LUCIEN - Lung-cancer diagnostic trajectories: a nationwide process-mining cluster analysis of 18,569 French patients

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Background

Delays in initiating therapy worsen lung-cancer outcomes, yet real-world pre-treatment pathways in France remain heterogeneous and insufficiently described. Leveraging the French Cancer Data Platform enables reconstruction of care use in the year preceding first treatment for adults treated in 2018–2019, providing a basis to identify patterns in pre-treatment trajectories.

Objectives

To identify clusters of pre-treatment care pathways for patients with lung cancer in France using process mining in national claims data from 2018–2019, as the foundation for describing patterns and delays prior to first treatment.

Methods

Study Design:

- Retrospective cohort indexing adults at initiation of first lung-cancer treatment; inclusion period July 1, 2018–June 30, 2019, with 12-month look-back, plus a 5-year historical window (2013–2019) to exclude non-incident patients and characterize first treatment
- Inclusion criteria: Adults with a first inpatient diagnosis of primary lung cancer (ICD-10 C34) ; treated with surgery, radiotherapy, or drug therapy within the inclusion/characterization windows.
- Exclusion criteria: Under 18 years of age; residing abroad; diagnosed with lung cancer or cancer in another location within 5 years prior inclusion; absence of treatment characteristic of lung cancer.

Data sources:

- The French Cancer Data Platform cohort (FDCP) is an extract from the National Health Data System (NHDS) containing outpatient and inpatient claims for over 8 million cancer patients or high-risk individuals.

Analysis:

- Stage-specific finite-mixture models were applied to the patients of FDCP, diagnosed with **local/locally-advanced (LLC)** or **advanced/metastatic (AMC)** tumors, using all reimbursed activity in the 12 months before primary lung cancer treatment (systemic or surgery). Time to treatment was the difference between treatment initiation and first inpatient diagnosis of primary lung cancer.

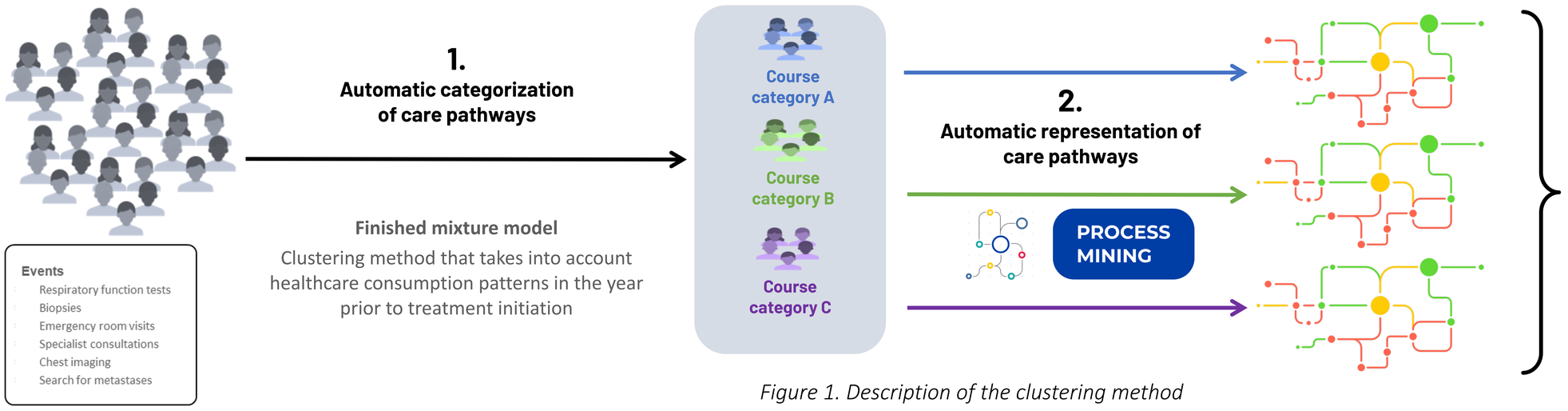

Figure 1. Description of the clustering method

Results

*Table 1. Description of patients included in the study **(N=18,569)***

	Local / Locally-advanced (LLC) (n=6,964)				Advanced / Metastatic (AMC) (n=11,605)		
	Early cluster (EC)	Late cluster (LC)	Continuous cluster (CC)	Last-minute cluster (LMC)	Standard cluster (SC)	Continuous cluster (CC)	Last-minute cluster (LMC)
Number of patients (%)	3,444 (49)	2,617 (38)	378 (5)	525 (8)	9,491 (82)	1,170 (10)	944 (8)
Age (mean ± SD)	66.9 ± 9.8	65.2 ± 11.3	68.4 ± 10.1	64.1 ± 11.4	64.9 ± 10.1	68.1 ± 9.3	64.5 ± 10.5
Sex (%M ; %F)	61 ; 39	59 ; 41	62 ; 48	59 ; 41	67 ; 33	73 ; 27	65 ; 35
Charlson (mean ± SD)	7.1 ± 3.8	7.8 ± 4.5	7.2 ± 3.5	10.4 ± 4.7	10.7 ± 4.6	9.9 ± 4.7	12.2 ± 4.0

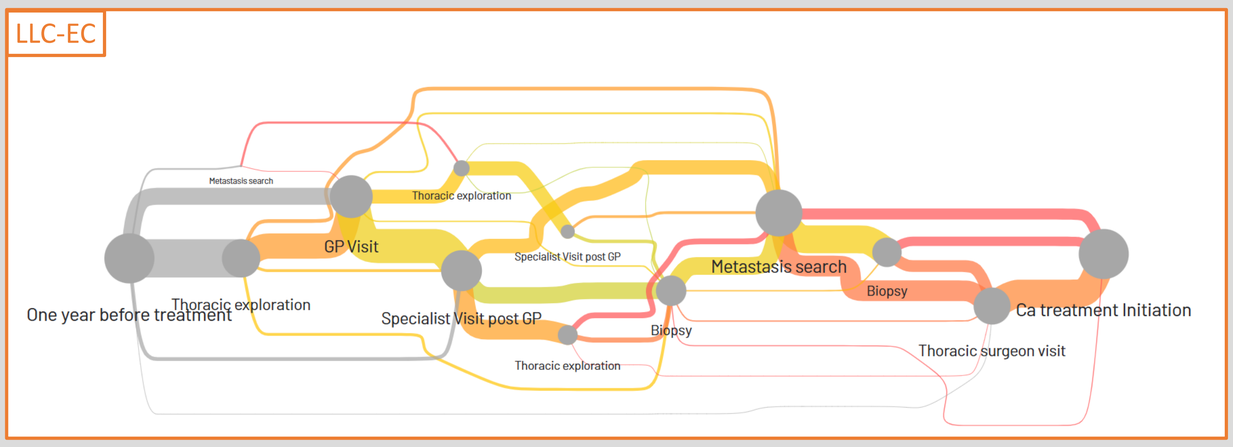

*Figure 2. LLC-EC process mining pathway, n = 3,444, **median time to treatment [Q1-Q3] = 37 days [0-68]***

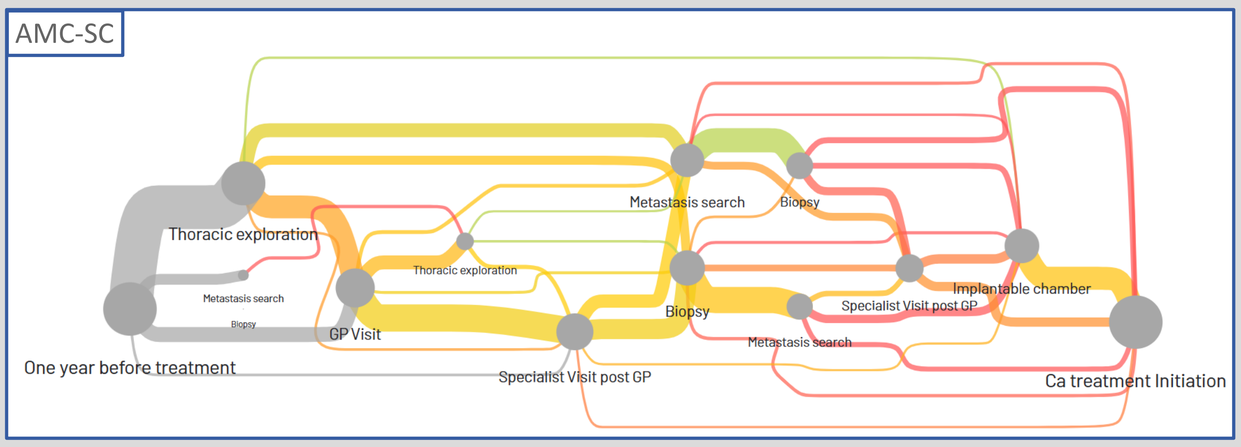

*Figure 3. AMC-SC process mining pathway, n = 9,491, **median time to treatment [Q1-Q3] = 35 days [20-53]***

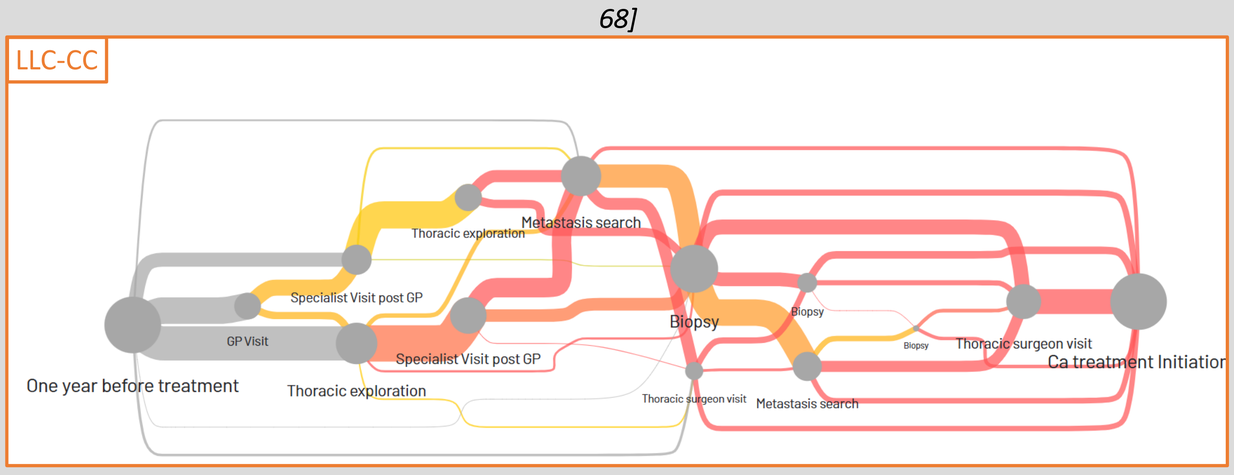

*Figure 4. LLC-CC process mining pathway, n = 378, **median time to treatment [Q1-Q3] = 34.5 days [0-77]***

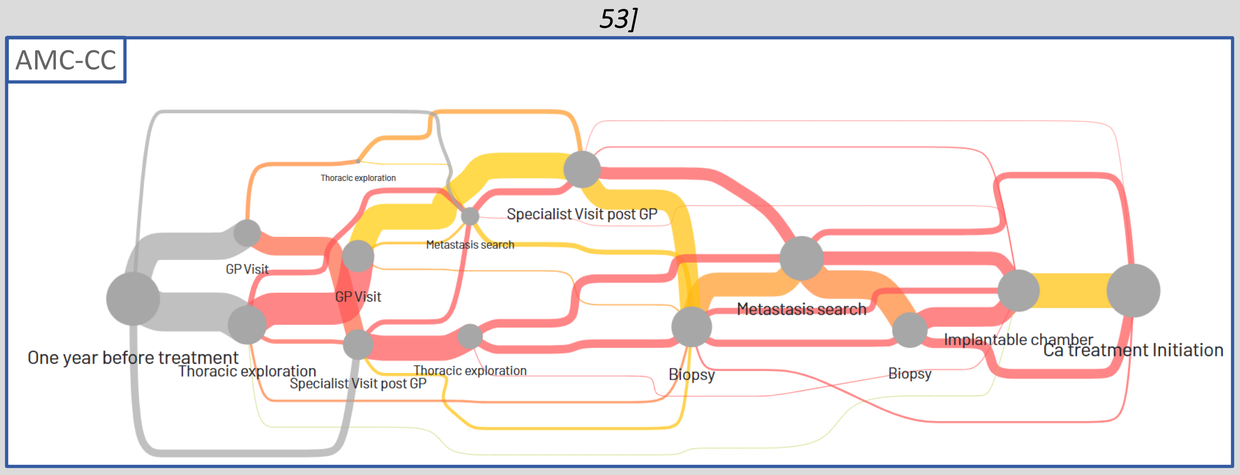

*Figure 5. AMC-CC process mining pathway, n = 1,170, **median time to treatment [Q1-Q3] = 58 days [33-87]***

For clarity, only four patient pathways are presented here, but all patient pathway descriptions are available in a document that can be viewed by scanning the QR code at the bottom right of this poster.

Conclusions & perspectives

- In this national real-world analysis, clustering and process-mining of pre-treatment care sequences revealed reproducible, stage-specific clusters of diagnostic work-up and time-to-treatment.
- Large time-to-treatment disparities were unrelated to age, sex or comorbidities. The potential factors associated with delays in these treatment pathways will be studied in a second part of this study.
- The French Cancer Data Platform cohort will be enriched in the future with molecular biology data and data from multidisciplinary meetings. These elements will be taken into account in a second part of this study.

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The project went trough the French regulatory process (CESREES-CNIL) and was approved by the French authorities in July 2024.

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