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Variation in rates of breast cancer surgery: A national analysis based on French Hospital Episode Statistics

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Abstract

Aims: Minimum volume thresholds were introduced in France in 2008 to improve the quality of cancer care. We investigated whether/how the quality of treatment decisions in breast cancer surgery had evolved before and after this policy was implemented.
Methods: We used Hospital Episode Statistics for all women having undergone breast conserving surgery (BCS) or mastectomy in France in 2005 and 2012. Three surgical procedures considered as better treatment options were analyzed: BCS, immediate breast reconstruction (IBR) and sentinel lymph node biopsy (SLNB). We studied the mean rates and variation according to the hospital profile and volume.
Results: Between 2005 and 2012, the volume of breast cancer surgery increased by 11% whereas one third of the hospitals no longer performed this type of surgery. In 2012, the mean rate of BCS was 74% and similar in all hospitals whatever the volume. Conversely, IBR and SLNB rates were much higher in cancer centers (CC) and regional teaching hospitals (RTH) [IBR: 19% and 14% versus 8% on average; SLNB: 61% and 47% versus 39% on average]; the greater the hospital volume, the higher the IBR and SLNB rates ($p < 0.0001$). Overall, whatever the surgical procedure considered, inter-hospital variation in rates declined substantially in CC and RTH.
Conclusions: We identified considerable variation in IBR and SLNB rates between French hospitals. Although more complex and less standardized than BCS, most clinical guidelines recommended these procedures. This apparent heterogeneity suggests unequal access to high-quality procedures for women with breast cancer.

Keywords: Breast neoplasms; Surgical procedures; Hospital Episode Statistics

Introduction

In 2012, approximately 50 000 women were diagnosed with breast cancer in France and most of them underwent surgery. Through early detection and improved treatments, breast conserving surgery (BCS) is possible for most primary tumors [Clough et al.,[1] Stang et al.[2]]. The surgical management of breast cancer comprises several steps: the initial excision, lymph node exploration and breast reconstruction. Several studies have shown that variations in practice between hospitals are not only driven by patient characteristics which suggests heterogeneity in the quality of care across institutions [Greenberg et al.,[3] Jeevan et al.,[4] Van Steenbergen et al.,[5] Zhong et al.[6]]. Furthermore, a growing body of evidence shows that breast cancer surgery outcomes are better in high-volume hospitals [Guller at al.,[7] Roohan et al.[8]].

In 2008, the Ministry of Health and the French Cancer Institute introduced minimum activity thresholds for cancer-related procedures to improve the quality of care. A volume threshold for breast cancer surgery was set at a

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minimum of 30 surgical procedures per year. So far, no studies have assessed the impact of this policy on the quality of care.

The aim of this study was to examine whether the threshold policy affected the quality of surgical treatment decisions for patients diagnosed with early breast cancer in French hospitals. We studied how the rates of appropriate surgical procedures (considered as quality of care benchmarks) evolved between 2005 and 2012.

Methods

Data source

We used patient-level data from the French Hospital Episode Statistics Database (*Programme de Medicalisation des Systemes d'Information*) for 2005 and 2012. This administrative database used for activity-based payment contains all hospital stays in all acute care hospitals. The information available for each stay comprises: patient age, sex, primary and secondary diagnosis (ICD-10 codes), procedures (French classification procedure codes) and diagnosis-related group (DRG) codes. Another administrative database *Statistique Annuelle des Établissements de Santé* and the French National Cancer Institute website were used to identify hospital characteristics.

French hospital sector

The French hospital sector is characterized by a multiplicity of providers with public, private not-for-profit and private for-profit hospitals and cancer centers. Cancer centers (n = 20) are relatively small-sized entities highly specialized in cancer-related procedures including chemotherapy and radiation therapy. These 20 cancer centers are homogeneously distributed throughout the country and are reference centers for complex cases as well as regional teaching hospitals (public hospitals). Half of the breast cancer surgical interventions are performed in private for-profit hospitals.

Patient population

We extracted the hospital stays of all women diagnosed with invasive breast carcinoma (ICD-10: C50) or breast carcinoma *in situ* (ICD-10: D05) who underwent breast cancer surgery either in 2005 or 2012. Surgical treatment was identified with diagnosis-related group (DRG) and procedure codes. Hospitals with fewer than five stays for breast cancer surgery were excluded in order to avoid overdispersion due to outliers.

Surgical procedures as benchmarks of quality care

The decision concerning the type of surgery for early breast cancer considered as sensitive to "practice style" can be influenced by subjective factors related to the attitude of individual surgeons or hospitals [Wennberg,[9]Lee et al.[10]]. Systematic variation in surgery rates raised questions about the quality of treatment decisions. Our approach consisted in selecting a limited number of recommended procedures, in order to compute and compare hospital rates over time. The choice of these procedures was based on the literature and on whether the corresponding codes existed in the hospital databases. We selected three surgical procedures: breast conserving surgery (BCS), immediate breast reconstruction (IBR) after mastectomy and the sentinel lymph node biopsy (SLNB). The variability in these procedures, considered as good practices, was previously studied in other countries according to hospital, regional and patient characteristics [Jeevan et al.,[4] Van Steenbergen et al.,[5] Zhong et al.,[6] Fisher et al.,[11] Jagsi et al.,[12] Katz et al.,[13] Ess et al.,[14] Nattinger et al.,[15] Farrow et al.,[16] Morrow et al.,[17] Joslyn et al.[18]].

BCS is performed at the discretion of the surgeon, according to oncological and anatomic considerations [Clough et al.[1]]. The main decision making factors are the tumor-to-breast volume ratio, but also multicentricity together with biological tumor and axillary node findings. Despite recommendations in favor of BCS, the rates of mastectomy and partial mastectomy have been shown to vary widely by region, age and race [Raine et al.[19]; Albain et al.[20]]. The SLNB is recommended for tumors measuring less than 5 cm without clinical and ultrasound suspicion of nodal metastasis because it is a less invasive technique [Lyman et al.[21]]. IBR is ideally indicated in intraductal carcinoma and small multifocal invasive cancer with negative axillary nodes not requiring adjuvant treatment (radiotherapy, chemotherapy). However, indications can be influenced by "practice style", team habits or organizational factors such as the availability of plastic surgeons in the institution.

Data analysis

BCS and SLNB rates were derived as a percentage of all women who underwent BCS or a mastectomy excluding patients who had a surgical procedure other than BCS or a mastectomy during the years of the analysis (mainly delayed breast reconstructions). For the SLNB rate, we also excluded patients with a carcinoma *in situ* because the systematic use of SLNB for patients with a carcinoma *in situ* may not be warranted [Francis et al.[22]]. For the BCS rate, some patients could have undergone both BCS and a mastectomy. As we were interested in all the BCS procedures performed in each hospital, if a patient successively underwent BCS and a mastectomy, she was counted in both the denominator and the numerator. The IBR rate was calculated as the percentage of women who underwent a mastectomy. As some patients might have gone to several hospitals; they were counted in the rate of each hospital if such was the case. To determine whether this had an