialists at UCLA in the adolescent medicine and emergency medicine and infectious disease departments.

WHAT PLACES ADOLESCENTS AT RISK OF SEXUALLY TRANSMITTED INFECTIONS?

Fifty-three percent of high school students have had at least one sexual encounter,¹ and 20.8% of 12th grade girls have had more than four sexual partners.² In 1995, just under half of all girls in high school had used condoms,² and the number decreased as girls progressed from 9th to 12th grade.^{1,3} The risk factors associated with sexually transmitted infections such as choosing a partner whose health history is not determined, using drugs or alcohol with sexual activity, being young at the time of first consensual sexual encounter, having been incarcerated, having had a new partner within the preceding 2 months, and having a history of a similar infection are often difficult to elicit from an adolescent patient. Even when risky behaviors are controlled for, the incidence of chlamydia is twice as high among women aged 15-19 as among other age groups.² This is probably because susceptible columnar epithelium is present on the exocervix of adolescents; this changes to squamous epithelium as women reach their 20s. The prevalence of chlamydia among teenage women is 13%-26% and the prevalence of gonorrhea is 2%-10%. There is a 10%-40% chance that a teen will contract

Summary points

- Dysuria in adolescent girls can be a symptom either of a urinary tract infection or a sexually transmitted infection
- The incidence of sexually transmitted infections is higher in sexually active adolescent women than in women in other age groups
- The consequences of pelvic inflammatory disease, a complication of untreated cervicitis, include chronic pain, infertility, and an increased risk of ectopic pregnancy
- A pelvic exam may be necessary if pelvic inflammatory disease is suspected but in certain situations a bimanual exam may be sufficient
- The discriminating use of laboratory tests may help physicians avoid invasive exams
- Treatment should be started while awaiting the results of confirmatory tests

chlamydia again in the months after the initial diagnosis is made.^{2,4}

WHAT ARE THE GOALS OF TREATMENT?

The appropriate treatment of a symptomatic infection, whether sexually transmitted or a urinary tract infection, should relieve a woman's discomfort and prevent undesirable complications. Treating a condition that has been transmitted to her by a partner and helping her to contact the partner may prevent future cases of sexually transmitted infection. Most importantly, 10%-40% of untreated gonorrheal or chlamydial infections will progress to pelvic inflammatory disease, a term describing the constellation of endometritis, tubo-ovarian abscess, salpingo-oophoritis, and pelvic peritonitis. Pelvic inflammatory disease is diagnosed in 1 million women annually.⁵ Of these cases, 20% to 30% occur in adolescent girls, and one study found that sexually active adolescent girls have a 1 in 8 chance of contracting pelvic inflammatory disease in comparison with the 1 in 80 chance of contracting the disease that is found among sexually active women in other age groups.³ The morbidity associated with one case of pelvic inflammatory disease is great: there is a 12% risk of infertility, an 18% chance of chronic pelvic pain,⁶ and a sevenfold increase in the risk of ectopic pregnancy. The risk of infertility increases to 25% after two episodes and to >50% after three.⁷ The annual cost of treating these complications is \$4 billion to \$5 billion.⁸ Preventing the complications of pelvic inflammatory disease requires that sexually transmitted infections be diagnosed early.

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ARE THERE SYMPTOMS THAT RELIABLY DIFFERENTIATE BETWEEN SEXUALLY TRANSMITTED INFECTIONS AND URINARY TRACT INFECTIONS?

The cliché that foul vaginal discharge can be treated with a shot of penicillin is an archaic view of sexually transmitted infections. Unfortunately, asymptomatic carriage of a sexually transmitted infection is so prevalent that many experts now recommend that all teens be routinely screened for these infections.⁹ However, studies have been unsuccessful in identifying reliable indicators in women who have symptoms. Sexually transmitted infections can cause dysuria, with or without frequency, either from external lesions or by causing inflammation of the urethra, which is known as acute urethral syndrome.⁷ Two emergency departments retrospectively reviewed presenting symptoms in women of all ages who later tested positive for chlamydia. At Wayne State University in Indiana, of 181 young women who tested positive for chlamydia, 61% complained of abdominal pain, 35% of vaginal discharge, 30% of vaginal bleeding, and 4% of dysuria.¹⁰ Of 233 women who tested positive for chlamydia at Albany Medical College in New York, 18% had “urinary tract infection symptoms” but only 13% had vaginal discharge.¹¹ Many of these women did not initially receive appropriate antibiotic treatment.

Gonorrhea can cause symptoms that are similar to those of chlamydia or can present as proctitis (10%-30% of cases), an abscess of Bartholin’s gland with pain and swelling over the labia minora, or as an abscess of Skene’s gland with periurethral pain.² Roughly about 25% of adolescent girls with dysuria who are considered to be at high risk of contracting a sexually transmitted infection will have one; at one clinic 60% of women with dysuria had vaginitis.¹² In cases of acute urethral syndrome occurring secondary to candidal or trichomonal vaginitis, dysuria is associated with a vaginal discharge but many women with urinary tract infections also complain of vaginal discharge.^{9,12} At least one study found there was no significant difference between symptoms in women who were later proved to have urinary tract infections and in those with sexually transmitted infections; in many cases symptoms included a low-grade fever.¹³ The only historical factors reliably shown to be preferentially associated with urinary tract infection are a history of urinary tract infection, urgency, and gross hematuria.¹² Therefore, history alone can neither lead the physician to a definitive diagnosis nor obviate the need for a pelvic exam.

OF WHAT BENEFIT IS THE EXAMINATION?

This question is composed of two parts: which physical findings help point to a specific diagnosis and, with the advent of sensitive urine tests for gonorrhea and chlamydia,

is an external exam and quick swab of the vaginal vault adequate for diagnosis in most cases?

Regardless of whether a speculum exam is performed, an external exam of the genitalia is invaluable. About 10%-12% of those younger than age 20 have genital manifestations of infection with the herpes simplex virus,¹ and 10% of women with this infection will complain of dysuria.¹² Often women deny having urinary frequency and complain of external pain. Patients with herpes might also complain of fever, malaise, headache, and myalgia, especially during their first infection. Viral culture of vesicle fluid has a high sensitivity for diagnosing herpes infection but it takes about 24 hours.¹⁴ A more efficient alternative is to do a Tzanck test of the vesicle base; this yields an immediate result.

The other painful external lesion seen in America is chancroid; it can produce dysuria, vaginal discharge, and dyspareunia. Chancroid is much less common than herpes, occurs predominantly in men, and tends to occur in epidemics. On exam, a red, tender papule or a painful ulcer with ragged edges and foul smelling gray-yellow exudate will be apparent, and a Gram or Giemsa stain or culture of the lesion will confirm the diagnosis.¹⁵

Findings that support the diagnosis of chlamydia during a pelvic exam are vaginal discharge (seen in 66% of women with chlamydia), cervical motion tenderness (31%), vaginal bleeding (19%), and abdominal or adnexal tenderness (16%). These findings lack specificity.¹⁰ Cervical motion tenderness, for example, is a sign of peritoneal irritation and can be found in women with an ectopic pregnancy, appendicitis, and other abdominal conditions. Mucopus has a sensitivity of 11% and a specificity of 95% for diagnosing chlamydia. Friability of the cervix is also a sign of cervicitis having a sensitivity of 13% and a specificity of 94%.¹⁶

Clinics fortunate enough to have urinary tests (ligase chain reaction, for example) available for diagnosing chlamydia and gonorrhea may need to decide if these tests, coupled with a swab of the vaginal vault, are adequate to allow the physician to forgo the speculum exam. A study done at Johns Hopkins University compared the results of a full speculum exam to those of a blind vaginal swab in 686 women aged 12-22.¹⁶ There was no significant difference in the accuracy of the diagnosis of vaginitis between collection methods. Other studies have shown ligase chain reaction, a gene amplification technique, to have a sensitivity of 95%-96% and a specificity of 100% for gonorrhea, and a sensitivity of 88%-96% and a specificity of 100% for chlamydia. Ligase chain reaction performed on urine is approved only as a screening tool for gonorrhea, but it has been used successfully for both gonorrhea and chlamydia in adolescents.¹⁶⁻¹⁸

The most pressing reason for a practitioner to perform at least a bimanual exam is to rule out the possibility of

pelvic inflammatory disease, which is classically diagnosed by the triad of low abdominal pain, cervical motion tenderness, and adnexal tenderness. Unfortunately, if compared with the gold standard of laparoscopy, the clinical accuracy of these findings reaches only 65%.^{3,19} Other indications that can help confirm the diagnosis are that symptoms occur early in the menstrual cycle, douching is performed regularly, and that there is nausea, dysuria, fever, irregular bleeding, dyspareunia, and vaginal discharge. Concentrations of C reactive protein are raised in up to 96% of cases, and their fall to normal limits indicates that treatment has been adequate.²⁰ If the patient has an erythrocyte sedimentation rate >15 mm/hour, temperature >38°C, and an adnexal mass in addition to the standard diagnostic criteria, sensitivity increases to 98%.¹⁹ Magnetic resonance imaging and ultrasound scanning look promising in studies of nonsurgical diagnoses.^{6,21}

Adolescents with pelvic inflammatory disease can be treated as outpatients if they are reliable, stable, and not infected with HIV, if they will take oral medication, and if a follow-up appointment is arranged for 72 hours later (box). Physicians should, however, maintain a low threshold for admitting women who do not meet these criteria or who have a tubo-ovarian abscess.²² If pelvic inflammatory disease is diagnosed, a cervical culture should be done to ensure that the pathogen is gonorrheal or chlamydial, since other agents may be involved including mycoplasmas, herpes simplex virus, anaerobic bacteria, *Escherichia coli*, streptococcus species, bacterioides species, peptostreptococcus, and even actinomyces species in patients who use intrauterine devices.²³

WHICH LABORATORY TESTS HELP?

Initial decisions about treatment need to be made in the context of a quick visit to an office or emergency department, and laboratory tests that can be done quickly are the

most useful guides. Results of urine dipstick analyses are sometimes useful. Leukocyte esterase is produced by white blood cells and is a marker of their presence in urine. The presence of this enzyme indicates that there are bacteria in the urine, and this finding is 90%-95% sensitive if the urine contains >100,000 bacteria; it is 70% sensitive for <100,000 bacteria. Unfortunately, both acute urethral syndrome and urinary tract infections can yield positive leukocyte esterase tests, and many substances, including cephalixin and tetracycline, can cause false negatives. The presence of nitrites points toward a probable urinary tract infection but the lack of nitrites cannot rule one out; *Staphylococcus saprophyticus*, a non-nitrate reducing bacteria, is a common cause of urinary tract infections in adolescents.¹³ Negative tests for nitrites and leukocyte esterase have a negative predictive value of 97.5% for ruling out urinary tract infections but they do not rule out acute urethral syndrome.²⁹ Hematuria, either gross or microscopic, is uncommon in acute urethral syndrome but is common in urinary tract infections, particularly those caused by *S saprophyticus*.³⁰⁻³²

Pyuria may be identified by microscopic exam in both urinary tract infections and acute urethral syndrome. It is defined by different sources as >5 to >10 white blood cells per high power field. Using the cut off of ≥ 8 white blood cells per high power field the sensitivity for diagnosing a urinary tract infection is 91% and the specificity is 50%.³² About 50% of urinary tract infections occurring in the lower tract and 90%-95% of those occurring in the upper tract will have Gram stains with >100,000 bacteria/mL.³¹ Identification of a single typical organism has a sensitivity and specificity of >90% for diagnosing a urinary tract infection.²⁴ Unfortunately, patients with acute urethral syndrome may have any number of white blood cells or bacteria present on microscopic exam, although the syndrome is generally associated with a lower white blood cell

Outpatient treatment of urinary tract infections^{24-28,36}

Diagnosis	First line treatment*	Second line treatment	Percentage of cases resistant to these drugs at UCLA's student health services†
Uncomplicated cystitis	3 days of trimethoprim-sulfamethoxazole double strength twice a day; or 3 days of ciprofloxacin 250 mg two times a day, ofloxacin 200 mg two times a day, or another fluoroquinolone‡	Cephalexin 500 mg orally four times a day for 7-10 days	Trimethoprim-sulfamethoxazole 15%; ciprofloxacin 0%; ampicillin 39%; cephalexin 15% (<i>E coli</i> in 81% of isolates)
Uncomplicated pyelonephritis	Doses as above but increase treatment duration to 14 days for trimethoprim-sulfamethoxazole and 7 days for ciprofloxacin (slightly more effective than trimethoprim-sulfamethoxazole)	Doses as above but increase treatment duration to 14 days	As above

*Single-dose treatment no longer recommended

†Quinolones are recommended for first line treatment if resistance to trimethoprim-sulfamethoxazole is >10%. They have better bacteriologic resolution and fewer side effects but are more costly. Most studies identify resistance to ciprofloxacin in 5% to 10% of samples

‡Not recommended for treating patients ≤ 17 years. Ciprofloxacin and ofloxacin may be effective against *Staphylococcus saprophyticus*.

count and a lower bacterial count than urinary tract infections. In patients with gonorrheal urethritis, the appearance of intracellular gram-negative diplococci on urine microscopy is pathognomonic but is seen in only 50% of women with the disease.¹²

It is not necessary to culture a sample to treat uncomplicated, nonrecurrent cystitis in healthy people provided patients know that they should return in 48 hours if there is no improvement. Urine cultures are required, however, in uncomplicated pyelonephritis occurring in healthy people, although blood cultures are not.²⁵ However, a much higher percentage of urinary tract infections in adolescents may be caused by infection with *Staphylococcus saprophyticus* than in the general population. Therefore, if an antibiotic that is not effective against gram-positive bacteria is used, a culture may be necessary. The more common reason for doing a culture is to ensure that, if tests for gonorrhea and chlamydia have not been done, the symptoms attributed to a urinary tract infection are not actually related to a sexually transmitted infection.

If vaginitis is suspected, a swab from the vaginal vault should be obtained and slides made for a wet mount. More sensitive methods of detecting trichomonas species include culture and polymerase chain reaction.³³ If taken from the cervix, a cell culture is 100% specific for chlamydia but only 65%-80% sensitive, and it requires 3-5 days to produce results.² Direct immunofluorescence and enzyme immunoassay are sensitive tests for gonorrhea and chlamydia; enzyme immunoassay is technically easier and requires only 4-5 hours to perform. Ligase chain reaction is a sensitive test that can be performed either on a cervical swab or a urine sample. For gonorrhea, an additional helpful test is a Gram stain of the cervical mucus, which will test positive for polymorphonuclear neutrophils with intracellular diplococci in 2 of 3 patients with symptoms.¹⁹

CONCLUSIONS

In an adolescent girl who is at high risk of contracting a sexually transmitted infection and who has dysuria and frequency, it is difficult to rule out a sexually transmitted infection using only results from simple, noninvasive tests. If an external exam rules out lesions such as genital herpes and chancroid, and the results of a potassium hydroxide slide and wet mount are negative and have made the diagnosis of vaginitis unlikely, the question of how extensive a work up is needed remains to be answered. In a woman at a low risk of contracting a sexually transmitted infection treatment of cystitis may be appropriate, if her symptoms include urgency, hematuria, suprapubic pain, a dipstick test that is positive for nitrites, and a finding of >100,000 bacteria/mL on an unspun urine sample. If the diagnosis is less clear, a urine culture and an exam for gonorrhea and chlamydia may be necessary.

As urine ligase chain reaction testing becomes more

widely available for the diagnosis of chlamydia and gonorrhea, it will be reasonable to limit the number of full pelvic exams performed. It may be possible to treat a woman for cystitis while awaiting the results of the ligase chain reaction if she is at low risk and has dysuria with or without discharge, no abdominal pain, and the results of the external exam and vaginal wet mount are normal. As long as follow up of these results is ensured and careful discharge instructions are given, many women presenting to clinics and emergency rooms can avoid a speculum exam. If necessary, a bimanual exam to exclude pelvic inflammatory disease may be done instead of a full speculum and bimanual exam since it is more comfortable for the patient, faster for the physician, and does not require a speculum, exam lights, and a gynecological bed.

Pregnant teens with pain or vaginal bleeding generally have both a speculum exam and a bimanual exam, as well as assessment for cervicitis and a urinary tract infection. Localization of pain, estimation of uterine size, and visualization of the os to see if it is open all help in evaluating the risk of an ectopic pregnancy and in managing a possible spontaneous abortion.^{34,35} Many texts teach that any woman with low abdominal pain should have a bimanual exam to differentiate between abdominal and pelvic pathology, although no study has directly evaluated the accuracy of this advice.^{36,37} Since pelvic inflammatory disease, a ruptured ectopic pregnancy, and many other gynecological disorders can present as generalized abdominal pain, consideration should be given to performing a bimanual exam on teens who are at moderate to high risk of these conditions and who have these symptoms.³⁸

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Netphiles

www.safersex.org refers to itself as the pre-eminent resource for information on safer sex on the Internet. I doubt many would disagree after visiting it. It is explicit, but necessarily so, as it points to the fact that the failure of condoms to protect against sexually transmitted diseases and pregnancy almost always results from incorrect use. The site offers the browser the option of viewing a short video clip showing how to put on and take off a condom correctly, using a realistic plastic penis. For the more easily embarrassed, there is a series of cartoons that show step-by-step how to use a condom (including tips for the uncircumcised male). Parents who are uncomfortable or unable to broach such issues, yet feel a duty to make sure their child is responsibly informed, should consider visiting this site. They can then decide whether or not the information is suitable for their teens. www.safersex.org is a clear example of how the Web can be a useful resource for honest discussion of safer sex aimed specifically at teens.

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We welcome suggestions for Web sites to be included in future Netphiles