Real-World Impact of Immunotherapy on Survival and Hospital Costs in Advanced/Metastatic Lung Cancer: A Retrospective Analysis from the French Health Data System

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INTRODUCTION

Lung cancer remains a leading cause of mortality in France and worldwide, representing a high burden for patients and healthcare systems. Immunotherapy agents have demonstrated a substantial improvement of overall survival in clinical trials. Nonetheless, real-world data are expected to assess their effectiveness and the evolution of healthcare costs.

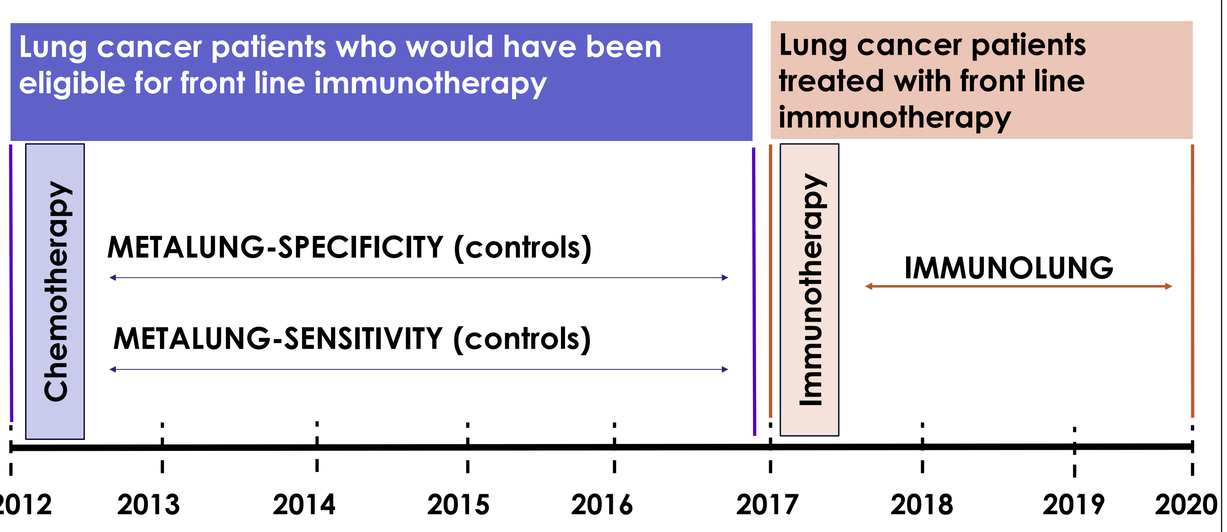
OBJECTIVES

To compare overall survival and healthcare costs in advanced/metastatic lung cancer patients, before and after the reimbursement of immunotherapy agents.

METHODS

- We conducted a retrospective cohort study using data from the French National Health Data System (SNDS) for the period 2012-2020.
- Three cohorts of lung cancer patients who had not been treated with targeted therapies were selected:
  - **IMMUNOLUNG cohort (n=15,306):** lung cancer patients (C34) treated with front-line immunotherapy between 2017 and 2020.
  - **METALUNG-SPECIFICITY cohort (historic control 1, n=43,587):** lung cancer patients with a metastasis ICD-10 code (C772, C774, C775, C78 and C79) and a first systemic treatment between 2012 and 2016. This cohort where a metastatic code was recorded may select the most severe patients.
  - **METALUNG-SENSITIVITY cohort (historic control 2, n=52,426)**: lung cancer patients with non-localized disease (exclusion of patients who underwent surgery or received stereotactic radiotherapy), and a first systemic treatment between 2012 and 2016. This broader cohort aimed at including advanced patients and metastatic patients for whom metastatic codes have been omitted.
- Propensity score matching was used to balance baseline characteristics, including age, sex, comorbidities, and time from diagnosis to treatment.
- To account for differences in follow-up durations due to different inclusion periods, control patients were censored at the follow-up time of their matched IMMUNOLUNG counterparts, ensuring comparability in survival and healthcare costs.
- Survival, number of hospitalizations, number of hospital days and healthcare costs were assessed **from the start of first systemic treatment to death or censor date** (last observation, or censor date for controls with longer follow-up than their matched case).
- Healthcare costs included the cost of all hospitalizations (treatment administration, radiotherapy etc.), high-costs drugs funded in addition to DRG-based payment, ambulatory oral anti-cancer drugs (excluding targeted therapies), and imaging procedures.
- In each cohort, mean monthly cost and mean cost per patient were estimated.

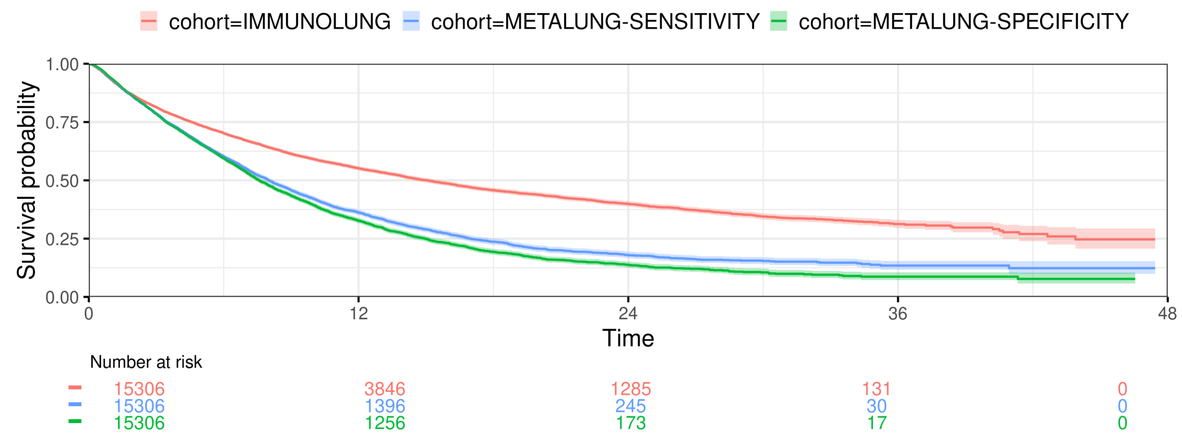
Figure 1. Study design



RESULTS

- After matching, the three cohorts had similar baseline characteristics, with a median age of 65 years and a male proportion of 70%.
- Patients had a median follow-up of 10.8 months in IMMUNOLUNG vs 5.8 in METALUNG cohorts (shorter due to earlier deaths and censoring of controls, before censoring, controls' median follow-up was over 70 months). Median overall survival was 15.1 (95% CI: 14.4, 15.7) months in IMMUNOLUNG, 7.6 (7.4, 7.8) in METALUNG-SPECIFICITY and 8.0 (7.8, 8.2) in METALUNG-SENSITIVITY cohorts.

Figure 2. Overall survival in the 3 cohorts (after propensity score matching)



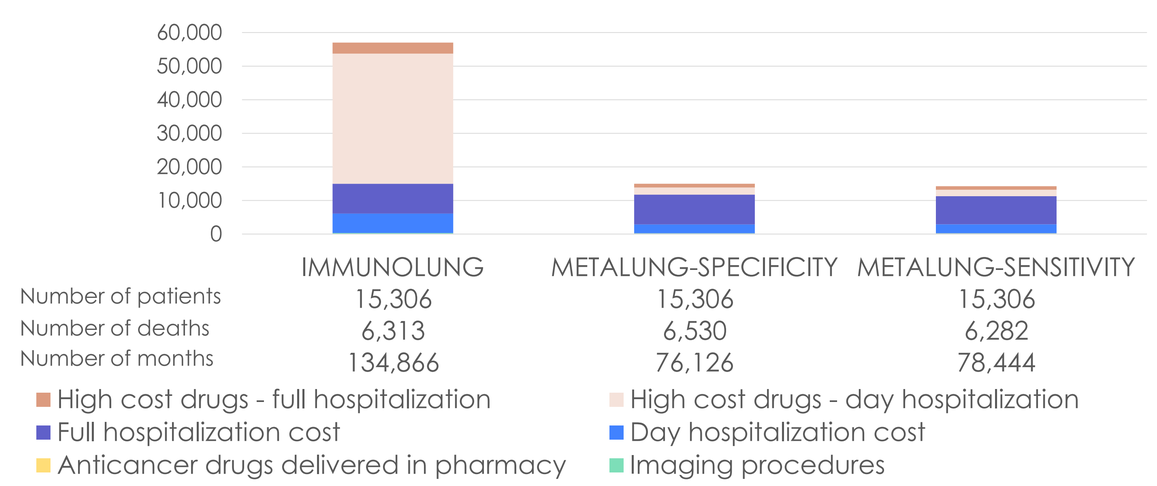
- The mean monthly cost was higher for IMMUNOLUNG patients compared to METALUNG cohorts, however the average number of hospitalizations/hospital days per month was lower.

Table 1. Monthly cost and hospitalization number/days

Cohort	Monthly cost: mean [95% CI]	Monthly hospitalization number: mean [CI]	Monthly hospital days: mean [CI]; median
IMMUNOLUNG	€ 8,754 [8,638, 8,869]	2.0 [2.0, 2.0]	6.4 [6.3, 6.5]; 3.5
METALUNG-SPECIFICITY	€ 4,208 [4,145, 4,270]	2.5 [2.5, 2.5]	8.7 [8.6, 8.9]; 6.1
METALUNG-SENSITIVITY	€ 4,046 [3,983, 4,109]	2.6 [2.5, 2.6]	8.5 [8.4, 8.7]; 5.9

- The mean cumulated healthcare cost per patient was higher in the IMMUNOLUNG cohort (€57,003) compared to controls (€14,979 in METALUNG-SPECIFICITY and €14,236 in METALUNG-SENSITIVITY). This difference is due to a higher monthly cost and a longer duration of treatment/overall survival in IMMUNOLUNG patients.

Figure 3. Mean cost per patient between 1st systemic treatment and death or censor date



CONCLUSION AND LIMITATIONS

- Using real-world data in the French setting, we show that immunotherapy in advanced/metastatic lung cancer patients has dramatically improved overall survival. We observed an incremental monthly cost of approx. €4,500 since immunotherapy reimbursement.
- Limitations:
  - SNDS lacks key prognostic factors such as performance status, thus an imbalance can remain between cohorts despite the matching.
  - Difference in time periods: METALUNG patients were diagnosed earlier than IMMUNOLUNG patients, thus survival improvement might partly be due to improvement in overall clinical practice. On the other hand, the year 2020 was impacted by the SARS-CoV-2 pandemic, which affects the IMMUNOLUNG cohort.

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