

Analysis of Public and Private Hospital Databases (PMSI) 2010 / 2011 to Estimate the Frequency and Associated Costs for Febrile Neutropenia in France

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BACKGROUND

- The use of anti-cancer chemotherapy drugs has increased by 24% in both private and public hospitals since 2005¹.
- Neutrophils are white blood cells with a short half-life that play a crucial role in the defense against pathogens.
- Cancer patients treated with myelotoxic chemotherapy are at high risk of developing neutropenia.
- Patients with chemotherapy-induced neutropenia may develop febrile neutropenia (FN), defined as fever in the presence of neutropenia.
- FN treatment is an economic burden for healthcare systems (longer and/or unplanned hospitalization, utilization of additional resources and increased death rate)^{2,3}.

OBJECTIVES

- To estimate the frequency and costs of hospital stays for cancer patients receiving cytotoxic chemotherapies inducing FN, in public and private hospitals in France.

METHODS

Study design

- Retrospective cohort study in France
- Performed using data collected between 2010 and 2011
 - Main outcomes were
 - Patient characteristics, hospital stays (number and frequency and length of stay) related to FN.
 - Economic data (costs of stay, drugs)
 - Specific focus on:
 - Hematologic tumors (including Non Hodgkin lymphoma)
 - Solid tumors (including 5 sub types: Colorectal, Ovarian, Lung, Prostate and Breast)

Data sources

- Data were obtained from the French Hospital National Database (PMSI), a exhaustive (National level) claims database which includes information on diagnoses and procedures, and allows record linkage.
- Costs were obtained from the 2010 public national tariffs (T2A) for private and public costs.
- Physician fees were obtained from the 2010 National Scale Costs (ENCC) 2010, used for private hospital costs only.
- Costs of drugs registered on T2A list were obtained from the 2010/2011 FICHCOMP.
- Others fees were used for costs adjustments (including partial presence in the recovery unit, intensive care unit...)

Inclusion Criteria for Patient Selection (Figure 1)

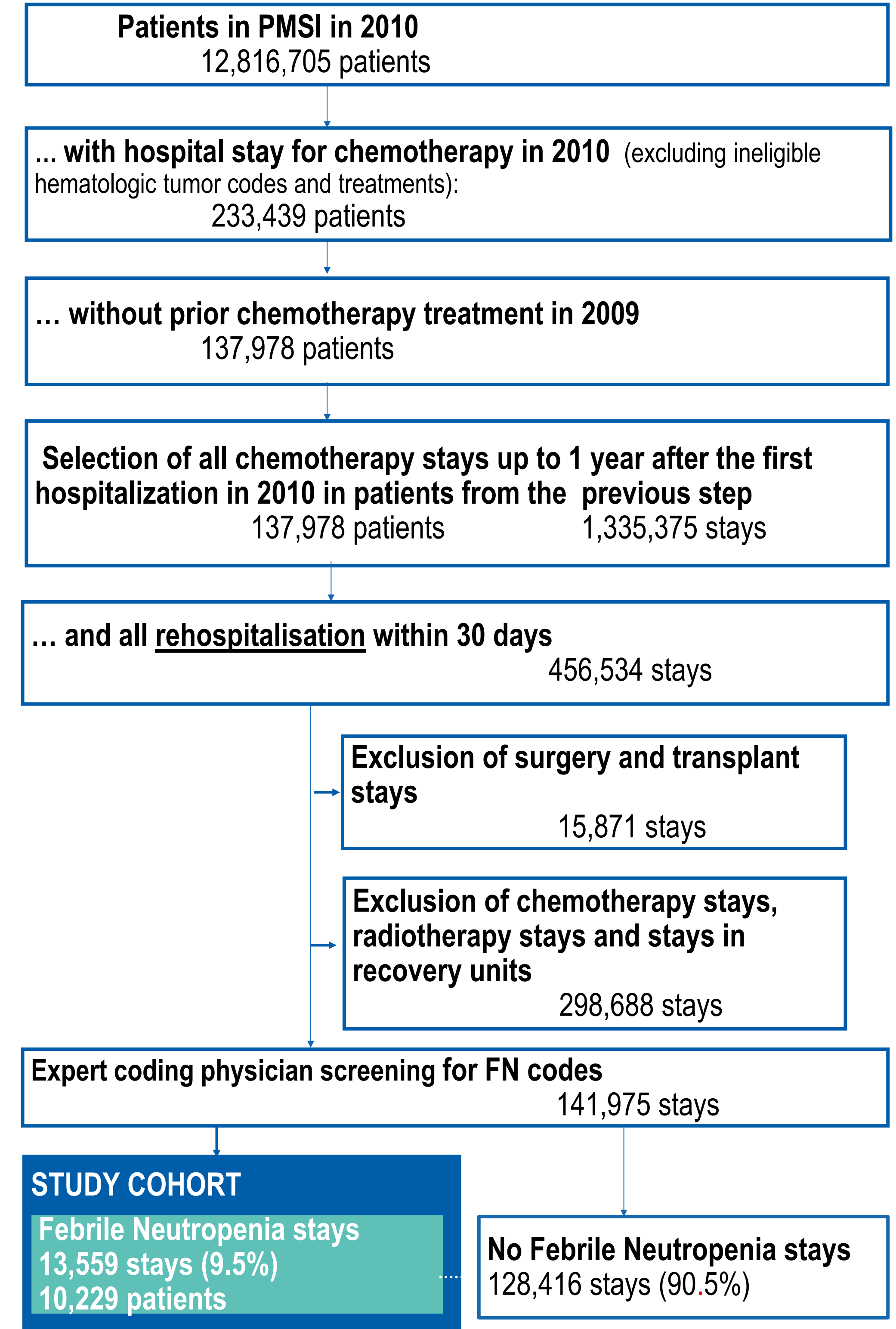
- Cancer patients with a first hospital stay for chemotherapy between 01/01/2010 and 31/12/2010 (1 year based on expert advice);
- Re-hospitalization for FN within 30 days after a discharge (follow-up for one year after the first hospital stay for chemotherapy in 2010).

Exclusion Criteria for Patient Selection (Figure 1)

- Hematologic tumor ICD-10 codes: C91* except C911 + C92* to C97*
- Treatment by Fasturtec® (rasburicase) or Mozobil® (plerixafor).
- Exclusion of surgery and transplant stays
- Exclusion of chemotherapy stays, radiotherapy stays and stays in recovery units (to distinguish between specific FN stays and non FN stays)
- **PMSI Codes Selection (ICD-10 & DRG nomenclature)**
- Chemotherapy treatment codes GHM 28Z07Z + 17M05 (1-4) + 17M06 (1-4 + T)
- Solid tumors codes C00*-C80*
- Hematologic tumors codes C810-C889 + C900-C903 + C911
- Expert coding physician screening:

RESULTS

Figure 1. Selection of the Study Cohort



RESULTS (cont)

Table 1. Number of FN-related Stays per Hospital Sector

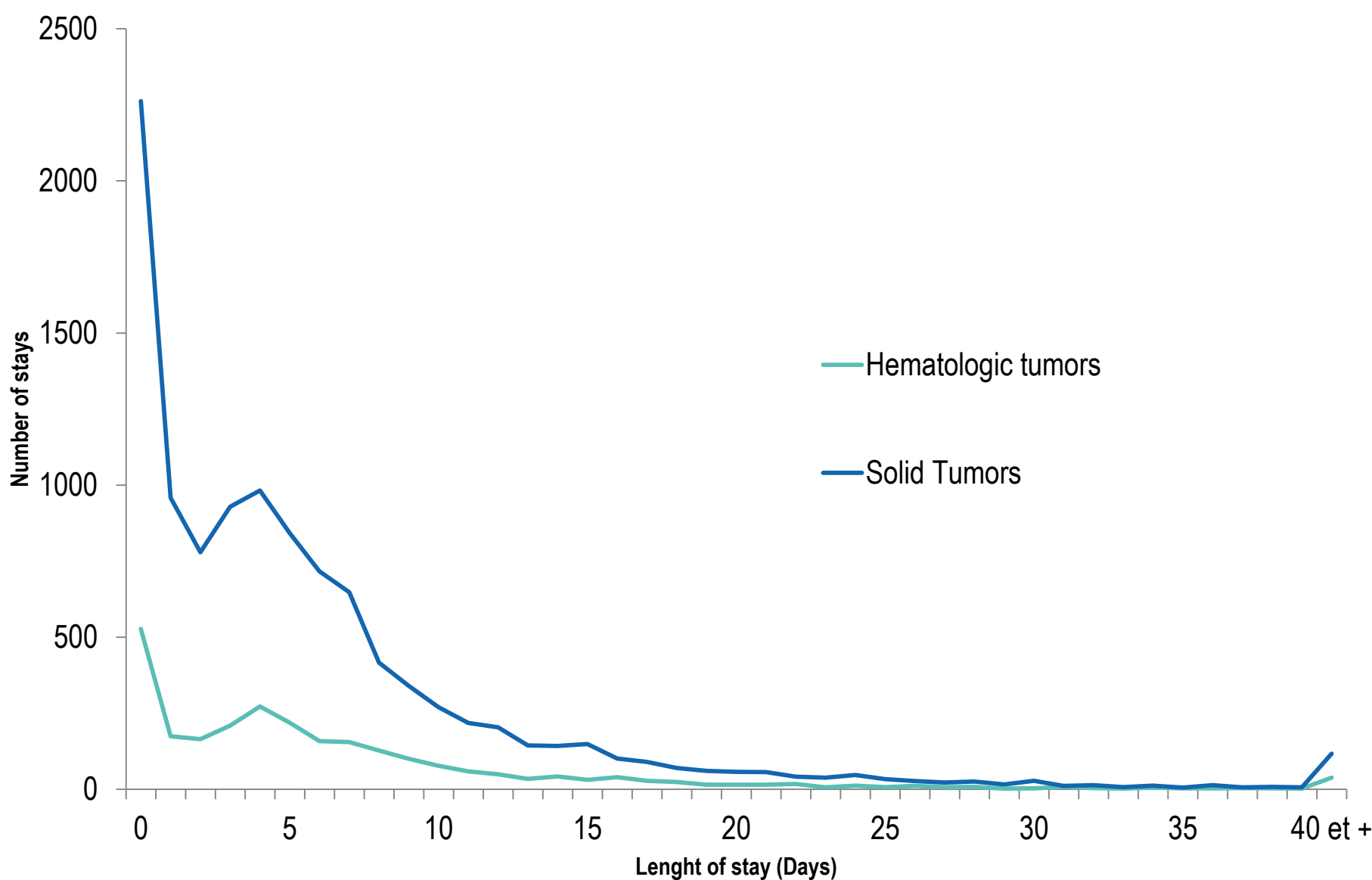
	Public	Private	Total
Hematologic Tumor (HT)	2,460	190	2,650 (20%)
NHL	1,539	135	1,674 (12%)
Solid Tumor (ST)	9,139	1,770	10,909 (80%)
Colorectal	502	120	622 (5%)
Ovarian	203	51	254 (2%)
Lung	2,810	485	3,295 (24%)
Prostate	194	73	267 (2%)
Breast	1,692	464	2,156 (16%)
Total *	11,599 (86%)	1,960 (14%)	13,559 (100%)

* All HT + all ST

- Cohort characteristics:
 - Men 53%, mean age 59.8 years
- Patients were mainly treated in public hospitals.

- Among newly treated patients in 2010, those with a HT had a higher incidence of hospital stay for FN (9.7%) than those with a ST (7.0%).
- 93% of hospital stays involved medical treatments (i.e. not surgical procedures)
- 8,730 patients with a hospital stay for FN (80.7%) were treated in the inpatient setting.
- Among outpatients, 57 ST patients and 11 HT patients with a hospital stay for FN were transferred to another hospital.
- The average length of stay (LOS) for FN was 6.3 days (6.1 days for ST patients and 6.7 days for HT patients (Figure 2)) .
 - Hospital stays took place in a recovery unit for 2.3% of HT and ST patients, with a mean LOS of 9.63 days.
 - Hospital stays took place in a intensive care unit for 2.3% of ST patients (mean LOS of 4.7 days) and 8.0% of HT patients (mean LOS of 7.4 days).

Figure 2. Distribution of Hospital LOS for FN



Sub Analysis of Selected Tumour Types with FN

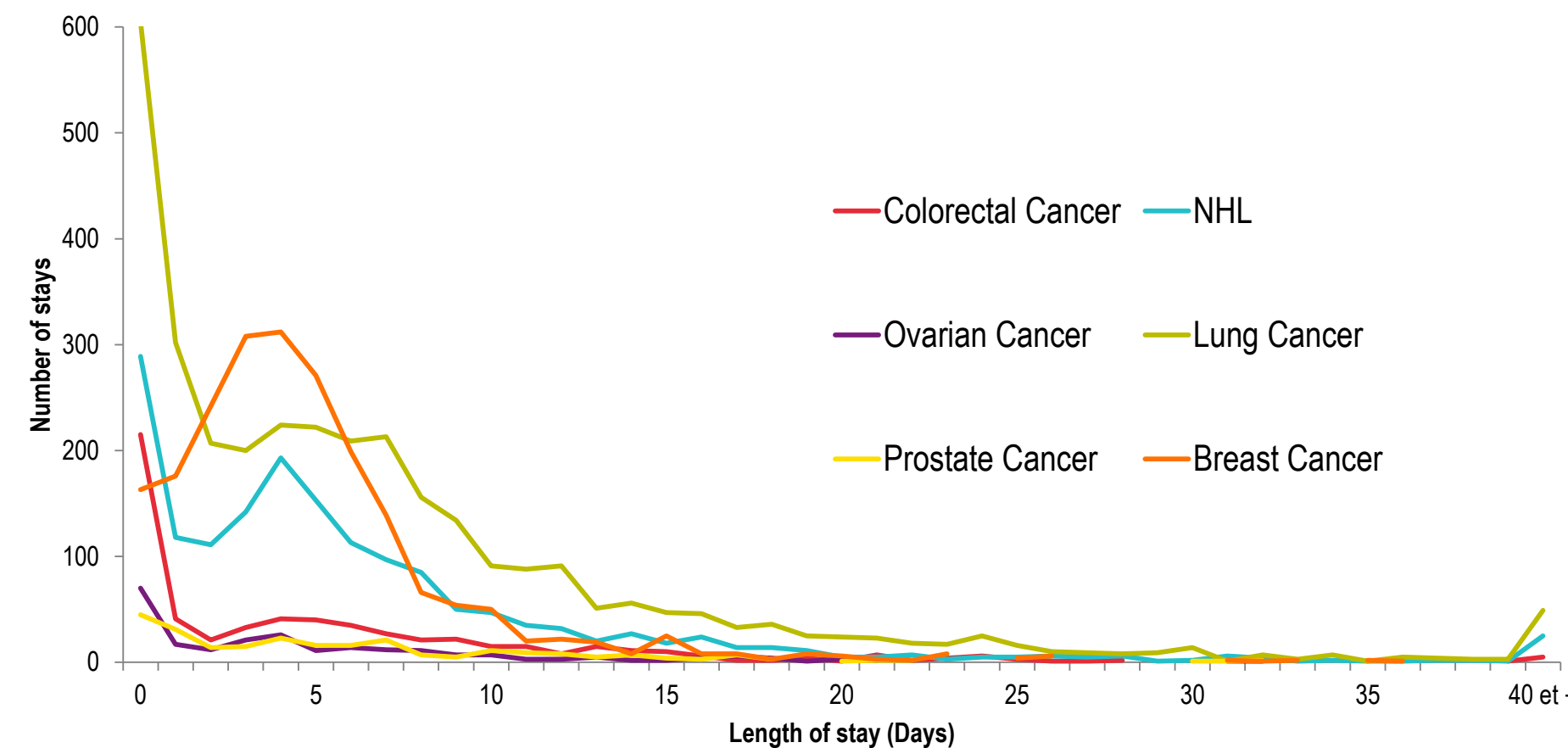
- Among the 10,229 patients in the study cohort, 6,659 patients (65%) were selected for further analysis based on tumour type:
 - For ST:
 - Lung cancer: 2,699 patients,
 - Breast cancer: 1,857 patients,
 - Colorectal cancer: 531 patients,
 - Prostate cancer: 218 patients,
 - Ovarian cancer: 207 patients.
 - For HT:
 - NHL: 1,150 patients.

- Patients were mainly treated in public hospital in all tumors.
- The proportion of men was 2% in breast cancer, 52% in colorectal cancer, 55% in NHL and 80% in lung cancer.
- Patients mean age was 61.7 years; being lowest in breast cancer (56.9 years) and highest in prostate cancer (71.7 years).
- Among patients newly treated in 2010, NHL (12% 1,150/9,904 patients) and lung cancer (12% 2,699/22,929 patients) were, respectively, the most common of HT and ST types with a hospital stay for FN.
- Hospital stays involved medical treatments (i.e. not surgical procedures) (7,796 stays or 94%) or others (e.g., blood transfusion) (472 stays or 6%).
- 8,730 (out of 10,229) patients (85%) with a hospital stay for FN were treated in the inpatient setting, from 70% for colorectal cancer to 94% for breast cancer.
- The average LOS for FN was between 5.3 days for patients with breast cancer and 7.9 days for patients with ovarian cancer (Figure 3).
- Hospital stays for FN took place in a recovery unit for between 1% (breast cancer) and 4% (NHL) of patients, with a mean LOS between 5.1 days (colorectal cancer) and 57.2 days (ovarian cancer).
- Hospital stays for FN took place in an intensive care unit for approximately 2% of all tumour types except NHL (8%), with a mean LOS between 2.3 days (ovarian cancer) and 7.1 days (NHL).

RESULTS (cont)

- Percentage of mortality among patients with a hospital stay for FN were highest in those with lung cancer (11%), followed by prostate cancer (9%), colorectal cancer (8%), ovarian cancer (6%), NHL (5%) and breast cancer (3%).

Figure 3. Distribution of Hospital LOS for FN



Economic Evaluation

Table 2. Annual Economic Burden of Hospital Stays with FN for the French Health Insurance

(€)	Public			Private *	
	T2A Tariff	Off-DRG Drugs	Total	T2A Tariff	Total
HT	10,806,106	843,803	11,649,910	582,804	12,232,713
NHL	6,802,997	463,169	7,266,166	391,355	7,657,521
ST	34,912,023	679,171	35,591,194	5,354,861	40,946,056
Colorectal	1,594,334	43,090	1,637,424	395,577	2,033,001
Ovarian	1,017,665	13,085	1,030,750	154,964	1,185,714
Lung	11,453,021	291,328	11,744,349	1,499,804	13,244,153
Prostate	762,156	14,102	776,258	207,120	983,378
Breast	6,077,177	106,079	6,183,256	1,217,032	7,400,288
Subgroup Total**	27 707 350	930 853	28 638 203	3 865 852	32,504,055
Total ***			47,241,104	5,937,665	53,177,131

* No Off-DRG drugs tariffs available for private hospitals (confidential information)
** NHL + Colorectal + Ovarian + Lung + Prostate + Breast Cancer subanalysis
*** All HT + All ST

- Total annual cost of hospital stays associated with FN for all HT and ST for the Health Insurance was 53,177,131€ while the annual cost for the six selected tumor types was 32,504,055€ (61%) (Table 2).
- The mean cost per patient (calculated by dividing the total cost in each category by the number of patients in the same category) was 6,459€ for HT, 4,908€ for ST
 - 6,659€ for NHL, 5,728€ for ovarian cancer, 4,907€ for lung cancer, 4,511€ for prostate cancer, 3,985€ for breast cancer and 3,829€ for colorectal cancer.
- Numerous drugs were used for FN treatment costing annually 1,522,975€.
 - HT cost 843,803€ and ST cost 679,171€;
 - Most drug costs were related to Antifungals : Cancidas® (323,372€), Vfend® (105,436€) and Ambisome® (59,343€).

LIMITATIONS

- This retrospective study was conducted for 2010/2011 hospital stays and may therefore not reflect current values.
- The incidence of FN may be underestimated due to the lack of a specified FN code within CIM 10 classification. Nonetheless, we expected the large majority of FN patients to be identified by the multiple selection of FN-assumed codes within the hospital records (PMSI).
- In addition, a potential for misclassification or diagnosis errors of FN patients existed.
- The French PMSI database is designed to be used for pricing not for epidemiological studies.

CONCLUSIONS

In 2010/2011, FN induced a total of 13,559 hospital stays and a total cost of 53.1 million euros for the French Statutory Health Insurance, for 10,229 patients. Mean cost per patient to treat FN was 6,459€ for HT and 4,908€ for ST.

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- 3- NCAG. National Chemotherapy Advisory Group. Chemotherapy Services in England: Ensuring quality and safety; 2009.
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