Received: 31 May 2018 | Revised: 22 October 2018 | Accepted: 14 May 2019

DOI: 10.1111/ecc.13117

ORIGINAL ARTICLE

European Journal of Cancer Care WILEY

Prevalence of patients hospitalised for male breast cancer in France using the French nationwide hospital administrative database

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Abstract

Background: Breast cancer (BC) in men is a rare and neglected disease representing <1% of all cancers in men and only 1% of all incident BC in western countries.

Objective: This study aimed to describe trends in the prevalence of patients hospitalised for male BC in France from 2009 to 2013, using the national administrative database (PMSI).

Methods: We included all men aged ≥18 admitted to hospital for BC during this period and estimated the prevalence of male breast cancer hospitalised in France over 5 years. We also describe clinical characteristics and treatments in men with surgery for BC over the 5-year period of the study.

Results: The prevalence of patients hospitalised for BC significantly decreased from 7.5 per 100,000 adult male inhabitants in 2009 to 6.3 per 100,000 in 2013. Considering the entire period, 2009–2013, we found a prevalence of 25.5 per 100,000 adult male inhabitants over 5 years. At 1 year of follow-up, we found a significant trend for at least one comorbidity (from 44.6% in 2009 to 51.2% in 2013, $p = 0.04$) but not for malignant nodes and metastasis.

Conclusions: Ours is the first study to analyse the prevalence of patients hospitalised for male breast cancer and its changes over time in the whole population of a country. Our study also provides data on the clinical characteristics and treatments of male BC in France.

KEYWORDS
administrative database, follow-up, male breast cancer, prevalence, surgery

1 | BACKGROUND

Breast cancer (BC) in men is a rare and neglected (Chavez-Macgregor, Clarke, Lichtensztajn, Hortobagyi, & Giordano, 2013; Otto, 2011) disease representing <1% of all cancers in men and only 1% of all incident BC in western countries (Jemal et al., 2003). By contrast, BC is the most frequently diagnosed cancer in women (Bao et al., 2016; Jemal et al., 2011) and accounts for 33% of all cancer cases in women in France (INCA, 2011).

Data describing the changes over time of the incidence of mortality from BC in men are very rare. Only seven studies (Dabakuyo et al., 2012; Dabakuyo-Yonli et al., 2013; Giordano, Cohen, Buzdar, Perkins, & Hortobagyi, 2004; Miao et al., 2011; Otto, 2011; Stang &

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Thomssen, 2008; Sun et al., 2017) were found in the literature and mostly realised in USA (Giordano et al., 2004; Otto, 2011; Stang & Thomssen, 2008; Sun et al., 2017).

To our knowledge, no previous study has provided data on the changes over time of the prevalence of male BC in a whole country.

In France, the French national administrative database (PMSI) was set up with the objectives to be used for the allocation of hospital budgets and encourages improvement in data quality in terms of coherence, accuracy and exhaustiveness. Thus, for 20 years, hospital data have been used for medical research purposes and the quality of the French hospital database has been evaluated. It provides a huge amount of epidemiological information concerning hospitalised patients in France (Abdulmalak et al., 2015; Creuzot-Garcher et al., 2016; Lorgis et al., 2013; Pagès, Cottenet, Mariet, Bernard, & Quantin, 2016; Quantin et al., 2013) and can be used to create a large enough cohort to detect rare events, such as male BC. Population-based studies using the French national administrative database (PMSI) may therefore be useful to provide hospital data on this disease.

This study aimed to describe trends in the prevalence of patients hospitalised for male breast cancer in France from 2009 to 2013, using the national administrative database. The secondary purpose was to describe how the clinical characteristics and treatments in men with surgery for breast cancer changed over the 5-year period of the study.

2 | METHODS

2.1 | The national administrative database (PMSI—Programme de Médicalisation des Systèmes d'Information)

This database is a centralised repository of administrative and medical data on every hospital stay in France, including main diagnosis, associated diagnoses and hospital care received.

Inspired by the American DRG (diagnosis-related groups) model, the gathering of national administrative health data was established in France in 1991 and extended to all French healthcare facilities in 1997. This coding system was initially designed to analyse hospitals' activity and to contribute to the development of strategic healthcare plans. Since 2008, each hospital's budget depends on the medical activity described in a specific computer program, which compiles discharge abstracts related to all admissions. Information in these abstracts is anonymous and covers both medical and administrative data. Diagnoses identified during the hospital stay are coded according to the 10th edition of the International Classification of Diseases (ICD10), and procedures performed during the hospitalisation are coded according to the French Common Classification of Medical Procedures (CCAM). Each facility produces its own standardised anonymous data set, and these are then compiled at the national level. The fact that these national data are used for the allocation of hospital budgets encourages improvement in data quality in terms of coherence, accuracy and exhaustiveness.

2.2 | Study design

This study was a retrospective multicentre study based on nationwide PMSI data collected from January 2009 to December 2013. We included all men aged ≥18, who were admitted to hospital for BC during this period, identified by a main, related or associated diagnosis of BC (ICD 10 code C50). In the second step, we focused on men with surgery for BC identified by a diagnosis of BC and a surgical procedure (CCAM codes beginning with QEFA) during the same stay.

From the PMSI database, we collected data about age, area of residence, comorbidities, use of chemotherapy, presence of metastasis or malignant nodes and family histories and personal histories of cancer. In the PMSI coding system, the clinician must indicate the main diagnosis (symptom or disease) and any associated diagnosis (to the extent that this requires substantial levels of care). The related diagnosis could complete the main diagnosis when it corresponded to a Z code (follow-up, treatments like chemotherapy) and when a chronic disease could not be recorded during the hospitalisation. We therefore determined comorbidities (diabetes, obesity, hypertensive diseases, metabolic disorders), chemotherapy, metastasis, malignant nodes or histories when the diagnosis mentioned was the main, related or associated diagnosis. We defined as "at least one comorbidity" the presence of diabetes or obesity or hypertensive diseases or metabolic disorders. A detailed list of recorded items is presented in Table 1.

2.3 | Statistical analysis

We first recorded data about the prevalence of men hospitalised for BC (which means the number of men aged ≥18 who were admitted to hospital with a main diagnosis of breast cancer or a mention of breast cancer on their discharge summary) in France by year from 2009 to 2013. The changes over the 5-year period of the study of this prevalence from 2009 to 2013 were tested by the Cochran–Armitage test. We then studied the geographical distribution of male BC in France and determined whether there were regional differences. Patients were localised according to the postal code of their

TABLE 1 List and ICD10 codes of recorded items

Studied variables	ICD10 codes
Metastasis	C78–C79
Malignant nodes	C77
Diabetes	E10–E11
Metabolic disorders	E70–E90
Obesity	E65–E66–E67–E68
Hypertensive diseases	I10–I11–I12–I13–I14–I15
Family histories of cancer	Z80
Personal histories of cancer	Z85
Chemotherapy	Z511

residence to assess the prevalence of patients hospitalised for male BC among the population of adult men in their region.

In the second step, to evaluate hospital medical care, we studied medium-term outcomes in patients with respect to comorbidities, chemotherapy, metastasis, malignant nodes or histories, during 1 year of follow-up for men with surgery for BC admitted from 2009 to 2013. These items were studied during the surgery stay and at 1 year after the surgery, after exclusion of patients who died at surgery. Changes over the 5-year period of the study were also tested.

Categorical variables were expressed as percentages and quantitative variables as means and standard deviations. For the Cochran–Armitage test, a p-value <0.05 was considered significant. SAS 9.3 software was used for analysis.

2.4 | Ethics

This study was approved by the National Committee for data protection (registration number 1576793) and therefore was conducted in accordance with the Declaration of Helsinki. Written consent was not needed for this study. The PMSI database was transmitted by the national agency for the management of hospitalisation data (ATIH number 2015-111111-47-33).

3 | RESULTS

3.1 | Prevalence of patients hospitalised for male breast cancer

Results for the prevalence of patients hospitalised for male BC are shown in Table 2. About 4 million men were hospitalised yearly in French public and private hospitals during the period January 2009 to December 2013 and registered in the national administrative database. Among these patients, about 1,600 (from 1,728 in 2009 to 1,472 in 2013) were admitted each year for BC or had a mention of BC on their discharge abstract. The average age of this population increased from 66 years in 2009 to 68 years in 2013. Each year, about 860 patients were rehospitalised at 1 year with a main diagnosis of BC or a mention of BC. An increase in the 1-year rehospitalisation rate was seen from 49.8% in 2009 to 58.4% in 2013.

The prevalence of patients hospitalised for male BC was calculated taking into account the national population of men aged more than 18 years in France. This prevalence decreased from 7.5 per 100,000 adult male inhabitants in 2009 to 6.3 per 100,000 adult male inhabitants in 2013 ($p < 0.01$). Concerning regions, the minimum prevalence was 2.2 per 100,000 adult men and the maximum was 9.9 per 100,000 adult men. Among the 23 regions, six showed the same significant decrease (mainly in the south-west and west). No trend was found for the other regions.

Considering the entire period, 2009–2013, (meaning that a patient is counted only once in the period), we found a prevalence of male BC hospitalised of 25.5 per 100,000 adult male inhabitants over 5 years. We observed a considerable variability between French regions as the prevalence ranged from 10.5 per 100,000 adult male inhabitants to 43.6 per 100,000 adult male inhabitants. After having standardised by age, variability was greatly reduced with prevalence from 5.9 per 100,000 adult male inhabitants to 12.4 per 100,000 adult male inhabitants (Figure 1).

3.2 | Characteristics of men with breast cancer during the surgery stay and 1 year after

Each year, about 1/3 of the men hospitalised for BC had surgery (Table 2). The average age of these men ranged from 67 to 68 years. The prevalence of men with surgery for BC was calculated taking into account the national population of men aged more than 18 years in France. This prevalence was constant each year with about two per 100,000 adult male inhabitants.

Concerning patient characteristics during the surgery stay, the presence of metastasis ranged from 2% to 3%, more than 22% had malignant nodes, more than 35% had at least one comorbidity, and almost none had chemotherapy. We found no statistically significant trends over time despite an increase in the presence of metastasis (from 3.0% in 2009 to 3.5% in 2013), malignant nodes (from 22.9% in 2009 to 25.5% in 2013) and at least one comorbidity (from 37.7% in 2009 to 42.3% in 2013; Figure 2). No time trends were found for family histories of cancer (ranging from 1.5% to 4%), for personal

TABLE 2 Number and prevalence of patients hospitalised for male breast cancer

	Number of patients hospitalised for male BC	Mean age (years) ± *SD*	Prevalence of patients hospitalised for male BC (per 100,000 adult male inhabitants)	Number of men with surgery for BC	Prevalence of men with surgery for BC (per 100,000 adult male inhabitants)
2009	1,728	67 ± 13	7.5	498	2.2
2010	1,619	68 ± 13	7.0	509	2.2
2011	1,541	67 ± 13	6.6	483	2.1
2012	1,548	68 ± 12	6.6	499	2.1
2013	1,472	68 ± 12	6.3	482	2.1

Abbreviations: BC, breast cancer; *SD*, standard deviation.

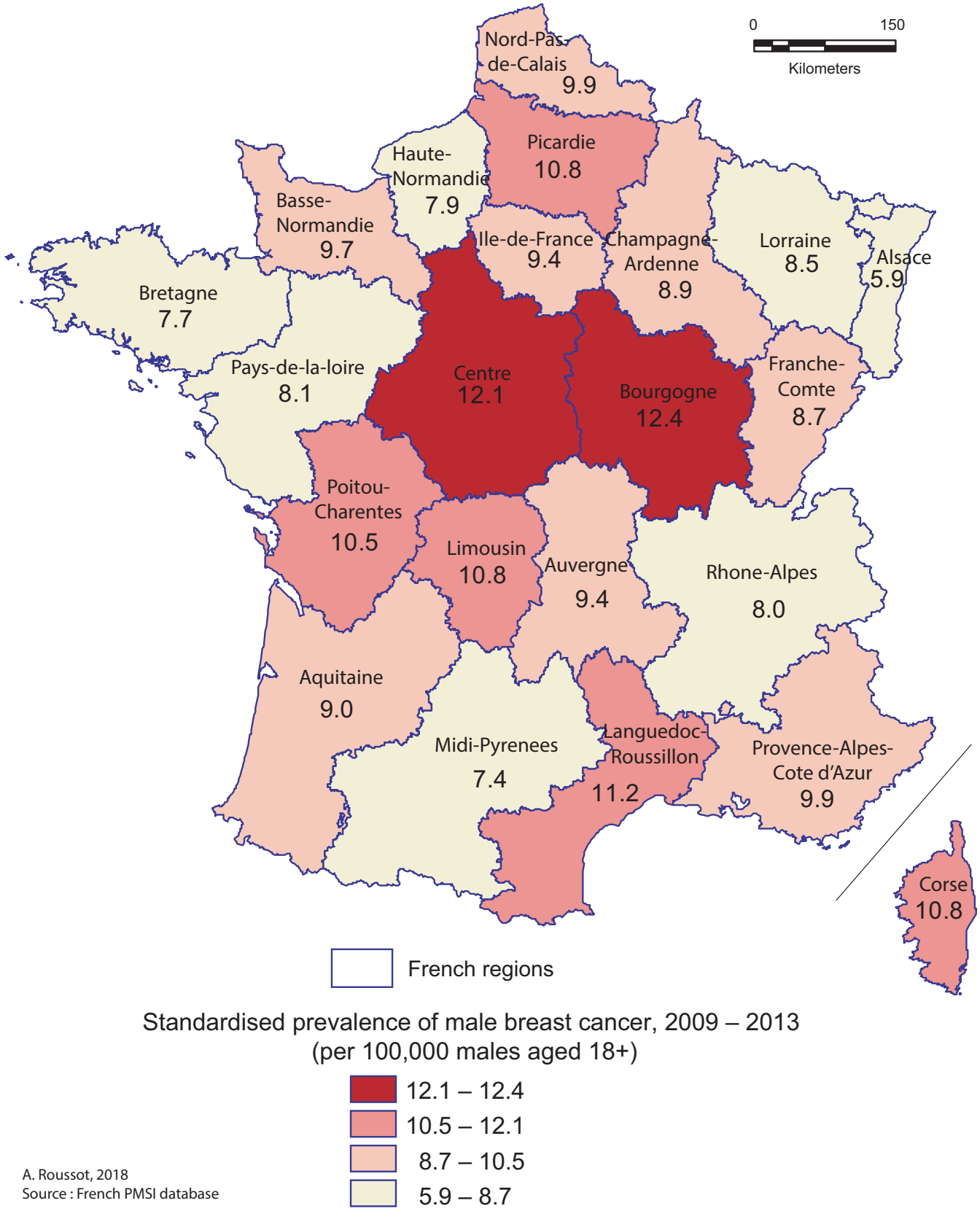

FIGURE 1 Prevalence of male breast cancer hospitalised in French regions, 2009–2013

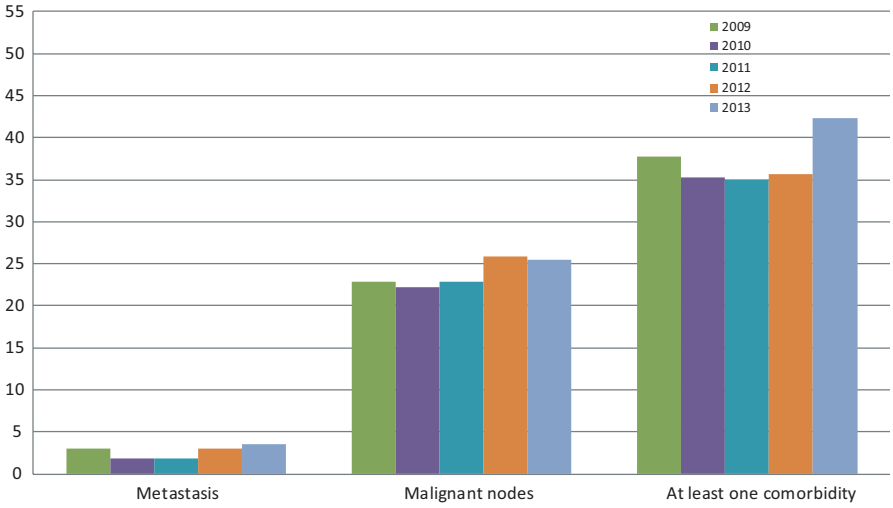

FIGURE 2 Percentages of morbidities and comorbidities during the surgery stay (N = 2,471); This figure describes the changes over the 5-year period of the study of metastasis, malignant nodes and at least one comorbidity (diabetes or obesity or hypertensive diseases or metabolic disorders) in men during the surgery stay for breast cancer in France between 2009 and 2013

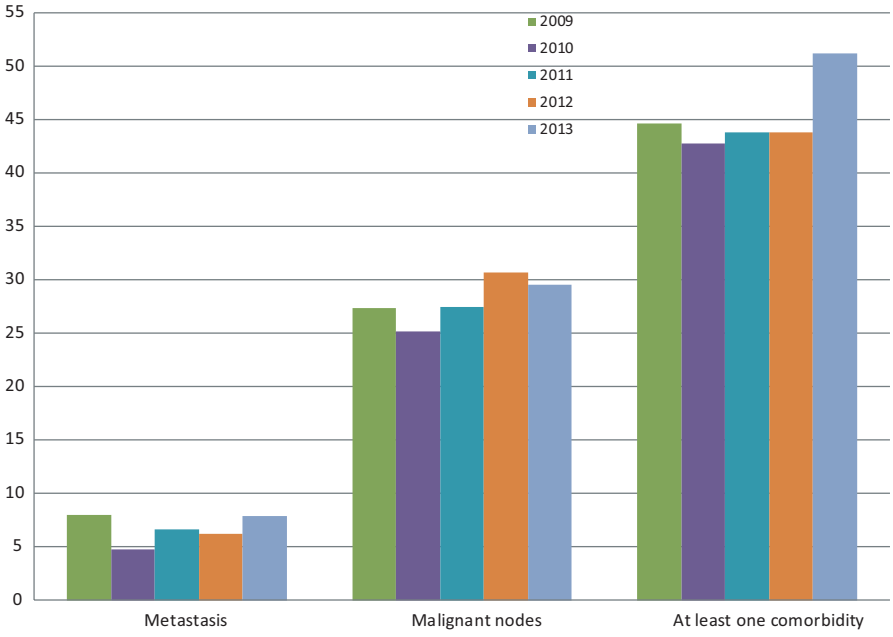

FIGURE 3 Percentages of morbidities and comorbidities at 1 year after the surgery (N = 2,468); after the exclusion of three patients who died during surgery, this figure describes the changes over the 5-year period of the study of metastasis, malignant nodes and at least one comorbidity (diabetes or obesity or hypertensive diseases or metabolic disorders) in men at 1 year after the surgery for breast cancer in France between 2009 and 2013

histories of cancer (ranging from 1.5% to 4%) or for each comorbidity taken separately.

One year after surgery, in male patients with breast cancer, the presence of metastasis ranged from 4% to 8%, more than 25% had malignant nodes, more than 40% had at least one comorbidity, and 40% had chemotherapy. Once again, there were no statistically significant time trends for malignant nodes (from 27.3% in 2009 to 29.5% in 2013) and metastasis (from 8% in 2009 to 7.9% in 2013). However, there was a significant trend for at least one comorbidity (from 44.6% in 2009 to 51.2% in 2013, p = 0.04; Figure 3). No statistically significant trends were found for family histories of cancer (ranging from 2% to 4.5%), for personal histories of cancer (ranging from 6% to 9%) or for each comorbidity taken separately even though the increase for obesity was close to significance (from 7.8% in 2009 to 9.8% in 2013, p = 0.06) and for metabolic disorders (from 13.1% in 2009 to 17.2% in 2013, p = 0.06).

Finally, between the surgery stay and 1 year after, we found that the prevalence of metastasis and personal histories of cancer almost doubled and that prevalence of at least one comorbidity was a fifth more.

4 | DISCUSSION

In this study, we estimated the prevalence of patients hospitalised for male breast cancer in France over 5 years. To our knowledge, this is the first study to provide such data.

Our results showed that the prevalence of hospitalisation for male breast cancer in France significantly decreased from 7.5 per 100,000 adult male inhabitants in 2009 to 6.3 per 100,000 adult male inhabitants in 2013.

In our study, it could be surprising to observe a decrease in the prevalence of patients hospitalised for male breast cancer as

previous data showed an increase in incidence rates using population-based data (Dabakuyo-Yonli et al., 2013).

This decrease in prevalence could be due to higher mortality in this population. Indeed, our previous work (Dabakuyo et al., 2012) showed that survival in one French region (Côte d'Or) did not seem to improve over time: 5-year survival rates were 73%, 70% and 62% for 1982–1990, 1991–1999 and 2000–2008 respectively (Dabakuyo et al., 2012). However, this study was set up in a small area of France and survival is subject to geographical variability. A study conducted in France and based on the data of all French cancer registries has reported an increase in the incidence of breast cancer in men in French with mortality rates in men which remained stable from 1980 to 2012 (Dabakuyo-Yonli et al., 2013). This stability in mortality rates were also seen over the last decade in the UK from 2003–2005 to 2012–2014 () while an increase in survival rates was seen from 1970 to 2007 in Denmark, Finland, Geneva, Norway, Singapore and Sweden (Miao et al., 2011), as well as in the last 30 years in the United States (Otto, 2011).

Another explanation to the decrease in the prevalence of patients hospitalised for male breast cancer could be an increase in ambulatory treatments (Curigliano et al., 2015; Martin, Pourtau, Palma, & Delaloge, 2016) or to shorter in-hospital treatments without hospitalisation. This trend was now seen in other cancers as observed by the French National Cancer Institute in its annual report. Indeed, in their 2014 report on oral chemotherapy, the French National Cancer Institute has reported an increase in cancer patients taking oral therapies. They also showed an increase in per os treatments available since 2005 and between 2010 and 2015 in particular.

Regarding comorbidities, the prevalence of obesity, diabetes and hypertension increased in France from 2009 to 2013 in the general population of men (Eschwege, Basdevant, Crine, Moisan, & Charles, 2015; Inserm, Khantar Health, Roche 2012; Julia & Hercberg, 2016; Mandereau-Bruno, Denis, Fagot-Campagna, & Fosse-Edorh, 2014). This could explain the increase in the number of men with at least one comorbidity between 2009 and 2013 during the surgery stay and at 1 year after surgery. The number of metastases increased between the surgery and the follow-up at 1 year due to the occurrence of metastasis during follow-up in the natural history of the disease. At 1 year, the BC may have become a history and coded as such, thus explaining the increase in personal cancer history between the two points.

Concerning treatments, neoadjuvant therapy is recommended only in cases of large or inflammatory invasive BC and after the advice of a multidisciplinary meeting. It remains rare, thus explaining the low number of chemotherapies at the time of surgery (HAS, INCa., 2010). However, adjuvant chemotherapy (i.e., after surgery) is recommended in cases of invasive BC, which explains the high number of patients treated with chemotherapy at 1 year. Moreover, our rate of chemotherapy is consistent with the study of Sineshaw et al. who found a rate of adjuvant chemotherapy in older men (≥65 years) of about 40% (Sineshaw, Freedman, Ward, Flanders, & Jemal, 2015).

4.1 | Limitations

One limitation of this study is that we could not include post-mastectomy radiation therapy in our data seeing as radiation procedures are not recorded in French private hospitals.

Given the reliance on ICD-10 codes for the selection of patients and the ascertainment of outcomes, there was a potential for misclassification-related or under-detection-related bias, especially for comorbidities (Goldberg, Jougla, Fassa, Padieu, & Quantin, 2012; Setoguchi et al., 2007). Coding practices may vary among institutions as the people who perform the coding of diagnoses can be clinicians or information system technicians. Nevertheless, coding quality is checked in a standardised manner by medical information professionals in each hospital to correct diagnoses and improve the level of comorbidity recording (internal quality assessment). Concerning metastases, it has been shown that the algorithm for detecting bone metastases in claims data had high sensitivity and a high PPV for breast cancer patients (Sathiakumar et al., 2016).

One could question the use of hospital data to identify all cases of BC. However, it seems unlikely that patients were not hospitalised at least once for the initial management. Moreover, as cancer is included in the long-term conditions (ALD), hospitalisations for BC are fully reimbursed by French national healthcare insurance. It also seems unlikely that breast cancer was not recorded in the PMSI data as BC is a severe medical condition, which is difficult to ignore when summarising a patient's history. Coding for BC has an impact on the hospital budget allocation, meaning that hospital claims data should be accurate on this point. There could be, of course, a documentation bias. However, this documentation bias should have decreased with time. In fact, in France, an improvement in the collection of discharge abstracts has been observed since 2008 when the Ministry of Health decided to implement a 100% DRG-based reimbursement (for each DRG, the hospital tariff is only based on this system). Due to the impact on hospital budget allocation, it has been shown that hospital claims data are increasingly accurate. Moreover, an external national quality assessment program was implemented in order to check the quality of discharge abstracts in each hospital. Furthermore, we conducted a validation study in different areas, using breast cancer registries as a reference. This study showed good results for prevalent cases (Quantin et al., 2012).

Finally, considering that endocrine therapy is the mainstay treatment for breast cancer in men, it would be relevant to have information on this type of treatment. However, this information is not available in PMSI data. Further studies are needed to explore this treatment.

4.2 | Strengths

The principal strength of this study lies in the ability of the French PMSI database to capture rare events (Boudemaghe & Belhadj, 2017), such as male BC, and is related to the large size of our sample,

with national recruitment, which allowed us to provide data on prevalence.

Men with surgery for BC could generally be associated with new cases of male BC. Our number of men with surgery for BC (about 500 years) is similar to the estimation given by French agencies. Indeed, about 50,000 new cases are identified by year for BC for whom 1% concerns men (Binder-Foucard et al., 2013).

5 | CONCLUSIONS

In conclusion, this study is the first one to analyse the prevalence of patients hospitalised for male breast cancer and its changes over time in the whole population of a country. Our study provides data on the prevalence, as well as the clinical characteristics and treatments of male BC in France.

Like many other rare diseases, male BC is a little-studied disease. The rarity of the disease makes it difficult to conduct randomised clinical trials. Other studies are needed to know this disease better, especially since its incidence is increasing.

ACKNOWLEDGMENTS

We would like to thank G. Periard for her help concerning the layout and the management of this article and P. Bastable for his thorough proofreading.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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How to cite this article: Cottenet J, Dabakuyo-Yonli TS, Mariet A-S, Roussot A, Arveux P, Quantin C. Prevalence of patients hospitalised for male breast cancer in France using the French nationwide hospital administrative database. *Eur J Cancer Care*. 2019;28:e13117. https://doi.org/10.1111/ecc.13117