State-of-the-Art Office-Based Interventions to Eliminate Youth Tobacco Use: The Past Decade

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abstract

Tobacco use and tobacco smoke exposure are among the most important preventable causes of premature disease, disability, and death and therefore constitute a major pediatric health concern. The pediatric primary care setting offers excellent opportunities to prevent tobacco use in youth and to deliver cessation-related treatment to youth and parents who use tobacco. This report updates a “state-of-the-art” article published a decade ago on office-based interventions to address these issues. Since then there has been marked progress in understanding the nature, onset, and trajectories of tobacco use and nicotine addiction in youth with implications for clinical practice. In addition, clinicians need to remain abreast of emerging nicotine delivery systems, such as electronic cigarettes, that may influence uptake or continuation of smoking. Although evidence-based practice guidelines for treating nicotine addiction in youth are not yet available, research continues to build the evidence base toward that goal. In the interim, practical guidelines are available to assist clinicians in addressing nicotine addiction in the pediatric clinical setting. This article reports current practices in addressing tobacco in pediatric primary care settings. It reviews our increasing understanding of youth nicotine addiction, summarizes research efforts on intervention in the past decade and additional research needed going forward, and provides practical guidelines for pediatric health care providers to integrate tobacco use prevention and treatment into their clinical practice. Pediatric providers can and should play an important role in addressing tobacco use and dependence, both in the youth they care for and in parents who use tobacco.

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concern that ENDS could increase progression to daily smoking and reduce cessation. Parental tobacco use is also of great concern because it harms the health of their children and increases the likelihood of initiation.

Pediatric health care providers have unique opportunities to prevent tobacco use initiation and nicotine addiction in their patients, identify current tobacco use in both youth and parents (and other caregivers), and initiate or refer for treatment. Here we update a “state-of-the-art” report published a decade ago. Specifically, we (1) describe current frequency of practice in addressing tobacco in pediatric primary care settings and barriers to practice, (2) describe what is known about nicotine dependence in youth, (3) summarize research efforts on intervention in the past decade and additional research needed going forward, and (4) provide practical guidelines for clinicians to integrate intervention into their clinical practice. Although most of the literature in this area refers to cigarette smoking, the most prevalent form of tobacco use in the United States, the term “tobacco use” as used here includes other nicotine delivery devices such as ENDs and spit tobacco, except when referring to studies specifically addressing cigarette smoking.

Tobacco-Related Practice and Barriers in Pediatric Primary Care Settings

Youth identify physicians as their preferred information source regarding smoking and quitting smoking, and parents are supportive of pediatricians screening and counseling for parental smoking. Given that parental smoking is strongly associated with adolescent smoking, pediatricians are in an excellent position to advise parents who smoke to stop, both for their child’s health as well as their own. However, the frequency of addressing tobacco in pediatric primary care has remained low, and many barriers still need to be addressed.

Frequency of Counseling

Surveys of American Academy of Pediatrics (AAP) members in 2004 (n = 879) and 2010 (n = 887) revealed few changes over time in the frequency of pediatricians providing tobacco-related advice or assistance to parents and youth. Most pediatricians (85% in 2004 vs 81% in 2010) advised their adolescent patients who smoke to quit, but only a third (34% vs 32%) discussed quit strategies; fewer (17% vs 18%) recommended nicotine replacement medications. Approximately half (56% vs 48%) reported helping adolescents assess their reasons for and against continuing to smoke, 20% vs 15% provided print or other quit materials, and 18% vs 13% referred their patients to a quitline or cessation program (all P < .05). Although few pediatricians counseled parents, there were improvements over time: 10% in 2004 vs 14% in 2010 provided educational materials, and 11% vs 16% referred parents to a quitline or cessation program (all P < .05). Despite improvements, most pediatricians did not discuss strategies to quit smoking or provide materials or refer smokers for support, representing a critical missed opportunity. Intervention delivery is infrequent even for vulnerable youth with asthma, chronic illness, and/or from low-income families.

Barriers to Counseling

Pediatricians noted that they would be more likely to provide cessation counseling if they believed that counseling is effective (90%), felt more than moderately confident in advising patients on cessation (77%) and the harmful effects of tobacco use (74.1%), and if their adolescent patients were not fearful that parents would be notified (75.6%). Other barriers include competing health issues, limited time, lack of education and training, lack of access to supportive research, concern about alienating their patients, and inadequate reimbursement for delivering preventive services. Several strategies can be helpful in resolving some of these concerns. First, physician delivery of and self-efficacy or confidence in providing tobacco intervention to youth is increased by training. Therefore, increased access to training and information on the harmful effects of tobacco use as well as research on the benefits of provider intervention, receptivity to such intervention, and concrete clinical steps pediatricians can take in addressing tobacco with their adolescent patients would be of value (see Resources for Pediatric Providers later in the article). Second, the use of office system prompts (e.g., paper or computerized reminders in patient charts) can improve service delivery for adult smokers, and provision of charting tools improves delivery of preventive services to youth. Concerns regarding reimbursement for cessation efforts for adolescent patients and their parents have historically been valid: despite the availability of billable current procedural terminology (CPT) codes and valid “up coding,” there is great variability in insurers reimbursing for these codes. With the Affordable Care Act, however, tobacco cessation is a covered benefit, and counseling for cessation is a clinical quality measure for meaningful use, allowing providers and hospitals to earn incentive payments for meeting electronic health record criteria and objectives.

Preventing Initiation

Pediatric health care providers can help prevent initiation of tobacco use through anticipatory guidance, by helping parents quit smoking, and by using their privileged position to advocate for effective tobacco control policies. Because tobacco promotion increases smoking initiation,
pediatric health care providers should ensure that their offices, waiting rooms, and other environments where children’s health care is delivered are tobacco free and are free of tobacco advertisements.

A key risk factor for smoking initiation in youth is parental smoking, addressed later in this article. Other factors include minimal parental monitoring, easy access to cigarettes, sibling and friends smoking, impulsivity, use of other tobacco products, alcohol use, stress, and exposure to tobacco promotion.27 Provider assessment of these key factors is recommended to determine the level of risk for initiation of each patient who is not using tobacco. In addition, clinicians can reinforce nonsmoking by discussing resisting the influence of tobacco advertising and rehearsing refusal skills when offered tobacco by peers (Fig 1). They can also reinforce that weight reduction through cigarette use is not effective, and address family-related stress issues. See Supplemental Information for additional information on assessing susceptibility to tobacco use initiation and intervention strategies.

Tobacco Dependence and Trajectories

The developing brain is particularly susceptible to the addictive potential of nicotine.5 Understanding the nature, onset, and trajectories of tobacco use and nicotine addiction in youth will enhance the ability of pediatric health care providers to more accurately evaluate their patients’ smoking status and level of risk for addiction and long-term smoking.

Tobacco Use Trajectories

Young tobacco users generally follow 1 of 3 tobacco use trajectories: low frequency/quantity users (smoke only a few cigarettes per week or month or steadily decrease consumption from a low initial level), early increasers (rapidly increase consumption then continue increasing more slowly), and late increasers (begin smoking infrequently or at a low level of consumption, increase slowly until a later age, then increase sharply).9,28–35 Escalating trajectories are predicted by poor academic performance and friends smoking and may also be predicted by male gender, older age, and parental smoking.9 Factors that may protect against an escalating pattern of cigarette consumption include attending a school with a clear set of rules on smoking and having confidence in one’s abilities to succeed at school.31 Advice from clinicians may need to be adapted to stage in the onset process as well as trajectory pattern.

Early Onset of Nicotine Addiction

Some youth develop symptoms of addiction rapidly after their first exposure to nicotine,36–38 at low levels ofnicotin exposure,39–41 or well before they consume a lifetime total of 100 cigarettes or become daily smokers.37,38,42 Nicotine addiction symptoms (eg, cravings for cigarettes; feeling strong urges to smoke, irritable, nervous, restless or anxious when unable to smoke; feeling addicted to tobacco) can appear within 1 month of initiation of monthly smoking.43 and the appearance of any symptom predicts failed quit attempts, continued smoking, and daily smoking.36 Early onset of symptoms and appearance of symptoms before escalation in cigarette use have now been confirmed in 9 cohorts with >100 000 young smokers, including 2 nationally representative samples in the United States and New Zealand.37–39,41,42,44–46

Tobacco Use and Dependence

The relationship between tobacco use and addiction symptoms may be bidirectional; tobacco use causes symptoms, and early symptoms may promote escalation in use, leading to more symptoms.37–49 The trajectory patterns described here predict the risk of developing addiction. In a cohort of adolescents assessed to age 28, there was a relationship between trajectory pattern and nicotine dependence in young adulthood.46 Compared with low-use smokers, early and late stable users were 20 and 6 times more likely, respectively, to be dependent at age 26 to 28 years, although even smokers in the low-use trajectory who smoked as few as 2 to 4 cigarettes per week became dependent.46

Withdrawal

Withdrawal symptoms intensify through a predictable progression from “wanting” (a mild desire to smoke that is transitory and easily ignored), to “craving” (a strong, persistent, and intrusive urge to smoke), to “seeking” (an unrelenting urgency to smoke) and to “suffering” (an unremitting desire to restore “normal” function and emotional wellbeing).50–53 In some young smokers, the lag before experiencing withdrawal symptoms after smoking a cigarette can be as long as a week, but as they continue to smoke, the time lag diminishes. Shortening of the latency to withdrawal symptoms follows a predictable time course and leads to increased cigarette use.53,54 In adult smokers, this progression is correlated with higher scores on other measures of addiction55 and with structural changes in brain areas related to craving.56,57

Cessation

Although the desire to quit begins soon after initiation in many young smokers, repeated relapses lead to lack of confidence in the ability to quit and awareness that quitting is difficult.58 Males, older youth, and those for whom cigarette package warnings induced fear are more likely to quit, whereas smokers who experience family stress, those who are worried about their weight or are
overweight, those who use illicit drugs, and those who report symptoms of nicotine dependence are less likely to quit.59 CYP2A6 activity leading to slow nicotine metabolism is associated with a higher probability of quitting.60

<table>
<thead>
<tr>
<th>Ask</th>
<th>If yes, what kind?</th>
<th>If no</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Do you currently smoke or use other forms of tobacco?”</td>
<td>Cigarettes</td>
<td>Ex-tobacco user</td>
</tr>
<tr>
<td></td>
<td>Cigars</td>
<td>Never used tobacco—assess susceptibility to initiating use</td>
</tr>
<tr>
<td></td>
<td>Chewing tobacco</td>
<td></td>
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<tr>
<td></td>
<td>Electronic cigarettes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other (eg, hookah, etc)</td>
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</tbody>
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Reinforce
| “That’s great!”                                                    |                                    |                                                                      |
|                                                                  | “I believe you can do it. That’s got to be your choice and you have to be ready to try.” (Empowering) |

Assess
| “How important do you think it is for you to quit using tobacco?”  | (Solicit reasons for quitting)      |                                    |
| “How confident are you that you will be able to quit?”           | (Empirical)                        |                                    |
| “Are you willing to try quitting smoking/using tobacco?”         |                                    |                                    |

Assist

<table>
<thead>
<tr>
<th>Ready to Quit</th>
<th>Considering Quitting</th>
<th>Not Ready to Quit</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Great!”</td>
<td>Offer encouragement: “That’s great you are thinking about quitting!”</td>
<td>“Please think about we discussed.”</td>
</tr>
<tr>
<td></td>
<td>“Here are some things that can help you thing about it…”</td>
<td>Consider motivational interviewing counseling—5Rs (Relevance, Risks, Rewards, Roadblocks, Repetition)</td>
</tr>
<tr>
<td></td>
<td>Give a cessation brochure</td>
<td>Offer AAP “Tobacco: Straight Talk for Teens” brochure</td>
</tr>
<tr>
<td></td>
<td>Discuss quitting resources: quitline, Web resources (<a href="http://www.smokefree.gov">www.smokefree.gov</a>), apps (Smokefree:TXT)</td>
<td>“Let me know when you are ready to quit. I can help you.”</td>
</tr>
</tbody>
</table>

Arrive Follow-Up
| I’ll check back with you (how?): by this date:                   |                                    |                                    |

Adapted from the Adolescent Health in Pediatric Practice study, conducted by the AAP Pediatric Research in Office Settings (PROS) practice-based research network. Funded by NCI R01-CA140576.

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**TREATING TOBACCO USE IN THE PEDIATRIC PRIMARY CARE SETTING**

**Best Practices in Counseling**

Although most youth smokers want and attempt to quit,61 few seek assistance to do so,61,62 most quit attempts are unsuccessful,63–65 and relapse is high.66,67 The Public Health Service Clinical Practice Guideline68 states that counseling is effective in treating adolescent smokers and recommends counseling interventions to help them (strength of evidence = B, indicating that this service should be provided; an A level recommendation was not given because of mixed findings and low absolute abstinence rates in studies conducted to date). The counseling steps recommended follow the 5As model of care (Ask, Advise, Assess, Assist, Arrange follow-up),68 which is a preventive services screening and brief counseling intervention that improves tobacco cessation rates in adults.68 The 5As model adapted for youth (Fig 1) is described briefly here; for more details, see Supplemental Information. The first step is to Ask about and document tobacco use at all clinical encounters, including well- and sick-child visits, keeping in mind that many youth use both cigarette and noncigarette tobacco products concurrently.7 Next, Advise cessation in a clear, strong manner, personalizing the risks of tobacco use, the benefits of quitting and expressing confidence in the tobacco user’s ability to quit. The clinician should then Assess level of nicotine addiction, reasons for quitting, confidence in ability to quit, and readiness to make a quit attempt and/or initiate tobacco dependence treatment. In the Assist step, the clinician should initiate treatment, tailoring support to the adolescent’s...
readiness to quit and severity of addiction.

Youth Ready to Quit

Provide youth ready to make a quit attempt with brief counseling, including tips to seek social support, learning from previous quit attempts, and discussing anticipated challenges and coping strategies. A key part of the Assist step is to provide concrete, readily accessible support and resources (Fig 1). There are many resources available to clinicians including self-help materials, referral to statewide or national quitlines that provide free telephone counseling to assist tobacco users with cessation, smartphone applications, texting programs, and local community cessation resources (see Supplemental Information for details).

Youth Ready to Quit: Pharmacotherapy

Pharmacotherapy is currently not recommended for adolescents in the Public Health Service 2008 Tobacco Treatment Guideline because of insufficient evidence of effectiveness in published studies.68 This conclusion is frustrating for many clinicians who seek a definitive recommendation for use and for those who have seen benefit to individual adolescents using nicotine replacement therapy (NRT) to quit tobacco. Indeed, surveys of youth document that many tobacco-addicted youth use NRT without physician guidance.69,70 Additionally, the cut point for child and adolescent versus adult guidelines (age 18) is based on legal concerns rather than developmental milestones. Cognitive science and neuroanatomic changes associated with formal operational thought (age 14) and with maturation of higher executive function (age 24) are now well described71 but have not been incorporated into clinical or behavioral counseling for smoking. Underage over-the-counter purchases and off-label prescriptions have not been studied outside of clinical trials, therefore accurate estimates of the frequency of use and its efficacy in such real-world use are not available. Given the importance of nicotine addiction, pharmacotherapy and combination pharmacotherapy deserve additional study in both adolescents and young adults. Until definitive studies are available, decisions about nicotine addiction pharmacotherapy should consider the evidence for efficacy in adults, the severity of the adolescent’s addiction, the individual's experiences with cessation attempts, and his or her adherence to recommendations.

Pharmacotherapy may be considered by pediatric providers for youth who want to quit, have moderate or severe nicotine addiction, and accept the use of medication. NRT safety concerns for youth are similar to those for adults, including oral or skin irritation depending on the site of use, increased heart rate, and increased blood pressure. NRT has low abuse potential, given the way it is absorbed in the bloodstream.72 Although some have raised concern about the potential of NRT to intensify nicotine addiction, this concern needs to be balanced against the high addictive potential of continued tobacco use. The goal of pharmacotherapy is to control nicotine withdrawal symptoms so that youth can quit more comfortably. Intensity and duration of therapy should be calibrated on the basis of the severity of nicotine addiction and adjusted on the basis of control of withdrawal symptoms to minimize the risk of relapse.73 Close follow-up is important because nonadherence to treatment is common. In deciding on the use of pharmacotherapy, one needs to balance the relatively low risks of NRT against the substantial risk of harm to health caused by continued use of tobacco.74 The presence of other chronic conditions, psychiatric illnesses, and other substance abuse can make treating nicotine addiction more difficult such that more intensive behavioral and pharmacologic therapy is needed.

Youth Not Ready to Quit

Clinicians should provide interventions to increase the likelihood of making a quit attempt in youth who are not ready to quit. These youth may lack information about the harmful effects of tobacco and the benefits of quitting. They may have concerns about quitting, perceive personal or social benefits from continued tobacco use, or they may lack confidence because they have relapsed after previous quit attempts.75 Brief interventions based on motivational counseling principles76 may be effective in increasing future quit attempts in both youth and adults.77–80 The motivational counseling intervention is reflected in the 5Rs: Relevance, Risks, Rewards, Roadblocks, and Repetition (Table 1).

Arrange Follow-up

For all tobacco users, regardless of readiness to quit, Arrange follow-up, noting how and by when the individual should be contacted by the clinician or other provider from the practice to check on progress and provide continued support. For youth willing to make a quit attempt, arrange for follow-up contact within the first week of the quit date. For those not willing to attempt to quit, address tobacco use at the next clinic visit. For all of the 5A steps, intervening with youth is best done in a manner that maintains confidentiality and privacy, including speaking with the patient without the parent present.

The AAP Pediatric Research in Office Settings (PROS) network is currently testing the recommended 5As protocol (without pharmacotherapy)69 in 152 pediatric primary care practices with 375 practitioners nationwide.81,82 The results, which will be available in late 2015, will provide invaluable information on the effectiveness of the 5As approach in youth and identify issues regarding implementation feasibility and protocol adherence.
Clinicians can consider delivering an abbreviated version of the 5As: Ask, Advise, Refer (AAR). This model begins with the first 2 steps of the 5As model. If the patient is ready to quit, the clinician moves directly to referral to cessation resources. In this model, as with the 5As, follow-up is critical. AAR seeks to increase primary care referrals to existing resources including quitlines, Web resources, and apps that provide more intense support than is possible in clinical settings.

**Best Office Practices**

Several office practice-level changes have been shown to increase the likelihood of making counseling more routine. The first is to incorporate screening for tobacco use as standard care. Practices that care for youth should set up systems to identify and document tobacco use status and tobacco smoke exposure. Cues to inquire about these issues in electronic medical records are particularly effective in promoting delivery of prevention and cessation counseling in clinical settings. Short screening tools to distinguish patients with a higher probability of becoming established smokers may be helpful in directing counseling to those who would benefit most.

Another potential system-level change is development of patient registries for tobacco use, which would allow for technology-improved tracking of interventions and outcomes. Accountable Care Organizations are using care coordinators to manage other chronic diseases and the approach of delivering tobacco cessation messages through this model may be effective, although it has yet to be tested. The inclusion of tobacco cessation as a clinical quality measure for meaningful use escalates the importance of tobacco cessation for individual providers as well as hospital systems, helping promote effective system changes.

Other system-level changes are suggested by the movement toward creating patient-centered medical homes. These include optimizing office design to facilitate workflow and communication among staff and creating practice-based care teams in which all practice staff work to facilitate patient well-being. Training designated office staff to provide cessation counseling fits well with a care team approach. A national survey of primary care physician and practice factors found that having trained office staff available significantly increased physicians’ advising patients to quit at each visit.

**Resources for Pediatric Providers**

Up-to-date resources and tools for clinicians, educators, researchers, community advocates, and patients and families are available on the AAP Julius B. Richmond Web site at http://www.aap.org/richmondcenter.

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**TABLE 1** The 5Rs Motivational Counseling for Adolescents Not Ready to Make a Quit Attempt

| Relevance | Ask the adolescent to talk about why quitting is personally important to him or her |
| Risks      | Ask the adolescent to identify potential negative consequences of continued tobacco use, particularly more immediate risks that are most relevant to the individual, such as bad breath and smell, impaired sports performance, cough, dry hair and brittle nails, yellow teeth, premature aging, increased respiratory infections, and manipulation by the tobacco industry |
| Rewards    | Ask the adolescent to identify potential benefits of quitting most relevant to him or her; such as saving money, improved appearance, performing better in physical activities, better smelling hair, breath, and clothing; and feeling better about herself or himself |
| Roadblocks | Ask the adolescent to identify barriers to quitting, such as withdrawal symptoms, being around other tobacco users, weight gain, lack of support, not sure how to quit, and problem solve strategies to address the barriers |
| Repetition | Repeat each time the adolescent visits the clinical setting the importance of stopping tobacco use, reassuring him or her that most tobacco users make repeated quit attempts before being successful |

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**Tobacco Intervention Research in the Past Decade and Research Gaps**

Table 2 summarizes the findings of scientific reviews on the effectiveness of youth tobacco cessation interventions published since 2003. Briefly, comprehensive Medline and SCOPUS searches were conducted by using the following key words: youth, adolescent, pediatric, tobacco smoking, cigarette, cessation, intervention, clinic, clinic-based, cessation, intervention, clinic, clinic-based, cessation, intervention, clinic, clinic-based. In addition, the recent Surgeon General’s Report and Cochrane Reviews were reviewed to check for omissions from the search. Two authors, KH and ST, reviewed the list to identify review papers (it was beyond the scope of this project to conduct another systematic review of the literature). These reviews collectively identified that although the evidence base is increasing, few findings are generalizable, and results on adherence to treatment protocols are disappointing. Several of the reviews made a resounding call for additional studies. In general, studies have used age 18 to differentiate adolescent and adult studies and guidelines. However, in the past decade, continued advances in understanding neurobiology and cognitive development in youth have demonstrated that such a cutoff is not developmentally valid. Significant changes in decision-making occur over time, from the development of formal operational thought (usually around age 14–15) through maturation of higher executive function (decision-making, impulsivity, etc.), which continues to mature through age 24 to 25 years.

This gradual development of neurobiological processes and cognitive control mechanisms over adolescence and early adulthood has implications for extrapolation of “adult” guidelines to young adults and older adolescents. Existing reports including those we highlight in this...
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<th>Author(s), Year</th>
<th>Title</th>
<th>Purpose</th>
<th>Major Conclusions</th>
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<tr>
<td>Stanton and Grimshaw, 2013</td>
<td>Tobacco cessation interventions for young people (Cochrane Intervention Review)</td>
<td>Evaluate the effectiveness of strategies that help young people stop smoking tobacco. Update of a review initially conducted in 2006 and updated in 2009; 28 trials were included in this review from 2009 to 2011.</td>
<td>Complex approaches show promise for cessation with persistence of abstinence (30-d point prevalence abstinence or continuous abstinence at 6 mo), especially those interventions incorporating elements of stages of change, motivational enhancement and CBT. There are few trials with evidence supporting pharmacologic interventions (nicotine replacement and bupropion) for adolescent smokers. A need persists for well-designed adequately powered randomized controlled intervention trials, and given the episodic nature of adolescent smoking, more data on sustained quitting are needed.</td>
</tr>
<tr>
<td>Patnode et al, 2012/2013</td>
<td>Primary care–relevant interventions for tobacco use prevention and cessation in children and adolescents: a systematic evidence review for the US Preventive Services Task Force</td>
<td>To review the evidence for the efficacy and harms of primary care–relevant interventions that aim to reduce tobacco use among children and adolescents. Identified 18 studies that met criteria.</td>
<td>Primary care–relevant interventions may prevent smoking initiation over 12 mo in children and adolescents. Behavior-based interventions were effective only in lowering smoking initiation among nonsmoking youth. Combined prevention and cessation behavioral interventions failed to show a statistically significant effect on overall smoking prevalence. Quit rates among the included cessation studies were highly variable. The lack of effect seen across the cessation trials may reflect the limited number of studies. Findings suggest that primary care–relevant interventions designed to reduce cigarette smoking among youth can have small, positive effects on smoking initiation among those who have not yet become regular smokers and are an essential component of comprehensive tobacco control programs.</td>
</tr>
<tr>
<td>Bailey et al, 2012</td>
<td>Efficacy and tolerability of pharmacotherapies to aid smoking cessation in adolescents</td>
<td>Provide information on the pharmacologic action of each medication, the efficacy of each medication for adolescent smoking cessation, the tolerability of each medication based on reported adverse events, and compliance with the medication protocols. Reviewed 13 studies in total, from 1996 through 2011.</td>
<td>There is some evidence of efficacy of nicotine patch and bupropion at the end of treatment, but none of the medications included in this review were efficacious in promoting long-term smoking cessation among adolescent smokers. Participants had poor adherence to recommended dose or length of pharmacotherapy.</td>
</tr>
<tr>
<td>Kim et al, 2011</td>
<td>Effectiveness of pharmacologic therapy for smoking cessation in adolescent smokers: meta-analysis of randomized controlled trials</td>
<td>To evaluate the effectiveness of pharmacologic therapy for smoking cessation in adolescent smokers. Reviewed 6 studies also included in Bailey (2012).</td>
<td>No significant increase in abstinence rates was found in subgroup meta-analyses of studies with both short-term (≤12 wk) and midterm (26 wk) follow-up periods. Although few serious adverse events were reported, there was no evidence directly linking these effects to the pharmacologic therapy used. The limited number of participants in published trials may have affected results.</td>
</tr>
<tr>
<td>Karpinski et al, 2010</td>
<td>Smoking cessation treatment of adolescents</td>
<td>Review pharmacotherapy literature regarding options for nicotine dependence in adolescents and discuss efficacy, safety, and other issues surrounding the use of bupropion and NRT specific to adolescents. Reviewed 9 RCTs.</td>
<td>Some evidence exists from short-term trials that bupropion and NRT are beneficial to aid adolescents in smoking cessation and to reduce the number of cigarettes smoked per day. Long-term quit rates in the pharmacotherapy trials have not been optimal; however, decreases in cigarettes smoked per day have been observed. Many studies with NRT had cessation rates &lt;15%. Additionally, although cessation of smoking occurred in many of the studies at the end of the treatment phase, longer-term follow-up of the patients demonstrated that many do not remain abstinent after stopping treatment.</td>
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TABLE 2 Continued

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<thead>
<tr>
<th>Author(s), Year</th>
<th>Title</th>
<th>Purpose</th>
<th>Major Conclusions</th>
</tr>
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<tbody>
<tr>
<td>Sussman and Sun,115 2009</td>
<td>Youth tobacco use cessation: 2008 update</td>
<td>Reviewed teen smoking cessation literature to examine: cessation program contents, delivery modalities, number of contacts, expected quit rates, means of recruitment and retention of smokers. Promising contemporary methods of teen smoking cessation were examined, including use of pharmacologic adjuncts, electronic technology, and cigarette price increases (and no smoking policy). Review included 47 of 48 studies from earlier (2010) review, with an additional 17 studies not included in or published since that review.</td>
<td>Teen smoking cessation programs are efficacious overall, consistent with those found in the adult cigarette smoking cessation literature, particularly using cognitive-behavioral strategies and a sufficient dosage of an intervention. With very limited research there is little evidence of the efficacy of pharmacologic adjuncts with youth, whereas there is extensive evidence of benefit in adults. Suggesions for advancing youth cessation internationally were proposed.</td>
</tr>
<tr>
<td>Gervais et al,116 2007</td>
<td>A systematic review of randomized controlled trials of youth smoking cessation interventions</td>
<td>Assess the effectiveness of smoking cessation interventions in youths, looking at RCTs only. They assessed all of the pertinent articles that had been published among 8 preceding review articles regarding tobacco cessation in youth since 2001, but retained only 16.</td>
<td>Some evidence to support the efficacy of certain school- and health care–based youth smoking interventions, but evidence for pharmacologic interventions was inconsistent. Abstinence rates in the intervention group varied from 0% (nicotine patches) to 52% (curriculum-based information sessions). Statistically significant differences in abstinence rates in favor of the intervention group were reported in 3 of 4 RCTs assessing school-based interventions, all of which used CBT (2 RCTs) or a behavioral intervention (1 RCT). Only 2 of 4 trials that assessed health care–based interventions found a statistically significant difference in abstinence rates; this was in favor of a motivational interviewing intervention.</td>
</tr>
<tr>
<td>Pbert et al,110 2003</td>
<td>The state of office-based interventions for youth tobacco use</td>
<td>Report current tobacco treatment practices of pediatric and family practice clinicians. Discuss similarities and differences between adolescent and adult tobacco use, summarize research efforts to date and current cutting-edge research that may ultimately help to inform and guide clinicians. Present recommendations regarding treating tobacco use in youths.</td>
<td>Pediatricians and other clinicians can and should play an important role in treating tobacco dependence in youths. Pediatricians report a greater tendency to encourage youth not to start using tobacco than to intervene with those who already smoke. Clinicians report substantial rates of screening and lesser rates of counseling. However, they tend to overestimate their screening and counseling practices, both for smoking and for other preventive services, in comparison with patient reports. Clinical practice guidelines for the treatment of tobacco dependence in youth are needed to make treatment available to youth through the health care system. Coordinated efforts are needed at several levels of the health care system to maximize the likelihood that cessation interventions will be routinely delivered to youths. Important points of intervention include the clinician (eg, best practices for clinicians, clinician training, tools), organizational systems (eg, health care system changes, office systems), and policy (eg, reimbursement, incentives, performance measures).</td>
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CBT, cognitive behavioral therapy; RCT, randomized controlled trial.

review, have not considered these new developmental data and instead use age 18 as the definition of adulthood. Ideally, future evidence will take developmental trajectory data into account.

In 2003, the US Preventive Services Task Force (USPSTF) concluded that there was insufficient evidence to make recommendations on routine screening for tobacco use and dependence or interventions to prevent initiation and promote cessation in youth.90 More recently, however, in 2013, it concluded that behavior-based interventions were effective in reducing initiation in nonsmoking youth, but neither behavior-based nor short-term bupropion interventions resulted in long-term effects on cessation in young smokers after the intervention ended.91 The revised USPSTF recommendation suggests that primary care clinicians should provide education or brief counseling to prevent initiation in school-aged
youth (strength of evidence = B, indicating practices should provide this service).27 Even minimal intervention such as mailing newsletters, activity guides, or tip sheets can result in reductions in initiation.91 In contrast, evidence on the effectiveness of office-based cessation interventions for young smokers was limited,91 in part because few studies tested office-based interventions in this age group or examined findings by level of smoking.27 The 5 trials conducted in primary care or dental settings reviewed by the USPSTF93 involved face-to-face interactions with health care providers including brief advice to quit smoking or counseling using the 5As model.68 Three of the trials trained counselors to provide intensive counseling and telephone follow-up.92–94 Overall, these studies suggest that behavioral interventions improve cessation.

Pharmacotherapy

Pharmacotherapy is effective in adult smokers, with increased benefit from combination pharmacotherapy.68 Research on cessation interventions for youth, however, has focused primarily on behavioral interventions, with few trials on pharmacotherapy and none combining pharmacotherapies. Several reports have found that bupropion and NRT increase cessation in youth and reduce short-term daily consumption; however, none report effective long-term cessation in adolescents.95–97 Among 13 studies reviewed,95 courses of treatment were brief, and levels of nonadherence and rates of relapse on stopping treatment were high. For example, in 1 study, only 26% of adolescents used nicotine nasal spray daily, and 57% had stopped using the spray completely by the end of the first week.98 In another, adherence to the nicotine patch was only 31%.99 Two studies on pharmacotherapy combined with counseling in moderate to severely addicted adolescents achieved better levels of medication adherence than other studies and demonstrated a benefit. One found decreased rates of smoking during the 6-week course of bupropion but no difference compared with placebo after the medication was discontinued.100 The second found substantial improvement in abstinence with the nicotine patch over placebo at end of treatment, but nicotine gum, marked by poor adherence, did not differ from placebo.101

Research Gaps

There are few rigorous randomized controlled trials of behavioral and/or pharmacotherapy interventions for adolescent tobacco treatment in the primary care setting.27,91 The need persists for research to inform practice-based youth tobacco interventions including high-quality replication and effectiveness studies in real-world primary care practice. Research should include youth at various stages of tobacco use and addiction and should address the array of tobacco products now available (cigarettes, cigars, little cigars, smokeless tobacco, e-cigarettes, hookah, dissolvable tobacco, etc). Given that clinical encounters are limited in time, research must explore optimal dosage, brief clinician intervention, and clinician referrals to resources providing more intensive support.27 An example is brief motivational interviewing, which can reduce cigarette smoking and increase serious attempts to quit in adolescents.102,103 Another promising area of research is the use of self-administered computer-facilitated screening tools combined with brief clinician intervention.104 Internet-based intervention, including smartphone applications and social media, may also have utility in clinical settings and warrant investigation. And lastly, given the significance of nicotine addiction, pharmacotherapy and combination pharmacotherapy deserve additional study in both adolescents and young adults.

TREATMENT OF TOBACCO USE IN PARENTS

Health care encounters in pediatric offices should routinely screen for and document sources of tobacco smoke exposure for the child.105 Because parents are among the most important sources of a child’s tobacco smoke exposure,106 parental and caregiver smoking should be specifically queried. Inquiry can be verbal or in a self-report questionnaire administered in the clinic intake process. Suggested questions include the following107: (1) does anyone who lives with (child’s name) smoke? (2) Does anyone who provides care for (child’s name) smoke? and (3) Does (child’s name) visit places where people smoke? Counseling by the pediatrician or other clinicians should encourage the family to make the home and car smoke-free.108 Smoking in a motor vehicle exposes children to high concentrations of tobacco smoke.109 Although smoke-free policies can reduce a child’s tobacco smoke exposure,110 they are unlikely to eliminate it as long as close family members and/or caregivers smoke. If parents use tobacco, readiness to accept cessation help should be assessed, and treatment and/or referral appropriate for their level of addiction should be offered. Pediatric clinic-based programs for parents using decision support tools to ask, assist (including providing prescription for pharmacotherapy), and refer for telephone counseling via the quitline (1-800-QUIT-NOW) have been validated as practical to implement within the workflow of the pediatric office and substantially improve parental report of receipt of tobacco control assistance.111,112 Telephone counseling for tobacco dependence treatment is beneficial, and text-to-quit programs show great promise as well.113,114 Control of nicotine withdrawal symptoms is a key component of effective pharmacotherapy and minimizes the
risk of relapse. Because pharmacotherapy improves smoking cessation rates, a recommendation and/or prescription for appropriate pharmacotherapy should be offered to parents.\textsuperscript{60} Nicotine patches, nicotine gum, and nicotine lozenges are available over the counter without a prescription, but a prescription may allow the parent to get these medications covered by insurance. The feasibility of prescribing these nicotine replacement therapies by enhancing existing systems of care in the pediatric setting has been demonstrated.\textsuperscript{112} Nicotine nasal spray, nicotine inhaler (different from the e-cigarette), bupropion, and varenicline require a prescription. Intensity of therapy should be calibrated based on level of nicotine addiction and adjusted based on adequacy of control of nicotine withdrawal symptoms.\textsuperscript{73} As in other situations in which parent or caregiver treatment is offered as part of the child’s health care (eg, pertussis, meningococemia, and scabies), documentation of parent/caregiver treatment can be incorporated into the child’s medical record.

**CONCLUSIONS**

Pediatric health care providers must actively engage in delivering prevention and cessation interventions to patients and their parents by routinely advising both patients and parents who use tobacco to quit. Understanding how to treat tobacco dependence in youth by incorporating strategies to address youth tobacco cessation and prevention in clinical practice has expanded in the past 10 years. However, even the best interventions show only modest effects. Research is needed to develop more effective approaches to prevent and treat youth tobacco use and addiction, especially given the limited time and competing priorities of clinical practice. Because even brief intervention can potentially prevent a lifetime of nicotine addiction and its consequences, it is difficult to imagine any other behavioral or chronic disease in which pediatric clinicians could have a bigger impact on public health.

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