



Technical Report—Tobacco as a Substance of Abuse

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SUBSTANCE ABUSE

KEY WORDS

tobacco use, smoking, adolescents, youth, smoking cessation

ABBREVIATIONS

AAP—American Academy of Pediatrics

FDA—Food and Drug Administration

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abstract

Tobacco use is the leading preventable cause of morbidity and death in the United States. Because 80% to 90% of adult smokers began during adolescence, and two thirds became regular, daily smokers before they reached 19 years of age, tobacco use may be viewed as a pediatric disease. Every year in the United States, approximately 1.4 million children younger than 18 years start smoking, and many of them will die prematurely from a smoking-related disease. Moreover, there is recent evidence that adolescents report symptoms of tobacco dependence early in the smoking process, even before becoming daily smokers. The prevalence of tobacco use is higher among teenagers and young adults than among older adult populations. The critical role of pediatricians in helping to reduce tobacco use and addiction and secondhand tobacco-smoke exposure in the pediatric population includes education and prevention, screening and detection, and treatment and referral. *Pediatrics* 2009;124:e1045–e1053

TOBACCO AS A SUBSTANCE OF ABUSE

Tobacco products contain the addictive drug nicotine as well as many other toxic chemicals. The use of tobacco, in any form, can lead to addiction, significant morbidity, and premature death. There are several different ways in which tobacco is used, including smokeless chewing tobacco and snuff, as well as tobacco that is smoked through a hookah or water pipe or as a cigar (large cigar, cigarillo, or little cigar), bidi, kretek, or cigarette. Because cigarette smoking is the most prevalent method of tobacco use, it will be the predominant focus of this report. Tobacco smoke contains thousands of toxic chemicals, including many known carcinogens. There is no safe method, level, frequency, or duration of tobacco use or exposure.¹ Moreover, smokeless tobacco is not a safe alternative to cigarette smoking. A policy statement² and additional technical report³ from the American Academy of Pediatrics (AAP) accompany this technical report.

Nicotine in tobacco is a powerfully addictive substance with multiple physiologic and psychological effects. Like many other drugs of addiction, it activates the same brain reward system involved in pleasurable activities such as eating and sexual activity.^{4,5} Tobacco withdrawal symptoms make it difficult for individuals to quit, are variable among individuals, and usually include unpleasant effects such as anxiety, irritability, difficulty concentrating, restlessness, impatience, hunger, tremor, racing heart, sweating, dizziness, nicotine craving, insomnia, drowsiness, headaches, digestive disturbances, and depression.⁶ The addictive nature of nicotine combined with the unpleasant withdrawal

symptoms experienced when individuals try to quit are what make nicotine dependence such a chronic, relapsing disease.

EPIDEMIOLOGY OF TOBACCO USE

Tobacco addiction usually begins in childhood or adolescence.^{7,8} Children younger than 10 years have reported experimenting with tobacco. Every year in the United States, approximately 1.4 million children younger than 18 years start smoking, and many of them will die prematurely from a smoking-related disease.⁹ The prevalence of tobacco use among teenagers and young adults is comparable to and slightly higher than prevalence rates among other adult populations. According to data from the 2007 National Health Interview Survey, an estimated 19.7% of all adults in the United States are current cigarette smokers. In comparison, 20% of high school students are current smokers.¹⁰ The prevalence of current cigarette use is highest among 12th-grade students (26.5%), followed by 11th-grade (21.6%), 10th-grade (19.6%), and 9th-grade (14.3%) students.¹⁰ Unfortunately, the prevalence of quitting (ie, the percentage of those who have ever smoked and who are now former smokers) is lower among younger age groups than among older adults. Approximately 21.3% of male and 18.7% of female high school students in the United States are current cigarette smokers, defined as use in the previous 30 days. Rates of current smokers are highest among non-Hispanic white high school students (23.2%), followed by Hispanic (16.7%) and non-Hispanic black (11.6%) students.¹⁰ Among US middle school students, approximately 6.3% are current cigarette smokers, and estimated rates are slightly higher for girls (6.4%) than for boys (6.3%). Approximately 6.5% of white students, 6.8% of Hispanic students, 5.5% of black students, and 2.6% of Asian American stu-

dents in middle school are current cigarette smokers.¹¹ Cigarette-smoking estimates in the US adult population according to age are as follows: 18 to 24 years: 23.9%; 25 to 44 years: 23.5%; 45 to 64 years: 21.8%; and 65 years or older: 10.2%.¹²

In the United States, approximately 7.9% of high school students are current smokeless-tobacco users, defined as use of smokeless tobacco on at least 1 day during the 30 days before the survey. The prevalence of current smokeless-tobacco use is higher among male (13.4%) than among female (2.3%) students and higher among white (10.3%) than among Hispanic (4.7%) or black (1.2%) students. Regarding current cigar use, 13.6% of high school students had smoked cigars, cigarillos, or little cigars on at least 1 day during the 30 days before the survey. Overall, the prevalence of current cigar use was higher among male (19.4%) than among female (7.6%) students and higher among white (14.8%) than among Hispanic (12.7%) and black (10%) students.¹⁰

Education and Socioeconomic Status

There is an inverse relationship between rates of cigarette smoking and both socioeconomic status and education in young people and adults. For example, in 2006, smoking a half-pack or more per day was approximately 3 times as prevalent among 12th-graders who were not going to college as among those who were college bound (13.0% vs 3.9%, respectively). Among survey respondents of college age (1–4 years past high school), those not enrolled in college had a dramatically higher rate of half-pack-a-day smoking than those who were in college (17.0% vs 4.9%, respectively).¹³ Cigarette-smoking prevalence is highest for adults with a general education development (GED) diploma (46.0%) or

9 to 11 years of education (35.4%) and lowest for adults with an undergraduate college degree (9.6%) or a graduate college degree (6.6%).¹²

Tobacco Use and Mental Illness

Nicotine dependence is more common among adults with mental health disorders such as schizophrenia and depression. Likewise, in youth, tobacco use may be a marker for mental health problems such as depression and anxiety disorders.^{14–19} Tobacco use may represent a means of self-treating symptoms often associated with these disorders.²⁰ Depending on the population studied, 55% to 90% of individuals with other mental disorders smoke, compared with approximately 20% in the general population. Mood disorders, anxiety, and other substance use–related disorders may be more common in individuals who smoke than in those who are former smokers and those who have never smoked.^{14–19} Facilities that offer mental health services often do not treat tobacco addiction^{21,22}; however, inpatient mental health and substance abuse treatment facilities with no-smoking policies have been successful in promoting smoking cessation, even among adolescents.^{23,24} Monihan et al²⁵ reported that after implementing a smoking ban, some inpatient psychiatric facilities noted an increase in staff satisfaction and a significant decrease in violence and behavioral problems related to smoking habits. These results lend support to the recommendation that inpatient facilities should offer tobacco-addiction treatment.

Tobacco Use Among Lesbian, Gay, Bisexual, and Transgender Youth

Studies show that lesbian, gay, bisexual, and transgender youth are significantly more likely than heterosexual youth to engage in high-risk behaviors (such as fighting, substance use, and

alcohol use).^{26,27} Adolescents who report same-sex attraction or activity were 2.5 times as likely to smoke at least weekly compared with heterosexuals; bisexual/lesbian girls were 9.7 times more likely.²⁸ Ryan et al²⁹ found that 59% of teenagers who classified themselves as lesbian, gay, or bisexual reported using tobacco (compared with 35% of heterosexual teenagers), and almost half tried their first cigarette before 13 years of age. Lesbian and gay teenagers are also 4 times more likely than their heterosexual counterparts to use smokeless-tobacco products. Given that these youth are at considerable risk of tobacco use, population-specific tobacco-prevention and -cessation strategies are warranted.

INITIATION OF TOBACCO USE AND ONSET OF ADDICTION

Initiation of tobacco use is considered multifactorial. Several factors are involved in influencing youth to experiment with tobacco, including socioenvironmental (eg, advertising/media influences, peer influences, parental influences, ethnic and gender factors), psychological (eg, psychiatric illness or history, child development, weight concerns), and biological (eg, genetics) factors.^{8,30–38} Teenagers with at least 1 smoking parent are twice as likely to become smokers compared with teenagers whose parents do not smoke.³⁹ This is attributed to the availability of tobacco products in the home, modeling of the behavior, and the hypothesized role of nicotine receptor priming as a result of being exposed to nicotine in utero and second-hand smoke after birth.

Studies of twins and cigarette smoking have indicated that genetic influences play a crucial role in smoking initiation, persistence, and ability to quit smoking, with the heritability of smoking initiation considered to be 50% and

that for smoking persistence to be 70%.^{40–43} It is hypothesized that multiple polymorphic genes are involved, with each modestly increasing the risk of developing nicotine dependence.^{40,41,44,45} These genes affect nicotine metabolism as well as the dopamine receptors and transporters that mediate reward in the brain nucleus accumbens.⁴⁶

Peer influences are also important in the uptake of tobacco use; teenagers with more friends who smoke are more likely to start smoking. Teenagers who have an inaccurately high perception of smoking prevalence among their peers and who believe that smoking is popular among the elite/successful elements of society are more likely to smoke.⁴⁷ Studies have also shown among adolescent girls a relatively consistent association between having higher body weight or concerns about weight and a greater likelihood of smoking.⁴⁸

Nicotine is the primary addictive component in tobacco. Like other drug addictions, nicotine addiction is a chronic condition with the potential for periods of relapse and remission throughout life. The time interval from experimentation or initiation of tobacco use to regular use varies considerably among individuals but typically averages 2 to 3 years.⁸ Experts traditionally believed that nicotine addiction developed after 2 or 3 years of regular tobacco use, but recent evidence has shown that symptoms of nicotine addiction may be apparent in some youth after short-term use of tobacco.^{49–51} DiFranza et al⁵¹ demonstrated that 10% of youth who become hooked on cigarettes exhibit “loss of autonomy” within 2 days of first inhaling from a cigarette, and 25% demonstrate evidence within 1 month. The study also revealed that even adolescents who smoke only a few cigarettes per month and those who have

smoked as few as 100 cigarettes can suffer physical and psychological withdrawal symptoms when they attempt to quit using tobacco and are deprived of nicotine. Despite not yet being daily smokers, these youth may benefit from help to overcome withdrawal symptoms. Adolescent tobacco users often underestimate the addictive nature of nicotine. Of adolescent smokers who reported believing that they would not be smoking in 5 years, approximately 75% were still smoking 5 to 6 years later.⁸ The younger a person is when starting tobacco use, the more likely he or she is to become heavily addicted to nicotine and experience more difficulty with trying to quit.⁵² This is likely related to the vulnerability of the developing brain, because animal research has shown that the adolescent brain is more susceptible than the adult brain to the reinforcing effects of nicotine.⁵³

SOURCES OF TOBACCO USED BY YOUTH

Youth obtain tobacco from a variety of sources. Noncommercial sources of tobacco include friends, siblings, parents, relatives, and even baby-sitters.⁵⁴ Youth most commonly obtain their first cigarettes from friends or siblings, although stealing their first cigarettes from parents is not uncommon.⁵⁴ After the first cigarette, those who continue to smoke typically will rely on same-aged friends as their first steady source.⁵⁵ Sharing cigarettes among friends is very common. In 1 study, 99% of young smokers reported having, at some time, obtained tobacco from friends.⁵⁴

The 2007 Monitoring the Future survey revealed that 56% of 8th-graders and 78% of 10th-graders said cigarettes were easy for them to get.⁵⁶ Although all states have laws that prohibit the sale of tobacco products to people younger than 18 years, the level of enforcement of these prohibitions varies.

The 2003 National Survey on Drug Use and Health revealed that among 12- to 17-year-olds who had smoked in the previous month, more than three quarters of them (77%) had purchased their own cigarettes. More than half (53.3%) had directly purchased their own cigarettes; 63.3% had given money to others to buy cigarettes for them; nearly one third (30.5%) had purchased cigarettes from a friend, family member, or someone at school; and a small portion had purchased cigarettes over the Internet or through the mail (2.6% and 2.9%, respectively). In addition, 62% had “bummed” cigarettes from others, and 13.1% had taken cigarettes from others without asking, with 0.8% having stolen cigarettes from a store. Older underage smokers were more likely to buy directly in stores than were younger smokers.

TOBACCO AS A GATEWAY DRUG

Tobacco is often described as a gateway drug that can lead to the use and abuse of other substances. Teenagers who smoke are 3 times more likely than nonsmokers to use alcohol, 8 times more likely to use marijuana, and 22 times more likely to use cocaine.^{1,57} Smoking has been associated with other high-risk behaviors including high-risk sexual practices, such as having multiple sexual partners or unprotected sex, and perpetration of youth violence.^{8,58} In fact, tobacco use is an individual risk factor for youth violence.⁵⁸

EFFECTS OF TOBACCO USE

Smoking harms nearly every organ of the body, causing many diseases and reducing the health of smokers as well as those exposed to secondhand smoke¹ (see Table 1 and the accompanying AAP policy statement² and technical report³). The adverse health effects from cigarette smoking account for an estimated 438 000 deaths each

TABLE 1 Major Conclusions of the 2004 Surgeon General Report¹

Smoking harms nearly every organ of the body, causing many diseases and reducing the health of smokers in general.
Quitting smoking has immediate and long-term benefits, reducing risks of diseases caused by smoking and improving health in general.
Smoking cigarettes with lower machine-measured yields of tar and nicotine provides no clear benefit to health.
The list of diseases caused by smoking has been expanded to include abdominal aortic aneurysm, acute myeloid leukemia, cataract, cervical cancer, kidney cancer, pancreatic cancer, pneumonia, periodontitis, and stomach cancer. These are in addition to diseases previously known to be caused by smoking, including bladder, esophageal, laryngeal, lung, oral, and throat cancers; chronic lung diseases; coronary heart and cardiovascular diseases; and reproductive effects and sudden infant death syndrome.

year in the United States. Although most people are aware of the negative health consequences of tobacco use in adults, youth also experience negative health consequences attributable to tobacco use. Smoking impairs lung growth and results in decreased lung function. A smoker's resting heart rate is, on average, 2 to 3 beats per minute faster than that of a nonsmoker. Also, smokers experience more coughing as well as more frequent and severe respiratory illnesses. Smokers have less physical endurance and tend to experience shortness of breath even with minimal exertion.¹ Nicotine staining of teeth can be identified early by pediatric dentists. Smokeless-tobacco use is associated with periodontal disease, gum recession, leukoplakia, and cancers of the oral cavity.^{8,59}

Smoking poses some additional risks for women and girls. As a direct consequence of smoking, lung cancer now exceeds breast cancer as the leading cause of cancer-related deaths in women. Women who smoke also have an increased risk of other cancers, including cancers of the oral cavity, pharynx, larynx, esophagus, pancreas, kidney, bladder, and uterine cervix.¹

Women who smoke double their risk of developing coronary heart disease and increase by more than 10-fold their likelihood of dying from chronic obstructive pulmonary disease.¹ Moreover, cigarette smoking increases the risk of infertility, preterm delivery, stillbirth, low birth weight, and sudden infant death syndrome.¹

PREVENTION

Effective strategies for preventing adolescent tobacco use include public health approaches as well as individual strategies. Some public health approaches that may be effective include restricting the promotion of tobacco products in general and specifically prohibiting promotions aimed at children, including laws prohibiting the sale of tobacco to minors and raising the price of tobacco through aggressive taxation.⁶⁰ Also, changing the social norm about the normality and acceptability of tobacco use is an effective prevention strategy that can be accomplished through the use of school smoking bans, health education, household smoking bans, and restrictions on smoking in public places.^{22,61,62} As part of the 1998 Master Settlement Agreement between 46 states' attorneys general and the 4 largest tobacco companies in the United States, the tobacco manufacturers agreed to stop using cartoon characters in their advertisements, advertising on billboards, and putting their brand names on articles such as clothing and also agreed to avoid targeting children and adolescents with marketing and advertising.⁶³ However, the tobacco industry has continued to devise new ways to target product marketing to children through using print ads, sponsoring motor sports, and depicting smoking in movies.

Pediatricians and parents have important roles in preventing tobacco use by children and adolescents. Pediatrici-

cians should use anticipatory guidance to implement and encourage individual patient-level strategies to educate patients and families and prevent tobacco use and exposure. Children should be screened for smoking risks beginning by 5 years of age. All clinical encounters should include inquiries about tobacco use and second-hand smoke exposure and clear documentation of the information in the medical record. Children and adolescents should be warned about the harmful effects of tobacco and the ease with which experimentation progresses to addiction and regular use.^{50,51} Because children with smoking parents are more likely to smoke and to start at an earlier age, screening for parental tobacco use is an important preventive measure.⁶⁴ Parents should be advised to maintain smoke-free households and vehicles and to articulate clear messages that they expect their children to remain smoke free. Parental attitudes, opinions, and feelings about their children's smoking status greatly influence whether children will smoke, even when parents smoke.^{65–67}

PUBLIC POLICIES FOR TOBACCO-USE REDUCTION

Comprehensive tobacco-control programs should include interventions that have been proven effective in preventing tobacco-use initiation among youth and young adults, promote cessation among adults and youth, and eliminate secondhand smoke exposure and tobacco-related disparities. The ideal comprehensive approach to tobacco control includes population-based and individual-level interventions.^{61,68} Population-based interventions include clean indoor-air legislation, tobacco tax increases, restricted youth access to tobacco, and mass-media anti-tobacco campaigns.^{61,68} Individual-level interventions include treatment services that have been proven to increase

tobacco-cessation rates, such as behavioral counseling and pharmacotherapy. The progress that has been made thus far in reducing youth smoking rates has been accomplished through a combination of such strategies, including raising tobacco taxes, passing legislation that limits minors' access to tobacco products and prohibits smoking in public places, and running aggressive media countermarketing campaigns.⁶⁹ Studies have demonstrated that youth are particularly susceptible to tobacco advertising and promotions. One important source of tobacco promotions is movies. Tobacco is depicted in 56% of films with Motion Picture Association of America ratings of G, PG, or PG-13—the films children are most likely to see—and in 87.5% of films with an R rating.⁷⁰ Research has indicated that exposure to movie smoking is a primary independent risk factor for youth smoking initiation.^{36,71} Given the prevalence of protobacco images in movies viewed by children and the impact it has on smoking initiation among youth, there is a critical need to support the Smoke Free Movies effort. The Motion Picture Association of America recently agreed to consider whether a film depicts smoking when determining its ratings of movies.

Youth tobacco users are also very price sensitive, so raising tobacco taxes causes a dramatic decrease in youth tobacco-use rates. Raising taxes also leads to more adults seeking smoking-cessation services.^{60,61} Clean indoor-air legislation also correlates with more tobacco-use cessation. The American Legacy Foundation's social marketing campaign, Truth (www.thetruth.com), has been independently associated with significant declines in youth smoking.⁷²

Cigarette warning labels are an important component of comprehensive tobacco-control and smoking-cessation efforts. In 1984, Congress

enacted the Comprehensive Smoking Education Act (Pub L No. 98–474), which required rotation of the following 4 black-and-white text messages on the side of cigarette packages:

1. Surgeon General's Warning: Smoking causes lung cancer, heart disease, emphysema, and may complicate pregnancy.
2. Surgeon General's Warning: Quitting smoking now greatly reduces serious risks to your health.
3. Surgeon General's Warning: Smoking by pregnant women may result in fetal injury, premature birth, and low birth weight.
4. Surgeon General's Warning: Cigarette smoke contains carbon monoxide.

For the past 20 years, there have been no changes to US cigarette package warning labels; however, several other countries, including Canada, Australia, Thailand, South Africa, Singapore, and Poland, have mandated stronger health warnings on cigarette packages by requiring the addition of graphic images, detailed statistical information about tobacco-use health risks, and information about how to quit smoking. In a study that compared US and Canadian warning labels, young adult (18–24 years of age) focus-group participants perceived the larger, more graphic Canadian warning labels to be more informative and more likely to attract a smoker's attention.⁷³ Hammond et al⁷⁴ found that large, comprehensive warnings on cigarette packages are more likely to get noticed and have been rated as more effective by smokers in deterring them from smoking. Active discussion and advocacy efforts in the United States currently focus on legislation that passed in 2009, giving the US Food and Drug Administration (FDA) the authority to regulate tobacco products and

TABLE 2 Brief Interventions to Treat Tobacco Dependence^{7,81}: The 6 A's for Brief Intervention to Treat Tobacco Dependence

Anticipate risk of tobacco use	Routinely ask parents about smoking. Make parents aware of age of smoking onset. Discuss health effects of tobacco use. Be aware of populations at increased risk of tobacco initiation.
Ask about tobacco use	Identify and document tobacco-use status and secondhand smoke exposure for every patient at every visit.
Advise to quit	In a clear, strong, and personalized manner, urge every tobacco user to quit and nonusers to remain tobacco free. (Focus on short-term effects with youth; remind parents of their responsibility as role models.)
Assess willingness to make a cessation attempt	Is the tobacco user willing to make a cessation attempt at this time? (Assess risk of future tobacco use; praise and reinforce healthy decisions; help youth practice refusal skills.)
Assist in cessation attempt	For the patient willing to make a cessation attempt, use counseling to help him or her quit. (Set a quit date; provide brief counseling and self-help materials; refer to quit line.)
Arrange follow-up	Schedule follow-up contact, preferably within the first week after the cessation date. (Monitor progress and problems; reinforce antismoking messages; discuss possibility of relapse and ways to prevent relapse.)

marketing and strengthen warning labels.

CLINICAL PRACTICES FOR TOBACCO-USE REDUCTION

Studies have indicated that most adolescent and young adult smokers want to quit and even try to quit smoking, but few are successful. In 2007, the percentage of high school smokers who made a quit attempt ranged from

43.4% to 62.5%, with a median of 55.7%.⁷⁵ Although youth report a desire to quit and quit attempts, few seek medical help with quitting.^{76,77} A number of possible reasons have been cited for this, including the lack of smoking-cessation modalities proven effective for youth, youth not believing that quitting tobacco use warrants professional help, youth preferring privacy, and available cessation pro-

grams not addressing the unique concerns and issues most relevant to youth tobacco users.⁷⁶ When pediatricians do provide medical care related to tobacco use, they must uphold confidentiality standards established through pediatric and adolescent medicine professional organizations and supported by state laws.^{78–80}

Although extensive scientific evidence supports best-practice recommendations and strategies for tobacco dependence treatment in adults, the scientific evidence for treating tobacco use and dependence effectively in adolescents is still evolving.⁷ The recently released Public Health Service clinical practice guideline, “Treating Tobacco Use and Dependence: 2008 Update,” states that counseling has been shown to be effective in the treatment of adolescent smokers.⁷ The cognitive-behavioral counseling approach involves establishing awareness of tobacco use, identifying motivations to quit, preparing to quit, and providing strategies for maintaining abstinence after cessation. The 5 A's model, as out-

TABLE 3 Smoking-Cessation Medications⁷

Medication ^a	Dose	Adverse Effects, Precautions, Warnings, and Contraindications
Bupropion	Begin treatment 1–2 wk before quit date; 150 mg/day for 3 d, 150 mg twice daily for 7–12 wk after quit date	Adverse effects: insomnia, dry mouth; contraindications: monoamine oxidase (MAO) inhibitor use in past 14 d, history of seizure or eating disorder
Nicotine gum: 2 mg if <25 cigarettes per day, 4 mg if ≥25 cigarettes per day	At least 1 piece every 1–2 h for the first 6 wk (≤24 pieces per day)	Adverse effects: mouth soreness, hiccups, dyspepsia; acidic drinks interfere with absorption of nicotine
Nicotine inhaler: 4 mg of nicotine per cartridge (80 inhalations)	6–16 cartridges per day	Acidic drinks interfere with absorption of nicotine
Nicotine lozenge: 2 mg if first cigarette >30 min after waking, 4 mg if first cigarette <30 min after waking	1 lozenge every 1–2 h for first 6 wk (at least 9 lozenges per day), 1 every 2–4 h during weeks 7–9, then 1 every 4–8 h (≤20 lozenges per day)	Adverse effects: nausea, hiccups, heartburn; acidic drinks interfere with absorption of nicotine
Nicotine nasal spray: a dose is 0.5 mg per nostril (1 mg total)	1–2 doses per hour (minimum: 8 doses per day; maximum 40 doses per day)	Adverse effects: nasal irritation, nasal congestion; precaution: do not use in people with severe reactive airways disease
Nicotine patch	21 mg/24 h for 4 wk, 14 mg/24 h for 2 wk, and 7 mg/24 h for 2 wk (step-down dosage) or 15 mg/16 h for 8 wk (single dosage)	Adverse effects: local skin reaction, insomnia, and/or vivid dreams
Varenicline (Chantix [Pfizer, Mission, KS])	Start treatment 1 wk before quit date; 0.5 mg/d for 3 d, 0.5 mg twice daily for 4 d, 1 mg twice daily for 3 mo	Precaution: decrease dose if kidney disease; warning: depressed mood, agitation, behavior changes, suicidal ideation, and suicide have been reported; adverse effects: nausea, trouble sleeping, abnormal/vivid dreams

^a See FDA package insert for more complete information.

lined in the Public Health Service guideline, has been modified for children and adolescents.⁷ The AAP has advocated a sixth A—anticipate—that takes into account child development and the importance of anticipatory guidance in pediatric practice⁸¹ (see Table 2). Counseling for children and adolescents should be developmentally appropriate and relevant across various age groups. Behavioral counseling from a health care professional can range in intensity from brief advice and encouragement to quit, to more intense multisession group-therapy programs, to proactive telephone quit lines, to interactive computer-based programs. The Public Health Service guideline recommends that all clinicians strongly advise patients who use tobacco in any form to quit.⁷

Pediatricians should be familiar with the pharmacotherapies for smoking cessation that have been approved by the FDA, including various forms of nicotine-replacement therapy, the antidepressant bupropion, and a nicotine receptor partial agonist, varenicline, although none of these have been approved by the FDA for tobacco cessa-

tion in people younger than 18 years (see Table 3). A few studies have examined the use of pharmacotherapy agents in helping youth quit smoking; however, most of the studies have suffered from small sample sizes, limited power, and high attrition rates. Although nicotine-replacement medications have been shown to be safe in adolescents, there is little evidence that these medications or bupropion are effective in promoting long-term abstinence among adolescent smokers. They are, therefore, not recommended as components of pediatric tobacco intervention by the Public Health Service guideline.⁷

ADDITIONAL RESEARCH NEEDED

There are major gaps in the scientific literature used to support decisions regarding youth tobacco control. Although there are challenges to conducting this research, including recruitment and retention, researchers have been making steady progress. Some areas that require further study in youth populations include the factors that motivate tobacco-cessation attempts, safety and effectiveness of tobacco-cessation pharmacotherapy

in adolescents, use and efficacy of telephone quit lines, and Web-based strategies for engaging youth in tobacco cessation.

CONCLUSIONS

Smoking remains the most common preventable cause of illness and death in the United States. Smokeless-tobacco and secondhand smoke exposure cause additional morbidity and mortality. Clinicians caring for pediatric patients should provide tobacco-use and exposure prevention and cessation education and advice, screening and counseling, and intervention and referral for patients and their families.

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REFERENCES

1. US Public Health Service, Office of the Surgeon General, US Office on Smoking and Health. *The Health Consequences of Smoking: A Report of the Surgeon General*. Rockville, MD: US Department of Health and Human Services, Public Health Service; 2004
2. American Academy of Pediatrics, Committee on Environmental Health, Committee on Substance Abuse, Committee on Adolescence, and Committee on Native American Child Health. Tobacco use: a pediatric disease. *Pediatrics*. 2009;124(5):1473–1486
3. Best D; American Academy of Pediatrics, Committee on Environmental Health, Committee on Adolescence, and Committee on Native American Child Health. Secondhand and prenatal tobacco smoke exposure. *Pediatrics*. 2009;124(5):e1017–e1044
4. Henningfield J, Cohen C, Pickworth W. Psychopharmacology of nicotine. In: Orleans C, Slade J, eds. *Nicotine Addiction: Principles and Management*. New York, NY: Oxford University Press; 1993:24–45
5. Tomkins DM, Sellers EM. Addiction and the brain: the role of neurotransmitters in the cause and treatment of drug dependence. *CMAJ*. 2001;164(6):817–821
6. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV)*. Washington, DC: American Psychiatric Association; 1994
7. Fiore M, Jaen C, Baker T, et al. *Treating Tobacco Use and Dependence: 2008 Update—Clinical Practice Guideline*. Rockville, MD: US Department of Health and Human Services, Public Health Service; 2008
8. Centers for Disease Control and Prevention. *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1994
9. Substance Abuse and Mental Health Services Administration. *Results From the 2006 National Survey on Drug Use and Health: National Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies; 2007. NSDUH series H-32, DHHS publication No. SMA 07–4293. Available at: <http://oas.samhsa.gov/nsduh/2k6nsduh/2k6results.pdf>. Accessed September 4, 2008
10. Eaton DK, Kann L, Kinchen S, et al; Centers for Disease Control and Prevention. Youth risk behavior surveillance: United States, 2007. *MMWR Surveill Summ*. 2008;57(4):1–131
11. Centers for Disease Control and Prevention. 2006 National Youth Tobacco Survey and key prevalence indicators. Available at: www.cdc.gov/tobacco/data_statistics/surveys/NYTS/index.htm#NYTS2006. Accessed September 4, 2008

12. Centers for Disease Control and Prevention. Cigarette smoking among adults: United States, 2006. *MMWR Morb Mortal Wkly Rep.* 2007;56(44):1157–1161
13. Johnston L, O'Malley PM, Bachman JG, Schulenberg JE. *Monitoring the Future: National Survey Results on Drug Use, 1975–2006. Volume II: College Students and Adults Ages 19–45.* Bethesda, MD: National Institute on Drug Abuse; 2007. NIH publication No. 07–6206
14. Dani JA, Harris RA. Nicotine addiction and comorbidity with alcohol abuse and mental illness. *Nat Neurosci.* 2005;8(11):1465–1470
15. Grant BF, Hasin DS, Chou SP, Stinson FS, Dawson DA. Nicotine dependence and psychiatric disorders in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Arch Gen Psychiatry.* 2004;61(11):1107–1115
16. Heiligenstein E, Smith SS. Smoking and mental health problems in treatment-seeking university students. *Nicotine Tob Res.* 2006;8(4):519–523
17. John U, Meyer C, Rumpf HJ, Hapke U. Smoking, nicotine dependence and psychiatric comorbidity: a population-based study including smoking cessation after three years. *Drug Alcohol Depend.* 2004;76(3):287–295
18. Kessler RC. The epidemiology of dual diagnosis. *Biol Psychiatry.* 2004;56(10):730–737
19. Ramsey SE, Brown RA, Strong DR, Sales SD. Cigarette smoking among adolescent psychiatric inpatients: prevalence and correlates. *Ann Clin Psychiatry.* 2002;14(3):149–153
20. Abrams D, Niaura R, Brown R, Emmons K, Goldstein M, Monti P. *The Tobacco Dependence Treatment Handbook: A Guide to Best Practices.* New York, NY: Guilford Press; 2003
21. Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: a population-based prevalence study. *JAMA.* 2000;284(20):2606–2610
22. Moore L, Roberts C, Tudor-Smith C. School smoking policies and smoking prevalence among adolescents: multilevel analysis of cross-sectional data from Wales. *Tob Control.* 2001;10(2):117–123
23. Callaghan RC, Brewster JM, Johnson J, Taylor L, Beach G, Lentz T. Do total smoking bans affect the recruitment and retention of adolescents in inpatient substance abuse treatment programs? A 5-year medical chart review, 2001–2005. *J Subst Abuse Treat.* 2007;33(3):279–285
24. El-Guebaly N, Cathcart J, Currie S, Brown D, Gloster S. Public health and therapeutic aspects of smoking bans in mental health and addiction settings. *Psychiatr Serv.* 2002;53(12):1617–1622
25. Monihan KM, Schacht LM, Parks J. *A Comparative Analysis of Smoking Policies and Practices Among State Psychiatric Hospitals.* Alexandria, VA: National Association of State Mental Health Program Directors Research Institute Inc; 2006
26. Gruskin EP, Hart S, Gordon N, Ackerson L. Patterns of cigarette smoking and alcohol use among lesbians and bisexual women enrolled in a large health maintenance organization. *Am J Public Health.* 2001;91(6):976–979
27. Remafedi G. Lesbian, gay, bisexual, and transgender youths: who smokes, and why? *Nicotine Tob Res.* 2007;9(suppl 1):S65–S71
28. Austin SB, Ziyadeh N, Fisher LB, Kahn JA, Colditz GA, Frazier AL. Sexual orientation and tobacco use in a cohort study of US adolescent girls and boys. *Arch Pediatr Adolesc Med.* 2004;158(4):317–322
29. Ryan H, Wortley PM, Easton A, Pederson L, Greenwood G. Smoking among lesbians, gays, and bisexuals: a review of the literature. *Am J Prev Med.* 2001;21(2):142–149
30. Centers for Disease Control and Prevention. Selected cigarette smoking initiation and quitting behaviors among high school students: United States, 1997. *MMWR Morb Mortal Wkly Rep.* 1998;47(19):386–389
31. Gidwani PP, Sobol A, DeJong W, Perrin JM, Gortmaker SL. Television viewing and initiation of smoking among youth. *Pediatrics.* 2002;110(3):505–508
32. Hill KG, Hawkins JD, Catalano RF, Abbott RD, Guo J. Family influences on the risk of daily smoking initiation. *J Adolesc Health.* 2005;37(3):202–210
33. Komro KA, McCarty MC, Forster JL, Blaine TM, Chen V. Parental, family, and home characteristics associated with cigarette smoking among adolescents. *Am J Health Promot.* 2003;17(5):291–299
34. Leatherdale ST, Brown KS, Cameron R, McDonald PW. Social modeling in the school environment, student characteristics, and smoking susceptibility: a multi-level analysis. *J Adolesc Health.* 2005;37(4):330–336
35. Rajan KB, Leroux BG, Peterson AV Jr, et al. Nine-year prospective association between older siblings' smoking and children's daily smoking. *J Adolesc Health.* 2003;33(1):25–30
36. Sargent JD, Beach ML, Adachi-Mejia AM, et al. Exposure to movie smoking: its relation to smoking initiation among US adolescents. *Pediatrics.* 2005;116(5):1183–1191
37. Tomeo CA, Field AE, Berkey CS, Colditz GA, Frazier AL. Weight concerns, weight control behaviors, and smoking initiation. *Pediatrics.* 1999;104(4 pt 1):918–924
38. Wellman RJ, Sugarman DB, DiFranza JR, Winickoff JP. The extent to which tobacco marketing and tobacco use in films contribute to children's use of tobacco: a meta-analysis. *Arch Pediatr Adolesc Med.* 2006;160(12):1285–1296
39. den Exter Blokland EA, Engels RC, Hale WW 3rd, Meeus W, Willemsen MC. Lifetime parental smoking history and cessation and early adolescent smoking behavior. *Prev Med.* 2004;38(3):359–368
40. Hall W, Madden P, Lynskey M. The genetics of tobacco use: methods, findings and policy implications. *Tob Control.* 2002;11(2):119–124
41. Lerman C, Berrettini W. Elucidating the role of genetic factors in smoking behavior and nicotine dependence. *Am J Med Genet B Neuropsychiatr Genet.* 2003;118B(1):48–54
42. Munafò M, Clark T, Johnstone E, Murphy M, Walton R. The genetic basis for smoking behavior: a systematic review and meta-analysis. *Nicotine Tob Res.* 2004;6(4):583–597
43. True WR, Heath AC, Scherrer JF, et al. Genetic and environmental contributions to smoking. *Addiction.* 1997;92(10):1277–1287
44. Crabbe JC. Genetic contributions to addiction. *Annu Rev Psychol.* 2002;53:435–462
45. Uhl GR, Liu QR, Naiman D. Substance abuse vulnerability loci: converging genome scanning data. *Trends Genet.* 2002;18(8):420–425
46. Munafò M, Johnstone E, Murphy M, Walton R. New directions in the genetic mechanisms underlying nicotine addiction. *Addict Biol.* 2001;6(2):109–117
47. Primack BA, Switzer GE, Dalton MA. Improving measurement of normative beliefs involving smoking among adolescents. *Arch Pediatr Adolesc Med.* 2007;161(5):434–439
48. Potter BK, Pederson LL, Chan SS, Aubut JA, Koval JJ. Does a relationship exist between body weight, concerns about weight, and smoking among adolescents? An integration of the literature with an emphasis on gender. *Nicotine Tob Res.* 2004;6(3):397–425
49. Colby SM, Tiffany ST, Shiffman S, Niaura RS. Are adolescent smokers dependent on nicotine? A review of the evidence. *Drug Alcohol Depend.* 2000;59(suppl 1):S83–S95
50. DiFranza JR, Rigotti NA, McNeill AD, et al. Initial symptoms of nicotine dependence in adolescents. *Tob Control.* 2000;9(3):313–319
51. DiFranza JR, Savageau JA, Fletcher K, et al. Symptoms of tobacco dependence after brief intermittent use: the Development and Assessment of Nicotine Dependence in Youth-2 study. *Arch Pediatr Adolesc Med.* 2007;161(7):704–710
52. Breslau N, Fenn N, Peterson EL. Early smoking initiation and nicotine dependence in a cohort of young adults. *Drug Alcohol Depend.* 1993;33(2):129–137
53. Levin ED, Rezvani AH, Montoya D, Rose JE, Swartzwelder HS. Adolescent-onset nicotine self-administration modeled in female rats.

- Psychopharmacology (Berl)*. 2003;169(2):141–149
54. DiFranza J, Eddy J, Brown L, Ryan J, Boğojavlensky A. Tobacco acquisition and cigarette brand selection among youth. *Tob Control*. 1994;3(4):334–448
 55. Centers for Disease Control and Prevention. Usual sources of cigarettes for middle and high school students: Texas, 1998–1999. *MMWR Morb Mortal Wkly Rep*. 2002;51(40):900–901
 56. Johnston LD, O'Malley P, Bachman J, Schulenberg J. *Monitoring the Future: National Results on Adolescent Drug Use—Overview of Key Findings, 2007*. Bethesda, MD: National Institute on Drug Abuse; 2008. NIH publication No. 08-6418
 57. Henningfield JE, Clayton R, Pollin W. Involvement of tobacco in alcoholism and illicit drug use. *Br J Addict*. 1990;85(2):279–291
 58. Resnick MD, Ireland M, Borowsky I. Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*. 2004;35(5):424.e1–424.e10
 59. International Agency for Research on Cancer. Summaries and evaluations: tobacco products, smokeless (group 1). Available at: www.inchem.org/documents/iarc/suppl7/tobaccosmokeless.html. Accessed September 4, 2008
 60. Lantz PM, Jacobson PD, Warner KE, et al. Investing in youth tobacco control: a review of smoking prevention and control strategies. *Tob Control*. 2000;9(1):47–63
 61. Centers for Disease Control and Prevention. *Best Practices for Comprehensive Tobacco Control Programs: 2007*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2007
 62. Wakefield MA, Chaloupka FJ, Kaufman NJ, Orleans CT, Barker DC, Ruel EE. Effect of restrictions on smoking at home, at school, and in public places on teenage smoking: cross sectional study. *BMJ*. 2000;321(7257):333–337
 63. National Association of Attorneys General. The Tobacco Master Settlement Agreement. Available at: www.naag.org/tobacco.php. Accessed September 4, 2008
 64. Bauman KE, Foshee VA, Linzer MA, Koch GG. Effect of parental smoking classification on the association between parental and adolescent smoking. *Addict Behav*. 1990;15(5):413–422
 65. Distefan JM, Gilpin EA, Choi WS, Pierce JP. Parental influences predict adolescent smoking in the United States, 1989–1993. *J Adolesc Health*. 1998;22(6):466–474
 66. Farkas AJ, Distefan JM, Choi WS, Gilpin EA, Pierce JP. Does parental smoking cessation discourage adolescent smoking? *Prev Med*. 1999;28(3):213–218
 67. Jackson C, Dickinson D. Enabling parents who smoke to prevent their children from initiating smoking: results from a 3-year intervention evaluation. *Arch Pediatr Adolesc Med*. 2006;160(1):56–62
 68. Institute of Medicine, Committee on Reducing Tobacco Use. *Ending the Tobacco Problem: A Blueprint for the Nation*. Bonnie RJ, Stratton KR, Wallace RB, eds. Washington, DC: National Academies Press; 2007
 69. Wakefield M, Chaloupka F. Effectiveness of comprehensive tobacco control programmes in reducing teenage smoking in the USA. *Tob Control*. 2000;9(2):177–186
 70. Worth K, Tanski S, Sargent J. *Trends in Top Box Office Movie Tobacco Use: 1996–2004*. Washington, DC: American Legacy Foundation; 2006. Legacy First Look report 16
 71. Dalton MA, Sargent JD, Beach ML, et al. Effect of viewing smoking in movies on adolescent smoking initiation: a cohort study. *Lancet*. 2003;362(9380):281–285
 72. Farrelly MC, Davis KC, Haviland ML, Messeri P, Heulton CG. Evidence of a dose-response relationship between “truth” antismoking ads and youth smoking prevalence. *Am J Public Health*. 2005;95(3):425–431
 73. O'Hegarty M, Pederson LL, Yenokyan G, Nelson D, Wortley P. Young adults' perceptions of cigarette warning labels in the United States and Canada. *Prev Chronic Dis*. 2007;4(2):A27
 74. Hammond D, Fong GT, Borland R, Cummings KM, McNeill A, Driezen P. Text and graphic warnings on cigarette packages: findings from the international tobacco control four country study. *Am J Prev Med*. 2007;32(3):202–209
 75. Centers for Disease Control and Prevention. Cigarette use among high school students: United States, 1991–2007. *MMWR Morb Mortal Wkly Rep*. 2008;57(25):686–688
 76. Grimshaw G, Stanton A, Blackburn C, et al. Patterns of smoking, quit attempts and services for a cohort of 15- to 19-year-olds. *Child Care Health Dev*. 2003;29(6):457–464
 77. Centers for Disease Control and Prevention. Use of cessation methods among smokers aged 16–24 years: United States, 2003. *MMWR Morb Mortal Wkly Rep*. 2006;55(50):1351–1354
 78. American Academy of Pediatrics. Confidentiality in adolescent health care. *AAP News*. 1989;4:151. Available at: <http://aapnews.aapublications.org/cgi/content/full/e2005175v1>. Accessed September 4, 2008
 79. American Academy of Pediatrics, Committee on Adolescence. Achieving quality health services for adolescents. *Pediatrics*. 2008;121(6):1263–1270
 80. Ford C, English A, Sigman G. Confidential health care for adolescents: position paper for the Society for Adolescent Medicine. *J Adolesc Health*. 2004;35(2):160–167
 81. Klein JD. Incorporating effective smoking prevention and cessation counseling into practice. *Pediatr Ann*. 1995;24(12):646–652

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