# Routes to Diagnosis for Lung Cancer in England: Examining the Patient Journey Using Linked Data from Hospital Episode Statistics and the Diagnostic Imaging Database

HSD12

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## 1 INTRODUCTION

- **Lung Cancer (LC) remains the leading cause of cancer incidence and mortality worldwide.** In 2022, there were approximately 2.5 million new cases globally, making it the most frequently diagnosed cancer, accounting for 12.4% of all new cancer cases.[1] Lung cancer also leads in mortality, causing around 1.8 million deaths annually.[2]
- **Timely diagnosis is critical** because delays in diagnosis and treatment can reduce the effectiveness of interventions and lead to significantly poorer outcomes.
- **Delays in diagnosis are associated with an increased need for urgent healthcare due to exacerbation of symptoms.** These issues frequently result in unplanned Accident and Emergency (A&E) visits, which place additional pressure on healthcare services and reflect underlying delays in accessing timely cancer care. [1,2]

### Objective

- To examine the diagnostic pathways in patients with LC in England.

## 2 METHODS

### Data Sources

- Linked data from Hospital Episode Statistics (HES) and the Diagnostic Imaging Database (DID) were used.
- Records of chest imaging in the **six months before diagnosis** were extracted using OPCS-4 codes in HES and SNOMED, modality, or National Interim Clinical Imaging Procedure (NICIP) codes in DID.
- Presence of a code for imaging and a code for body part (i.e., chest) were both required.

### Sample

- Adult patients (≥ 18 years) diagnosed with LC (ICD-10: C34) between 1 April 2018 and 31 March 2019 were included.
- Patients were excluded if they had another primary cancer or no records in DID prior to diagnosis.

### Analysis

- Average intervals from chest imaging to diagnosis were reported as median days.
- Proportions of patients via different diagnostic pathways were reported.

## 3 RESULTS

### Study sample

- A total of 21,052 patients with LC were included, with a mean age of 71.1 ± 10.5 years and 52.8% male (**Figure 1**). A third (34.0%) of the patients had metastases at the time of diagnosis.

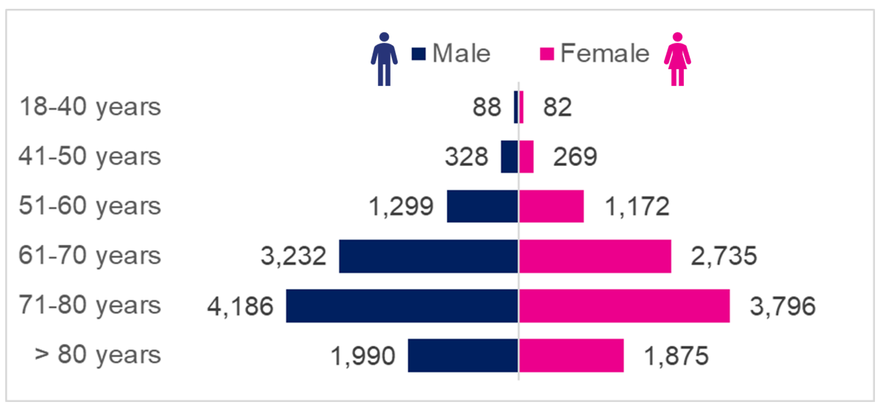



**Figure 1.** Number of Lung Cancer Patients by Age and Sex

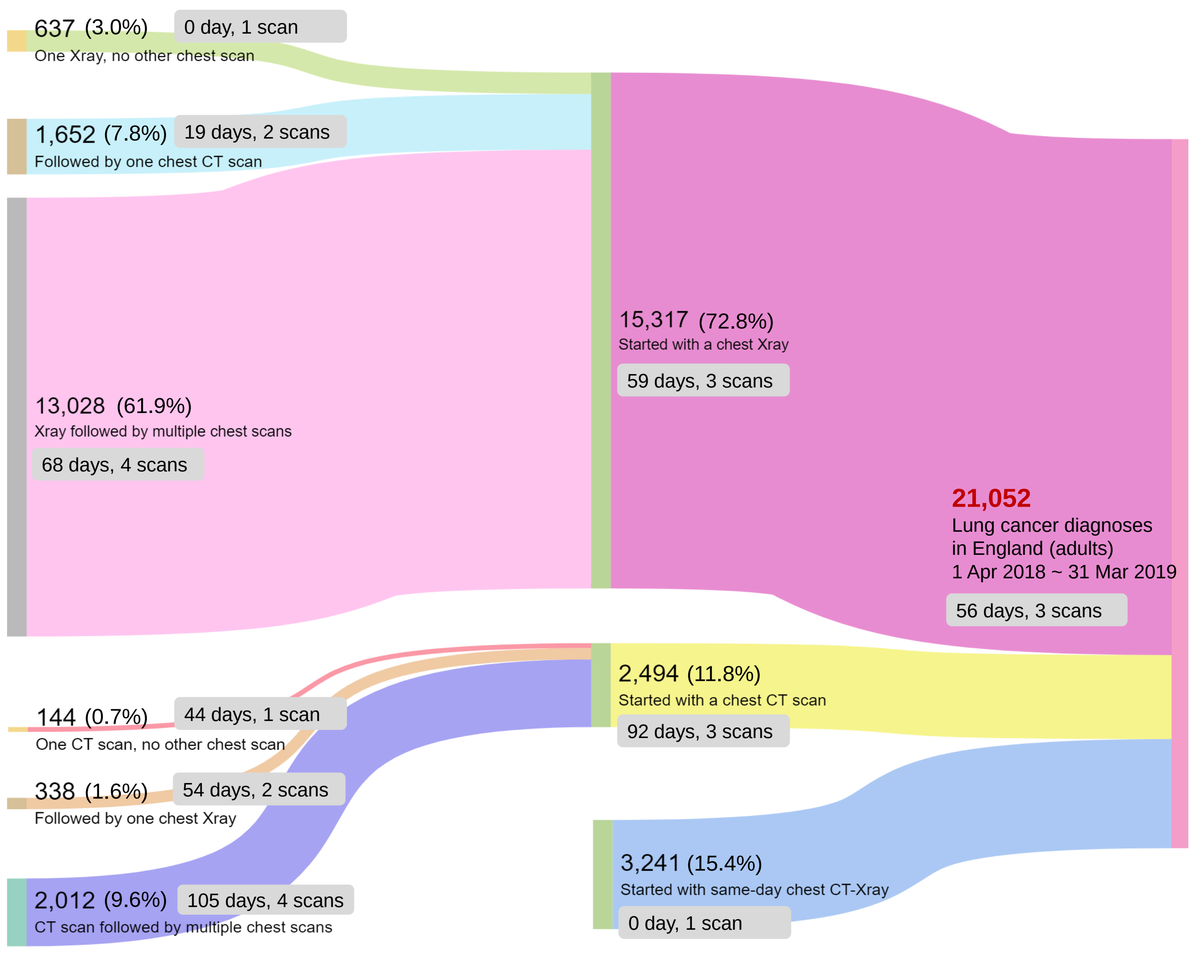
### How the journey began?

- Most LC patients (72.8%) started the journey with a chest X-ray (CXR) that led to the diagnosis. The rest started with a chest CT scan (11.8%) or same-day CT and CXR (15.4%). No patient started the journey with a chest MRI or ultrasound.
- A third (30.6%) were diagnosed via emergency presentation, and 32.2% attended A&E between the first chest imaging and diagnosis.

### How long was the journey to diagnosis?

- The average interval (median) from the first chest imaging to diagnosis was 56 days. This interval was considerably longer in patients who started with a CT scan (92 days), had multiple CTs or CXRs (84 days), or had CXR after the initial CT (82 days).
- Overall, it took a median of three chest scans to diagnose, with fewer repeated scans for same-day CT and CXR starters (**Figure 2**).

**Figure 2.** Patient Journey from the First Chest Scan to Diagnosis of Lung Cancer




NOTES:
- A chest scan includes chest x-ray, chest CT scan, chest MRI, or chest ultrasound.
- The median duration (days) from chest scans to diagnosis was reported.
- The median number of chest scans was reported.
- An interval of 0 days indicates that the patient received the scan during the same inpatient admission as the diagnosis. However, this does not necessarily mean that the diagnosis and scan occurred on the exact same day.

## 4 DISCUSSION AND CONCLUSIONS

### Key Findings

- Timeliness of LC diagnosis is critical in improving patient outcomes. This study highlights the significant disparities in diagnostic pathways across the healthcare system in England, which contribute to prolonged time to diagnosis. Delays in diagnosis are associated with advanced disease stages at the time of treatment initiation, adversely impacting survival rates and increasing the need for healthcare resources.[3]
- The findings suggest that patients may experience increased healthcare utilisation, including more frequent visits to emergency departments and greater reliance on secondary care due to late-stage presentations.

### Limitations

- This is a retrospective observational study based on secondary use of electronic healthcare data. The findings are limited by potential data quality issues, missing values, and potential misclassification of key study variables.
- The study only examined data within six months before LC diagnosis, which may exclude relevant prior healthcare events, potentially impacting observed outcomes.

### Suggestions for Further Research

- Further research is needed to investigate the impact of different diagnostic pathways on clinical outcomes in LC patients. Understanding these pathways may identify bottlenecks and inefficiencies within the healthcare system, enabling the development of targeted interventions to streamline the diagnostic process.
- Additionally, studies should explore the role of patient demographics, socioeconomic factors, and access to care in influencing diagnosis times, which could inform future healthcare policies aimed at reducing disparities.

## REFERENCES

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## DISCLOSURES

JL is employee of Intuitive Surgical and may hold shares or stock options in the company. XLM is employee of OPEN Health, which received consulting fees to conduct the research from Intuitive Surgical. MM and RT have received institutional and research support from Intuitive Surgical. The authors report no other conflicts of interest in this work. The study was funded by Intuitive Surgical. The study protocol was approved by the National Health Service in England, who provided the linked HES-DID datasets. The interpretation and conclusions contained in this study are those of the author/s alone. 

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