retrievable IVCFs, removal of these devices should always be attempted.

Smaller studies have described high rates of technical success when retrieving IVCFs with prolonged dwell times, now corroborated in our larger study. Retrievable IVCFs with prolonged dwell times can be removed with a high degree of technical success without increasing the rate of procedural adverse events. Adjunctive retrieval techniques positively affect retrieval rates and are often needed for retrieval of IVCFs with prolonged dwell times.

Study limitations include the evolution of adjunctive techniques during the study period. The use of these techniques was operator dependent and was not objectively assigned. In addition, this single-center experience may not translate broadly.

Retrievable IVCFs can be removed safely with a high rate of technical success, regardless of dwell time. These findings support the US Food and Drug Administration's goal of removing devices that are no longer necessary by eliminating a limit on dwell times. Weighed against the risks of prolonged dwell times of retrievable IVCFs, removal of these devices should always be attempted.

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Discussion | Reports of device-related complications have increased with the growing use of retrievable IVCFs, resulting in a 2010 safety communication from the US Food and Drug Administration urging removal of these devices when their use is no longer indicated.4 Prolonged IVCF dwell times have been associated with increased risks for device-related complications5 and retrieval failure,6 resulting in the perception that retrieval of IVCFs with prolonged dwell times should not be attempted.

The 2014 US Surgeon General’s Report provided the estimated annual number of smoking-attributable deaths during 2005 to 2009 from cancer overall and lung cancer specifically but not separately for the 11 other cancers found to be caused by smoking.1 Current estimates of smoking-attributable mortality for specific cancer sites are based on data from 2000 to 2004.2 Updated estimates are needed because smoking patterns and the magnitude of the association between smoking and cancer death have changed in the past decade. From 2000 to 2012, smoking prevalence decreased from 23.2% to 18.1%.3 In contrast to this favorable trend, recently published data revealed that the risk of cancer death among smokers can increase over time.4 Therefore, we estimated the number and proportion of deaths in the United States in 2011 attributable to cigarette smoking for 12 cancers caused by smoking.

Methods | For 12 cancers established as caused by smoking, we used the standard formula6 to calculate the population-attributable fraction (PAF) within strata defined by sex and age group (35-54, 55-64, 65-74, and >75 years) using SAS statistical software, version 9.3 (SAS Institute Inc). The PAFs were calculated using smoking prevalence (current, former, or never) from the 2011 National Health Interview Survey3 and age- and sex-specific relative risks (RRs) for former and current smoking from the Cancer Prevention Study II (CPS-II)4 (for the 35- to 54-year age group, follow-up from 1982-1988) or the pooled contemporary cohort (PCC)4 (for other age groups, follow-up from 2000-2011). The National Health Interview Survey provides smoking prevalence estimates based on in-person interviews of a nationally representative sample of US adults. The
Table. Number and Proportion of Cancer Deaths in Adults 35 Years and Older Attributable to Cigarette Smoking in the United States in 2011*

<table>
<thead>
<tr>
<th>Cancer Site</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Deaths, No.</td>
<td>Smoking-Attributable Deaths, No. (%) [95% CI]</td>
<td>Total Deaths, No.</td>
</tr>
<tr>
<td>Colorectum</td>
<td>26,608</td>
<td>[11.2] [6.8 to 16.2]</td>
<td>24,815</td>
</tr>
<tr>
<td>Esophagus</td>
<td>11,483</td>
<td>[52.3] [45.2 to 59.1]</td>
<td>2921</td>
</tr>
<tr>
<td>Kidney and renal pelvis</td>
<td>8,550</td>
<td>[22.3] [15.2 to 30.3]</td>
<td>4870</td>
</tr>
<tr>
<td>Larynx</td>
<td>2,946</td>
<td>[72.1] [62.2 to 80.5]</td>
<td>782</td>
</tr>
<tr>
<td>Liver and intrahepatic bile duct</td>
<td>14,525</td>
<td>[28.1] [18.2 to 39.6]</td>
<td>6,916</td>
</tr>
<tr>
<td>Lung, bronchus, and trachea</td>
<td>86,690</td>
<td>[83.2] [81.9 to 84.6]</td>
<td>70,165</td>
</tr>
<tr>
<td>Myeloid leukemia</td>
<td>5,098</td>
<td>[23.2] [15.4 to 32.1]</td>
<td>3,949</td>
</tr>
<tr>
<td>Oral cavity and pharynx</td>
<td>6,073</td>
<td>[48.7] [37.0 to 59.6]</td>
<td>5,059</td>
</tr>
<tr>
<td>Pancreas</td>
<td>18,841</td>
<td>[9.9] [4.3 to 16.2]</td>
<td>18,448</td>
</tr>
<tr>
<td>Stomach</td>
<td>6,474</td>
<td>[25.6] [17.0 to 35.2]</td>
<td>4,419</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>10,585</td>
<td>[46.5] [40.2 to 52.8]</td>
<td>4,412</td>
</tr>
<tr>
<td>Uterine cervix</td>
<td>NA</td>
<td>NA</td>
<td>3,889</td>
</tr>
<tr>
<td>Total</td>
<td>197,873</td>
<td>[51.5] [47.9 to 55.4]</td>
<td>148,089</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not applicable.

* Calculations are based on relative risks by smoking status and age group, adjusted for alcohol consumption, generated from analyses of the Cancer Prevention Study II (CPS-II) and updated analyses of the pooled contemporary cohort (which includes the CPS-II, the Nurses’ Health Study, the Health Professionals Follow-Up Study, the Women’s Health Initiative, and the National Institutes of Health-AARP Diet and Health Study) as described by Thun et al.4

Figure. Number of Cancer Deaths Attributable to Cigarette Smoking in 2011 in Adults 35 Years and Older by Cancer Type

Letters
CPS-II and the 5 studies that compose the PCC are large US cohort studies that ascertained smoking from self-administered questionnaires and are described in detail elsewhere. The RRs were adjusted for age, race, educational level, and alcohol use; the RRs from the PCC were additionally adjusted for cohort. The RRs from CPS-II appear in the 2014 US Surgeon General’s Report, and the RRs from the PCC appear in the article by Carter et al. For each cancer site, smoking-attributable deaths in each age and sex group were calculated by multiplying age- and sex-specific PAFs by age- and sex-specific death counts in 2011 derived from the National Vital Statistics System. Smoking-attributable deaths were then summed across age and sex groups to determine the total number of smoking-attributable deaths, which was divided by the total number of deaths to calculate the overall PAF. These statistical methods and data sources match those used in smoking-attributable mortality calculations in the 2014 US Surgeon General’s Report but use slightly updated data.

Results | Of the 345,962 deaths among adults 35 years and older in 2011 from the 12 cancer sites examined, we estimate 167,805 (48.5%: 95% CI, 46.2%-51.2%) were caused by cigarette smoking. The largest proportions of smoking-attributable deaths were for cancers of the lung, bronchus, and trachea (125,799 [80.2%]; 95% CI, 79.2%-81.1%) and larynx (28,568 [76.6%]; 95% CI, 68.7%-83.5%) (Table and Figure). Approximately half of the deaths from the cancers of the oral cavity, esophagus, and urinary bladder were due to smoking.

Discussion | Cigarette smoking continues to cause numerous deaths from multiple cancers despite half a century of decreasing prevalence. The smoking downturn is likely reflected in the generally lower proportions of deaths caused by smoking in 2011 than in 2000 to 2004 for the 10 overlapping cancer sites. Earlier estimates excluded colorectal and liver cancers (10,029 smoking-attributable deaths in 2011) because they were not yet established smoking-related sites.

One limitation of our study is the cohort populations, which are less racially diverse and more educated than the US population. In addition, tobacco exposures other than cigarettes were not included in our analysis. These exposures include secondhand smoke, which is estimated to cause an additional 5% of lung cancer deaths, and the use of cigars, pipes, and smokeless tobacco, which undoubtedly account for a considerable proportion of deaths from cancers of the oropharynx, larynx, and esophagus. Although differences in exposures (eg, diet and exercise) between smokers and nonsmokers may have potentially confounded our results, these differences have minimal effect on smoking-attributable risk.

Continued progress in reducing cancer mortality, as well as deaths from many other serious diseases, will require more comprehensive tobacco control, including targeted cessation support.

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Drafting of the manuscript: Siegel.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Jacobs, Newton, Feskanich, Prentice.
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Study supervision: Jemal.

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