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## Through the Haze: What Clinicians Can Do to Address Youth Vaping

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As the popularity of e-cigarettes and other vaping devices continues to increase among youth, so does our understanding of the numerous harms associated with their use. Immediate harms include e-cigarette, or vaping, product-use associated lung injury (EVALI) [1], and as highlighted in *Journal of Adolescent Health* this month, seizures [2]. Longer term harms include impacts on the developing adolescent brain, increased risk of transition to combustible cigarettes and marijuana, and nicotine addiction [3,4]. Amid these mounting concerns, clinicians are faced with a pressing question: how to effectively address vaping and e-cigarette use with adolescents and young adults in the clinical setting.

Numerous national and international guidelines exist to address nicotine use among youth [5–14]. However, few of these guidelines offer specific guidance as to which screening and therapeutic strategies can and should be applied specifically with youth who consume nicotine or other substances primarily through vaping [15].

Despite a relative lack of up-to-date, youth-focused screening or treatment guidelines, clinicians of all disciplines are being asked to address vaping with youth, families, and community members. This commentary seeks to provide preliminary clinical guidance on how to address vaping among youth with a specific focus on screening and assessment, counseling, and pharmacotherapy.

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Conflict of Interest:

Dr. Hadland and Dr. Chadi have no conflicts of interest to declare.

## Screening and assessment

Although there are no validated screening tools that explicitly ask youth about use of e-cigarettes or other vaping products, there are well-studied instruments that ask youth about tobacco. These screening tools include Screening to Brief Intervention (S2BI) and the Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD), both of which are freely available (see [16]) and can be easily adapted to inquire about e-cigarettes and other vaping products.

For example, S2BI asks the validated question, “In the past year, how many times have you used tobacco?” Although nicotine-containing e-cigarettes are considered tobacco products in some jurisdictions (such as the United States), youth are unlikely to understand this nuance. To maximize sensitivity, clinicians should integrate youth-friendly terminology when asking about vaping. Such terms may include: “e-cigarettes, pods, mods, and vape pens”, as well as examples of popular brand name products such as JUUL [17]. Given how rapidly vaping products are evolving, clinicians may want to consider asking their patients which specific products they are using and how they use them. In the absence of up-to-date academic sources, providers may also benefit from consulting internet blogs, parent or community education websites, and other lay sources to familiarize themselves with some of these products.

Once a young person discloses a history of vaping, a series of follow-up questions is warranted (Table 1). Understanding what youth are vaping (i.e., nicotine, tetrahydrocannabinol [THC], and/or flavoring) is critical, as is knowing where those products are sourced. Of note, while specific causal agents have yet to be identified, individuals with EVALI commonly have a history of vaping THC products, particularly those purchased in the illicit market [18,19]. One challenging point is that many youth do not actually know which vaping substances they are consuming and whether they are consuming nicotine [20].

It is important to understand the context in which youth vape as well as the intensity and frequency of use, since heavier use may be associated with cravings and withdrawal. One way of measuring this—particularly for individuals using popular brands such as JUUL whose pods’ (i.e., cartridges’) nicotine strength is advertised—is to ask how frequently youth need to replace their cartridge. The higher concentration 5% nicotine-containing JUUL pods are estimated to deliver about as much nicotine as a pack of 20 combustible cigarettes [21,22]. The Hooked on Nicotine Checklist is a helpful, validated instrument to detect nicotine withdrawal and cravings among adolescents [23,24].

Youth whose use is marked by loss of control, social impairment, unsafe use, or physiologic dependence (i.e., tolerance and withdrawal) likely meet formal criteria for a substance use disorder as defined by the *Diagnostic and Statistical Manual of Mental Disorder 5<sup>th</sup> Edition (DSM-5)* [25]. Severe substance use disorders may be more difficult to treat and require multiple approaches among the behavioral and pharmacological interventions described below.

Finally, clinicians should familiarize themselves with recent publications in order to recognize symptoms of acute and severe vaping-associated harms such as EVALI (e.g., [18,19,26,27]) and seizures (as described in this issue, [2]).

## Counseling

A five-step algorithm known as the 5 A's is commonly used to guide smoking cessation and can provide a helpful framework when working with youth who vape. Clinicians should routinely **ask** all youth whether they vape; **advise** youth who vape to quit; **assess** their motivations and readiness to quit; **assist** their cessation effort, using some of the approaches described below; and **arrange** for ongoing follow-up [28].

Clinicians should routinely *ask* youth about vaping using the approaches described above, then be prepared to *advise* about the potential harms of vaping, using concise and youth-tailored information. The discussion should be balanced, reviewing known (e.g., EVALI, seizures, and risk for addiction) and potential harms (e.g., exposure to volatile organic compounds and heavy metals), and throughout should avoid scare-tactic approaches. Educational materials for youth, parents, and clinicians are available from the US Surgeon General [29] and US Centers for Disease Control and Prevention [30].

Next, using a youth-focused and strength-based approach to *assess* motivations and readiness to quit, clinicians should help youth identify pros (e.g., social connectedness, coping strategy for mood or anxiety) and cons (e.g., costs, health risks, addiction and withdrawal symptoms) of vaping. Often, youth will express the belief that they can stop vaping at any time but choose not to do so; an abstinence challenge in which a clinician encourages their patient to try stopping for a limited period of time can be a revealing experience if it proves more difficult than expected. For youth who express motivation to quit, clinicians should work with youth to identify a quit date and prepare for close follow-up surrounding that date. For some youth, quitting altogether may not be a realistic or desirable goal at first, and helping them decrease the intensity and frequency of their use may be a reasonable objective. For youth who lack motivation or readiness to quit, motivational interviewing should continue during scheduled follow-up visits so that the clinician can continue to support change, even if slow.

To *assist* youth who want to quit, individual or group counseling, ongoing motivational interviewing, cognitive behavioral therapy, and mindfulness approaches are available in many settings and can serve as part of a comprehensive cessation or harm reduction plan [15]. Phone and text quit lines as well as smart phone apps are also available in many regions and can provide access to individualized coaching (e.g., in the US, My Life, My Quit [31], and the quitSTART app [32]). Regular physical exercise and other prosocial activities are also helpful for some youth if they do not involve spending time with peers who vape, as are distraction techniques, such as fidget toys, stress balls, or use of toothpicks [33]. Youth may be open to receiving several of the behavioral and lifestyle supports listed here; the treatment plan should be individualized and include components that youth believe will be helpful.

To further assist cessation, parents and family members should be integrated into the treatment plan whenever possible [34]. Youth who do not initially want family involvement can be counseled that their cessation attempt may be more successful if a parent or other trusted adult is involved, and clinicians can continue to address this at ongoing follow-up visits for youth who remain resistant. Family members can be helpful by holding vaping devices, supporting adherence to behavioral and pharmacological interventions, positively reinforcing change, and providing transportation and monetary support.

Last, while many initial cessation attempts are unsuccessful, youth and families should be informed that the greater the number of attempts, the higher the chances of success. Regular and ongoing follow-up can help identify relapse early and give clinicians an opportunity to provide positive reinforcement and revisit the treatment plan.

## Pharmacotherapy

Youth who experience nicotine cravings and withdrawal, both of which are likely to hamper cessation attempts, should be offered pharmacotherapy (Table 2). Medications have typically been underused in youth [35]. Nicotine replacement therapy is recommended for adolescents under 18 seeking to quit smoking [36,37]; it is similarly helpful for many youth who vape nicotine. Youth should receive the combination of a long-acting patch (for maintenance nicotine delivery) as well as short-acting gum or lozenges (for breakthrough cravings). Short-acting nicotine inhalers and oral/nasal sprays are also available but should be avoided given concerns about potential misuse and reinforcing effects [38].

Bupropion and varenicline, used alone or in combination with nicotine replacement therapy, have been shown to increase smoking quit rates in adults [39,40]. Data on the effectiveness of these agents in adolescents and young adults is limited, and how study findings may apply to youth who consume nicotine primarily through vaping remains unknown. Nonetheless, these medications might be considered in combination with behavioral interventions as part of a comprehensive vaping cessation plan (Table 2). Of note, clinical trial data remain limited for use of bupropion in adolescents under 18 and do not currently support use of varenicline in adolescents under 17 [41–43].

Unfortunately, there are currently no medications with established efficacy for managing cannabis withdrawal among youth who vape THC.

## Conclusion

The youth-focused workforce has a vital role to play in protecting against the known and potential risks of e-cigarette use and vaping [26]. By staying informed on recent developments, asking the right questions, and offering effective interventions to youth who vape, clinicians from all disciplines can help mitigate the impacts of what may be one of the most pressing public health issues of our time.

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**Table 1:**

Key questions to ask youth who vape.

Questions	Rationale
What type and brand of vape are you using? Where and how do you obtain your cartridges or vaping liquid? Do they come from a legitimate vendor (i.e., a store), or were they produced and sold in the illicit market?	<i>Although data are still emerging, preliminary reports suggest that illicit market products may be associated with EVALI and other vaping-related harms.</i>
When and at what age did you start vaping? Why did you start? Why do you continue to vape? What are some downsides of vaping for you?	<i>Early onset of substance use is associated with greater lifetime risk of substance use disorder. Motivations for initiating and continuing vaping can help inform cessation counseling.</i>
What type of cartridges or liquids do you put in your vape? Do they contain nicotine? Tetrahydrocannabinol (THC)? Flavoring? If nicotine and/or THC, what is the concentration (or milligram content) of the cartridges/liquids?	<i>Vaping nicotine and THC place youth at risk for nicotine and cannabis use disorders; higher concentration cartridges may be associated with greater risk. Vaping THC may also be associated with EVALI.</i>
How often do you vape in a day? How long after you wake up do you start vaping? Are you vaping at school and/or work, and if so, are you doing so regularly throughout the day? How many days a week do you vape?	<i>Understanding the context in which youth vape can help clinicians offer effective cessation counseling. Frequent use throughout the day places youth at risk for developing withdrawal symptoms.</i>
How long does a cartridge last you? How many cartridges do you go through in a typical week? If not using cartridges, how often do you refill your vaping device?	<i>More frequent use places youth at risk for withdrawal.</i>
Have you tried quitting on your own? What happens if you stop vaping? Do you experience cravings (a strong feeling that you want to use again)? <ul style="list-style-type: none"> <li>• If vaping nicotine: Do you develop symptoms of nicotine withdrawal (i.e., irritability, depressed mood, difficulty concentrating, feeling restless, increased appetite)?</li> <li>• If vaping THC: Do you develop symptoms of cannabis withdrawal (i.e., anxiety, hostility, difficulty sleeping, low appetite, depressed mood)? Have you had episodes of persistent vomiting? Paranoia? Psychotic symptoms like hearing voices or seeing things that aren't really there?</li> </ul>	<i>Cessation attempts are likely to be hampered by cravings and withdrawal. For nicotine, these symptoms can be reduced with pharmacotherapy.</i>



**Table 2:**Medications<sup>a</sup> for management of nicotine use disorder [44].

Characteristics	Nicotine replacement	Bupropion sustained-release (SR) (Zyban®)	Varenicline (Chantix®)
Mechanism of action	Full agonist that binds to nicotinic cholinergic receptors	Mechanism incompletely understood; modulates dopaminergic transmission in the brain	Partial agonist that binds to nicotinic cholinergic receptors
Age considerations <sup>b</sup>	All ages	Approved for adults 18; off-label use for youth under 18	Adolescents and adults 17
Typical administration	<p><i>Combined therapy with a nicotine patch and a short-acting nicotine product for breakthrough cravings is recommended.</i></p> <p><i>Nicotine patch (for maintenance dose):</i> Apply nicotine patch to skin every 24 hours (change site daily).<sup>c</sup> Dose according to number of nicotine cartridges used per day:            &lt;1/2 cartridge/day (=0–25 mg of nicotine salts): 7 mg patch            1/2 to 1 cartridge/day (=25–50 mg of nicotine salts): 14 mg patch            1–2 cartridges/day (= 50–100mg of nicotine salts): 21 mg patch            Administer patch for 4–6 weeks, then administer the next lowest dose patch for 2–4 weeks, and continue wean until patient tolerates no nicotine.</p> <p><i>Short-acting nicotine<sup>d</sup> (for breakthrough cravings):</i>            Gum: Use one piece (2 or 4 mg) every 1 to 2 hours. (After chewing into piece and tasting nicotine, gum should be “parked” between oral gums and cheek for best absorption.)            Lozenge: Use one lozenge (1, 2 or 4 mg) every 1 to 2 hours.            In adults smoking cigarettes, 4 mg gum and lozenges have typically been recommended for patients whose first cigarette is within 30 minutes of waking; otherwise, 2 mg gum or lozenges are recommended. How these recommendations might apply to youth who vape is unclear. In general, treatment should begin with more frequent use of short-acting nicotine products, and then attempts should be made to increase interval between doses as cessation continues (e.g., 1 piece/lozenge every 1–2 hours for weeks 1–6, then every 2–4 hours for weeks 7–9, and every 4–8 hours for weeks 10–12).</p>	<p><i>Begin treatment at least one week before target quit date.</i>            Bupropion SR 150 mg by mouth once daily for 3 days, then increase to 150 mg by mouth twice daily.            After 2–3 months, may consider discontinuing medication; however, continued treatment with bupropion may support ongoing cessation for up to a year, and some patients may choose to remain on the medication even longer.</p>	<p><i>Begin treatment at least one week before target quit date.</i>            Varenicline 0.5 mg by mouth once daily for days 1–3, then increase to 0.5 mg by mouth twice daily for days 4–7, then increase to 1 mg by mouth twice daily.            Continue for a total of 12 weeks of treatment; a second 12-week course of treatment may support ongoing cessation.</p>
Other considerations	In some countries nicotine replacement therapy is available over-the-counter for adults. Data suggest that for adults, cessation is most likely following <i>combination therapy</i> of nicotine replacement with varenicline (preferred), or of nicotine replacement with bupropion [5,39,40,45,46].	May be beneficial in patients with underlying depression. Due to elevated risk for seizure, contraindicated in individuals with a seizure disorder or eating disorder, or who have abruptly discontinued alcohol, benzodiazepines, or anti-epileptic drugs.	Previously had a black-box warning in the United States due to concern for risk of increased suicidality and agitation; warning was dropped in 2016 after clinical trial data showed that varenicline did not significantly increase these risks [42,47]. If patients experience these symptoms, the medication should be discontinued, and the patient closely monitored.

<sup>a</sup>Listed medications have been studied for smoking cessation; their use among youth who vape has not been extensively studied

<sup>b</sup>Based on US Food & Drug Administration recommendations and available clinical trial data; use of medications in younger ages than those listed here can be considered

*c.* Patches can be worn during the daytime only or overnight; wearing the patch overnight may help reduce morning cravings

*d.* Short-acting nicotine inhalers and nicotine oral/nasal sprays are also available; their use in youth is discouraged due to concerns regarding potential misuse and reinforcing effect [38]

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