INTRODUCTION
Lung cancer is a lethal disease that claims the lives of more people in the United States annually than the next 4 most lethal cancers combined, which are, in order, colon, breast, pancreas, and prostate cancers. In the United States an estimated 224,210 people will be diagnosed with lung cancer, and an estimated 159,260 people will die of the disease in 2014.

Under the Affordable Care Act, LDCT lung cancer screening for people aged 55 to 80 years with a history of heavy smoking must be covered without cost-sharing by qualified health plans starting January 1, 2015. In addition, LDCT lung cancer screening has been adopted by essentially every major academic body with an interest in lung cancer, including the National Comprehensive Cancer Network, American Association for Thoracic Surgery, American College of Radiology, Society of Thoracic Surgeons, International Association for the Study of Lung Cancer, American College of Chest Physicians, and the American Cancer Society. Medicare has begun a national coverage analysis to determine whether LDCT lung cancer screening meets its criteria for coverage, which includes whether screening is reasonable and necessary for early detection, whether the service has an “A” or a “B” recommendation by the US Preventive Services Task Force (USPSTF), and whether screening is appropriate for Medicare beneficiaries.

Long-term survival rates of approximately 80% have been reported for patients with lung cancer who are diagnosed by CT screening compared with a 16.8% 5-year survival rate for the national data.

PURPOSE OF THE STUDY
The purpose of the present study was to estimate the hypothetical 2014 costs and benefits associated with the implementation of widespread lung cancer screening in the high-risk US population covered by Medicare.

METHODS
- First the authors determined Medicare’s cost of screening, assuming a 50% uptake rate for the portion of eligible individuals who would use the screening. Then the authors determined Medicare’s cost per life-year saved.
- The Medicare enrollment and demographics were derived from the 2012 Centers for Medicare & Medicaid Services (CMS) beneficiary files and were forecast to 2014 based on the US Census Bureau projections.
- The group eligible for lung cancer screening was estimated to comprise approximately 4.9 million people, or approximately 10% of Medicare beneficiaries, based on actuarially adjusted (to 2014) populations reported by Ma and colleagues for 2010.
- The authors estimated the cost of LDCT lung cancer screening and follow-up components of the screening process using 2014 Medicare fees. They analyzed medical claims in the Medicare 5% sample to determine the cost and distribution of biopsy types (fine-needle aspiration, bronchoscopy, and video-assisted thoracic surgery). They then applied these costs to the established screening protocols and the observed distribution of outcomes in the lung cancer screening trials, such as those used in the National Lung Screening Trial (NLST) and the International Early Lung Cancer Action Program (I-ELCAP). Each Screening included a 30 minute smoking-cessation session.
- In this model, stage shifting, in which screening identified cancers at earlier stages, is fundamental to the ability of lung cancer screening to reduce mortality. LDCT screening results in a greater number of lung cancers being detected at an earlier stage, which leads to earlier treatment and lower treatment costs and to more people living after having been diagnosed with lung cancer.
• In each model year and scenario, the authors applied SEER (Surveillance, Epidemiology, and End Results) cancer incidence rates by age sex, and stage classified as local, regional, and distant cancers (15) to identify the incidence at status quo (no screening) and base case screening scenarios, with corresponding treatment costs and mortality. The authors explain that the differences in costs and life-years lived between the status quo and base-case scenarios provide the net cost of screening and the number of life-years saved as a result of screening.

**RESULTS**

• The authors conclude that if 50% of the patients aged 55 to 80 years with >=30 pack-years of smoking were screened, the Medicare cost spread across the Medicare population would be $1.02 per member per month (PMPM), assuming no cost-sharing for the initial or annual screening LDCT or smoking-cessation session.

• The authors state that if all of the 4.9 million high-risk Medicare beneficiaries meeting USPSTF criteria for lung cancer screening in 2014 had been screened and treated consistently from age 55 years, approximately 358,134 additional individuals with current or past lung cancer would be alive in 2014. This does not include patients who were cured of lung cancer but who died of other causes, or the estimated 83,835 “lead-time” cases, who were not counted as “lung cancer survivors” until they reached the age when they would have been diagnosed with lung cancer in the absence of screening.

• The authors conclude that the average cost of such a screening policy is estimated to be $241 for a Medicare beneficiary screened, assuming that 75% of the screenings were annual repeat screenings. The $241 figure includes offsets for the reduced cost associated with earlier stage treatment and is increased by extra costs of treatment for additional years.

**Estimated Impact of Lung Cancer Screening on Life-Years Saved and Cost per Life-Year Saved**

*Using Base-Case (I-ELCAP Data for Screening Results)*

<table>
<thead>
<tr>
<th>Impact of Screening</th>
<th>Total (male and female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative life-years saved</td>
<td>2,825,652</td>
</tr>
<tr>
<td>Lead-time correction, yrs</td>
<td>568,599</td>
</tr>
<tr>
<td>True life-years saved</td>
<td>2,257,053</td>
</tr>
<tr>
<td>Cumulative extra cost, $</td>
<td>41,647,811,614</td>
</tr>
<tr>
<td>Cost per additional life-year, $</td>
<td>18,452</td>
</tr>
</tbody>
</table>

**Patients diagnosed with lung cancer in 2014**

| Average life expectancy without screening, yrs | 3.07 |
| Average life expectancy with screening (with no lead time), yrs | 7.01 |
| Average increased life span because of screening, yrs | 3.94 |

*Life-years saved and cost are for patients with cancer aged 55-110 years. I-ELCAP indicates International Early Lung Cancer Action Program. Source: Author’s analysis*

• **With screening, these Medicare patients would have an additional 4 years of additional life expectancy** incremental to the life expectancy without screening. In addition, because LDCT lung cancer screening can detect nodules before a cancer becomes symptomatic the lung cancer would have been caught at an earlier stage at an estimated 3 years earlier consistent with the time for a 6-mm cancer detected in screening to grow from stage I to stage III, with a diameter of >7cm, assuming a volume doubling time (ie, measure of the tumor growth rate) of 98 days.16
CONCLUSION

The cost per life-year saved figures reported here for LDCT lung cancer screening in the Medicare population are comparable with or lower than the estimates for breast, cervical, and colorectal cancer screenings in the Medicare population. LDCT screening is a low-cost and cost-effective strategy that fits well within the standard Medicare benefit, including its claims payment and quality monitoring.

**THIS CONCLUDES THE CLINICAL SYNOPSIS OF THIS PUBLICATION**
References


