Q/ Does using e-cigarettes increase cigarette smoking in adolescents?

**EVIDENCE-BASED ANSWER**

**PROBABLY.** Electronic cigarette (e-cigarette) use by adolescents is associated with a 2- to 4-fold increase in cigarette smoking over the next year (strength of recommendation: A, meta-analysis and subsequent prospective cohort studies).

**Evidence summary**

A meta-analysis of 9 prospective cohort studies (total 17,389 patients) at least 6 months in duration evaluated the association between e-cigarette exposure and subsequent cigarette smoking in adolescents and young adults.1 It found that smoking was more prevalent in ever-users of e-cigarettes than nonusers at 1 year (23.3% vs 7.2%; odds ratio [OR] = 3.5; 95% confidence interval [CI], 2.38-5.16). The association was even stronger among recent users (within 30 days) of e-cigarettes compared with nonusers (21.5% vs 4.6%; OR = 4.28; 95% CI, 2.52-7.27). The mean age of approximately 80% of participants was 20 years or younger.

Further studies also support a link between e-cigarette and cigarette use

Four subsequent cohort studies also found links between e-cigarette exposure and any level of cigarette smoking (TABLE).2-5 A Canadian study of high school students reported a positive association between recent e-cigarette use (within the previous 30 days) and subsequent daily cigarette usage (OR = 1.79; 95% CI, 1.41-2.28).2 A British study that documented the largest association uniquely validated smoking status with carbon monoxide testing.3 A study of Mexican adolescents found that adolescents who tried e-cigarettes were more likely to smoke cigarettes and also reported an association between e-cigarette use and marijuana use (relative risk [RR] = 1.93; 95% CI, 1.14–3.28).4 A California study that evaluated e-cigarette nicotine level and subsequent cigarette smoking found a dose-dependent response, suggesting an association between nicotine concentration and subsequent uptake of cigarettes.5

**Recommendations**

A policy statement from The American Academy of Pediatrics Section on Tobacco Control states that youth who use e-cigarettes are more likely to use cigarettes and other tobacco products.6 It recommends that physicians screen patients for use of electronic nicotine delivery systems (ENDS), counsel about immediate and long-term harms and the importance of not using ENDS, and offer current users tobacco cessation counseling (with Food and Drug Administration-approved tobacco dependence treatment).

**Editor’s takeaway**

While these cohort studies don’t definitively prove causation, they provide the best quality evidence that we are likely to see in support of counseling adolescents against using e-cigarettes, educating them about harms, and offering tobacco cessation measures when appropriate.
TABLE

E-cigarette use and subsequent cigarette smoking: What the studies show

<table>
<thead>
<tr>
<th>Location</th>
<th>Demographic (N)</th>
<th>Duration (mo)</th>
<th>E-cigarette exposure</th>
<th>Any cigarette smoking* (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada²</td>
<td>Grades 9-12</td>
<td>12</td>
<td>Within past 30 days</td>
<td>OR = 2.12 (1.68-2.66) NNH = 5</td>
</tr>
<tr>
<td></td>
<td>(19,130)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>England³</td>
<td>Ages 13-14</td>
<td>12</td>
<td>Ever used</td>
<td>OR = 5.38 (4.02-7.22)</td>
</tr>
<tr>
<td></td>
<td>(2836)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico⁴</td>
<td>Ages 12-13</td>
<td>20</td>
<td>Ever used</td>
<td>RR = 1.4 (1.22-1.6) NNH = 5</td>
</tr>
<tr>
<td></td>
<td>(4695)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States⁵</td>
<td>Grade 10 (181)</td>
<td>6</td>
<td>Ever used (at different concentrations)</td>
<td>OR = 2.26 (1.28-3.98) for each tertile increase</td>
</tr>
</tbody>
</table>

CI, confidence interval; e-cigarette, electronic cigarette; NNH, number needed to harm; OR, odds ratio; RR, relative risk.

*All outcomes are compared with no e-cigarette exposure.

References