
Electronic cigarettes (e-cigarettes) have become increasingly popular in the United States and are advertised as a potentially safe and useful method of smoking cessation, despite unknown long-term health sequelae. Individuals with cancer are particularly sensitive to the harms of active smoking, thus smoking cessation is a critical component of cancer survivorship. However, the patterns and implications of e-cigarette use in patients with cancer are not well known. Therefore, we examined contemporary trends of conventional smoking and e-cigarette use among patients with cancer.

Methods | The National Health Interview Survey, an annual cross-sectional survey, collects data on a range of health indicators for noninstitutionalized, civilian adults. Beginning in 2014, participants were queried about e-cigarette use. Harmonized data of participants reporting a cancer diagnosis were obtained through the Integrated Health Interview Series.

Data analysis was conducted from 2014 to 2017. Multivariable logistic regression defined the adjusted odds ratios (AORs) and associated 95% CIs for the odds of using e-cigarettes, with year of survey response (2014-2015 vs 2016-2017) as the primary independent variable, including an age (<50 vs ≥50 years) × year of survey (2014-2015 vs 2016-2017) interaction term. Predicted margins defined prevalence standardized to the distribution of the covariates. Sample weighting stratified by year defined nationally representative estimates. The institutional review board at the University of Texas Southwestern deemed the study exempt, and patient written consent was waived.

Results | Among 13 274 participants (median [range] age, 68 [18-85] years) reporting a cancer diagnosis, 1259 (9.5%) had used e-cigarettes. Although the rates of conventional smoking remained stable from 2014 to 2017 (50.7% to 51.9%, P = .36), the...
prevalence of e-cigarette use increased from 8.5% to 10.7% ($P = .01$) (Figure, A), and later survey year (2016-2017) was associated with increased odds of e-cigarette use (AOR, 1.26; 95% CI, 1.01-1.57).

Age younger than 50 years was also associated with higher odds of e-cigarette use (AOR, 3.79; 95% CI, 2.86-5.03), and the positive association between later survey year (2016-2017) and e-cigarette use was seen only in participants younger than 50 years (AOR, 1.71; 95% CI, 1.17-2.51) and not in those 50 years or older (AOR, 1.05; 95% CI, 0.82-1.35) ($P = .02$ for age × year interaction). From 2014 to 2017, the prevalence of e-cigarette use among participants younger than 50 years increased from 22.8% to 26.8% ($P = .01$), compared with 6.0% to 8.0% ($P = .20$) for those 50 years or older (Figure, A).

Although the prevalence of e-cigarette use among current and never smokers remained stable throughout the study period (Figure, B and C), e-cigarette use among former smokers increased from 5.8% to 8.3% between 2014 and 2017 ($P < .001$) (Figure, D).

**Discussion** | In this large contemporary national survey, the prevalence of e-cigarette use among participants reporting a cancer diagnosis increased from 2014 to 2017, whereas conventional smoking rates remained stable. The high prevalence of e-cigarette use among current conventional smokers calls into question whether e-cigarettes are a useful method of smoking cessation, although prospective studies are needed to address this concern. Notably, the trend for increasing e-cigarette use in our study appeared to be driven by former smokers and participants younger than 50 years. The health outcomes of former smokers who use e-cigarettes merits further study to elucidate the long-term health effects of switching to e-cigarettes. Among the general population, experts worry that e-cigarettes may be creating addiction to nicotine among younger individuals who are at risk of prolonged exposure.3 Our findings prompt similar concerns regarding potential deleterious long-term consequences on oncologic outcomes and survivorship, including the potential for increased cancer risk, for which further investigation is needed.

There are several important limitations to our work: data were self-reported, most of the participants in our cohort were white, and we cannot comment on whether e-cigarette use affected quantity of conventional smoking. Given the unknown consequences of e-cigarette use in those with cancer, policy and guidelines are needed, including e-cigarette screening and cessation as a part of cancer survivorship counseling.

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COMMENT & RESPONSE

Overestimation of the Benefit-to-Harm Ratio of Risk-Based Mammography Screening in the United Kingdom

To the Editor Pashayan et al1 used a cost-effectiveness model (initially described by Pharoah et al1) based on the UK mammography screening program to estimate the cost per quality-adjusted life-years (QALYs) gained associated with risk-based screening. The estimations consider QALYs gained owing to the reduced risk of breast cancer death associated with screening mammography and the QALYs lost owing to overdiagnosis. The results are interpreted using the threshold of £20 000 per QALY gained recommended by the UK National Institute for Health and Care Excellence (NICE). We agree that risk-based screening is a relevant way to optimize the harm-benefit balance of cancer screening; however, we disagree with 2 aspects of the cost-effectiveness model used by Pashayan et al.1

First, the model ignores the considerable influence that therapies have on the risk of breast cancer mortality. If therapies reduce the risk of breast cancer mortality by 30% on average, which is a realistic figure, the difference in the number of breast cancer deaths in the screened cohort vs the unscreened cohort should be about one-third lower than the number estimated by the model (ie, 1065 vs 1521 deaths).5 When breast cancer therapies are available, the gains in QALYs associated with mammography screening are smaller than gains estimated in the absence of therapy. In general, the reduction in cancer mortality associated with mammography screening decreases with the increasing success of therapies. For instance, the success of cis-platinum-based therapies for treatment of testicular cancer, even metastatic cancer, has rendered obsolete the few attempts made to promote screening for this cancer.1 In contrast, the harms owing to screening (ie, false-positive screening test results and overdiagnosis) remain unchanged.

Second, the model used a 20% reduction of the risk of breast cancer mortality associated with screening, especially of advanced metastatic cancers.2 However, in countries where mammography screening has been available for 30 years or more (including in the United Kingdom), the incidence of advanced metastatic cancers has not or has only slightly diminished.4 5 These epidemiological data indicate that the effectiveness of mammography screening in populations would be lower than predicted by the randomized trials. Hence, QALYs gained with risk-based screening would be well below the estimations reported by Pashayan et al,1 and the costs per QALY gained would be much higher than those reported in the article.

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