

# Publication Summary

## **Costs of Biopsy and Complications in Patients with Lung Cancer**

Chiu YW, Kao YH, Simoff MJ, Ost DE, Wagner O, Lavin J, Culbertson RA, Smith DG. ClinicoEconomics and Outcomes Research. 2021 Mar 17;13:191-200. doi: 10.2147/CEOR.S295494. PMID: 33762834; PMCID: PMC7982449.

# Costs of Biopsy and Complications in Patients with Lung Cancer

Published study results

## Objective

To describe the distribution of diagnostic procedures, rates of complications, and total costs of procedures related to lung cancer diagnosis.

## Materials & methods

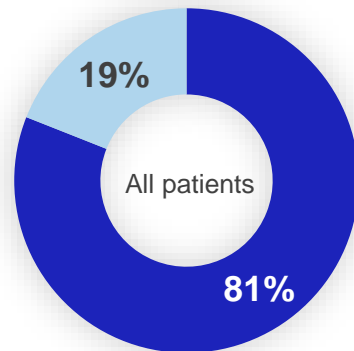
Observational study using data from **IBM MarketScan® Commercial Claims and Encounters and Medicare Supplemental Databases**. Databases for continuously insured adult patients aged 18 years and older with a primary lung cancer diagnosis and treatment between **July 2013 and June 2017**. The diagnosis of lung cancer was determined by **ICD-9 and ICD-10 codes**. Treatment was defined by CPT and/or ICD-9/10 procedure codes for surgery, ablation, radiation therapy, and chemotherapy. The NDC was used for therapeutic agents used in the treatment of lung cancer in relation to a procedure. Patients who were **not enrolled in a health plan 6 months prior to and following their diagnosis**, as well as those who did not receive lung cancer treatment following diagnosis, were excluded from the study. Costs of lung cancer diagnosis covered 6 months prior to index biopsy through treatment. For complications to be considered biopsy-related, **they must have occurred within a day immediately following the biopsy**. This applies to all complications except for prolonged air leak and abscess of lung, which were evaluated up to five days after the biopsy. Costs of chest CT scans, biopsy, and post-procedural complications were estimated from total payments. Costs of biopsies incidental to inpatient admissions were estimated by comparable outpatient biopsies.

1. Chiu YW, Kao YH, Simoff MJ, Ost DE, Wagner O, Lavin J, Culbertson RA, Smith DG. Costs of Biopsy and Complications in Patients with Lung Cancer. ClinicoEconomics and Outcomes Research. 2021 Mar 17;13:191-200. doi: 10.2147/CEOR.S295494. PMID: 33762834; PMCID: PMC7982449.

# Costs of Biopsy and Complications in Patients with Lung Cancer<sup>1</sup>

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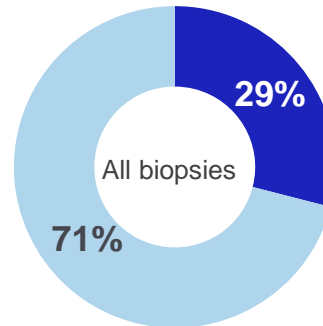
81% of patients had one or more biopsies



■ Patients with 1 or more biopsies ■ Patients with no biopsies

N = 28,304 patients included in final analyses

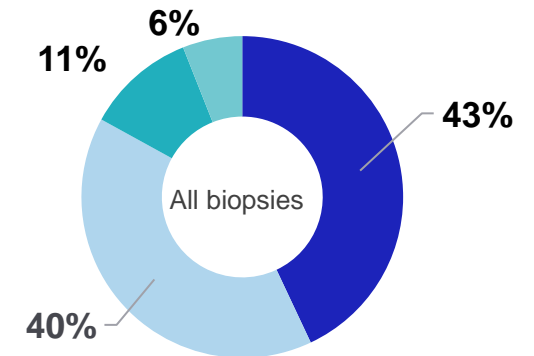
29% of biopsies occurred in the inpatient setting



■ Inpatient biopsy procedures ■ Outpatient biopsy procedures

N = 22,870 patients who had one or more biopsies

Distribution of biopsy procedure types



■ Percutaneous ■ Bronchoscopy ■ Surgical ■ Mediastinoscopy

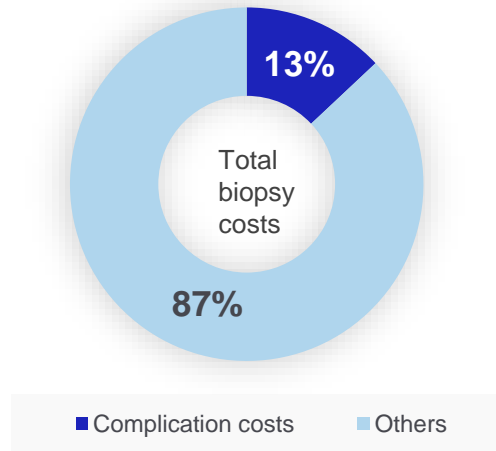
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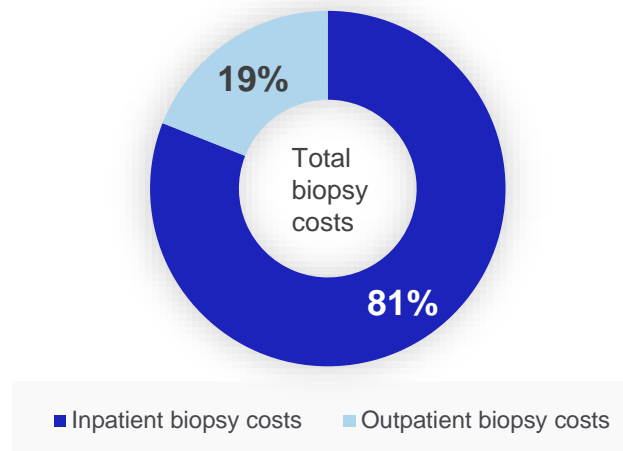
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Complications associated with biopsies accounted for 13% of total mean costs



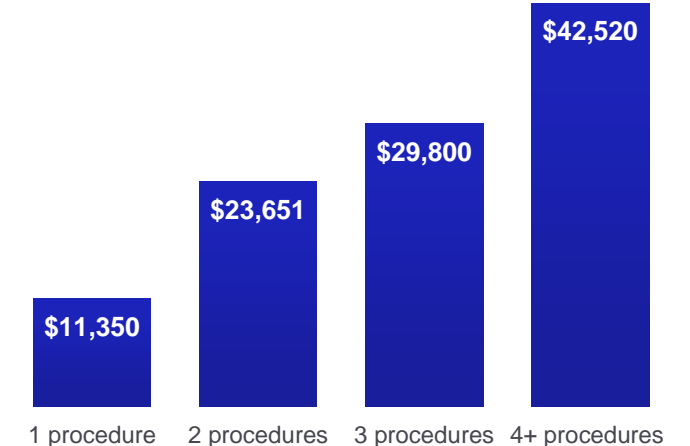
N = 22,870 patients who had one or more biopsies

Inpatient biopsies account for 81% of total mean costs



N = 22,870 patients who had one or more biopsies

The mean biopsy procedure costs increase by number of procedures, irrespective of biopsy type



N = 22,870 patients who had one or more biopsies

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42%

of diagnosed and treated lung cancer patients  
underwent multiple biopsies,

increasing mean healthcare costs by

40–80%.

Key drivers of cost were repeat procedures and  
procedure (inpatient/outpatient) setting.

1. Chiu YW, Kao YH, Simoff MJ, Ost DE, Wagner O, Lavin J, Culbertson RA, Smith DG. Costs of Biopsy and Complications in Patients with Lung Cancer. Clinicoecon Outcomes Res. 2021 Mar 17;13:191-200. doi: 10.2147/CEOR.S295494. PMID: 33762834; PMCID: PMC7982449.

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## Authors' conclusion

- Healthcare costs associated with the diagnosis of lung cancer **are primarily driven by repeat procedures and setting (inpatient vs outpatient).**
- **Costs of biopsies to confirm lung cancer diagnosis vary substantially** by type of biopsy and setting.
- **Multiple biopsies add substantially to the cost burden of lung cancer diagnosis**, leaving an opportunity for technological advancements that increase accuracy and effectiveness, leading to fewer repeat biopsies.
- **Over one-quarter of procedures were performed on an inpatient basis**, leaving an opportunity for greater use of outpatient services, when medically appropriate, to substantially reduce payer costs.

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### Study limitations

- The study population does not include persons who are uninsured, publically insured other than by Medicare, or persons without continuous enrollment.
- Claims data are focused on administrative rather than clinical information (i.e.. staging information).
- 30% of those diagnosed with lung cancer in the IBM MarketScan Database did not have continuous insurance enrollment, which is typically indicative of a change in employment status or a company's change in insurance provider.
- This study likely excludes low-income individuals and may not be generalizable to the broader U.S. population.
- Many patients, 5434 (19.2%), were observed to have lung cancer therapy with no evidence of biopsy.
- A single diagnosis of lung cancer in the primary diagnosis position was used as evidence of lung cancer, however, claims data does not provide a pathological diagnosis of lung cancer.
- While authors attempted to separate diagnosis and treatment claims, they may have included some costs associated with treatments if claims for diagnosis and treatments were combined. This is particularly a concern for patients with inpatient admissions.
- This analysis also excluded patients who received multiple biopsy types, a population subset that may have more complications, limiting the scope of the analysis.
- Complications (excluding prolonged air leak and abscess of the lung) were only considered to be biopsy-related if they occurred within a day immediately following the biopsy, which may underrepresent the complication rates.

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## Database Background

This observational study utilized data from both the **IBM Marketscan® Commercial Claims and Encounters and Medicare Supplemental Databases**. The Marketscan® Databases are constructed from **privately insured, paid, medical and prescription drug claims** contributed by employers and health plans who have business relationships with IBM Watson Health. Collectively, the data are incorporated from approximately 350 payers, including commercial insurance companies, Blue Cross and Blue Shield plans, and third-party administrators and include **approximately 62 million covered lives**. Each contributor's database is constructed by collecting raw data from the participating payer(s). These raw data are **service-level adjudicated paid claims and capitated encounters** containing both inpatient and outpatient services. As the database is fully de-identified and compliant with HIPAA regulations this study was exempted from Institutional Review Board approval.

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# Important safety information

## Important Safety Information

Risk associated with bronchoscopy through an endotracheal tube and under general anesthesia are infrequent and typically minor and may include but are not limited to: sore throat, hoarseness, respiratory complications including dyspnea or hypoxemia, airway injury, bronchospasm, laryngospasm, fever, hemoptysis, chest or lung infection including pneumonia, lung abscess or an adverse reaction to anesthesia.

Although rare, the following complications may also occur: bleeding, pneumothorax (collapsed lung), cardiac related complications, respiratory failure, air embolism, or death.

As with other medical procedures, there may be additional risks associated with the use of general anesthesia and/or endotracheal intubation which are not listed above; you should consult a health care professional regarding these and other potential risks.

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