

Long-term Evolution of Hospital Resource Utilization and Associated Costs Using Adjustment Methods in Patients Treated with Nivolumab for Advanced Non-Small Cell Lung Cancer

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Introduction

Lung cancer is one of the most diagnosed cancer in France, leading to approximatively 50,000 new patients diagnosed per year.¹ A majority of patients are diagnosed with advanced or metastatic disease, which is associated with poor prognosis.² Since 2015, immune checkpoint inhibitors (ICI), such as nivolumab, atezolizumab and pembrolizumab have become standard of care in advanced disease and demonstrated a long-term benefit in overall survival in second line.³

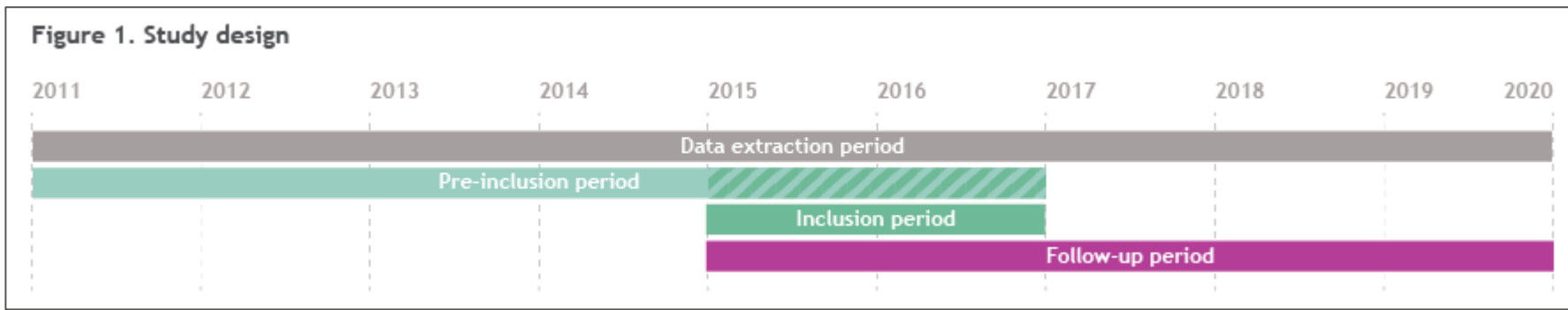
Cancer is the second most expensive disease in France after psychiatric or psychotropic illnesses, representing 11.5% of annual health expenditure. Lung cancer is the second most expensive cancer after breast cancer corresponding to 1.8 billion euros of expenditure in 2018.⁴

Few studies have described healthcare resource utilization (HCRU) and cost of patients with advanced non-small cell lung cancer (aNSCLC). Previous studies explored aNSCLC HCRU differences between countries, per stage or treatment line and overall cost per patient or per year. These studies related to cytotoxic chemotherapies and showed costs usually increased over treatment line until the end of life.⁵ The HCRU and cost trend for patients treated with ICIs is expected to differ from patients receiving chemotherapy since more patients achieve a sustainable partial or complete response, the tolerability profile differs, and quality of life is maintained or improved.⁶

Study objectives

- To describe 4 year HCRU (i.e. percentage of patients with at least one hospital stay, number of visit per patient, number of days at hospital per patient) and their evolution and costs of patients with aNSCLC initiating nivolumab in 2L and later.
- To explore adjustment methods to determine mean cost per year per patient.

Methods

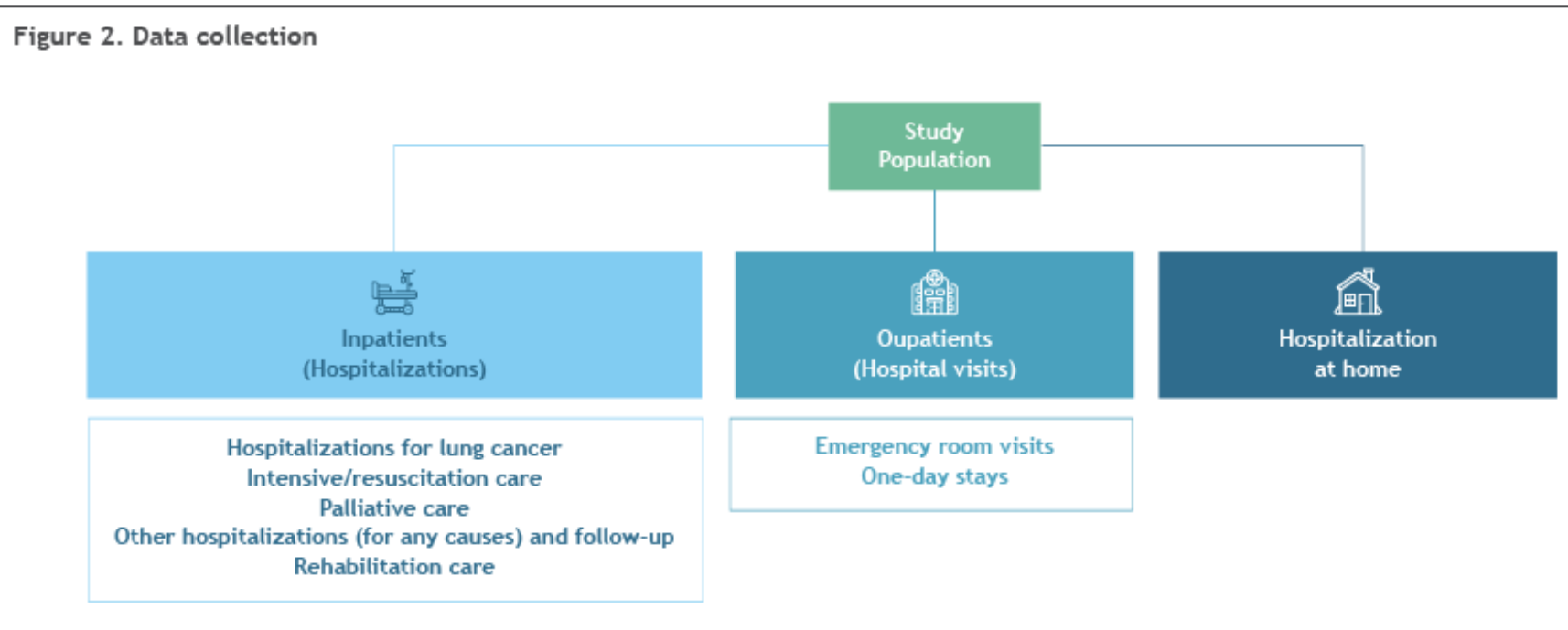


Study design

This retrospective cohort study of all aNSCLC patients initiating nivolumab between 01/01/2015 and 12/31/2016 is based on the French Hospital Medical Information database (Programme de Médicalisation des Systèmes d’Information - PMSI) (Figure 1). The PMSI databases analyzed in this study were the MCO sectors (Medicine, Surgery, and Obstetrics facilities), HAD (Hospitalization at home), SSR (Follow-up and rehabilitation care), and ACE (Outpatients public hospital visits) databases, the FICHCOMP (drugs out of DRG) and FICHCOMP ATU (Temporary Use Authorization) files. It covers all overnight or day hospitalizations in the public and private French hospitals.

Identification of patients (UNIVOC)

UNIVOC is a retrospective observational cohort of all French aNSCLC patients initiating nivolumab in 2nd line or more during it early access program (2015-2016). Patients were identified through the PMSI and were included when they had at least one hospital stay mentioning lung cancer (ICD-10 code: C34*), if they previously received at least one line of chemotherapy and started nivolumab. All patients were followed until 31th December 2019 or death, if it occurred before.



Data collection

•Data were collected during all outpatient, inpatient and hospitalizations at home. Outpatient stays included one-day stays (ODS) (e.g. drug administration, exam), emergency room visits (ERV) and outpatient consultations. Inpatient stays were divided into intensive/resuscitation care, palliative care, follow-up/ rehabilitation care, lung cancer hospitalizations and other hospitalizations (for any causes). (Figure 2)

•Costs were determined from the French social security perspective. They were calculated using the national tariffs for each year considered and were valued in 2020 euros.

Study outcomes

- Percentage of living patients requiring at least one hospital stay.
- Number of hospital visits per patient per year (overall and per category).
- Number of hospital days per patient (retrieved from PMSI for inpatient and hospitalization at home, hypotheses based on experts’ opinion for outpatient stays; 2 hours for consults, half a day for ODS and ERV).
- Mean cost per patient per year (overall and per category).

Statistical analyses

Trends over time in HCRU and costs were analyzed with Man-Kendall test on quarterly data.

As some patients did not reach a 4-years follow-up (i.e. patients initiating nivolumab in 2016), HCRU and costs are censored for some patients during their last year of follow-up. The costs analysis was performed with 3 methods for censored costs data: 1) without adjustment on all patients, 2) analysis only on uncensored cases and 3) with the Bang & Tsiatis method on all patients. For HCRU, the 4th year data were adjusted by applying the percentage of change of the 3rd year between two different years extractions (i.e. 2018 and 2019) on raw data.

Results

Study population

- The study included 10,452 patients, of which 71.0% were men. The mean age at inclusion was 63.8 years. The most common histological type was non-squamous cell (55.5%).
- The median follow-up duration was 9.9 months [Q1=3.5; Q3=24.2]. The median treatment duration (TTD) with nivolumab was 2.8 months [Q1=1.4; Q3=6.6]. The median overall survival (OS) was 11.8 months [Q1=4.2; Q3=31.1]. (Figure 3)

HCRU - Percentage of living patients with at least one hospital visit or one hospitalization

- The percentage of patients with at least one hospital visits tended to decrease over time for all categories except for consults (p<0.001).
- Outpatient visits category was the most frequently documented type of visit (Table 1):
 - ODS: from 96% in Year 1 (Y1) to 68% in Year 4;
 - Consults: 76% in Y1 to 86% in Y4;
 - Emergency visits: 47% in Y1 to 35% in Y4.
- Inpatient stays occurred for 65% of patients in Y1 and 41% in Y4.
- Hospitalization at home concerned only 12% patients in Y1 and only 5% in Y4

HCRU - Number of hospital visits per patient and days at hospital per patient

- The number of visits per patient per year tended to decrease over the follow-up (p<0.001). The overall number of hospital visits per patients was 23.3 in Y1, 21.3 in Y2, 19.7 in Y3 and 18.3 in Y4 after adjustment (Figure 4 - A).
- The number of visits tended to decrease over the follow-up (p<0.001) for all categories except for consults.
- ODS was the category leading to most visits per patient, representing 60%, 56%, 53% and 52% in Y1, Y2, Y3 and Y4 respectively.
- Consults proportion tended to increase, from 27% in Y1 to 38% in Y4.
- Inpatients stays tended to decrease from 2.1 stays in Y1 to 1.1 in Y4 representing from 9 to 6% of overall visits.
- Emergency visits and hospitalization at home led to less than 1 visit per year over all the follow up. These categories represented less than 5% of overall number of hospital visits.
- Patients spent on average 36.0 days at the hospital the 1st year of nivolumab initiation which significantly decreased over time to on average 20.5 days the last year (p<0.001) (Figure 4 - B).
- Inpatient stays accounted for more than 50% of days at hospital. Inpatients stays tended to decrease from 22.5 days in Y1 to 11.7 in Y4 (p<0.001).
- ODS represented a third of days at hospital. The days spent at the hospital for ODS tended to decrease from 7.0 days in Y1 to 4.7 days in Y4 (p<0.001).
- Hospitalization at home, consults and emergency visit represented less than 5 days per patient per year.

Costs

- Mean cost per patient decreased with the follow-up whatever statistical methods used (p<0.001).
- Mean cost per patient was similar between all methods for the first year ranging from €44,404 to €45,033. From Year 2 onwards, the unadjusted method on all patients and the analysis on uncensored patients presented similar costs while the Bang&Tsiatis presented a higher cost per patient. (Table 2)

Conclusions

- The UNIVOC cohort of patients with aNSCLC treated with nivolumab allowed the assessment of HCRU and costs evolution in this patient population.
- HCRU (percentage of patients requiring hospital care, number of visits per patient, number of days spent at the hospital) tended to decrease over the follow-up suggesting a decreasing intensity of care for surviving patients.
- The mean cost per patient also tended to decrease whatever the method tested.
- HCRU and their associated costs decreased over the 4-years of follow-up.

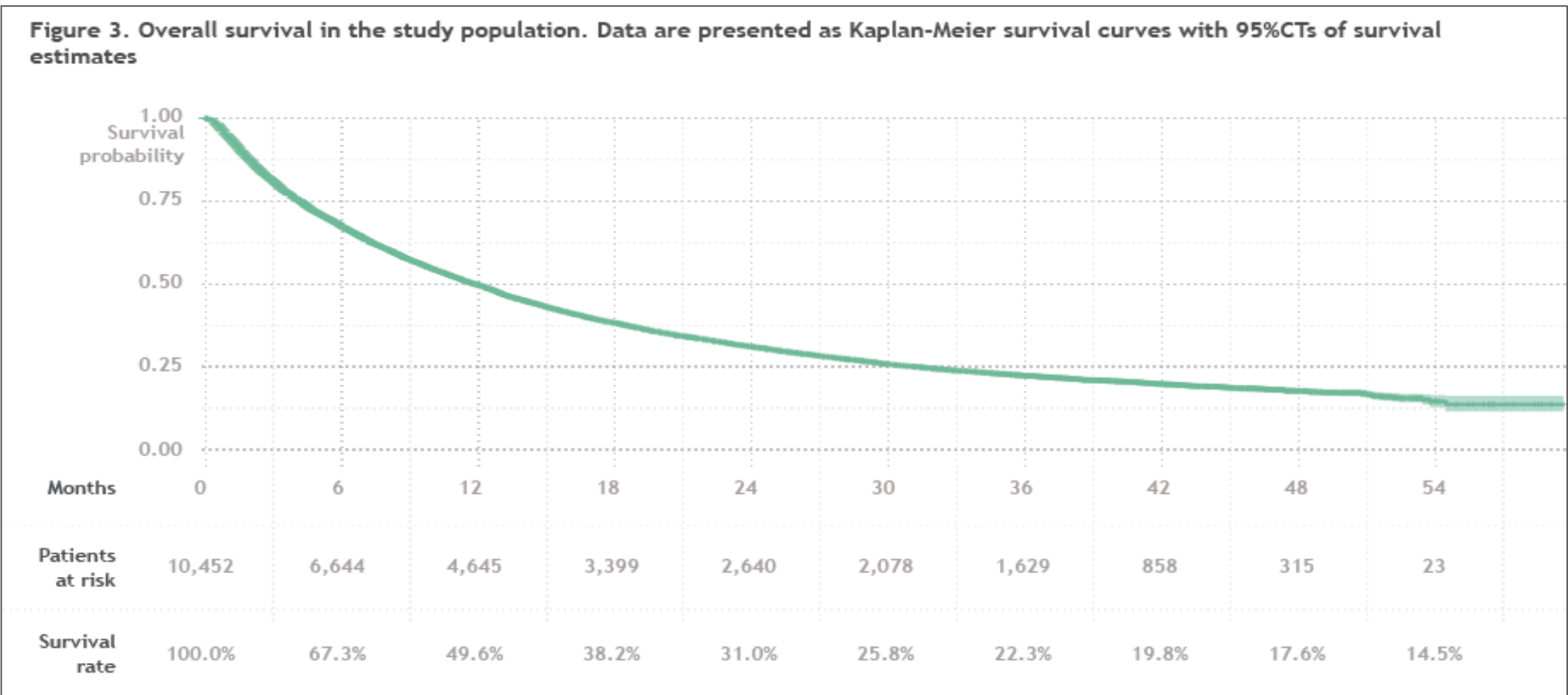
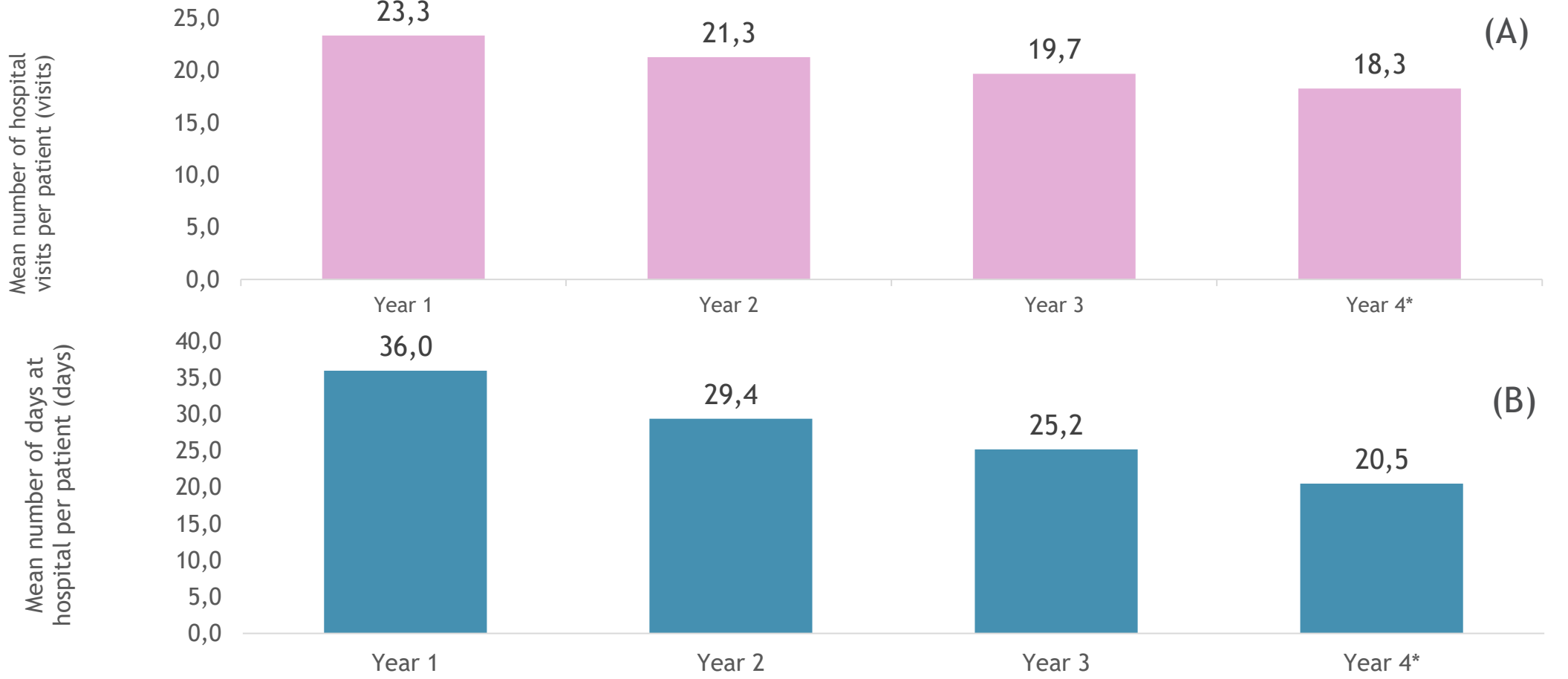


Table 1.Percentage of patients with at least one hospital visit or hospitalization				
	Year 1	Year 2	Year 3	Year 4*
One-day stays	96%	79%	74%	68%
Consults	76%	80%	84%	86%
Inpatient stays	65%	54%	49%	41%
Emergency visits	47%	39%	37%	35%
Hospitalization at home	12%	9%	7%	5%

Figure 4 - Number of visits per patient (A) and mean time spent at the hospital all causes per patient (B) *Year 4 data have been adjusted



*Visits: Year 4 has been adjusted. Of the 18.3 visits per patient, 13.2 represent the number of hospital visits per patient (without adjustment) while 5.1 is the number of additional visits after adjustment
*Days: Year 4 has been adjusted. Of 20.5 hospital days per patient, 14.9 represent the number of hospital visits per patient (without adjustment), while 5.6 is the number of additional visits after adjustment

Table 2. Methods comparison for costs estimation (euros)				
	Year 1	Year 2	Year 3	Year 4
All patients Without adjustment	€44,404	€32,206	€28,553	€18,841
Uncensored cases Without adjustment	€45,033	€32,705	€28,753	€19,442
Bang & Tsiatis	€45,002	€36,330	€35,080	€28,931

References

¹ Institut National du Cancer, – Guide du parcours de soins - Cancers broncho-pulmonaires
² Chouaid et al., ‘Survival Inequalities in Patients with Lung Cancer in France’.
³ Five-Year Outcomes From the Randomized, Phase III Trials CheckMate 017 and 057: Nivolumab Versus Docetaxel in Previously Treated Non-Small-Cell Lung Cancer
⁴ CNAM, Rapport Charges et produits [Internet]. 2021. https://assurance-maladie.ameli.fr/qui-sommes-nous/publications-reference/assurance-maladie/rapports-charges-et-produits/rapport-charges-produits
⁵ Tanguy-Melac et al., ‘Intensity of Care, Expenditure, Place and Cause of Death People with Lung Cancer in the Year before Their Death’.
⁶ Reck et al. ‘Evaluation of health-related quality of life and symptoms in patients with advanced non-squamous non-small cell lung cancer treated with nivolumab or docetaxel in Checkmate 057’.

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IB has no conflicting interests
All the authors have contributed to and approved this poster